ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

PREVALENCE OF COGNITIVE IMPAIRMENT AND ITS ASSOCIATION WITH CARDIOVASCULAR RISK FACTORS IN ELDERLY POPULATION

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Manuscript Info

Manuscript History:

Received: 19 October 2015
Final Accepted: 25 November 2015
Published Online: December 2015

Key words:

cognitive impairment, dementia, cardiovascular risk factors

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Abstract

Background: Today with the improved quality of life resulting in longer life span, percentage of elderly in the total population is increasing, raising concern regarding the prevalence of cognitive dysfunction in the future. Though dementia is not treatable in majority of cases, modification of co-morbid medical conditions may influence onset and rate of decline of cognitive functions.

Objective: To determine the prevalence of cognitive impairment in the elderly population and to assess its association with various cardiovascular risk factors.

Methods: Study Design: Cross sectional analytical study. Participants: 400 elderly subjects more than 60 years of age attending OPD or IPD, Sri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Amritsar, were recruited and assessed for cognitive functions by applying Hindi Mental Status Score Examination (HMSE). Relationships between cognitive impairment and various cardiovascular risk factors were determined.

Results: Prevalence of impaired cognitive function (HMSE<26) was 25.3% (101 cases), while that of dementia (HMSE<24) was 3.8% (15 cases) in the elderly population. Impaired cognitive function was higher in those with low education status (p< 0.01). Increasing age (p< 0.01), diabetes (p- 0.028), hypertension (p- 0.011), alcohol intake (p< 0.01), smoking (p< 0.01) and dyslipidemia (p< 0.01) were found to be significantly associated with impaired cognitive score. Prevalence of impaired cognitive function is not significantly affected by gender (p- 0.262) and obesity (p- 0.168). Statistical analysis was done using Chi- square test, univariate analysis and multivariate analysis.

Conclusion: Prevalence of cognitive impairment rises significantly as the age advances and is significantly associated with diabetes, hypertension, dyslipidemia, smoking and alcohol consumption.

INTRODUCTION

The twenty first century is often called the 'century of ageing'. Today with the improved quality of life resulting in longer life span, percentage of elderly in the total population is increasing .[1] With the increasing number of older adults, the problems faced by them are also increasing, among which cognitive impairment is an important one. The

ageing of population worldwide raises concern regarding the prevalence of cognitive dysfunction in the future.[2] Cognitive dysfunction is characterized by impairment of cognition, typically involving memory and at least one other cognitive domain (language, visuospatial and executive function).[3] Proposed risk factors for cognitive impairment include advanced age, previous head injuries, family history of dementia, low education level, female gender, hypertension, diabetes mellitus, dyslipidemias and obesity.[4] These risk factors predispose older adults to brain atrophy, white matter abnormalities, silent cerebral infarction, in addition to the clinical stroke.[5] With the elderly expected to comprise an increasingly larger portion of the world's population, dementia is projected to be one of the major health care problems of coming decades.[6] Although dementia is not treatable in majority of cases, modification of co- morbid medical conditions may influence onset and rate of decline of cognitive functions.[7] The key for managing cognitive impairment and dementia is prevention of their development by addressing various modifiable cardiovascular risk factors. So the current study was undertaken to assess the cognitive functions in the elderly population, to determine the prevalence of cognitive impairment and its association with various cardiovascular risk factors.

Material and Methods

In this cross sectional analytical study, 400 patients > 60 years of age meeting the eligibility criteria, attending OPD or IPD, Sri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Sri Amritsar for routine health check up were enrolled. Cases with clinical cerebrovascular stroke, metabolic encephalopathy (hepatic encephalopathy or uremic encephalopathy), any psychiatric illness, head injury or myxodema were excluded from the study. Informed consent was obtained from all the subjects and the study was approved by the Institutional ethics committee. All the subjects were historically assessed for various cardiovascular risk factors (smoking, alcohol consumption, hypertension, diabetes mellitus, dyslipidemia and obesity). Education status was categorized as iliterate, low education level and high education level. Iliteracy was defined as inability to read local news paper. Participants who left the school before matriculation were classified to have low education status and those who studied above the matriculation were classified to have the high education status.[8] History of smoking and alcohol consumption was noted. Hypertension was defined according to Joint National Committee VII.[9]

Category	**SBP mmHg**		**DBP mmHg**
Normal	<120	and/ or	<80
Prehypertension	120–139	and/ or	80–89
Hypertension, Stage 1	140–159	and/ or	90–99
Hypertension, Stage 2	≥160	and/ or	≥100

Diabetes mellitus was diagnosed on the basis of American Diabetes Association criteria [10]:

1. HBA1C >=6.5% or
2. Fasting plasma glucose greater than 126 mg/dl ; fasting is defined as no calorie intake for atleast 8 hours, or
3. 2-h plasma glucose>=200mg/dL (11.1mmol/L) during an OGTT, or
4. In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose >=200 mg/dL(11.1 mmol/L).

