RESEARCH ARTICLE

EVALUATING THE ASSOCIATION OF VERBAL RETENTION MEMORY WITH HB CONCENTRATION USING, PGI MEMORY SCALE IN ELDERLY POPULATION

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ABSTRACT

Objective: To evaluate the association of verbal memory scores of similar and dissimilar pairs with their Hb concentration in elderly population.
Methods: From an urban health centre, 60 healthy elderly subjects (aged between 50 to 60 years) who had participated in a health camp were selected. Their verbal retention memory levels were evaluated using PGIMS. The Hb concentration was collected from their haematology report. Then values of verbal memory was analysed against their Hb concentration.
Result: The R values of similar and dissimilar pair of verbal memory (0.26 & 0.35 respectively) showed weak positive linear association with Hb concentration. But still both the values showed significant correlation coefficient (P<0.05) with Hb concentration.
Conclusion: Using PGI memory scale, the verbal retention memory is associated with Hb concentration for elderly and the association was relatively more for dissimilar word pairs than similar word pairs.

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INTRODUCTION

In current scenario memory loss with limited physical activity poses a serious threat to the mortality of geriatric population (Schupf *et al*., 2005). Normal cognitive decline in elderly population has become a paramount focus for the researchers, as it ultimately results in irreversible neurological conditions like Dementia and Alzheimer's disease. Even though age related neuronal damages are normal, various other factors (like nutrition, exercise, pollution...etc) seem to worsen the condition. Chronic cerebral hypoxia caused by reduced Hb concentration is one such well established factor responsible for memory loss (Mackin *et al*., 2014; Denny *et al*., 2006). Recent advancements in neuroscience have revealed the connection of different neuronal components with particular type of memory. Verbal memory is one such type concerned with recollection of knowledge about written or spoken words (http://psychologydictionary.org/ verbal-memory). Medial temporal lobe (MTL) is the chief structure believed to be involved in formation and retrieval of Verbal memory (Annette Jeneson *et al*., 2010 and Jansen *et al*.). The impact of Hb concentration on verbal memory will offer valid information over the physiology of related neuronal structures.

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Hence this study was designed to associate the scores of verbal retention of healthy elderly people with their Hb concentration. Verbal memory was recorded using PGIMS and the scoring was given based on recollection of similar and dissimilar pairs of familiar words.

MATERIALS AND METHODS

This descriptive cross sectional study was performed in an Urban Health centre at Koothampakkam, in Kanchipuram district, TamilNadu. Out of 240 people attended the camp, Sixty (N=60) healthy volunteers were selected. 46 females and 14 males were among the selected subjects. The selection was done based on following inclusion criteria. Inclusion criteria: 1) volunteers aged between 50-70 years; 2) volunteers not undergoing any medical treatment. It includes cardio-pulmonary disorders, hormonal/endocrinal disorders and neurological disorders; 3) patients without any previous history of stroke or neurological disorders; 4) women who had attained menopause; 5) subjects who hasn't got communication problems. The scale used for was PGIMS. It was tested and validated by Post Graduate Institute of Medical Education and Research (Chandigarh), for assessing different memory domains. As it is applicable for people with different educational or language background, considered as an ideal one for Indian multicultural society (Pershad and Wig, 1976;

Dwarka Pershad, 2014). Verbal retention memory was assessed for similar word pairs and dissimilar word pair; each carrying maximum score of 5. (here 'similar' indicates both the word are interrelated by meaning. Eg Tree and Branch). The following instructions were given for scoring verbal memory of similar and dissimilar pairs of words (as per PGIMS).

Verbal retention for similar pairs

Instruction given to the subjects: "I will be reading out pairs of words. Listen to me carefully. From these pairs when one word of the pair is called out, you have to say the other word of the pair, associated with it" Instructions followed by the examiner: Read at the rate of 2 seconds per pair. Keeping an interval of five seconds, between each pair and an interval of 10 seconds after the last pair, read out the first word of the pair in a random order and ask the subject to name the other word of the pair.

1. Tree …… (5 seconds)…….Flower
2. Sweet…… (5 seconds)…….Salty
3. Man…… (5 seconds)…….Woman
4. Day…… (5 seconds)…….Night
5. Black…… (5 seconds)…….White

Verbal retention for dissimilar pairs

Instructions followed by the examiner: Instruction and administration as above, but ask for the other word of the pair in the order given. If the subject not able to answer satisfactorily, tell him the correct answer and then proceed with the first word of the next pair. In this manner conduct 3 trials. If the subject gives all correct answers in the first trial, still it is essential to give the other two trials.

Table   …… (5 seconds)…….Black
Tree   …… (5 seconds)…….High
Lamp   …… (5 seconds)…….Rough
Baby   …… (5 seconds)……Bitter
Dream   …… (5 seconds)…….Deep

Then these scores were analyzed separately with Hb concentration. The Hb concentrations of all subjects were collected from their blood test report, which was a part of their health checkup. These two parameters were analyzed against each other.

