Original Article

Hypertension and diabetes as risk factors for dementia: A secondary post-hoc analysis from north-west India

Sunil Kumar Raina, Vishav Chander, Sujeet Raina[1], Dinesh Kumar, Ashoo Grover[2], Ashok Bhardwaj

Departments of Community Medicine and [1]Medicine, Dr. Rajendra Prasad Government Medical College, Tanda, Kangra, Himachal Pradesh, [2]Scientist D, Non-communicable Diseases, Indian Council of Medical Research, India

Abstract

Introduction: A relation between midlife risk factors (hypertension and diabetes) and dementia has been studied in past and an association has been documented, in spite of some studies pointing to the contrary. **Materials and Methods:** The study was based on post-hoc analysis of data obtained from a study conducted on an elderly population (60 years and above) from selected geographical areas (migrant, urban, rural and tribal) of the Himachal Pradesh state in North-West India. **Results:** Analysis of variance revealed an effect of risk factors on cognitive scores; however, post hoc Tukey's honest significant difference (HSD) test revealed that only hypertensives' demonstrated higher chances of scoring lower on cognitive measures. **Discussion:** The possibility that hypertension and diabetes affect dementia needs further evaluation, more so in Indian context.

Key Words

Dementia, diabetes, hypertension, north-west India, post-hoc

For correspondence:
Dr. Sunil Kumar Raina, Department of Community Medicine, Dr. Rajendra Prasad Government Medical College, Tanda, Kangra - 176 001, Himachal Pradesh, India.
E-mail: ojasrainasunil@yahoo.co.in

Ann Indian Acad Neurol 2015;18:63-65

Introduction

It is important to identify early risk factors for dementia as the identification of these risk factors may shed some light on its pathophysiology. The identification of risk factors may also provide some insight into prevention and treatment of dementia. The role of diabetes and hypertension as risk factors for dementia has been gaining attention recently. Studies have found that raised blood pressure precedes the development of Alzheimer's disease. Two such studies-one study conducted in a Swedish population aged 70 years with a follow-up after 9-15 years and the other study in Japanese-American men reporting a mean age of 53 years with a follow-up after 25 years.[1,2] have pointed in this direction. Several longitudinal studies have demonstrated an association between a history of diabetes and cognitive deficits.[3-6] and dementia.[7-10] The finding of an association between diabetes and Alzheimer's disease has been inconsistent. Two reports from the Rotterdam Study showed a relation between diabetes and Alzheimer's disease, with relative risks of 1.3 (95% CI: 1.0, 1.9) and 1.9 (95% CI: 1.3, 2.8).[7,10] One study from Rochester, Minnesota[8] reported a doubling of the risk of Alzheimer's disease among men with diabetes as compared with men without diabetes (relative risk of 2.3).

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Quick Response Code:

Website: www.annalsofian.org

DOI: 10.4103/0972-2327.151045

Materials and Methods

Data for the present study was obtained from a study conducted on an elderly population (60 years and above) from the four geographical areas (migrant, urban, rural and tribal) of Himachal Pradesh state in North-West India. The details have been provided elsewhere.[11] A brief description of the source study is given here:

The researchers studied 500 individuals above 60 years of age were from the four geographical sites (migrant, urban, rural

Table 1: Association between risk factors (diabetes and hypertension) and Cognition using Analysis of variance (ANOVA)

Variance	Sum of squares	Degree of freedom	Mean square	F	Significance
Between groups	71.865	3	23.955		
Within groups	10153.903	1996	5.087	4.709	0.003
Total	10225.768	1999			

Table 2: Association between risk factors (diabetes and hypertension) and Cognition using Tukey HSD test

Disease (I)	Disease (J)	Mean difference (I-J)	Standard error	Significance	95% confidence interval	
					Lower bound	Upper bound
No disease	Diabetes mellitus	−0.134	0.277	0.963	−0.847	0.580
	Hypertension	0.516*	0.142	0.002	0.150	0.881
	Diabetes mellitus & Hypertension	0.222	0.251	0.814	−0.424	0.868
Diabetes mellitus	No disease	0.134	0.277	0.963	−0.580	0.847
	Hypertension	0.650	0.301	0.136	−0.125	1.424
	Diabetes mellitus & Hypertension	0.356	0.365	0.765	−0.584	1.295
Hypertension	No disease	−0.516*	0.142	0.002	−0.881	− 0.150
	Diabetes mellitus	−0.650	0.301	0.136	−1.424	0.125
	Diabetes mellitus & Hypertension	−0.294	0.277	0.713	−1.006	0.418
Diabetes mellitus and Hypertension	No disease	−0.222	0.251	0.814	−0.868	0.424
	Diabetes mellitus	−0.356	0.365	0.765	−1.295	0.584
	Hypertension	0.294	0.277	0.713	−0.418	1.006

*The mean difference is significant at the 0.05 level

and tribal) and involved a detailed socio-demographic profile of the population. The study was a cross-sectional study conducted in two phases; a screening phase and a clinical phase. The screening also involved a detail of the socio-demographic profile of study population.

For the purpose of this post-hoc analysis, the data for all 2000 participants (total sample) available were used. The extraction of data on diabetes, hypertension and dementia was conducted by another public health expert not involved with the primary collection of the data.

Results

Analysis of variance revealed an effect of risk factors (diabetes and hypertension) on cognitive scores ($F = 4.709$, $P = .003$) [Table 1]. A further analysis using post hoc Tukey's honest significant difference (HSD) test revealed an interesting result. Hypertensives demonstrated low scores on cognitive measures. However this result was not true for rest of the risk factors [Table 2].

Discussion

Two previous longitudinal, population based studies have shown an association between raised blood pressure and subsequent Alzheimer's disease.[1,2] These studies, however, suggested that the risk was related to raised diastolic blood pressure rather than raised systolic pressure. The results from our study point to an association between raised blood pressure and dementia, although we could not differentiate on the difference caused by diastolic or systolic blood pressure. Further we were not able to establish a relation between diabetes and dementia. Quite surprisingly the comorbidity of hypertension and diabetes did not seem to increase the chance of dementia. Differences in the study settings and populations could account for the discrepancy between our findings on association of hypertension and diabetes with dementia, in comparison to the findings from other studies in this regard. The present analysis establishes raised blood pressure as a more important predictor of cognitive impairment. This result could affect the design of prevention strategies for dementia with blood pressure management being a possible target for prevention of cognitive decline.

Limitations

A smaller study sample could have limited the interpretation of the results from this study. A larger study sample in the future will be helpful as it will give an accurate representation of the entire population under study. The cross-sectional design of the study may also have limited the interpretation of the results. Future research could conduct a case-control study design to show the strength of association between risk factors and the outcome. Future research in this area can be conducted by replicating the current study with other Indian populations.

Conclusions

The study establishes the role hypertension as risk factor for cognitive impairment. In this way, it opens up areas for further research on understanding role of midlife risk factors (diabetes and hypertension) on dementia.

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How to cite this article: Raina SK, Chander V, Raina S, Kumar D, Grover A, Bhardwaj A. Hypertension and diabetes as risk factors for dementia: A secondary post-hoc analysis from north-west India. Ann Indian Acad Neurol 2015;18:63-5.
Received: 09-08-14, **Revised:** 16-09-14, **Accepted:** 07-10-14

Source of Support: The data for this study has been derived from a study funded by ICMR. Nil, **Conflict of Interest:** None declared.