ALZHEIMER'S DISEASE AND ITS IMPLICATIONS ON COLOR RECOGNITION SYSTEM

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Abstract:

Alzheimer's disease (AD) affects older people's memory, thought and behavior. AD progresses inexorably, causing individuals with the condition to gradually forget knowledge acquired throughout life. The present study is an attempt to document Color recognition deficit found in Kashmiri and Urdu language among female Alzheimer's disease (AD) patients using cross-sectional design. Forty mild–moderate–advanced AD patients and 30 controls matched for age, gender and education completed a simple picture recognition task will be considered for the present study. Cross-sectional comparisons in the present study indicated that mild–moderate AD patients produced more errors in color recognition test than control group. Moreover there is a marginal difference between scores of Color recognition tests obtained from females in both Kashmiri and Urdu language when compared with the control group.

Keywords:

Alzheimer's disease, color recognition, linguistic, cross-section

INTRODUCTION

Dementia of the Alzheimer's type, is a dementia with an insidious onset and gradual progression. Various patterns of deficits are seen, but the disorder begins most commonly with deficits in recent memory, which are followed by aphasia, apraxia, and agnosia after several years. Family history of AD is one of the most strongly supported risk factor and other dementias, which has been associated with AD in large scale of population. Ferini-Strambi L *et al*., 1990;Fratiglioni L *et al*., 1993; Heyman A *et al*., 1984; van Duijn CM *et al*., 1992).Sedentary life style factors such as poor diet, drinking and less exercise are also responsible for the cause of AD.

Daniel Kempler *et al*., (1987) evaluated language ability of 20 patients with probable Alzheimer's disease (AD). The analysis of spontaneous speech revealed a normal range and frequency of syntactic constructions but poor lexical use. It was found that a writing task showed a similar divergence, with the ability to use syntactic cues significantly more intact than the ability to use semantic cues. The results indicated that syntactic ability is selectively preserved in AD.

OBJECTIVE

This paper will attempt to look at the effect of Alzheimer's disease on the patient's concept and perception of Kashmiri and Urdu language's color system and to check whether the disease affects patient's color recognition system or it is independent of the disease.

METHODOLOGY

A random sample of thirty normal people as control group and thirty cases of clinically diagnosed Alzheimer's disease patients are considered for the present study. This paper deals with the analysis of the thirty subjects, who suffered neuro-degeneration to the different parts of the brain and were able to respond to the tests, along with the thirty subjects as normal control group. On the basis of the medical reports, all subjects under study are categorized into three groups: Mild AD, Moderate AD, and Advanced AD. Out of thirty cases, 12 cases were Mild AD cases, 10 were AD Moderate and 8 were Advanced AD patients.

TEST BATTERIES FOR LANGUAGE DEFICIT.

Since the present study is focused on Linguistic Profiling of Alzheimer's disease rather than Dementia, it was decided to perform a simple Kashmiri and Urdu bilingual Test with focus on language deficit in production, comprehension, picture naming and picture recognition abilities in Kashmiri and Urdu language. Phonologically patterned structures was given to both groups. The bilingual phonological test includes 60 pictures (different shades of color) and 2 marks are allotted for each correct response. The present paper is focused on color recognition system in Kashmiri and Urdu Language among female Alzheimer's disease patients.

