



Comparison between Complementary Dietary Treatment of Alzheimer Disease in Iranian Traditional Medicine and Modern Medicine

Mohammad Mahdi AHMADIAN-ATTARI¹, Mahmoud MOSADDEGH^{1,2}, Anooshiravan KAZEMNEJAD³, *Ahmad Ali NOORBALA⁴

1. Dept. of Traditional Pharmacy, School of Traditional Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2. Traditional Medicine and Material Medical Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3. Dept. of Biostatistics, School of Medical Sciences, Tarbiat Modares University, Tehran, Iran
4. Psychosomatic Ward Imam Khomeini Hospital, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding Author: Email: noorbala@tums.ac.ir

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Abstract

Background: Dietary notifications have been introduced recently for Alzheimer Disease (AD). In Iranian old medical manuscripts, there are some nutritional recommendations related to *Nesyjan* (AD equivalent). The aim of this article was to compare dietary recommendations of Iranian traditional medicine (ITM) with novel medical outcomes.

Methods: 1) Searching for dietary recommendations and abstinences described in ITM credible manuscripts; 2) Extracting fatty components of ITM diet according to the database of the Department of Agriculture of the USA; 3) Statistical analysis of fatty elements of traditionally recommended foods via Mann-Whitney Test in comparison with elements of the abstinent ones; 4) Searching for AD dietary recommendations and abstinences which currently published in medical journals; 5) Comparing traditional and new dietary suggestions with each other.

Results: 1) Traditionally recommended foods are fatter than abstinent ones ($P < 0.001$). There are meaningful differences between unsaturated fatty acids (UFAs) ($P < 0.001$), saturated fatty acids ($P < 0.001$), and cholesterol ($P < 0.05$) of recommended foods and abstinent ones. 2) Traditionally recommended diet is also fatter than the abstinent diet (4.5 times); UFAs of the recommended diet is 11 times more than that of the abstinent one; it is the same story for cholesterol (1.4 times); 3) Recent studies show that diets with high amounts of UFAs have positive effects on AD; a considerable number of papers emphasizes on probable positive role of cholesterol on AD; 4) Traditional recommended diet is in agreement with recent studies.

Conclusion: ITM recommended diet which is full of unsaturated fatty acids and cholesterol can be utilized for complementary treatment of AD.

Keywords: Alzheimer disease, Traditional Medicine, Diet therapy, Fatty acids, Cholesterol

Introduction

Alzheimer's disease (AD) is a progressive and the most prominent old-age debilitating disease which had a notable epidemic growth in recent years. According to statistical analyses, it is estimated that the number of people suffering from AD will double every twenty years; and by 2050, the num-

ber of sufferers from AD in the world would reach 115 million (1, 2). Its prevalence is directly related to the age. In 2011, one-eighth of people aged 65 and older and half of people aged 85 and older were diagnosed with AD, approximately; its death toll from 2000 to 2008 has increased by

66% (3). The costs for this disease are so high that one percent of global GDP is spent on AD's consequences (4). Diagnosed patient with AD usually dies after 5 to 7 years (2).

In Iranian Traditional Medicine (ITM) manuscripts, diseases in which forgetfulness is the main symptom are categorized under *Nesyān* label. In ITM manuscripts, one of the types of *Nesyān* which originates from coldness and dryness of the brain has the same symptoms as AD. Forgetting recent events and remembering old happenings, cognitive disturbance, problems in constant talking (language disability), and insomnia are of its most important signs (5, 6) which are similar to AD's according to NINCDS-ADRDA criterion (7). ITM takes nourishment as one of the six pillars of health (8, 9); therefore, ITM manuscripts have dedicated a considerable part of their content to nutritional recommendations. In the first volume of Canon of Medicine, Avicenna (970- 1051 A.D.), the great Persian scholar, described those in detail (10). He urged elderly people not to take foods producing black bile (*Sowdā*) such as lentil, eggplant, beef, dried meat, and salted foods; and phlegmatic foods such as fish, watermelon, melon, and cucumber. On the other hand, taking milk, *Shirberenj* (An Iranian dish consists of milk, rice, sugar, and rosewater), honey milk, and milk with ginger are recommended. Dried fig is also advised to be taken (11).

