



Original Research Article

Assessment of Nutritional Status of Alzheimer Patients in Riyadh, Saudi Arabia

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ABSTRACT

Alzheimer's is a progressive disease that destroys brain cells causing memory loss and behavioral problems that are severe enough to affect an individual's life. An Alzheimer patient has difficulty in recognizing family members and friends, misplacing things and even forgetting to eat and drink water. This leads us to believe that Alzheimer's patients may often suffer from malnutrition. Malnutrition can have a serious impact on the symptoms of dementia and general well-being. Sufficient data assessing the relationship between nutritional status and Alzheimer's diseases is not available, especially for people living the Middle East. Therefore, the aims of this study was to assess the nutritional status of a small number of Alzheimer's patients living in Saudi Arabia and evaluate the risk of malnutrition associated with this disease.

A small sample of Saudi citizens aged 60 or above affected with Alzheimer's disease (n=63) for a year or more, were randomly chosen and interviewed to check their nutritional status. If the patients' cognitive status did not permit them to participate, the surrogates (patient's caretaker) were interviewed instead.

All Alzheimer's patients who participated in the study were found to be malnourished or at risk of malnutrition since their diet was not being taken care of properly which could lead to further deterioration of the patients health.

Keywords: Alzheimer patients, Malnutrition, nutritional status

INTRODUCTION

Alzheimer's disease (AD) is a condition where brain cells gradually deteriorate and eventually die. This causes a decline in memory and mental function. It's the most common cause of dementia.

⁽¹⁾Alzheimer's disease International estimated that there were 35.6 million people living with dementia worldwide in 2010, which will increase to 65.7 million by

2030 and 115.4 million by 2050. ⁽²⁾ The world Alzheimer report conducted a systemic review of the global prevalence of dementia, identifying 147 studies in 21 Global Burden of Disease (GBD) world regions. ⁽²⁾ Unfortunately, data on the prevalence of Alzheimer in the Middle East, particularly in Saudi Arabia is unavailable.

Studies have identified factors that appear to play a part in the development of

AD, but no ultimate causes have been found. Age and genetics are the two major risk factors for this disease. Most individuals who suffer from this disease are 65 years or older. The likelihood of developing Alzheimer's disease doubles every five years after the age of 65. ⁽³⁾ Some studies have also proved that if Alzheimer's disease is present in one sibling, there is a 2% risk; and if present in one sibling and one parent, the risk increases to 4%; ultimately, with every family member diagnosed with AD, the percentage of risk increases.

Aging is the major risk factor of AD in the general population. Recent research has identified 2 potential mechanisms related to aging that may contribute to the development of the disease. One is the concept that free radicals (reactive oxygen species) produced during cellular respiration may play an important role in the process of aging and in the development of AD. ⁽¹⁾

To slow down the progression of AD, it is important to recognize the symptoms early because it improves the chances of delaying the progress of Alzheimer's stages and maintains the patient at a particular stage, therefore preventing it from deterioration. Weight loss and malnutrition have been mentioned to have serious complications of Alzheimer's disease. ⁽⁴⁾ Alzheimer's disease patients living at home with a caregiver are frequently at risk of under-nutrition. Undernourished patients seem to present more rapid aggravation of the disease. ⁽⁵⁾ Furthermore, a significant decline in mental functions was discovered in AD patients also suffering from malnutrition and despite the normal voluntary energy intake, AD patients were still undernourished. However, the study confirmed that nutritional support significantly slowed the deterioration of the mental function of AD patient, as well as other complications. Hence, it was concluded that dietary counseling and

nutritional support in patients with AD are clinically important and reduce the impairment of mental function. ⁽⁶⁾