Patient were labeled as having dyslipidemia if: fasting triglyceride >150 mg/dl or HDL cholesterol < 40 mg/dl in men and <50 mg/dl in women, or on specific medication.[11] According to International Diabetes Federation obesity was defined by waist circumference of > 90 cm in men and >80 cm in women.[12] Cognitive score was assessed by applying HMSE (Hindi Mental State Examination) a modified version of MMSE. [13] HMSE is a 30 point scale consisting of several orientation questions. If a subject did not complete a test for any reason the missing score on this test was treated as if an indicator of impairment. Based on their cognitive score, subjects were classified as: Normal > 26 score, Mild Cognitive Impairment (MCI) = 24-25 score and Dementia <_ 23 score. [13] All the subjects who had HMSE < 23 were subjected to brain CT Scan and primary and vascular dementia was differentiated by imaging findings. Cortical and / or subcortical infarctions, confluent white matter changes on imaging defined vascular dementia. The results thus obtained were statistically analyzed using Chi- square test and univariate analysis. Unadjusted odds ratio with 95% confident interval (CI) was calculated and p values were computed. P values <0.05 were considered statistically significant. To determine factors independently associated with cognitive decline, multivariate analysis was carried out by means of multiple logistic regression analysis.

Results

A total of 400 patients of more than 60 years of age were enrolled in the study. Maximum number of the patients (46.3%) was between 61-65 years of age group. Male patients were higher in number (56.3%) as compared to female patients (42.8%). Cognitive impairment was observed in 25.3% of the elderly population (HMSE < 25), with minimal cognitive impairment in 21.5% and dementia in 3.8% patients. Vascular dementia was present in 1.75% and non vascular dementia in 2% patients.

TABLE 1: PREVALENCE OF MINIMAL COGNITIVE IMPAIRMENT (MCI) AND DEMENTIA (BASED ON HMSE SCORE)

HMSE SCORE	NO OF PATIENTS	PERCENTAGE
DEMENTIA (23 OR BELOW)	15	3.8%
MCI (24-25)	86	21.5%
NORMAL (26 OR ABOVE)	299	74.8%
TOTAL	400	100%

In our study, 7% of the patients with age between 61-65 years, 15% with age between 66-70 years, 32.3% between 71-75 years and 78.6% patients >75 years of age were found to have cognitive impairment. Thus suggesting important association between advancing age and cognitive impairment (p value< 0.01). 33.9% of the illiterate patients, 5.1% of the patients with low education status and no patients with high education status was found to have cognitive impairment. Thus revealing important association between illiteracy and cognitive decline (p value< 0.01). Significant correlation was found between smoking and the cognitive decline (p value <0.01). 62.8% of the smoker patients and only 20.7% of the non smoker patients were found to have cognitive impairment. In the study, 39.8% of the patients who consumed alcohol and 21.2% of the patients who do not consumed alcohol had cognitive impairment, signifying significant association between alcohol consumption and cognitive impairment (p value< 0.01). Dyslipidemia also predispose the patients to cognitive impairment with 40.7% of the patients in the study having cognitive impairment compared to only 16% of the patients without dyslipidemia having cognitive impairment (p value <0.01). 22.83% of the hypertensive patients and 4.54% of the non- hypertensive patients had cognitive impairment signifying positive correlation between the two (p value< 0.01). Diabetes mellitus was also found to be an important risk factor for cognitive decline (p value- 0.02 respectively). 28.1% males and 23.1% females had cognitive impairment, showing no significant association between female gender and cognitive impairment (p value- 0.262). Prevalence of cognitive impairment among obese patients was found to be 30.8% and 23.6% in non obese patients signifying no significant correlation between obesity and cognitive impairment (p value- 0.168). Hypertension and smoking were associated with more severe cognitive impairment i.e. dementia (p value- 0.012 and 0.01 respectively). Alcohol consumption, diabetes mellitus, dyslipidemia and obesity were not significantly associated with severity of cognitive impairment (p value- 0.48, 0.055, 0.59, 0.59 respectively).

TABLE 2: ASSOCIATION OF IMPAIRED COGNITIVE SCORE (MMSE<= 25) WITH CARDIOVASCULAR RISK FACTORS (UNIVARIATE ANALYSIS)

VARIABLE		NORMAL COGNITIVE SCORE	IMPAIRED COGNITIVE SCORE	TOTAL	p- VALUES
		N= 299	N= 101	N= 400	
SMOKING	ABSENT	283 (79.3%)	74 (20.7%)	357	OR: 6.454 95% CI: 3.305, 12.602 P <0.01
	PRESENT	16 (37.2%)	27 (62.8%)	43	
ALCOHOL	ABSENT	246 (78.8%)	66 (21.2%)	312	OR: 2.451 95% CI: 1.478, 4.066 P: 0.001
	PRESENT	53 (60.2%)	35 (39.8%)	88	
HTN	ABSENT	174 (79.8%)	44 (20.2%)	218	OR: 1.803 95% CI: 1.143, 2.844 P: 0.011
	PRESENT	125 (68.7%)	57 (31.3%)	182	

