

A CLINICO-RADIOLOGICAL STUDY IN PATIENTS WITH IDIOPATHIC INTRACRANIAL HYPERTENSION

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ABSTRACT

Background: The aim is to study the clinical and radiological profile of patients with Idiopathic Intracranial Hypertension. **Materials and Methods:** This cross-sectional study was carried out in the Neurology Department for a period of 18 months. 100 adult patients who present with headache, fulfilling the diagnostic criteria for IIH by ICHD-3 are enrolled in study. **Result:** The majority of patients were of 2nd and 3rd decade, with a mean age of 29.7+ 6.8 years. Headache was the most common symptom, reported by all patients, followed by Visual obscurations (57%), Diplopia (41%) and tinnitus (35%). Females were the majority of patients affected with the Female to male ratio being 11.5:1. Papilledema was the most frequently observed clinical sign along with corresponding enlargement of the blind spot. Other than vision the only neurological deficit found was Abducens Nerve palsy noted in 41%. Obesity was the most prevalent risk factor other associations include steroid usage and OCP intake. CSF opening were elevated in all the patients with majority (73%) had CSF pressure between 25 to 30cm followed by 21% between 31 to 35% and 6% with CSF pressure > 35cm. MRI brain imaging revealed majority finding as Empty sella in 71% followed by Flattening of posterior globe in 65% and Peri optic nerve sheath widening in 54% of patients. The mean CSF opening pressure in Obese patients was found to be significantly higher than Nonobese, there was a statistically significant association between the two. **Conclusion:** In our study, IIH predominantly affected young obese females, with headache and papilledema as common findings. Obese patients had significantly higher CSF opening pressures, indicating a strong association between obesity and disease severity.

INTRODUCTION

Idiopathic Intracranial Hypertension (IIH) is a neurological disorder characterized by elevated intracranial pressure (ICP) without an identifiable cause on neuroimaging or cerebrospinal fluid (CSF) analysis. It primarily affects obese women of reproductive age and presents most commonly with headache, visual disturbances, and papilledema. The exact pathophysiology remains unclear, but obesity, hormonal imbalances, and impaired CSF absorption are considered contributing factors. The diagnostic criteria were further refined by Friedman et al and proposed the condition best described under the umbrella term of Pseudotumor cerebri syndrome (PTCS) classifying it into primary and secondary IIH depending on the presence or absence of identifiable

cause. As a result, IIH acts as subset within the PTCS category.^[1-3]

The International Headache Society's International Classification of Headache Disorders 3rd edition (ICHD-3), 2018 defines IIH under Headaches attributed to non-vascular intracranial disorders/ Headache attributed to raised CSF pressure. As per ICHD-3, IIH is described as a new-onset headache or significant worsening of a pre-existing headache accompanied by clinical symptoms/signs, and/or neuroimaging signs of raised increased intracranial pressure.^[4,5] IIH is one of the common but underestimated condition causing headache, there are limited studies among Indian population, hence this study is an attempt to identify the clinico-radiological profile in IIH patients.

MATERIALS AND METHODS

Cross-sectional study done between December 2022 to May 2024 for a period of 18 months in 100 patients who presented to Gandhi General Hospital with headache fulfilling the diagnostic criteria for IIH by ICHD-3 [The international headache society's International Classification of Headache Disorders 3rd edition].

Inclusion criteria:

All adult patients who present with headache, fulfilling the diagnostic criteria for IIH by ICHD-3

Exclusion criteria:

All patients who had structural lesions (SOL) in CT or MRI. Patient with headache not fulfilling the diagnostic criteria for IIH by ICHD-3.

Methodology

During the period of admission, data was collected in the form of demographic profile, detailed history was taken. Data was collected in a pretested proforma meeting the objectives of the study after taking the informed consent from the patients and/or attendants. Patient underwent imaging studies, MRI brain and after excluding SOL or hydrocephalus, lumbar puncture was done and CSF analysis done.

CSF Pressure Study

Patient is positioned in right lateral decubitus position and under sterile aseptic precautions, lumbar puncture is performed with 20 G needle and the needle is connected to CVP (central venous pressure) manometer without letting out any CSF. The patient is allowed to relax, extend lower limbs and neck, lying comfortably in right lateral position, and

opening pressure is noted after CSF column stabilizes.

