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To evaluate retinal nerve fibre layer (RNFL) thickness in women with iron deficiency anemia (IDA).

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Abstract
AIM: To evaluate retinal nerve fibre layer (RNFL) thickness in women with iron deficiency anemia (IDA).
METHOD: This observational hospital based study was performed between December 2018 to April 2019. This study included 59 female patients with IDA and 44 controls.
RESULTS: Nasal and inferior quadrant RNFL thickness of IDA group were thinner than the control group ($p<0.001$).
CONCLUSION: RNFL thickness measured by OCT is thinner in adult female of child bearing age group with IDA. It may have significant effect in management of various disorders like glaucoma and neuro-ophthalmological diseases.
Key words: *Retinal nerve fibre layer thickness, Iron deficiency anemia, OCT*

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I. Introduction:

Anemia is a major public health problem of which iron deficiency anemia is the most common cause especially in child bearing age [(1)]. Iron is necessary for optic nerve myelination [(2)] and for structural stability and maintenance of optic nerve [(3)]. Visual evoked potentials are decreased because of hypomyelination in patients with iron deficiency [(4)]. Retinal nerve fibre layer (RNFL) thickness measurement gives important clues for differential diagnosis of diseases of optic nerve. Decreased RNFL thickness is seen in various types of ischemic retinal diseases [(5,6,7,8,9,10)]. Thinner RNFL was seen in pediatric patients with anemia [(11,12)]. Optical coherence topography (OCT) is a non invasive imaging method that is used in the diagnosis of optic nerve and RNFL diseases [(13)]. RNFL thickness was obtained with optic disc cube scan protocol. Average superior, inferior, nasal and temporal quadrant RNFL measurement was noted.

AIM:
In the current study, we aimed to evaluate effect of iron deficiency anemia(IDA) on peripapillary RNFL thickness in adults with OCT.

II. Materials And Methods:

This observational hospital based study was performed in a tertiary care centre of Jharkhand between December 2018 to April 2019. In this study females of reproductive age group (18-45 years age) were included. Group A had 59 female patients with IDA and Group B had 44 normal subjects free from major diseases.
Inclusion criteria were-

- Serum haemoglobin < 12g/dl
- Serum transferrin saturation <15%
- Serum iron <50µg/dl
- Serum ferritin <15µg/dl

Exclusion criteria for both groups were-

- Media opacities
- Glaucoma
- History of previous ocular surgery
- Ocular trauma
- Uveitis

All participants provided informed consent before being included in this study. Complete ophthalmological examination which included refractive error, intra ocular pressure, dilated fundus examination was done by indirect ophthalmoscope. Complete systemic examination along with complete blood count was

performed. All subjects underwent peripapillary RNFL thickness measurement via Cirrus HD OCT (Carl Zeiss) without pupil dilatation. Best scan with signal strength >7 was taken for analysis. Right eye was used for every patient. Peripapillary RNFL thickness was assessed using optic disc 200×200 cube scan protocol. Data was analysed using SPSS software. All differences associated with chance probability of ≤0.05 was considered statistically significant.

III. Results:

This study included 59 female patients with iron deficiency anemia and 44 controls age range of both the group was 18-54 years.

Clinical characteristics of the patients and control groups are given in table 1.

Characteristics	Patients (n=59)	Control (n=44)	Statistical significance
Hb (g/dl)	9.6±1.3	12.8±0.8	p<0.001
Serum iron (µg/dl)	27.04±15.8	95.7±30.51	P<0.001
Serum ferritin(µg/dl)	4.2±3.7	34.5±17.9	P<0.001
Total iron binding capacity (µg/dl)	417.1±48.1	320.6±34.6	P<0.001
Iop (mm/hg)	15.6±2.9	14.5±3.4	P<0.001
Serum transferrin saturation (%)	5.37±2.86	29.35±10.49	P<0.001

TABLE 1

Data regarding OCT parameters are shown in table 2.

Parameters	Patients (n=59)	Control (n=44)	Statistical significance
Superior quadrant	116.6±14.3	117.0±14.0	Not significant
Nasal quadrant	70.1±10.7	75.7±9.4	P<0.001
Inferior quadrant	125.0±16.4	132.5±15.0	P<0.001
Temporal quadrant	66.7±11.1	67.2±9.3	Not significant

TABLE 2

RNFL thickness in nasal and inferior quadrant was less in patient group than in control group.

Figure 1 shows relation between haemoglobin and mean RNFL thickness.

