The Egyptian Journal of Hospital Medicine (April 2014) Vol. 55, Page 239–244

Relation between Smoking and Cognition in Egyptian Elderly

Moatassem S Amer *, Sarah A Hamza *, Ekramy E Abd el Rahman*, Heba M Hamed *, Osama K Zaki **, Wessam E Saad *.**

*Geriatrics and Gerontology department, ** Genetics Unit, ***Clinical Pathology department, Faculty of Medicine, Ain shams university, Cairo, Egypt

Correspondance: Heba Mohamed Hamed MSc, Geriatrics and Gerontolgy department, Faculty of Medicine, Ain shams university , Abbasia , Cairo , Egypt.

Abstract

Background: In spite of numerous studies published in the past few years on the topic, the effect of smoking on Alzheimer's disease and dementia remains uncertain. Case–control studies have largely suggested that smoking lowers the risk of AD, whereas prospective studies have shown that smoking increases this risk or has no effect on the probability of developing AD.

Objectives: The aim of this study is to compare the prevalence of Smoking in elderly with cognitive impairment and elderly with non-cognitive impairment.

Design: A Case control study. **Participants**: 88 participants aged 60 years and above. They were selected from Ain Shams University Hospital from inpatient wards and outpatient clinics. The studied sample was divided into 3 groups: Group A (32 elderly patients with Alzheimer's disease), Group B (32 elderly patients with Mild cognitive impairment) and Group C (24 controls with normal cognitive function).

Measurements: Comprehensive geriatric assessment, including detailed history, physical examination, and also cognitive assessment using Montreal Cognitive Assessment (MOCA) and Mini mental status examination (MMSE).

Results: As regards smoking there was a highly statistical significant difference between the 3 groups as non-smokers were more prevalent in Alzheimer's disease and Mild cognitive impairment groups in comparison to control group with (p-value= 0.001).

Conclusion: There was a highly significant negative association between smoking and cognitive impairment.

Keywords: Alzheimer's disease – Mild cognitive impairment – Smoking – Elderly.

Introduction:

Age related cognitive decline affects people's quality of life and their ability to live independently. [1] Alzheimer's disease (AD) is the most common cause of the dementia syndrome in later life and has reached epidemic proportion with the explosive growth of the number of the elderly. [2]

Mild cognitive impairment (MCI), a transitional condition between normal aging and dementia, is characterized by the presence of cognitive dysfunctions in the absence of significant functional loss. [3] Patients with MCI are at higher risk for developing Alzheimer disease (AD) with an estimated conversion rate of 10 to 15% per year. [4]

In spite of numerous studies published in the past few years on the topic, the effect of smoking on Alzheimer's disease and dementia remains uncertain. Case–control studies have largely suggested that smoking lowers the risk of AD, [5, 6] whereas prospective studies have shown that smoking increases this risk or has no effect on the probability of developing AD. [7, 8]

Smoking could affect the risk of AD via several mechanisms. Smoking may increase the generation of free radicals, leading to high oxidative stress, or affect the inflammatory immune system, leading to activation of phagocytes and further oxidative damage. [9] In addition, smoking may promote cerebrovascular disease.

Evidence also exists, however, that smoking can have a protective effect against AD. Nicotine has been suggested to induce an increase in the level of nicotinic acetyl choline receptors, thereby counterbalancing the loss of these receptors, and subsequent cholinergic deficits, observed in AD. [10]

DOI: 10.12816/0004509

Earlier cross-sectional studies often reported a lower prevalence of AD among smokers compared with non-smokers. This seemingly protective effect was probably due to survivor bias since the proportion of smokers among the prevalent cases was smaller. [11]

Methodology:

Study design:

The study is a case control study conducted to compare the prevalence of smoking between elderly with Alzheimer's disease, elderly with MCI and elderly with normal cognitive function (controls).

Sample size: This study involved 88 elderly participants operationally defined as 60 years and above were recruited from the inpatients wards and outpatients clinics of Ain Shams University Hospitals. Elderly subjects were divided into 3 groups each group consisted of:

Group A: thirty two elderly patients with Alzheimer's disease diagnosed according to NINCDS-ADRDA criteria (National Institute of Neurological and Communicable Disease and Stroke / AD and Related Disorders Association criteria)**.** [12]

Group B: thirty two elderly patients with Mild Cognitive Impairment diagnosed by published criteria (**Petersen, 2004)** [13]

Group C (controls): twenty four cognitively normal elderly participants.