Apart from preventive recommendations, nutritional therapeutic recommendations are included to boost medication and shorten illness-period; and *Nesyān* is no exception. Muhammad ibn Zakariyā Rāzī (Rhazes) (865- 925 A.D.), another great Persian scholar, in his book "*Al-Hawi*" recommended to have poultry (such as chicken, dull-yellow partridge, hoopoe, pheasant, and sparrow meat), their brains, and yolks for people affected to *Nesyān*. At the same time the patients were prohibited from having beef, mutton, goat meat, camel meat, and rabbit meat because they produce black bile; and fish as well for producing phlegm (*Balgham*). Moreover, having nuts such as almond, hazelnut, coconut, and walnut were recommended (12). It is worth mentioning that

some other Persian scholars such as Aghili Korasani and Chishti had the same idea as Rhazes (5, 6). There have been remarkable either observational or experimental studies on the role of diet and nutrients in prevention and treatment of dementia, especially AD. Studies on effects of different kinds of fat such as saturated fatty-acids (SFA), unsaturated fatty-acids (UFA), and cholesterol on AD have been conducted recently. Unsaturated fatty-acids and cholesterol play an important role in the brain; 60 percent of dry weight of the brain is consisted of fat which 20% of it is of unsaturated fatty-acids (13). Although the brain is only 2% of the total body mass, it carries 25% of cholesterol of the whole body (14). In the light of the fact that most of the brain is consisted of fat and it uses nutrients as other organs, types and amounts of fat consumption could be vitally important in the brain's health.

Studying multi-nutrient diets (instead of one or more nutrients) has a notable importance. One of the multi-nutrient diets which have been frequently studied is the Mediterranean diet (Table 1) (15). Studies have shown that it has preventive effect on AD (16, 17). Taking types of fat into consideration, this diet has a great deal of UFAs and lesser amounts of SFAs and cholesterol. UFAs positive impact has been reported in several other researches (18). While the results of studies on therapeutic role of UFAs (especially omega-3) on AD are controversial (19, 20), UFAs are related to AD. Multi-nutrient diets like the Mediterranean diet which contains high levels of UFAs have abated the incidence of AD (16, 17); the abatement is 13% according to Sofi et al. study on the relationship between the Mediterranean diet and health status in 2008 (17). About cholesterol, it plays a vital role in cell membranes, yet its functions in neurons are more prominent. Cholesterol is amassed within lipid rafts in the neuronal cell membrane and is involved in the formation and maintenance of synaptic connections (21). Several studies on the effect of cholesterol on AD had ambiguous results.

According to the importance of diets –especially fats- in AD, this study attempted to analyze the fat content of ITM recommended diet for *Nesyān*

(ITM equivalent of Alzheimer's disease). Since traditional physicians used to recommend distinctive diets based on their own clinical experiences,

analyzing these diets would eventuate in new nutritional regimen to improve AD sufferers' quality of life.

Table 1: Mediterranean diet as a modern nutritional recommendation for some diseases including Alzheimer's disease

Food	Contribution in diet	Major fat components
Cereals	High	--
Fish	High	Unsaturated fatty acids, cholesterol
Fruits	High	--
Olive oil	High	Unsaturated fatty acids
Legumes	High	--
Tree nuts	High	Unsaturated fatty acids
Vegetables	High	--
Cheese	Moderate	Saturated fatty acids, cholesterol
Wine	Moderate	--
White meat	Moderate	Saturated fatty acids, Unsaturated fatty acids, cholesterol
Yogurt	Moderate	Saturated fatty acids, cholesterol
Milk	Low	Saturated fatty acids, cholesterol
Red meat	Low	Saturated fatty acids, Unsaturated fatty acids, cholesterol

Methods

In order to study the traditional recommended diet for *Nesyān*, ITM prominent books including *Al-Hawi* (Rhazes, 10th century), *Canon of Medicine* (Avicenna, 11th century), *Zakhire-ye-Khawrazmshahi* (Jorjani, 12th century), *Kholasat-ul-Hekma* (AqiliKhorasani, 18th century), and *Exir-e-Azgam* (Chishti, 19th century) were searched for recommended and abstinent foods and diets traditionally prescribed for patients afflicted by senescence and/ or *Nesyān* (5, 8, 11, 12, 22).