Nutrition and a healthy lifestyle play an important role in the prevention of AD as proven by many studies. Different diets have shown to have different effect on the patients with AD. Some foods increase the severity of the disease while others have shown to decrease it. Foods like fish, fruits, vegetables, nuts, or even Indian spices have been verified to decrease the risk of AD up to 45%. ⁽⁷⁾ A study demonstrated that patients without the genetic pattern associated with Alzheimer's disease, eating fish once a week had decreased risk of both dementia and Alzheimer's disease and a diet rich in fruits and vegetables lowers the risk for those with genetic predisposition. ⁽⁷⁾ Fish consumption, monounsaturated fatty acids and polyunsaturated fatty acids (PUFA; in particular, n-3 PUFA) have shown reduced risk of cognitive decline and dementia whereas, poorer cognitive function and an increased risk of vascular dementia were found to be associated with a lower consumption of milk or dairy products. ⁽⁸⁾ Deficiencies of some micronutrients (especially vitamins B1, B2, B6, B12, C, folate and more recently Vitamin D) have been found to be significantly associated with cognitive impairment in elderly people. ^(9, 10) Mediterranean diet combines several foods, micro- and macro-nutrients that have been recognized as having potential protective factors against dementia and Pre dementia Syndromes. ⁽¹¹⁾ Alcohol drinkers and drug abusers have been linked to increased cognitive decline. ⁽¹²⁾ Recently, it was observed that adherence to a Mediterranean-type diet was linked to decreased cognitive decline. Results have shown the nutritional aggravation to be strongly linked to behavioral disorders aggravation. ⁽¹³⁾

If an Alzheimer's patient suffers from malnutrition that may cause his condition to worsen at an earlier stage leading to early hospitalization that otherwise could be avoided. Early hospitalizations and the need for supplementations and formulas to correct malnutrition could be expensive and hard to obtain for some families, especially those with a low income. Moreover, the nutritional support needed for malnutrition may not always be available in some middle and low-income countries and could put more responsibilities on the patient's caregiver. (14)

Weight loss is usually observed in patients with Alzheimer's disease as seen in clinics and reported in the literature. Nevertheless, the reasons are not clear. Alzheimer's may cause appetite control systems in the brain to malfunction as nerve cells in those areas deteriorate, resulting in extreme eating behaviors. Patients can also lose weight because of decreased ability to prepare meals, in the case where a caregiver is not available. Other problems experienced by patients are tooth and dental problems, and poor vision, which contribute to diminished nutrients intake. (14)

Information on the evaluation of nutritional status and its impact on the prognosis of AD are still scarce. The aim of this study is to assess the nutritional status of Alzheimer's patients living in Saudi Arabia and evaluate the risk of malnutrition associated with the disease which could lead to deterioration in their health. Therefore, this study also aims to examine the dietary habits of these patients to find what is causing them to have such poor nutritional status.

SUBJECTS AND METHODS

Subjects

A sample of Saudi citizens aged 60 or above affected with Alzheimer's disease

(n =63) for a year or more, were interviewed to check their nutritional status. Patients were chosen in a randomized manner from King Khalid University Hospital and Prince Sultan Medical Military City Hospital over a period of two months. If the patients' cognitive status did not permit him /her to participate, the surrogates (patient's caretaker) were interviewed instead. Exclusion criteria were for patients with severe cognitive impairment and with no caretaker. Institutional guidelines for patient care and privacy were followed. The Institutional Research Advisory Committee of College of Applied Medical Sciences approved the protocol.

Anthropometric Measurements

Anthropometric variables included body weight and height measurements, which were estimated or taken from the patients file. Body weight was measured to the nearest 100 g using calibrated portable scales. Measurements were done with minimal clothing and without shoes. Height was measured to the nearest centimeter using a calibrated measuring rod while the subject is in a full standing position without shoes. Body mass index (BMI) was calculated as the ratio of weight in kilograms by the height squared in meters. Dietary Habits were examined with the use of carefully constructed questionnaires.

Furthermore, the Mini Nutritional Assessment (MNA) was used. The MNA is a quick method for assessing the nutrition state of elderly people. It uses 18 simple criteria and can be completed in 15 minutes or less. It has been validated in three successive studies of more than 600 elderly subjects for whom nutrition status varied from good to poor. The MNA is composed of two scores: a screening score that can evaluate the possibility of malnutrition in 3 minutes (MNA screening score ≥ 12 denotes good nutrition status; MNA screening score < 12 indicates possible malnutrition) and a

malnutrition indicator score, a more complete assessment that can be performed in approximately 10 minutes (MNA score \leq 23.5 indicates risk of malnutrition; MNA score \leq 17 denotes malnutrition).