BAR REPRESENTATION OF ANOMIA TEST RESULTS OF FEMALE AD SUBJECTS

FOCAL COLOR TEST

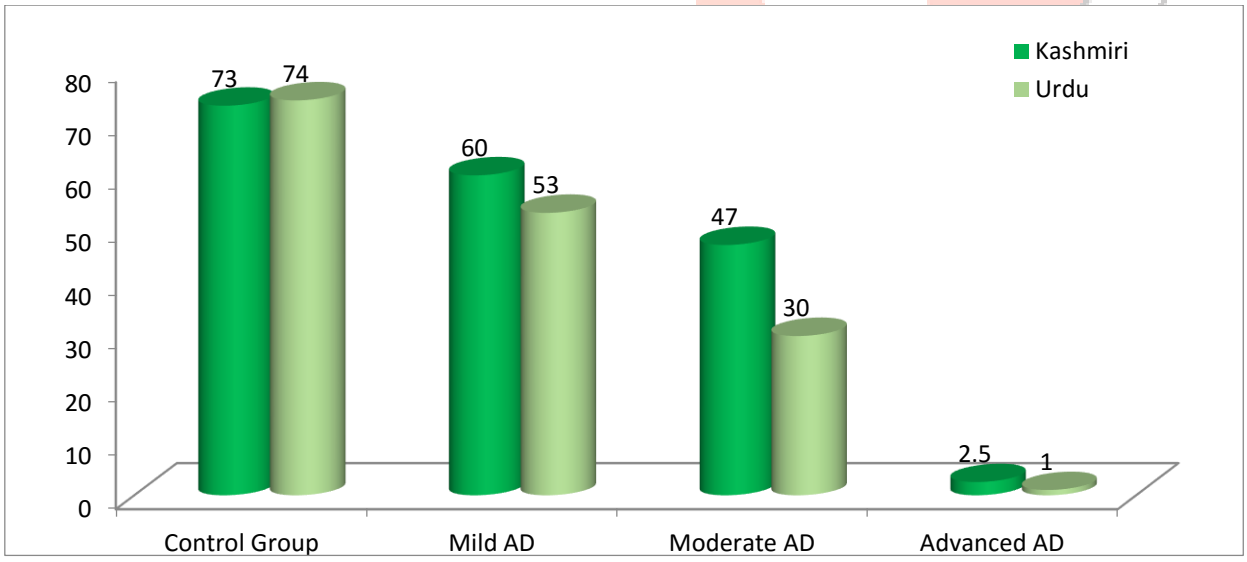

Fig 1: Percent Scores showing Focal Color difficulty among Mild, Moderate and Advanced female AD Patients.

From the bar chart presented above the following tentative conclusions can be drawn-

1. As compared to Control Group, Mild AD subjects show better performance than the other two groups (Moderate Alzheimer's disease and Advanced Alzheimer's disease) in both Kashmiri and Urdu Focal color test.
2. Mild AD group shows a deficit of 13% and 21% in Kashmiri and Urdu Focal color test respectively. Moreover, Mild AD subjects show better performance in Kashmiri Focal color test (60%) as compared to Urdu Anomia test (53%) with a minimum deficit of 8%.

3. As compared with the Mild AD group, Moderate AD group shows a deficit of 13% in Kashmiri Focal color test and 23% in Urdu Focal color test and around 26% and 44% in Kashmiri Focal color test and Urdu Focal color test respectively while comparing with the performance of Normal Control Group.

4. As compared to Normal Control Group, Advanced AD group shows maximum deficit of 70.5% in Kashmiri Focal color test and almost 74% in Urdu Focal color test. The Advanced AD group has disoriented sense of color perception. The scores generally corresponds to the severity of cases.

