

The Association of Anemia and Sensorineural Hearing Loss in Young Population

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Abstract

Hearing loss is a major health challenge worldwide. Many studies have been done to look for the causes and prevention of sensorineural hearing loss (SNHL). Anemia characterized by a reduction in hemoglobin has been looked into for its role in causing SNHL. To the best of our knowledge, there is a paucity in the number of studies correlating sensorineural hearing loss and anemia in India.

In this study, we evaluated the association of anemia and sensorineural hearing loss in adolescents and young adults (12-40 years). It was conducted in Department of Otorhinolaryngology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore. 50 patients diagnosed with bilateral sensorineural hearing loss by pure tone audiometry were tested for blood hemoglobin

levels. In this study, patients with hemoglobin level below 13gm/dL in males and below 12gm/dL in females were considered anemic (WHO criteria). Data was entered in MS Excel and analyzed using SPSS version 19 (Statistical Package for Social Sciences). Odds ratio, Fishers exact test and Chi-square test were applied to determine the association. P value < 0.05 was considered as statistically significant. We found anemia was prevalent in 46% (n=23) of the study population whereas 54% (n=27) were not anemic. Odds ratio was calculated to quantify the strength of relationship between SNHL and anemia which was found to be 0.85 which did not give a strong correlation. Chi-square test was done for testing the association between gender and hemoglobin, and showed a p value of 0.51, which was nonsignificant. The Fishers-exact test was applied to determine the

association between age and hemoglobin values, and was found to have a p value of 0.714 in females and 0.353 in males, which was nonsignificant. In our study, we looked for the association of anemia with sensorineural hearing loss in young patients in a tertiary care center in India. We found it to be insignificant. More research and evidence may be necessary to get a conclusive result. This may give insights in preventing hearing loss and improve the quality of life of people.

Keywords: Sensorineural hearing loss, Anemia, Pure Tone Audiometry, Haemoglobin.

Introduction

Hearing loss is one of the public health challenges of high magnitude, but is less recognized.¹ Hearing loss developed at a young age increases tremendously as age progresses, affecting all parts of a healthy being.¹⁻² It affects health, social and economic domains, leading to higher risk of unemployment, low per capita income, cognitive decline, and dementia in adults. Patients with hearing loss are more likely to feel socially isolated.² Anemia, one of the most common blood disorders, is defined as reduced red blood cell count and is characterized by a reduction in hemoglobin.³⁻⁵ Following WHO's recommendations, anemia in men was categorized if their hemoglobin concentration was lower than 13gm/dL.⁶ Anemia in non-pregnant women was defined as any anemia if hemoglobin concentration was below 12gm/dL.⁶ According to a recent study by Didzun et. al., the anemia prevalence among men aged 15-54 years in India was 21.7%, which was substantially lower than the 53.2% among women.⁷ Nutritional deficiencies such as iron and vitamin B12 in anemic patients have been reported to be related with sensory disorders including hyposmia⁸, olfactory craving (desiderosmia)⁹, and hypogeusia¹⁰. In addition, anemia

results in insufficient oxygen supply to various organs, which can cause behavioral dysfunction and cognitive impairment.¹¹

To the best of our knowledge, there is a paucity in the number of studies correlating sensorineural hearing loss and anemia in India. This study aims to study the association of anemia and sensorineural hearing loss (SNHL) in young population.

Objectives

To look for the association of anemia and sensorineural hearing loss in adolescents and adults (12-40 years).

Materials and methods

This descriptive study was conducted in the Department of Otorhinolaryngology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore over a duration of 3 months. 50 patients diagnosed with SNHL by pure tone audiometry were included in the study. The inclusion criteria were age group: 12-40 years (adolescents and young adults) and bilateral sensorineural hearing loss ≥ 40 db. Exclusion criteria were positive family history of hearing loss, comorbidities leading to nutritional anemia, fever with rash in childhood, history of ototoxic drugs usage, trauma leading to temporal bone fracture, significant birth and perinatal history. These patients were then subjected to hemoglobin blood test. In this study, a hemoglobin level below 13gm/dL in males and below 12gm/dL in females was considered to be below.