Statistical Analysis

Data was collected, tabulated and analyzed using the Excel statistical software. The frequency and percentage of responses to different parameters were also calculated.

RESULTS

Figure 1 shows that 61.9% of Alzheimer’s patients were malnourished,

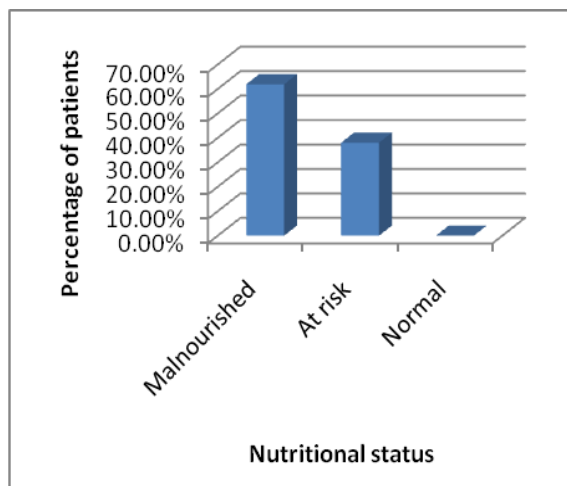


Figure 1. Nutritional status of Alzheimer’s patients (n=63).

while 38% were at risk. None of the patients presented normal nutritional status.

Alzheimer’s patients who are underweight were divided equally among the severe and mild groups of psychological problems. Patients with normal BMI was highest (38%) for having severe psychological problems, 4.7% had mild and no psychological problems, and 28.5% overweight and obese patients presented the highest percentage for mild psychological problems, 9.5% for severe psychological problems and 4.7% for no psychological problems as seen in Table 1 and Figure 2.

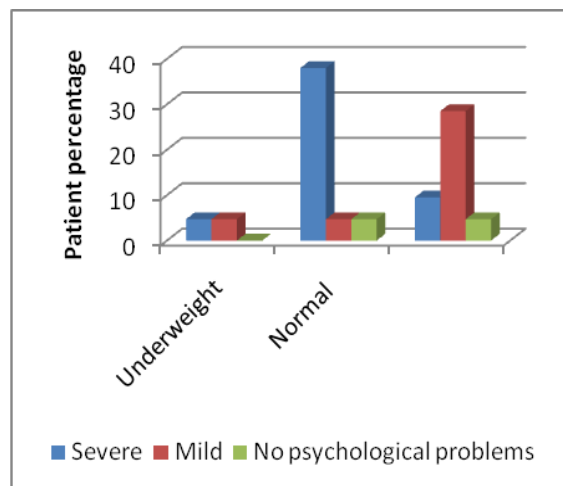


Figure 2. Relationship between BMI and severity of psychological problems in Alzheimer’s patients.

Table 1. Relationship between BMI and Severity of Psychological Problems

BMI	Psychological problems		
	No psychological problems	Mild dementia	Severe dementia/ Depression
Underweight	4.7%	38%	9.5%
Normal	4.7%	4.7%	28.5%
Overweight/ Obese	0%	4.7%	4.7%

Alzheimer’s patients who consumed breakfast daily were highest at 61.9%. Those who consumed breakfast most of the time was lowest (4.7%) whereas 19% consumed breakfast sometimes and 14.2% skipped breakfast always as seen in figure 3.