To quantify the results, the content of fatty components of each food (including polyunsaturated (PUFA), monounsaturated (MUFA), and saturated fatty acids (SFA) and also cholesterol) were extracted from the database of the Department of Agriculture of the USA (USDA) (23). The content of fatty elements per 100 gr of each recommended food was compared with that of the abstinent's and statistically analyzed by Mann-Whitney Test via SPSS (version 16). A $P < 0.05$ was considered significant. About the diet, the sum of the nutrients of recommended and abstinent diets for daily consumption was also measured.

AD dietary recommendations and abstinences which currently published in medical journals were also searched via Scopus. Finally, traditional and new dietary suggestions were compared with each other and the results presented as tables and figures.

Results

The results show that the recommended foods (presented in the first column of Table 2) are fattier than the abstinent ones (presented in the first column of Table 3) ($P < 0.001$). There are also meaningful differences between unsaturated fatty acids ($P < 0.001$), saturated fatty acids ($P < 0.001$), and cholesterol ($P < 0.05$) of recommended foods and abstinent foods (Fig.1). These foods form recommended and abstinent diets for *Nesyān*. This recommended diet is fattier than the abstinent diet (4.5 times) (see the last row of Table 2 and 3); polyunsaturated fatty acids of recommended diet is 11 times more than that of the abstinent one. It is the same story for monounsaturated fatty acids and cholesterol (11 and 1.4 times more than abstinent diet, respectively) (Fig.2).

The results of searching Scopus database show that recent studies emphasize on diets with high amounts of unsaturated fatty acids for AD sufferers.

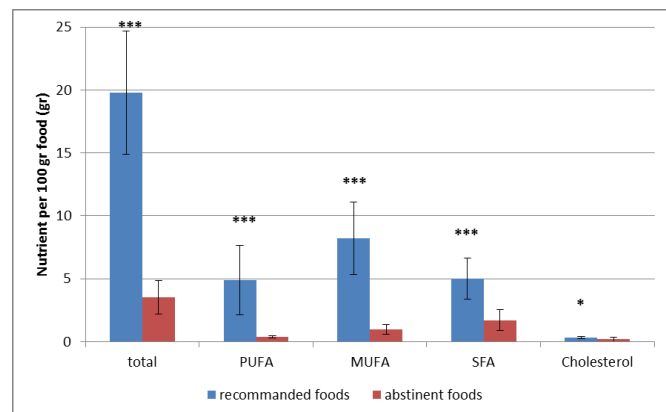


Fig.1: Fatty components in 100 gr of each food traditionally recommended or forbidden for people afflicted by *Neyyan*. *** $P < 0.001$; * $P < 0.05$. Error bars indicate SEM

A considerable number of papers –but not all of them- emphasizes on probable positive role of cholesterol on AD.

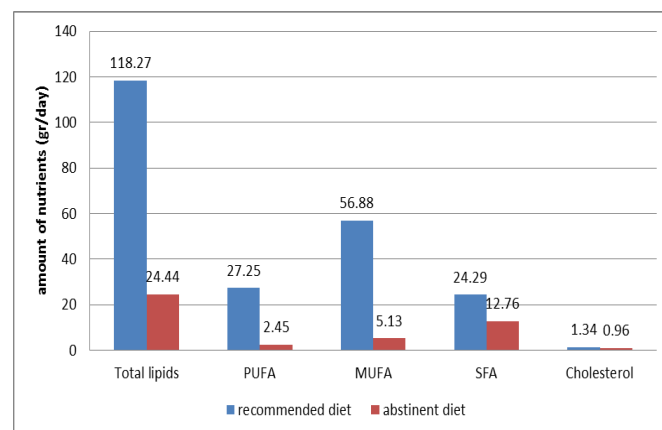


Fig. 2: comparison between nutritional factors of recommended and abstinent diet in *Nesyan*