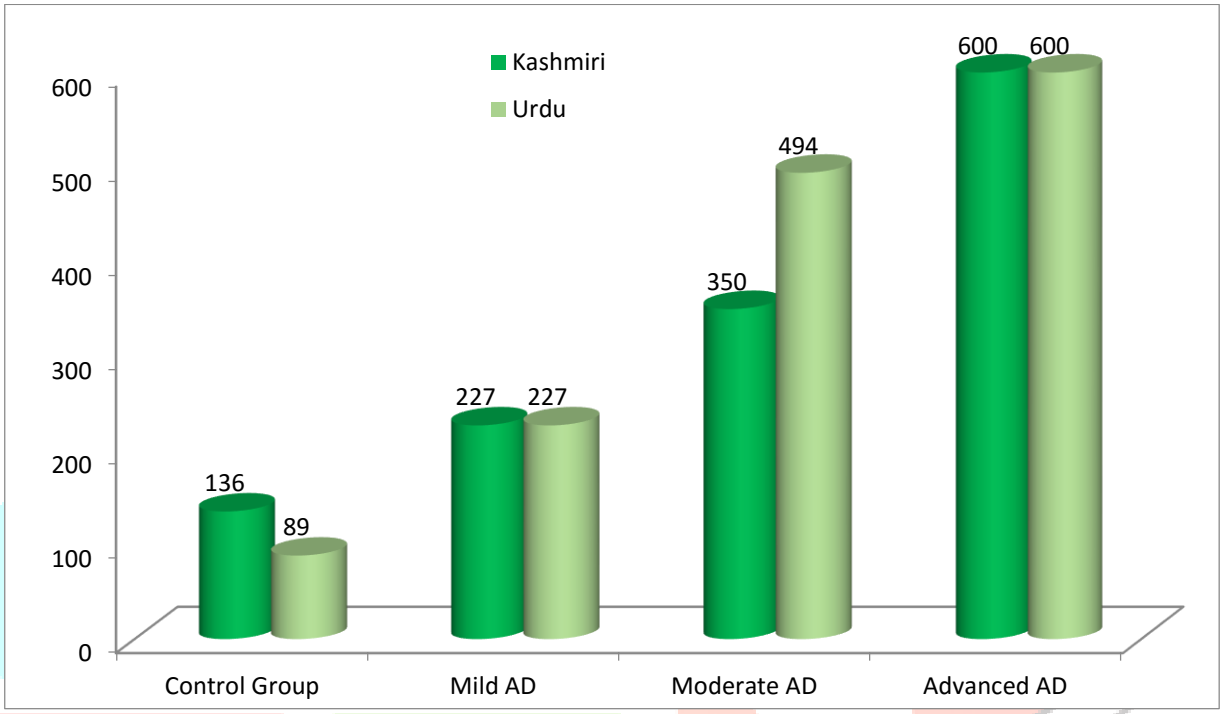

Fig 2: Average Time taken by Mild, Moderate and Advanced female AD Patients in case of Focal Color Test.

From the bar chart presented above the following tentative conclusions can be drawn-

1. The span of the time increases as we move from Control group to Advanced AD subjects.
2. The time taken generally corresponds to the severity of cases. Lesser the severity lesser is the time taken and more the severity more is the time taken.

STATISTICAL PROCEDURE

Out of various softwares available for the statistical analysis, SPSS (Statistical software for social sciences) is used for the statistical analysis of data. For the data analysis in present study, SPSS used. The statistical technique namely Distance Correlation is used to determine the association between the variables in the form of distances, more the distance far the variables are from each other and vice versa.

DISCUSSION ON DISTANCE CORRELATION RESULTS

The distance correlation displays Bar graphs based on Case summaries and Proximity matrix of Anomia Test:

THE SPSS OUTPUT FOR DISTANCE CORRELATION AMONG FEMALE MILD, MODERATE AND ADVANCED AD GROUPS AND DISCUSSION ON CORRELATION RESULTS.

Proximity matrix and Case Summaries showing Distance Correlation in Case of Kashmiri Focal Color Test

Table 1:

Case Summaries

	Control Group	Mild AD	Moderate AD	Advanced AD
Mean	43.7667	36.1667	28.1875	1.5
Std. Deviation	1.64606	3.20156	4.51139	1.64317
Time	135	226	349	600

Table 1 indicates that the average score taken by a Control Group in Kashmiri Focal color test is 43.7 while as score taken by the Subjects in Mild, Moderate and Advanced Stage are 36, 28 and 1.5 respectively, also the time taken by a Control Group in this test is 135 seconds while as time taken by Subjects in Mild, Moderate and Advanced Stages are 226, 349 and 600 seconds respectively.

Table 2

Proximity Matrix

	Euclidean Distance			
	Control Group	Mild AD	Moderate AD	Advanced AD
Control Group	0	20.304	43.826	105.891
Mild AD	20.304	0	24.97	87.603
Moderate AD	43.826	24.97	0	63.453
Advanced AD	105.891	87.603	63.453	0

Table 2 is called a Proximity matrix/Distance Matrix/ Dissimilarity Matrix which is used to predict the differences in the variables, more value between the variables corresponds to the severity of the case. Whereas, 0 value indicates that variable are same.