The diet consumed by the patients is shown in Table 2. Weekly consumption of vegetables and those who were malnourished had a percentage of 30.7%. The patients who were at risk of malnutrition and malnourishment consumed

vegetables less than once per month were 12.5% and 15.3% respectively. Alzheimer patients, who were at risk of malnutrition, presented an equal percentage for consuming fruits daily and weekly. However, malnourished patients were divided among the four groups (daily, weekly, 1/month and less than 1/month) with percentages of 30.1%, 38.4%, 15.3%, and 15.3% respectively. Weekly consumption of red meat among patients who were at risk of malnutrition and malnourished was highest at 62.5% and 46% respectively. At risk patients had an equal percentage of 12.5% among the groups who consumed meat daily, once per month and less than once per month. While 23% and 12% malnourished patients had meat daily and once per month and for less than once

per month. Twenty five percent subjects who were at risk of malnutrition consumed poultry daily and once per month, while 50% had a weekly intake. Among the malnourished patients, 23% consumed poultry daily while 69.2% took poultry weekly and 7.6% had it less than once per month. Approximately 38% Alzheimer patients at risk of malnutrition consumed fish weekly as well as for less than once per month. Twenty five percent consumed fish once per month whereas among malnourished patients, 46%, 30.7% and 23% consumed fish less than once per month, once per month and weekly respectively. Dairy consumption among the patients was highest for patients at risk of malnutrition and malnourished.

Table 2: Results of intake of various nutrients on the nutritional status of Alzheimer's patients

Vegetables intake	Daily	Weekly	1/ Month	< 1/Month
Normal	0%	0%	0%	0%
At risk of malnutrition	53.8%	30.7%	0%	15.3%
Malnourished	62.5%	25%	0%	12.5%
Fruit intake				
Normal	0%	0%	0%	0%
At risk of malnutrition	50%	50%	0%	0%
Malnourished	30.7%	38.4%	15.3%	15.3%
Red meat intake				
Normal	0%	0%	0%	0%
At risk of malnutrition	12.5%	62.5%	12.5%	12.5%
Malnourished	23%	46%	23%	7.6%
Poultry intake				
Normal	0%	0%	0%	0%
At risk malnutrition	25%	50%	25%	0%
Malnourished	23%	69.2%	0%	7.6%
Fish intake				
Normal	0%	0%	0%	0%
At risk of malnutrition	0%	37.5%	25%	37.5%
Malnourished	0%	23%	30.7%	46%
Dairy products intake				
Normal	0%	0%	0%	0%
At risk of malnutrition	75%	0%	12.5%	12.5%
Malnourished	69.2%	23%	7.6%	0%

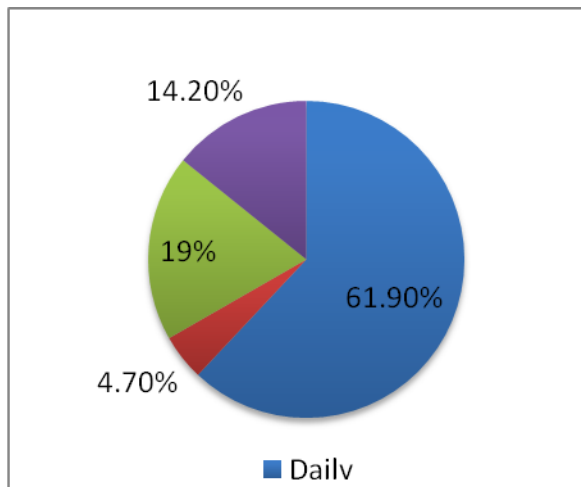


Figure 3. Consumption of breakfast among Alzheimer's patients.

DISCUSSION

The risk of Alzheimer's disease could decrease by a healthy lifestyle and a healthy diet but no special diet is required for people with Alzheimer's disease unless they have another condition, such as high blood pressure or diabetes that may require a particular diet but still eating a well-balanced, nutritious diet is extremely beneficial for their health.⁽¹⁵⁾ An example of such a diet includes, eating a balanced diet with variety of foods from each food group, limiting foods that are high in saturated fat, cholesterol, sodium and sugar, eating the right amount of servings from each food group, and finally maintaining a healthy body weight.

Our results showed that all Alzheimer patients were either at risk of malnutrition or being malnourished, with none having normal nutrition status. Approximately 62% of the patients were malnourished while 38% were at risk of malnutrition. This proves that there is a high prevalence of malnutrition among Alzheimer's disease patients. This data supports several studies that have been done before in other countries, but none were done in Saudi Arabia.