Opening pressure is measured by noting the stabilized CSF column and 5cm is added to the highest point of Column since we are using CVP manometer which starts from -5 level

Investigations as Complete blood picture, Erythrocyte sedimentation rate, Blood urea, Serum Creatinine, Viral markers-HIV, Hepatitis B, Hepatitis C, Liver function tests and Anti-Nuclear Antibody (ANA)

Prothrombotic profile: Protein C, Protein S, Antithrombin III, serum homocysteine, antiphospholipid antibodies.

Radiological investigations as CT Brain, MRI Brain with MRV and CT Venogram whenever necessary

Statistical methods

The data was analysed using descriptive statistics. Continuous variables were presented as mean and standard deviation, while categorical data were reported as frequencies and percentages. Unpaired T test was used to compare means of continuous variables and p value of < 0.05 was considered statistically significant.

RESULTS

Based on the current study the age range was noted between 17 to 43 yrs with majority in the age range of 26 to 30 years followed by 36 to 40 years. Patients were classified according BMI as Obese and Nonobese Patients with a BMI of > 30 kg/m² are classified under obese category.

Table 1: Demographic Distribution in present study

Age group	No of patients	Percentage
16-20	10	10%
21-25	17	17%
26-30	36	36%
31-35	9	9%
36-40	22	22%
41-45	6	6%
Gender		
Female	92	92%
Male	8	8%
BMI		
Non Obese	21	21%
Obese	79	79%

Table 2: Symptoms elicited in patients of study

Symptoms	No of patients	Percentage
Headache	100	100%
Diplopia	41	41%
Tinnitus	35	35%
Visual obscuration	57	57%

Headache was present in all 100 patients and constituted the major symptoms for which patients sought neurological opinion. Diplopia was present in 41 patients and in 11 Patients diplopia was a presenting symptom. 35 patients complained of

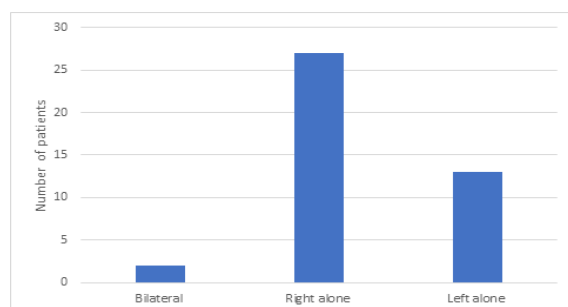
ringing sound in ears, which was unilateral in 21 patients and bilateral in remaining. Vision disturbances in the form of visual obscurations were complained by 57 patients.

Table 3: Papilledema

Papilledema	No of patients	Percentage
Bilateral	79	79%
Right alone	11	11%
Left alone	6	6%

Fundus examination revealed Papilledema in all patients with bilateral Papilledema in 79 patients, while 11 patients had Papilledema only in right and 6 only in left with 4 patients having normal Fundus in both eyes.

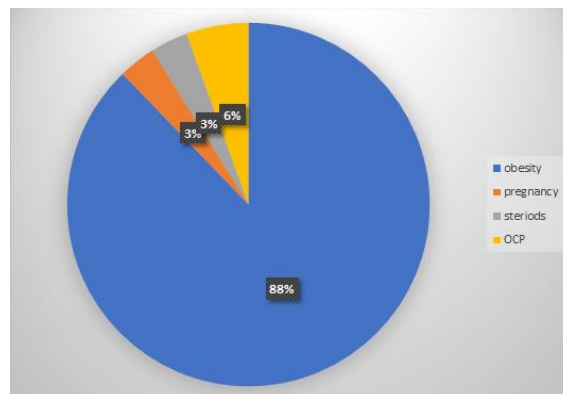
Even in Patients with unilateral papilledema, hyperemia of disc on opposite side was noted. Visual field examination revealed enlargement of blind spot corresponding to finding of Papilledema.

**Figure 1: Lateral Rectus Palsy in present study**

Among 100 patients, 41 had evidence of lateral rectus palsy, of which 27 had right, 12 patients had left and 2 patients had bilateral lateral rectus palsy. However visual acuity measured using Snellen's chart was normal in 54 patients, while remaining had visual acuity ranging from 6/24-6/60. Worst vision recorded was 6/60 in a patient who subsequently underwent surgery for deterioration of vision.