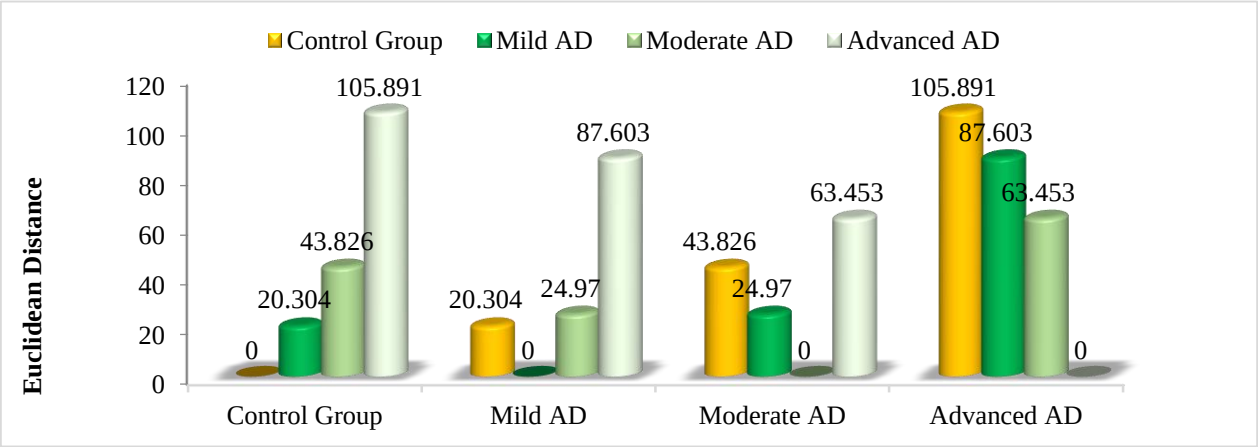

Fig 3: Euclidean distance showing difference between Mild, Moderate and Advanced Female AD Patients in case of Kashmiri Focal color Test.

From the table and the bar chart given above, the following conclusions can be drawn:

1. Comparing to the performance of control group, Mild AD group shows better performance in Kashmiri Focal Color test with a minimum Euclidean distance between them as compared to Advanced AD subjects. Hence, it is quite evident that there is a loss of control over Kashmiri color perception.
2. However, in case of Advanced AD subjects there is a drastic fall of result which leads to abrupt increase in Euclidean distance. It is also clear that the Mild AD and Moderate AD subjects have well-kept perception of color but Advanced AD subjects have severely affected color perception.

1. As compared to Control Group, the Euclidean distance shows increase from Mild AD to Moderate AD and from Moderate AD to Advanced AD subjects. The Euclidean distance between Control Group and Mild AD subjects is 20.3 whereas, the Euclidean distance between Control Group -Moderate AD subjects and Control Group-Advanced AD subjects is 43.8 and 105.8respectively. The Euclidean distance is least for Mild AD subjects and greater for Advanced subjects.
2. As compared to Mild AD subjects, the Euclidean distance between Mild AD-Moderate AD subjects and Mild AD -Advanced AD subjects is 24.9 and 87.6 respectively.
3. As compared to Moderate AD subjects, the Euclidean distance between Mild AD-Moderate AD subjects and Moderate AD -Advanced AD subjects is 24.9 and 63.4 respectively.
4. As compared to Advanced AD subjects, the Euclidean distance between Mild AD-Advanced AD subjects and Moderate AD -Advanced AD subjects is 87.6 and 63.4 respectively.

Proximity matrix and Case Summaries showing Distance Correlation in Case of Urdu Focal color Test

Table 3:

Case Summaries

	Control Group	Mild AD	Moderate AD	Advanced AD
Mean	44.4667	32	18	0.6667
Std. Deviation	1.39472	4.71699	3.55568	1.0328
Time	89	221	493	600

Table 3 indicates that the average score taken by a Control Group in Urdu Focal color test is 44.4 while as score taken by the Subjects in Mild, Moderate and Advanced Stage are 32, 18 and 0.6 respectively, also the time taken by a Control Group in this test is 89 seconds while as time taken by Subjects in Mild, Moderate and Advanced Stages are 221, 493 and 600 seconds respectively.

Table 4

Proximity Matrix

	Euclidean Distance			
	Control Group	**Mild AD**	**Moderate AD**	**Advanced AD**
Control Group	0	30.948	68.509	107.684
Mild AD	30.948	0	39.878	78.702
Moderate AD	68.509	39.878	0	39.626
Advanced AD	107.684	78.702	39.626	0

Table 4 is called a Proximity matrix/Distance Matrix/ Dissimilarity Matrix which is used to predict the differences in the variables, more value between the variables corresponds to the severity of the case. Whereas, 0 value indicates that variable are same.