DM	ABSENT	188 (78.7%)	51 (21.3%)	239	OR: 1.66 95% CI: 1.053, 2.618 P: 0.029
	PRESENT	111 (68.9%)	50 (31.1%)	161	
DYSLIPIDEMIA	ABSENT	210 (84%)	40 (16%)	250	OR: 3.581 95% CI: 2.239, 5.728 P< 0.01
	PRESENT	89 (59.3%)	61 (40.7%)	150	
OBESITY	ABSENT	236 (76.4%)	73 (23.6%)	309	OR: 1.431 95% CI: 0.853, 2.399 P: 0.174
	PRESENT	63 (69.2%)	28 (30.8%)	91	
TG	NORMAL	212 (80.9%)	50 (19.1%)	262	OR: 2.514 95% CI: 1.582, 3.997 P< 0.01
	INCREASED	86 (62.8%)	51 (37.2%)	137	
HDL	NORMAL	217 (82.8%)	45 (17.2%)	262	OR: 3.293 95% CI: 2.064, 5.256 P< 0.01

In multiple logistic regression analysis smoking, alcohol consumption, hypertension and dyslipidemia were found to be significantly associated with cognitive impairment.

TABLE 3: ASSOCIATION OF IMPAIRED COGNITIVE SCORE WITH CARDIOVASCULAR RISK FACTORS (MULTIVARIATE ANALYSIS)

VARIABLES	p VALUE	OR	95% CI
SMOKING	<0.01	6.271	2.971, 13.234
ALCOHOL	0.011	2.123	1.186, 3.800
HTN	0.020	1.850	1.103, 3.102
DM	0.115	1.515	0.903, 2.539
OBESITY	0.110	1.621	0.896, 2.932
DYSLIPIDEMIA	0.026	6.853	1.252, 37.501
TG	0.065	0.347	0.113, 1.067
HDL	0.625	1.397	0.367, 5.321

DISCUSSION

We found the prevalence of cognitive dysfunction to be 25.3% in the elderly population. The prevalence of minimal cognitive impairment was found to be 21.5% and that of dementia to be 3.8%. In a similar study conducted by MP Holay et al, in Nagpur, cognitive decline was observed in 33.25% of the elderly population, minimal cognitive impairment in 30% and dementia in 3.25% of the population.[14] Similar prevalence of dementia (3.5%) was observed in Shimla, in a study conducted by Deepak Sharma et al.[15] However, the prevalence of cognitive impairment was found to be 8.8% and 43% in studies conducted by Paramita Sengupta et al in Ludhiana and Sushma Tiwari et al in Varanasi respectively.[16, 17] Showing that the prevalence is different in different parts of the country.

There is a negative correlation between age and cognitive score in the present study (p value <0.01), which is well correlating with other studies.[14-17] In our study, statistically significant correlation was not observed between female gender and cognitive decline (p value- 0.262). Other studies also did not find any sex predisposition for cognitive impairment.[14, 15]

Iliteracy and low education status was also found to be associated with impaired cognitive functions (p value <0.01). These two have been linked in various other studies as well.[14-17] Low literacy is often linked to poverty or lower socioeconomic status, which is also associated with poorer health, poorer access to health care and increased risk of cognitive impairment. Some researchers believe that a higher level of education provides a "cognitive reserve" that enables individuals to better compensate for changes in the brain that could result in Alzheimer's or another dementia.[18]

Cognitive impairment was present in 62.8% of the patients with smoking, while only 20.7% non smoker patients were found to have cognitive dysfunction (p value <0.01). Similarly, in a longitudinal study conducted by Alex Dregan et al, smoking was found to be the most consistent vascular risk predictor of cognitive decline. [19] However, this type of association was not observed in other studies.**[14,15]** In the present study significant association was observed between alcohol consumption and the cognitive decline (p value< 0.01). This finding was consistent with association observed by MP Holay et al .[14] Variable results were obtained in other studies.[15,19]

Other cardiovascular risk factors like hypertension, diabetes mellitus, dyslipidemia, hypertriglyceridemia and decreased levels of HDL were found to be significantly associated with cognitive impairment. Controversial data is available regarding association of these risk factors with cognitive decline.[14,17,19,20]

No significant association was found between obesity and cognitive decline. Variable data is available regarding the association from various studies.[14,19,20]

CONCLUSION

Thus it was concluded that the prevalence of cognitive impairment increases as the age advances various cardiovascular risk factors like smoking, alcohol consumption, hypertension, diabetes mellitus and dyslipidemia are significantly associated with cognitive decline in the elderly population. As the dementia is not treatable, managing the above modifiable risk factors will delay the development of dementia and thus help elderly live a meaningful life.

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