Figure 1. Showing positive association between verbal retention score of similar pairs and Hb concentration
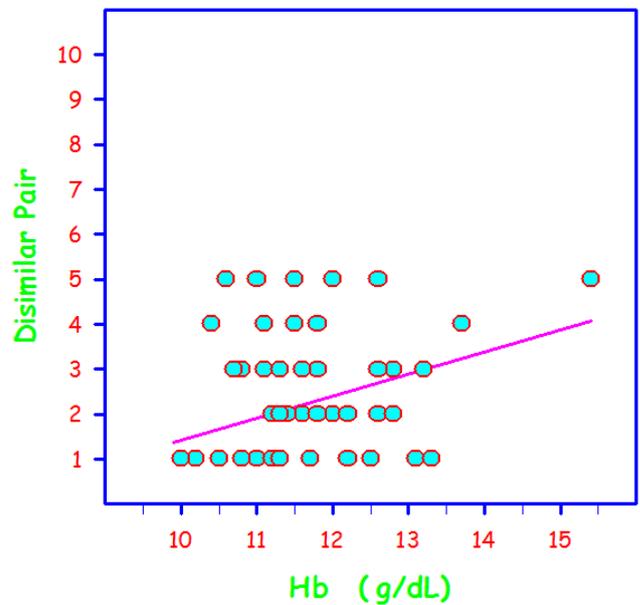
Figure 2. Showing positive association between verbal retention score of dissimilar pairs and Hb concentration

RESULTS

Table 1. Shows Hb concentrations of total population. For females (N=46) the average value is 11.06 gm% and for males (N=14) it is 12.60 gm%
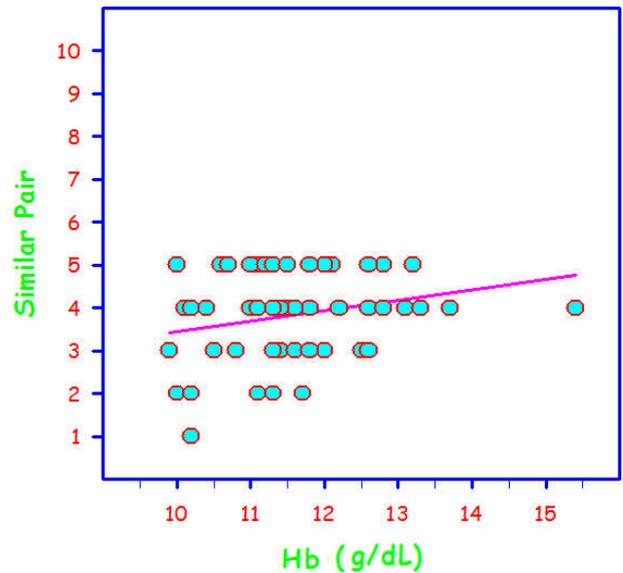
	Total population (N=60)	Females (N=46)	Males (N=14)
Hb concentrations (gm %)	11.61±0.14	11.90±0.10	12.60±0.40

Table 2. Depicts the average values of verbal score for similar and dissimilar pairs which are respectively 3.83 (±1.03) and 2.22 (±1.50)

Verbal memory score	Average	Standard deviation
Similar pair	3.83	±1.03
Dissimilar pair	2.22	±1.50

Table 3. Shows association of verbal retention score of similar and dissimilar pairs with Hb concentration. Both of them show significant correlation with P values less than 0.005; whereas, correlation coefficient values are 0.26 and 0.35 respectively

Independent variable	Dependent variable	Intercept	Slope	R Value	Probability
Hb Concentration	Similar pairs	1.00	0.25	0.26	<0.05
Hb Concentration	Dissimilar pairs	-3.47	0.49	0.35	<0.001

DISCUSSION

Mild memory related problems are the earliest clinical signs of general age related neurological conditions like Alzheimer's disease. The association between low Hb concentration and cognitive function is a well established hypothesis, as it is closely associated with brain oxygenation. But to what extent it affects the verbal memory of the elderly population is yet to be explored. In this cross sectional study out of total subjects (N=60), majority of them were females (N=46). The average Hb concentration of all subjects participated was 11.61(±0.14) gm%. While considering only the scores of similar and dissimilar pairs, the subjects have got relatively higher average score for similar word pairs (3.83±1.03) than that of dissimilar one (2.22±1.50). This supports the general concept of positive influences of familiarity on memory recollection. In scattered plot the memory scores of similar pars show a weak positive (R=0.26) linear relationship. But, when individual scores of Hb concentrations were plotted against corresponding verbal memory scores, it shows a significantly positive association (P<0.05). Similarly for verbal scores of dissimilar pairs, even though R value (0.35) is not convincing, P value is highly significant (P<0.001). These results point out two important features of memory formation. i) The structures related with verbal memory are sensitive to Hb concentration; because of P values. ii) But the sensitivity for different domains of verbal memory varies. This is reflected in differential P values of memory scores (more for dissimilar pairs). As neuronal components for each type of memory are different, their differential sensitivity to Hb level questions their metabolic properties. These results evoke reservations regarding the role of Hb concentration on general cognitive decline. More over it opens up further opportunities for the researchers to explore the biology of specific type of memory loss exclusively in elder population.

Conclusion

This study shows positive association between Hb concentration and verbal memory while using PGIMS. While considering the different components of verbal memory, the nature of dependency over Hb concentration is not identical. Further large scale studies specifically on verbal memory are required to support the above mentioned association.

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