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Impact of haemoglobin level on attention and concentration in old Adults population

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Abstract
Low hemoglobin levels are associated with tissue hypoxia and decreased oxygen delivery to brain which may lead to cognitive impairment. Some experimental studies in humans have shown that iron deficiency may cause brain mitochondrial damage causing decreased function of the enzyme cytochrome oxidase leading to cognitive impairment. There are very limited studies to find whether the haemoglobin concentration affects the attention and concentration in old age, so this study is one such effort to find the same. Very few studies and all in elderly have been conducted to study the impact of anemia on cognitive performance and having incontinent results. No information is available regarding the prevalence of cognitive impairment in anemic adult population of India. Considering this fact, there is need to study the impact of anemia on cognitive functions in neurologically intact adult anemic patients in rural population from a tertiary care hospital.

Keywords: Haemoglobin, concentration, attention, elder, old

Introduction
Iron deficiency is the third greatest global health risk after obesity and unsafe sex [1]. Anemia resulting from iron deficiency affects approximately 2 billion people or 34% of the world population [2]. Iron deficiency anemia most severe stage of iron deficiency (defined as a low hemoglobin concentration with iron deficiency) was found in 3% of the adolescent females in the United State of America [3]. More than half of the world's undernourished population lives in India [4] and half of Indian children and women are malnourished [5]. Apart from overall poverty and lower literacy rate the health status of women in India reflects gender discrimination from birth [6]. Intrafamilial food distribution, where the males are privileged with high quality nutritious food and the females are deprived of it, is seen in India. Moreover, early and frequent reproductive cycling and presence of reproductive tract infections in adolescent girls lead to iron deficiency anemia [7]. About three fourth of adolescent females do not meet the dietary requirements [8].
Iron deficiency is a systemic condition which has many non ematological consequences, which occurs in relation to its severity, like decreased physical work capacity [9], decreased athletic performance [10], lowered indurations [11], depressed immune function [12], decreased scholastic performance, compromised growth and development, and increased risk of pregnancy complication including prematurity and total growth retardation and impaired cognitive function [13-15]. There are very limited studies to find whether the haemoglobin concentration affects the attention and concentration in old age, so this study is one such effort to find the same.

Aims and Objectives: To find whether the haemoglobin concentration affects the attention and concentration in old age.

Materials and Methods
This study was done in AIMS BG Nagar from Jan 2018 to Dec 2018.
Thirty participants were selected randomly whose haemoglobin was low according to WHO standards. All the patients were asked for consent and then only were selected. All the patients were more than 70 years.
Thirty participants who formed the control group were selected whose haemoglobin were above the WHO described anaemic standards.

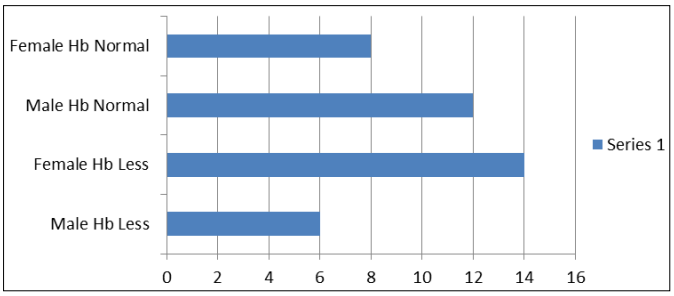
The participants were investigated for anemia and those with anemia were enrolled in case group and those without anemia were enrolled in control group. All these tests were carried out by standard laboratory technique. After all these investigations, both cases and control groups were subjected to cognitive function testing with the help of short portable mental status questionnaire (SPMSQ).

Exclusion criteria

- Previous known psychiatric issues.
- Previous known neurological issues
- Previous nervous system injuries
- Known systemic and metabolic disorders which influences the haemoglobin concentration.

SPMSQ is a modification of mental status questionnaire. It provides a brief, quantitative measurement of cognitive function in elderly. The questions cover orientation in time and place, remote memory, and general knowledge and serial subtractions. Time administered to complete the questionnaire is 5 min.

Results



Graph 1: Sex Distribution

Table 1: Age Distribution

	Mean Age	Std. Deviation
Group 1 (Hb Less)	75.98 years	3.76 years
Group 2 (Hb Normal)	72.91 years	1.1 years

Table 2: Mean Haemoglobin level

	Mean Hb (Gram Percent)	Std. Deviation
Group 1 (Hb Less)	8.12	1.14
Group 2 (Hb Normal)	14.37	2.83

Table 3: Cognitive impairment according to SPMSQ Scale when compared between the two groups

	Normal	Mild	Moderate	Severe
Group 1	04	17	09	Nil
Group 2	21	05	04	Nil

Table 4: Distribution according to severity

	Mild > 11.00	Moderate 8-11	Severe < 8
Mean SPMSQ score	2.1	2.4	4.1

Discussion

Anemia is defined according to World Health Organization (WHO) as a hemoglobin concentration less than 12 g/dL in women and less than 13 g/dL in men. An estimated two billion of the world's population is suffering from anemia and most of this population lies in developing countries. The prevalence of anemia is 5% below age of less than 5 years, 48% in age group of 5--14, 42% in women between 15 and 59 years age, 30% in men between 15 and 59 years of age, and 45% above age of 60 years.

In anemia there is decreased in number of RBCs or their oxygen carrying capacity which becomes insufficient to meet body's physical needs, depending on age, sex, and pregnancy status. Studies which have been done on Indian children have shown that iron deficiency anemia causes lower levels of attention and concentration. Anemia is associated with poor cognitive performance as shown by the effect of anemia on age-related cognitive decline or it may also be independent risk factor for poor cognition. In the general population, anemia is associated with increased risk for cognitive decline and dementia in elderly. In prospective studies, anemia has been associated with a 41–61% increased risk for dementia in elderly.

Low hemoglobin levels are associated with tissue hypoxia and decreased oxygen delivery to brain which may lead to cognitive impairment. Some experimental studies in humans have shown that iron deficiency may cause brain mitochondrial damage causing decreased function of the enzyme cytochrome oxidase leading to cognitive impairment.

Very few studies and all in elderly have been conducted to study the impact of anemia on cognitive performance and having incontinent results. No information is available regarding the prevalence of cognitive impairment in anemic adult population of India. Considering this fact, there is need to study the impact of anemia on cognitive functions in neurologically intact adult anemic patients in rural population from a tertiary care hospital.

Conclusion

This study shows that the haemoglobin concentration actually influences the attention and concentration in the elderly population. Prompt diagnosis and treatment is a must for the patients to have a healthy quality of life.

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