Three of our patients were pregnant during our study, 1 in first trimester and 2 in second trimester. All the 3 had history of consumption of oral contraceptives prior and also had headache prior to conception. One patient was detected to have IIH prior to pregnancy

and was on Acetazolamide, while other 2 patients were detected only after conception.

**Figure 2: Associated conditions in present study**

Eight patients were on chronic drug use. Five had oral contraceptive pills and 3 steroids. Among Five, 4 had taken them regularly during preceding 1 year. Among 3 patients who had taken steroids 2 had taken for nephritic syndrome 10 years prior to onset but discontinued and was not on drugs now. One patient had taken steroids for bronchial asthma through all routes, inhalation, oral and systemic.

Investigations

All patients were evaluated with routine biochemical investigations including sugar, renal and liver parameter. MRI brain was taken with special focus over orbital cuts MRI changes including perioptic nerve sheath widening, empty sella, kinking of optic nerve, flattening of posterior globe of sclera were noted. MRI was also screened for SOL and hydrocephalus.

Table 4: MRI Findings in present study

MRI FINDINGS	No of Patients
1) Empty Sella	-
Empty Sella alone	11
ES + FPG	19
ES + FPG + PNSW	21
ES + FPG + PNSW + ITON	13
ES + FPG + PNSW + ITON + TSS	07
3) FPG + PNSW	5
4) TSS + PNSW	8
5) Transverse sinus Stenosis	6
6) Normal	10

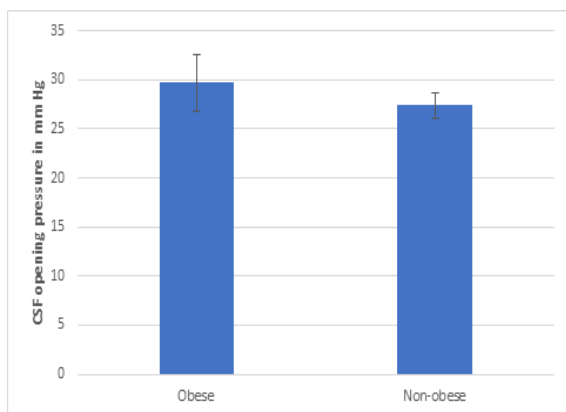


Figure 3: CSF opening pressure in Obese and Nonobese

All 100 patients underwent lumbar puncture and CSF analysis including biochemical, microbiological, cytology and pressure studies were done after obtaining written consent and under strict aseptic precautions.

The CSF parameters for the study population are as follows. All patients had CSF Opening pressure greater than 250 mm of CSF.

The mean CSF opening pressure in Obese patients was 29.69 ± 2.93 and in Nonobese patients was 27.38 ± 1.32 . A statistically significant association in mean CSF pressures was noted between Obese and Nonobese group of patients with a p value of 0.0007 ($p < 0.05$ considered statistically significant).

Table 6: CSF opening pressure

CSF opening pressure	No of patients	Percentage
25 to 30 cm	78	78%
31 to 35 cm	16	16%
>35 cm	6	6%

Table 7: CSF biochemical analysis

CSF routine	No of patients	Percentage
Normal	89	89%
Abnormal	11	11%

DISCUSSION

The present study was conducted at Gandhi Medical College and Hospital in Secunderabad In our study,

we examined the age, BMI, clinical Presentation, Investigations (Imaging & CSF Pressures) and outcome of 100 Patients with IIH.

Table 8: Comparision of our study with other studies

Studies	Results
Mean Age (Years)	
Radhakrishna et al, ^[6]	28
Craig et al, ^[7]	29
G McCluskey, ^[8]	29.8
Jasem Youssef Al-Hashel, ^[9]	32.1
Present study	29.7
Female: Male	
Wall and George, ^[10]	12 : 1
Keslare et al, ^[11]	8:1
Bruce et al, ^[12]	10.1 : 1
Khin P Kilgore et al, ^[13]	11.6 : 1
G McCluskey, ^[8]	6.9 :1
Jasem Youssef Al-Hashel, ^[9]	9.6:1
Present study	11.5 : 1
Percentage with Obesity	
Wall and George, ^[10]	94 %
AK Ball et al, ^[14]	92 %
Idiculla T et al, ^[15]	60 %
G McCluskey, ^[8]	82 - 96%
Jasem Youssef Al-Hashel, ^[9]	89.9%
Present study	79 %
Headache in percentages	
Wall and George, ^[10]	92%
Radhakrishna et al, ^[6]	98.7%
Michael Wall et al 95	94%
Jasem Youssef Al-Hashel, ^[9]	96.4%
Present study	100%
Diplopia in percentages	
Radhakrishna et al, ^[6]	17.5%
Jasem Youssef Al-Hashel, ^[9]	15.8%
Present Study	41 %
TVO in percentages	
Wall and George, ^[10]	72%
Radhakrishna et al, ^[6]	60.5%