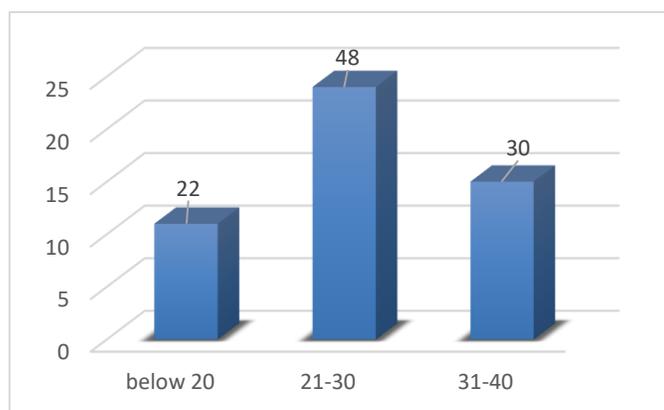
Statistical analysis: Data was entered in MS Excel and analyzed using SPSS version 19 (Statistical Package for Social Sciences). Continuous variables (hemoglobin level, sensorineural hearing loss) were presented as mean \pm standard deviation. Categorical variables (sex of the patient, age group, onset of hearing loss) were presented as frequency and percentage. Odds ratio,

Fishers exact test and Chi-square test were applied to determine the association. P value < 0.05 was considered as statistically significant.

Results

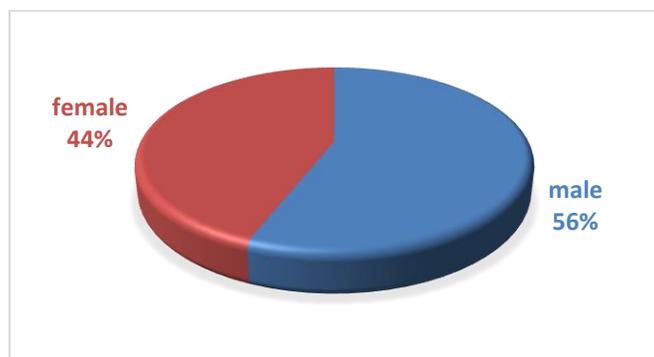
In our study, a total of 50 patients diagnosed with sensorineural hearing loss were evaluated for anemia.

Figure 1: Age distribution among patients with SNHL



The patient’s age ranged between 14 years to 40 years. A majority of our study population (48%) belonged to the age group 21-30 years, with a mean age of 26.58 ± 7.211 years.

Figure 2: Gender distribution among patients with SNHL



In this study 56% (28) of the study population were males, where as 44% (22) were females.

Table 1: Hemoglobin values in study population

		Gender			
		Male		Female	
		Count	Column N %	Count	Column N %
Hb	Low	13	46.4%	10	45.5%
	Normal	15	53.6%	12	54.5%
	Total	28	100.0%	22	100.0%

In this study conducted among SNHL patients, anemia was prevalent in 46% (n=23) of the study population whereas 54% (n=27) were not anemic. Odds ratio was calculated to quantify the strength of relationship between SNHL and anemia which was found to be 0.85 which did not give a strong correlation. Chi-square test was done for testing the association between gender and hemoglobin, and showed a p value of 0.945, which was considered to be non-significant.

Table 2: Age-wise distribution of hemoglobin values in females

Females		Age					
		20 and below		21 – 30		31 – 40	
Hb		Count	Column N %	Count	Column N %	Count	Column N %
Low	Normal	3	50%	5	50.0%	2	33.3%
	Total	6	100.0%	10	100.0%	6	100.0%

The Fishers-exact test was applied to determine the association between age and hemoglobin values, and was found to have a p value of 0.870, which was non significant.

Table 3: Age-wise distribution of hemoglobin values in males

Males		Age					
		20 and below		21 – 30		31 – 40	
		Count	Column N %	Count	Column N %	Count	Column N %
Hb	Low	3	60.0%	7	50%	3	33.3%
	Normal	2	40.0%	7	50%	6	66.7%
	Total	5	100.0%	14	100.0%	9	100.0%

The Fishers-exact test was applied to determine the association between age and hemoglobin values, and was found to have a p value of 0.682, which was insignificant.