When examining the diets of the subjects, we compared it to what is considered an optimal diet to achieve normal nutritional status for the elderly, since there are no special recommendations for Alzheimer patients.

The results showed that the relationship between BMI and severity of psychological problems in Alzheimer's patients was divided equally among the severe and mild groups of psychological problems. Thirty eight percent patients with normal BMI had severe psychological problems, while 4.7% each had mild or no psychological problems. Overweight and obese patients presented the highest percent (28.5%) for mild psychological problems, followed by 9.4% had severe psychological problems and 4.7% had no psychological problems. A study published by the journal Neurology found that older people in the earliest stages of Alzheimer's disease are more likely to have lower BMI.⁽¹⁶⁾ It could be concluded that patients with low BMI are most likely to be still in the early stages of Alzheimer's, having mild or no psychological problems at all. However, the results showed that patients with low BMI were equally divided between mild and severe psychological problems. That could be explained by misidentification of the severity of Alzheimer's disease by the surrogate source when answering the survey. Breakfast skipping has become norm and is not given much importance to even by the caretakers. This habit could further deteriorate the health of the patients.

Good nutrition in the elderly acts as protection against chronic diseases. Nutrients consumed in adequate amounts, supports the body in adaptive processes that become defective over time. Good nutrition is an important element of the lifestyle that can become a protective factor, promoting successful aging. It has been shown that the

aging period can be delayed by regulation of the way of life, proper diet, and physical and mental abilities maintenance. An individual's nutrition has to supply them with all the food ingredients, which are indispensable to proper functioning. In the last years the crucial role of the inflammatory process and oxidative stress in patho-mechanism of many chronic, non-infectious metabolic diseases, such as Alzheimer's disease, was documented. (17) Many studies proved that vegetable consumption is a preventive factor for AD. Nonetheless, our results showed that nearly half of the Alzheimer's patients who were at risk and were malnourished had a daily consumption of vegetables (62.5% and 53.8% respectively). It could be because that vegetables consumption alone cannot prevent a patient from being malnourished or of being at a risk. Even though, vegetables consumption plays a big role in the nutritional status of a normal person, it becomes less effective after being diagnosed with AD. (18) Despite the fact that vegetable consumption doesn't have a major influence in improving the nutritional status of AD patients, it still can worsen the condition if consumed in very low amounts.

Fruit consumption among Alzheimer's patients varied notably among patients who are at risk of malnutrition and those who are malnourished. The recommended intake of fruits is about 400 g per day according to the WHO/FAO. However, 50% of patients who are at risk of malnutrition and 38.4% of patients who are malnourished consumed fruits weekly and not daily. Moreover, 30.6% of malnourished patients consumed fruits either 1/month or less than 1/month. This low intake of fruits, below the recommended amount, could surely lead to vitamins and minerals deficiency which could also be a contributing factor to the poor nutritional status of these patients. Nonetheless, even

though patients could have consumed fruits daily, further investigation should be made to assess the number of servings consumed and also the type of fruits and the nutrients they are rich in. This will help give a better understanding of the patients' diets for future studies.

Our study also shows that half of the Alzheimer's patients who are at risk of malnutrition consumed poultry weekly while the other half consumed it daily which shows an overall high intake of poultry in that group of patients. Malnourished Alzheimer's patients also showed an overall high intake level of poultry divided among four groups (daily, weekly, 1/month and less than 1/month) with the majority eating daily and weekly while only 30% consumed once a month or lesser. Epidemiological evidence links diet as one of the most important modifiable environmental factors, leading to the risk of Alzheimer's disease increasing rapidly. However, current literature regarding the impact of individual nutrients or food items on Alzheimer's disease risk is inconsistent, partly because humans eat meals with complex combinations of nutrients or food items that are likely to be synergistic.