FIGURE 1

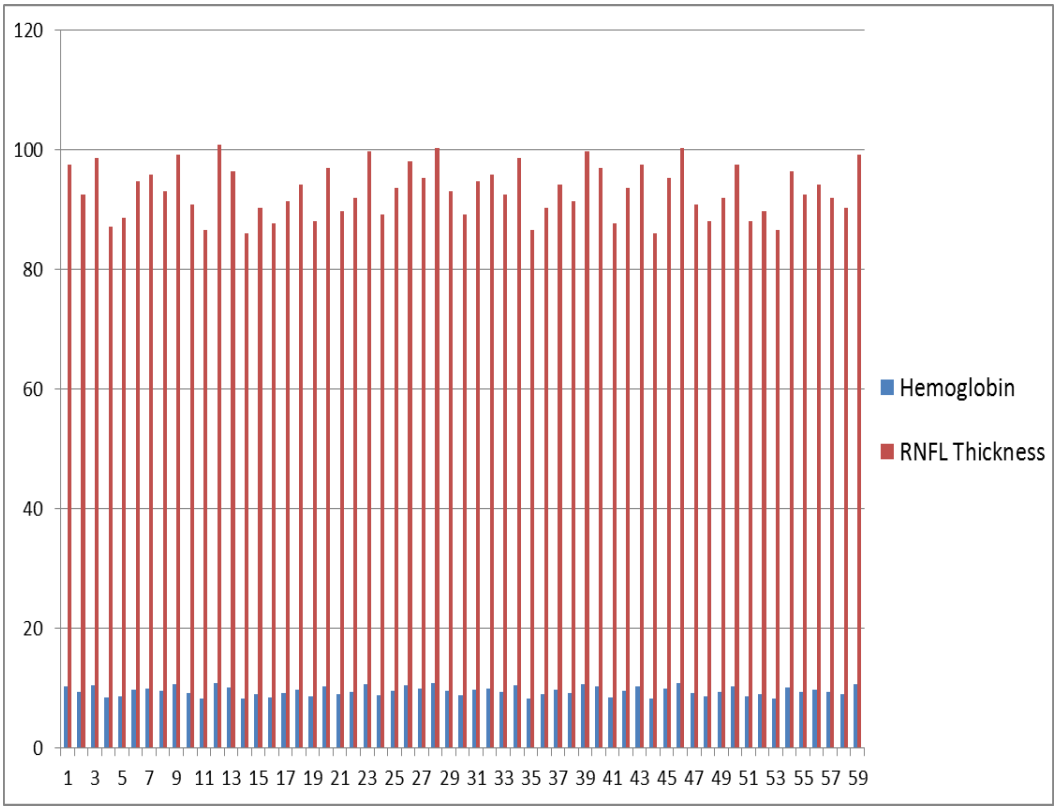

FIGURE 2

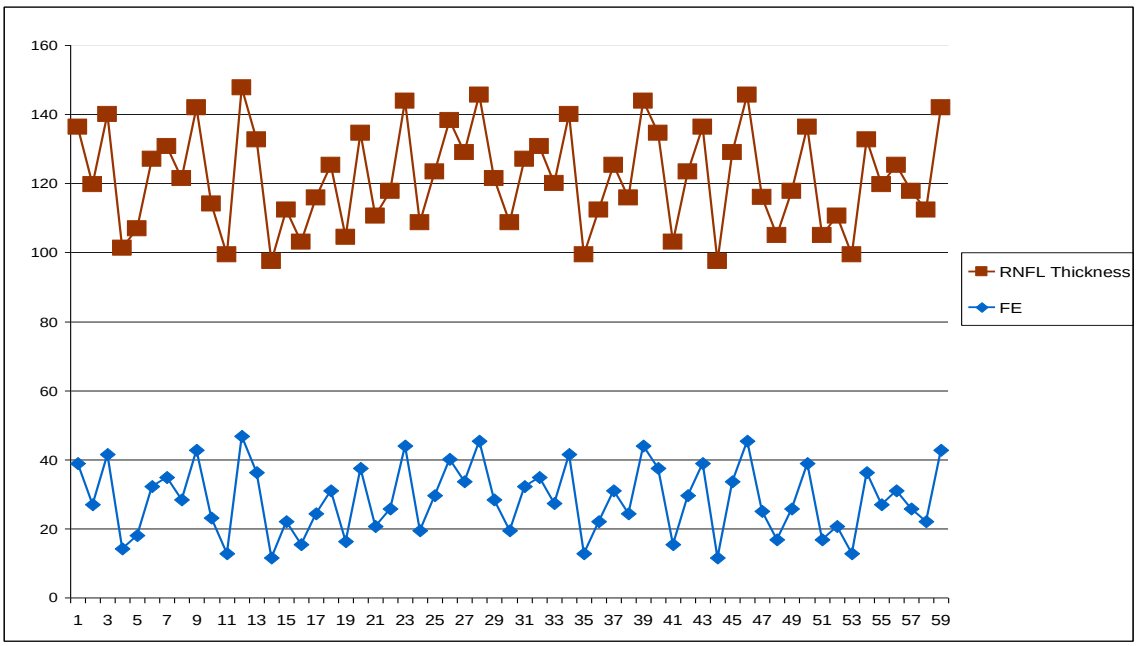

Figure 2 shows relationship between RNFL thickness and serum iron in iron deficiency anemia patients.

IV. Discussion:

This study showed that RNFL thickness in women with iron deficiency anemia was significantly less in nasal and inferior quadrants compared to control. This is in contrast to a study done by Turkyilmaz K et al (2013), which showed children with iron deficiency anemia have lower average, superior and inferior RNFL thickness compared to controls [(12)]. Another study done by Aksoy A et al (2014) [(14)], with thalassemia major patients showed RNFL thickness was decreased in all quadrants in children with thalassemia major but in inferior quadrant only in children with iron deficiency anemia. This inconsistency between our study and these studies may be due to differences in the study population as Jharkhand is basically a tribal belt and there is nutritional and genetic variability.The reduced RNFL thickness in patients with anemia compared with controls in our study is likely because of hypomyelination caused by iron deficiency. It is well known that iron performs important function in central nervous system, including nerve myelination and neurotransmitters synthesis [(15)]. Oncel

Acir et al (2015) has reported that peripapillary RNFL is thinner in nasal – inferior quadrant in patients with iron deficiency anemia [(16)] the results of which match our study. Mean haemoglobin value was 9.6±1.3g/dl and serum ferritin value was 4.2±3.7µg/dl which is similar to values in the study by Oncel Acir et al (2015)[(16)]. This study had several limitations. The sample size was small and it was not possible to sub-divide groups according to severity and duration of anemia. We did not re-evaluate RNFL thickness after treatment. The present study shows that iron deficiency anemia reduces RNFL thickness in adult women.

V. Conclusion:

RNFL thickness measured by OCT is thinner in adult female of child bearing age group with iron deficiency anemia. It may have significant effect on management of various disorders like glaucoma and neuro-ophthalmological diseases.

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