Exclusion criteria:

- Subjects excluded from the present study.
- Patients with symptoms or signs of intercurrent infectious conditions such as respiratory tract infection, urinary tract infection or wound infection.
- Patients with recent myocardial infarction, cerebrovascular stroke or other inflammatory conditions (in the past four weeks).
- Patients with depression.
- Patients with marked hearing or visual impairment.

Assessment

After taking informed consent, all groups were subjected to:

Comprehensive geriatric assessment, including complete medical history (especially smoking history). Physical examination, Activities of daily living [14], Instrumental activities of daily living (IADL) assessment [15] Screening for depression using Geriatric depression scale-15 items (GDS-15). [16]

Cognitive assessment

It was done by using: the Arabic version [17] of Montreal Cognitive Assessment (MOCA) which is translation of the original one**.** [18] The MoCA was designed as a rapid screening instrument for mild cognitive dysfunction

Mini mental status examination (MMSE) for assessment of cognitive function [19] Arabic version [20] was used to confirm diagnosis of AD and also for assessment of AD severity.

Statistical methods:

IBM SPSS statistics (V. 21.0, IBM Corp., USA, 2012) was used for the data analysis. Data were expressed as Median & Percentiles for quantitative non-parametric measures for both number and percentage for categorized data.

The following tests were done:

1. Comparison between the two independent groups for non-parametric data using Wilcoxon Rank Sum test.
2. Chi-square test to study the association between each 2 variables or comparison between 2 independent groups as regards to the categorized data.

The probability of error at 0.05 was considered significant, while at 0.01 and 0.001 are highly significant.

Results:

Demographic and descriptive data of the sample of study are shown in tables (1-2). They revealed that females were 51.1%, males 48.9%. Subjects in the AD group were significantly older with mean age of 69.5 than the MCI group and control group with mean age of 64.3 and 65.4 respectively (p-value=0.001) as shown in Table (3).

There was no significant statistical difference found between cases and controls regarding educational level with (p-value=0.7) as shown in table (4).

As regards smoking there was a highly statistical significant difference between the 3 groups as non-smokers were more prevalent in AD and MCI groups in comparison with control group with (p-value= 0.001) as shown in table (5).

The AD group (group A) was more functionally dependent than the other 2 groups (group B,C), and the difference was

statistically highly significant in both ADL (p =0.001) and IADL (p=0.001) tables (6,7).

Discussion:

The current study aimed at compare the prevalence of Smoking in elderly with Alzheimer's disease (AD), Mild cognitive impairment (MCI) and controls. It showed highly significant low prevalence of smoking among patients of both MCI and AD groups in comparison with the control group. This seemingly protective effect may be due to survivor bias since the proportion of smokers among the prevalent cases was smaller.

This result agreed with that population-based cohort of 668 people aged 75-101 years. [21] Smoking was negatively associated with prevalent Alzheimer's disease (adjusted odds ratio = 0.6, 95% confidence interval 0.4-1.1). [21]

A meta-analysis that examined the relationship between smoking and AD while accounting for tobacco-industry affiliation found that the combined results of 18 cross-sectional studies without industry affiliations yielded no association. [22]

In contrast, data from eight cross-sectional studies with tobacco industry affiliations suggested that smoking protected against AD. Analysis of 14 cohort studies without tobacco-industry affiliations yielded a significant increase in the risk of AD in smokers. [10]

On the other hand the relationship between smoking status and incident AD was investigated by Aggarwal *et al* [23] in a random stratified sample of a biracial community in Chicago. Analyses were based on 1,064 persons (of 1,134 evaluated) who had data on smoking status, disease incidence, and key covariates such as apolipoprotein allele status. During a mean of about 4 years of follow-up, 170 persons met criteria for incident AD. Current smoking was associated with increased risk of incident AD (OR = 3.4, 95% CI = 1.4–8.0) compared to persons who never smoked. There was no apparent increase in risk of AD for former smokers compared to persons who never smoked (OR = 0.9, 95% CI = 0.5–1.7). Apolipoprotein E allele status modified this association in that former smokers with an e4 allele were less likely to develop AD (p = 0.04) than those who never smoked. Former smokers also appeared to have a reduced risk of developing AD as their pack-years of smoking increased (p = 0.02). [23]

Meta-analyses of different analytical studies concluded that current smoking was associated with an increased risk of the development of AD**.** This reinforces need for smoking cessation, particularly aged 65 and over. [24]

Another study carried out by Sabia *et al*. examined the association between smoking history and cognitive function in middle age found that smoking was associated with greater risk of poor memory. Middle-aged smokers are more likely to be lost to follow-up by death or through nonparticipation in cognitive tests. Ex-smokers had a lower risk of poor cognition, possibly owing to improvement in other health behaviors. [25]

Acknowledgment

All authors contributed to the work and there are no areas of conflict. There were no sponsors.