Table 2: Nutritional factors of daily diet recommended for patients affected with *Neyyan* in Iranian Traditional Medicine. The last row of the table presents the amounts of nutrients in daily recommended diet

Foods*	common/ recommended measures (gr)	Total lipids (gr)	Poly-unsaturated fatty acids (gr)	Mono-unsatu- rated fatty acids (gr)	Saturated fatty acids (gr)	Cho- lesterol (mg)
Chicken, meat, skin, gib- lets and neck	140	20.76	4.466	8.512	5.936	126
Sparrow meat	140	6.7	1.41	2.14	2.57	322
Pheasant meat and skin	140	13	1.652	6.048	3.78	99.4
Domestic lamb meat	85	18.35	1.36	7.48	7.57	57.8
Meats nutrient average for daily consumption		14.7	2.22	6.04	4.96	151.3
Goose egg	1 egg (144 gr)	19.11	2.4	8.27	5.17	1227
Quail egg	15 egg (135 gr)	14.97	1.78	5.83	4.8	1139
Turkey egg	2 egg (158 gr)	18.78	2.6	7.2	5.72	1474
Duck egg	2 eggs (140 gr)	19.28	1.7	9	5.14	1238
Hen egg	4 larg eggs (200 gr)	19.02	2.52	7.31	6.25	744
Eggs Nutrient average for daily consumption		18.2	2.2	7.5	5.4	1164.4
Whole milk	244	7.39	0.475	1.981	4.550	24.4
Coconut meat	14	4.68	0.051	0.2	4.157	0
Walnut	28.35	18.48	13.373	2.532	1.736	0
Hazelnut	65	39.48	5.148	29.673	2.90	0
Sweet almond	28.35	14	3.42	8.757	1.057	0
Seedless raisins	97.5	0.44	0.036	0.049	0.056	0
Dried fig	97.5	0.9	0.336	0.155	0.14	0
Sum		118.27	27.25	56.88	24.295	1340.1

*Nutrients existing in different types of meat and egg are the average amount for daily consumption because all their types are rarely consumed in a meal all together.

Table 3: Nutritional factors of daily diet forbidden for patients affected with *Nesyān* in Iranian Traditional Medicine. The last row of the table presents the amounts of nutrients in daily abstinent diet.

Foods*	Common measures (gr)	Total lipids (gr)	Poly-unsaturated fatty acids (gr)	Mono-unsaturated fatty acids (gr)	Saturated fatty acids (gr)	Cholesterol (mg)
Goat meat	85	1.96	0.17	1.03	0.71	57
Beef	85	2.28	0.108	0.995	1.032	55
Rabbit meat	85	4.71	1.08	1.5	1.66	57
Muttons	85	13.1	0.57	5.53	6.88	78
Average of meats for daily consumption		5.51	0.48	2.26	2.57	61.75
Beef brain	28.3	2.92	0.45	0.53	0.65	853
Feta cheese	28.35	6.03	0.167	1.311	4.237	25.23
Yogurt, plain, whole milk	227	7.37	0.208	2.027	4.757	29.51
Pumpkin	245	0.4	0.147	0.147	0.098	0
Melon	160	0	0	0	0	0
Lettuce	56	0.16	0.089	0.006	0.021	0
Garlic	3	0.015	0.007	0.0003	0.002	0
Onion	14	0.014	0.002	0.001	0.005	0
Cabbage	70	0.07	0.011	0.011	0.023	0
Black beans, mature seeds	194	2.75	1.183	0.239	0.71	0
Kidney beans, mature seeds	184	1.52	0.841	0.118	0.221	0
Cranberry beans, mature seeds	195	2.39	1.028	0.207	0.616	0
Broadbeans, immature seeds	150	0.9	0.46	0.025	0.207	0
Lentils	192	1.05	0.42	0.192	0.1	0
Average of legumes for daily consumption		1.72	0.78	0.15	0.37	0
White mushrooms	70	0.238	0.112	0	0.035	0
Sum		24.44	2.45	5.13	12.76	969.5

*Nutrients existing in different types of meat and legumes are the average amount for daily consumption because all their types are rarely consumed in common measures in a meal all together.