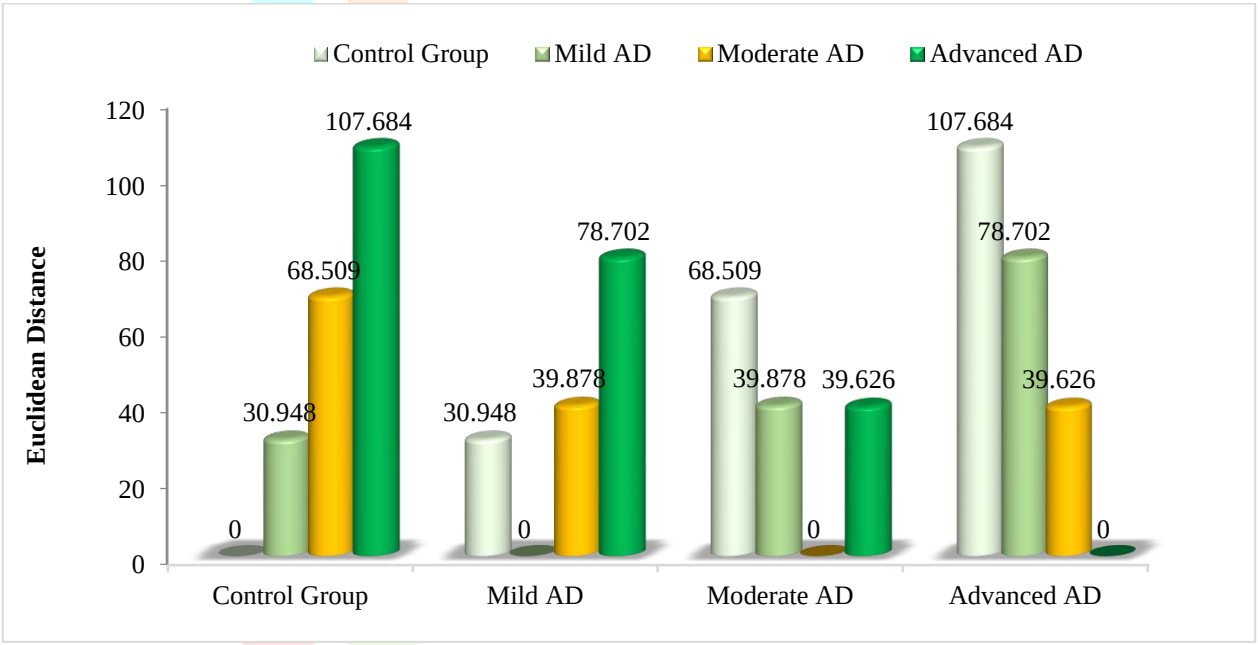

Fig 4: Euclidean distance showing difference between Mild, Moderate and Advanced Female AD Patients in case of Urdu Focal Color Test.

From the table and the bar chart given above, the following conclusions can be drawn:

1. Mild AD shows better performance than other two groups (Moderate and Advanced AD groups) in Urdu Focal color test. Hence, it is quite evident that there is a loss of control over Urdu color perception.
2. However, in case of Advanced AD subjects there is a drastic fall of result which leads to abrupt increase in Euclidean distance. It is also clear that the Mild AD and Moderate AD subjects have well-kept perception of color but Advanced AD subjects have severely affected color perception.
3. As compared to Control Group, the Euclidean distance shows increase from Mild AD to Moderate AD and from Moderate AD to Advanced AD subjects. The Euclidean distance between Control Group and Mild AD subjects is 30.9 whereas, the Euclidean distance between Control Group -Moderate AD subjects and Control Group-

Advanced AD subjects is 68.5 and 107.6 respectively. The Euclidean distance is least for Mild AD subjects and greater for Advanced subjects.

4. As compared to Mild AD subjects, the Euclidean distance between Mild AD-Moderate AD subjects and Mild AD -Advanced AD subjects is 39.8 and 78.7 respectively.
5. As compared to Moderate AD subjects, the Euclidean distance between Mild AD-Moderate AD subjects and Moderate AD -Advanced AD subjects is 39.8 and 78.7 respectively.
6. As compared to Advanced AD subjects, the Euclidean distance between Mild AD-Advanced AD subjects and Moderate AD -Advanced AD subjects is 78.7 and 39.6 respectively.

CONCLUSION

Our findings have concluded that color recognition occurs early in AD but it is difficult to mark at that stage because color recognition disorder also occurs in Normal aging. Patients with Mild AD and Moderate AD showed significant loss of color recognition abilities relative to controls and produced a variety of errors. Whereas, Advanced AD subjects have severely affected color perception in both languages due to severity of disease. Results also demonstrate that time is directly proportional to severity of disease i.e., lesser severity lesser is the time taken and vice-versa. Moreover, results show that female AD subjects show better performance in Kashmiri Color recognition Test as compared to Urdu color recognition test. Results also demonstrate that time is directly proportional to severity of disease i.e., lesser severity lesser is the time taken and vice-versa. It as also been observed that female AD patients have satisfactorily controlover color recognition as compared to male AD patients.

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