A study conducted, showed that diets consisting of higher intakes of salad dressing, nuts, fish, tomatoes, poultry, cruciferous vegetables, fruits and dark and green leafy vegetables, and a lower intake of high-fat dairy products, red meat, offal and butter, represented a diet rich in omega-3 polyunsaturated fatty acids, omega-6 polyunsaturated fatty acids, vitamin E and folate and with lower levels of SFA and vitamin B12. (17) People who showed the greatest adherence to this dietary pattern were 38% less likely to develop Alzheimer's disease than those who had the least adherence to this pattern. The combination of these nutrients reflects multiple pathways in the development of Alzheimer's disease.

For example, vitamin B12 and folate are homocysteine-related vitamins that may have an impact on Alzheimer's disease via their ability of reducing circulating homocysteine levels, vitamin E might prevent Alzheimer's disease via its strong antioxidant effect and fatty acids may be related to dementia and cognitive function through atherosclerosis, thrombosis or inflammation via an effect on brain development and membrane functioning or via accumulation of beta-amyloid. ⁽¹⁸⁾

Fish and other seafood are the major sources of healthful long-chain omega-3 fats and are also rich in other nutrients such as vitamin D and selenium, high in protein, and low in saturated fat. The American Heart Association recommends eating fish at least two times per week as part of a healthy diet. Long-chain omega-3 fatty acids, such as docosahexaenoic acid (DHA), are essential polyunsaturated fatty acids (PUFAs). Long-chain omega-3 fatty acids are important building blocks for neuronal cell membranes, and they have key roles in brain development, neurotransmission and modulation of ion channels, as well as possessing neuro-protective properties. ⁽¹⁹⁾ In our study, fish was consumed less than once per month by 46% of Alzheimer's patients who are malnourished, followed by 30.7% who consume fish once per month and 23% patients who consume fish weekly. This shows that fish consumption was lower than the recommended amounts by the American Heart Association, which is at least 2 times per week. Low consumption of fish could be one of the contributing factors to the poor nutritional status of Alzheimer's disease patients, and could also be a possible cause for further deterioration in their condition.

Several studies have been made about the benefits of omega-3 fatty acids in relation to Alzheimer's disease and its use as possible treatment, however the studies showed conflicting results and further

investigation regarding possible beneficial effects is needed. Studies should also be made regarding potential benefits of omega-3 fatty acids in correction of nutritional status and alleviation or reduction of AD symptoms and severity.

Furthermore, poorer cognitive function and an increased risk of vascular dementia (VaD) were found to be associated with a lower consumption of milk or dairy products (18). Our results showed that the daily intake group had the highest percent of 75% and 69.2% for patients at risk of malnutrition and malnourished respectively. A study done on 2000 elderly living in New York reported by The Times proved that consumption of high fat milk and milk products daily could increase the risk of developing Alzheimer's disease. ⁽²⁰⁾ This means that patients who consumed dairy products daily were at risk of malnutrition, leading to a bigger possibility of malnutrition and therefore conducting to a higher risk of developing Alzheimer's disease. Patients who consumed dairy products in lower amounts were still malnourished or at risk for malnutrition this could be because the consumption was much less than the RDA recommendations, as is expected that with very low dairy consumption will result in poor nutritional status.

This study proves that there is a high prevalence of malnutrition among Alzheimer's disease patients. This data supports several studies that have been done before in other countries, but none were done in Saudi Arabia.

CONCLUSION

In conclusion, all Alzheimer patients examined did have malnutrition or were at risk of malnutrition. All the dietary habits studied, ranging from fruits and vegetables consumption of meat, dairy, and fish are assumed to affect the patients' nutritional

status, in a positive or negative way as discussed, and proved by several researches mentioned. All the Alzheimer patients with poor nutritional status had some flaws where dietary habits were concerned, and that the overall intake of different nutrients affects the diet as a whole. However, the study lacked some specificities concerning some of the dietary intakes, such as the content of fat in the dairy and meat products consumed. In addition, types and servings of fruits and vegetables needed to be identified. Further studies need to be done on a larger number of Alzheimer patients to come to a more conclusive result.

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