Discussion

Iranian Traditional Medicine has nutritional recommendations to help curing *Nesyān* (AD equivalent in traditional medicine). In this study, evaluating the ingredients of the recommended foods highlights that it is UFAs-rich because of having nuts. Recent studies indicate that UFAs have reductive effect on AD prevalence (16-18). The types of meat in the recommendations are mostly poultry (chicken, pheasant, and sparrow); their remark is their greater amount of cholesterol

compared to the abstinences. Eggs are also responsible for high amounts of cholesterol of recommendations. Some recent studies substantiate that cholesterol is a boost to improve memory function (24, 25). When cholesterol is consumed with UFAs, it will turn into HDL (26, 27). In 2004, Reitz and colleagues have concluded that there is no connection between serum cholesterol level and AD (28). However, some other studies have shown that the higher the serum cholesterol level in the elderly, the better memory functions (24, 25). Some studies also have shown the decline in

serum total cholesterol levels is associated with increased dementia risk (29, 30). Furthermore, in a cohort study conducted on 1130 people (published 2010), Reitz et al. conclude that high HDL levels in elderly individuals may be associated with a decreased rate of AD (31). Prior to Reitz, Singh-Manoux and colleagues (2008) indicated that a low level of HDL could be considered as a risk factor of memory dysfunction (32). Bear in mind, there has been no study on HDL destructive effect on AD, so far (33). Therefore, prescribing more amounts of cholesterol along with UFAs in ITM is in accordance with recent studies.

On the other side, the forbidden foods contain lesser amounts of cholesterol. Recent studies have shown that cholesterol and all of its precursors in cerebrospinal fluid (CSF) and its precursor's lanosterol, lathosterol, and desmosterol in plasma abate in AD sufferers (34, 35). In 2010, Kölsch et al. determined CSF and plasma levels of cholesterol and its precursors in AD diagnosed people compared to those of healthy individuals. The results showed that CSF levels of cholesterol and all of its precursors and also plasma levels of two of the precursors named lanosterol and lathosterol are lower in AD diagnosed people than those of healthy individuals (34). Sato et al. showed in 2012 that plasma levels of desmosterol, another precursor of cholesterol, are also lower in Alzheimer's sufferers than the levels in healthy ones (35). These points highlight that cholesterol synthesis in AD sufferers is discomposed. This casts doubt whether the cholesterol reducing agents have preventive effect on AD or not.

There are some studies highlighting that cholesterol reducing agents such as statins are ineffective on AD incidence (36, 37). In a prospective study conducted by Zandi et al. (2005) on 5000 elderly people in the USA, the relationship between statins consumption and the onset of dementia or AD has been violated (36). Along the lines of Zandi's study, McGuinness and colleagues (2009) co-evaluated two randomized double blind clinical trials containing 26 thousand participants which resulted that there is no relationship between statins consumption and the risk of AD incidence (37). Also, reduction in serum total cholesterol

could be considered as a risk factor of dementia in the elderly (29, 30). All of the above explain why the low cholesterol foods are forbidden in ITM.

There are other ingredients in the abstinences which are not considerable in having fats and cholesterol. Pumpkin, lettuce, melon, garlic, onion, cabbage, beans, Broad beans, and mushroom are of its examples. It seems to be other reasons for their prohibition in *Nesyman*.

Limitations

According to Iranian cuisine in the past, there were foods in ITM that have no place in eating habit nowadays; so there is not much information about them. Hoopoe, lark, dull-yellow partridge meat and their brain are of the examples. Thus, there is no study on them in this approach.

Conclusion

Iranian Traditional Medicine suggests a diet full of nuts, poultry meats and eggs. This diet contains high amounts of unsaturated fatty acids and cholesterol to boost treatment of *Nesyman* (traditional equivalent of Alzheimer disease). According to new scientific findings, this kind of diet could be useful as a complementary therapy of Alzheimer disease.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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