Table 4: Gender-wise distribution of onset of sensorineural hearing loss

		Gender			
		Male		Female	
		Count	Column N %	Count	Column N %
Onset of hearing loss	Sudden	2	7.1%	3	13.6%
	Gradual	26	92.8%	19	86.4%
	Total	28	100.0%	22	100.0%

In our study population, only 2 male and 3 female patients had sudden sensorineural hearing loss, whereas the remaining 45 patients had gradual onset of sensorineural hearing loss.

Table 5: Age-wise distribution of onset of hearing loss

		Age					
		20 and below		21 – 30		31 – 40	
		Count	Column N %	Count	Column N %	Count	Column N %
onset of HL	Sudden	0	0.0%	2	8.3%	3	20.0%
	Gradual	11	100.0%	22	91.7%	12	80.0%
	Total	11	100.0%	24	100.0%	15	100.0%

In our study population, 2 patients belonging to the age group 21-30 years and 3 patients belonging to the age group 31-40 years gave history of sudden hearing loss.

Table 6: Correlation of hemoglobin with the onset of hearing loss in our study population.

		Hb			
		Low		Normal	
		Count	Column N %	Count	Column N %
onset of hearing loss	Sudden	1	0.0%	4	15.3%
	Gradual	22	100.0%	23	84.7%
	Total	23	100.0%	27	100.0%

Correlation of hemoglobin with the onset of hearing loss was found to be insignificant, as the p-value was 0.218.

Discussion

In our study, we did not find any significant association of anemia with sensorineural hearing loss in young patients. Anemia is characterized by an excessive loss of erythrocytes in relation to the erythrocyte production, and is multifactorial in nature. Its etiology includes nutritional deficiency, inflammation, or genetic conditions.⁵The cochlea is susceptible to ischemic injury due to the high metabolic demands of cochlear hair cells, end arterial supply by labyrinthine artery, and poor collateral circulation.^{12, 13, 14}Altered histopathology of inner ear such as stria atrophy and reduction of spiral ganglion cells have found to be responsible for the development of SNHL in iron deficient rat models.¹⁵Nutritional anemia hampers the neurotransmitter metabolism, DNA synthesis, and DNA repair mechanisms. Iron helps in the nerve myelination and dendritic arborization; the deficiency of which can lead to defects in development, learning, and long term memory.¹⁶⁻²⁶Additionally iron is a cofactor in the neurotransmitter metabolism, DNA synthesis and nerve myelination.¹⁶ Therefore neurological disorders such as epilepsy, cerebellar ataxia, brain atrophy, peripheral neuropathy, dementia can be associated with SNHL.^{16, 27, 28}

A systemic review and meta analysis by Mohammed SH et al in 2019 done to evaluate the association of anemia with SNHL found to have a significant association between iron deficiency anemia (IDA) and SNHL among both adults and children.²⁹The odds of SNHL was 55% higher in individuals with IDA compared with those without IDA.²⁹A case control study was done by Grampurohit et al in 2021 to study the association of

SNHL and IDA.³⁰ It was found that the participants who received iron supplements showed significant improvement in iron profile, nutritional status and high frequency hearing loss. Schieffer et al concluded that screening for IDA in 4-21 year olds should be considered in patients with SNHL as their study suggested a relationship between IDA and SNHL.² As these studies suggest, anemia should definitely be evaluated in patients of SNHL for early intervention to better the quality of life. There are very few studies done in India looking for this association. Our study could not find any significance. Further studies going into the type of anemia, duration of hearing loss, larger sample size and outcome of anemia correction is necessary to get a clearer picture and may give insights in preventing hearing loss in our community.

Conclusion

In our study, we looked for the association of anemia with sensorineural hearing loss in young patients in a tertiary care center in India. We found it to be insignificant. More research and evidence may be necessary to get a conclusive result.

Ethics Approval And Consent

Necessary approval was taken from the hospital ethics committee and informed written patient consent taken for their participation.

List of abbreviations

SNHL - sensorineural hearing loss

IDA - Iron deficiency Anemia

Authors Contributions

All authors read and approved the final manuscript.

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