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Table (1): Demographic data of the samples as regards gender, education and special habits

			Patient Group			**Total**
			Control group (n=24)	**MCI group (n=32)**	**AD group (n=32)**	
Gender	Female	N.	7	21	17	**45**
		%	29.1%	65.6%	53.1%	**51.1%**
	Male	N.	17	11	15	**43**
		%	70.9%	34.4%	46.9%	**48.9%**
Education	Illiterate	N.	9	12	17	**38**
		%	37.5%	37.5%	53.1%	**43.2%**
	Primary school	N.	10	13	11	**34**
		%	41.6%	40.6%	34.4%	**38.6%**
	Completed	N.	5	7	4	**16**

	high school	%	20.9%	21.9%	12.5%	**18.2%**

Table (2): Descriptive data of the sample as regards chronic diseases.

		Patient Group			**Total**
		Control group (n=24)	**MCI group (n=32)**	**AD group (n=32)**	
DM	N.	8	15	14	**37**
	%	33.3%	46.9%	43.7%	**42.0%**
HTN	N.	7	8	15	**30**
	%	29.2%	25%	46.8%	**34.1%**
IHD	N.	8	11	8	**27**
	%	20.9%	34.4%	25%	**30.6%**
COPD	N.	9	5	4	**18**
	%	37.5%	15.6%	12.5%	**20.5%**
CLD	N.	6	6	2	**14**
	%	25%	18.7%	6.2%	**15.9%**
CKD	N.	3	2	5	**10**
	%	12.5%	6.2%	15.6%	**11.4%**
OA	N.	9	5	3	**17**
	%	25%	15.6%	9.4%	**19.3%**
PU	N.	0	4	1	**5**
	%	0.0%	12.5%	3.1%	**5.9%**

DM (diabetes mellitus) , HTN (hypertension), IHD (ischemic heart disease), COPD(chronic obstructive pulmonary disease), CLD (chronic liver disease), CKD (chronic kidney disease),OA (Osteoarthritis) PU (Peptic ulcer)

Table (3): Comparison between the 3 groups as regards age.

	Patient group	**N**	**Mean**	**SD**	**Min.**	**Max.**	**P-value**	**Sig.**
Age	Controls	24	65.371	4.5574	60	74	0.001	HS
	MCI	32	64.286	3.9747	60	73		
	AD	32	69.543	6.3122	60	87		

Table (4): Comparison between the 3 groups as regards educational level.

			Patient Group			**P-value**	**Sig.**
			Control group (n=24)	**MCI group (n=32)**	**AD group (n=32)**		
Education	Illiterate	N.	9	12	17	0.700	NS
		%	37.5%	37.5%	53.1%		
	primary school	N.	10	13	11		
		%	41.6%	40.6%	34.4%		
	completed high school	N.	5	7	4		

		%	20.9%	21.9%	12.5%		

Table (5): Comparison between the 3 groups as regards smoking.

			Patient Group			P-value	Sig.
			Control group (n=24)	MCI group (n=32)	AD group (n=32)		
special habits	Non-smoker	N.	10	23	27	0.001	HS
		%	41.7%	71.8%	84.3%		
	Smoker	N.	14	9	5		
		%	58.3%	28.1%	15.6%		

Table (6): Comparison between the 3 groups as regards functional status (ADL).

			Patient Group			P-value	Sig.
			Control group (n=24)	MCI group (n=32)	AD group (n=32)		
ADL	Independent	N.	24	28	13	.001	HS
		%	100.0%	87.5%	40.6%		
	Assisted	N.	0	4	15		
		%	0.0%	12.5%	46.8%		
	Dependent	N.	0	0	4		
		%	0.0%	0.0%	12.6%		

ADL (Activities of Daily Living)

Table (7): Comparison between the 3 groups as regards functional status (IADL).

			Patient Group			P-value	Sig.
			Control group (n=35)	MCI group (n=35)	AD group (n=35)		
IADL	Independent	N.	14	17	0	0.001	HS
		%	58.3%	53.1%	0.0%		
	Assisted	N.	10	15	8		
		%	41.7%	46.9%	25%		
	Dependent	N.	0	0	24		
		%	0.0%	0.0%	75%		

IADL (Instrumental Activities of Daily Living)