Michael Wall et al, ^[16]	68%
Jasem Youssef Al-Hashel, ^[9]	60.4%
Present Study	57%
Tinnitus in percentages	
Michael Wall et al, ^[16]	58%
Jasem Youssef Al-Hashel, ^[9]	51.8%
Present Study	35%
Papilledema in percentages	
Radhakrishna et al, ^[6]	100%
Jasem Youssef Al-Hashel, ^[9]	99.3%
Present Study	96%
Abducens Nerve Palsy in percentages	
Radhakrishna et al, ^[6]	17.1%
Present Study	41%
Visual Acuity Nerve Palsy in percentages	
Radhakrishna et al, ^[6]	23.6%
Craig et al, ^[7]	25%
Present Study	24%
Visual field defects percentages	
Radhakrishna et al, ^[6]	31.6%
Present Study	96%
CSF Biochemical Analysis	
Sklas et al, ^[17]	11.4%
Present Study	11%

The Youngest age in our study is 17 and the oldest is 43 years old, with mean age of 29.7+ 6.8 years. This correlates well with study by Wall and George,^[10] in which mean age was 31 years, Radhakrishna et al,^[6] study with a mean age of 28 years, Study done by Craig et al,^[7] with a mean age of 29 years.

Male: Female ratio was 11.5:1, This correlates with the study by The Youngest age in our study is 17 and the oldest is 43 years old, with mean age of 29.7+ 6.8 years. This correlates well with study by Wall and George,^[10] in which mean age was 31 years, Radhakrishna et al,^[6] study with a mean age of 28 years in 1993, Study done by Craig et al,^[7] with a mean age of 29 years. which had a prevalence of 12:1, Bruce et al,^[12] which had 10.1:1 and Khin P Kilgore et al,^[13] which had prevalence of 11.6 Keslar et al,^[11] reported a prevalence about 8:1 in 2000. Jasem Youssef Al-Hashel,^[9] reported an incidence of 9.6:1 in 2020.

Analysis of BMI showed only 4 patients had normal weight, 17 (17%) patients were overweight (BMI 25-29.9) and 79 (79%) were obese (BMI >30). (NIH2000). Studies done in western population has greater incidence of obesity (92% AK Ball et al)^[14]. Among IIH patient Wall and George,^[10] reported 47 out of 50 patients as obese. Study done by Idiculla T et al,^[15] reported incidence of obesity about 60%.

Headache is present in all 100 patients in our study, Headache has a quality of raised ICP in all of them, and majority experience vomiting and nausea at least once during this course of illness. Various studies (Wall and George,^[10] Radhakrishna et al,^[6] kesler et al,^[11]) all noted a similar prevalence of headache among IIH patients (80-98%)

Diplopia was noted in 41 (41%) of our patients and most of them described it as double vision for distant objects and on looking to either side. Similar incidence was noted in various other studies between 57-72%. (Wall and George,^[10] Radhakrishna et al,^[6] and 15.8 % by Jasem Youssef Al-Hashel.^[9]

Visual obscurations was noted in 57 (57%) of patients in our study. Study done by Michael Wall et al,^[16] showed a prevalence of 68%, Jasem Youssef Al-Hashel,^[9] showed TVO in 60.4% in 2020.

Tinnitus was noted in 35% of the study population. In a study done by Michael Wall et al,^[16] in 2010 showed a prevalence of 58 %. A study done in 2020 by Jasem Youssef Al-Hashel,^[9] showed a prevalence of 51.8%.

Papilledema is almost a universal finding in IIH patients 96% of patients had papilledema either unilateral or bilateral. Bilateral papilledema was noted in 79 patients whereas right alone in 11 patients and left eye alone in 6 patients. Another marked feature is presence of asymmetry in fundus findings even in patients with bilateral papilledema. Similar prevalence was noted among other studies Including Radhakrishna et al,^[6] 100%, Jasem Youssef Al-Hashel 99.3%.^[9]

Abducens Nerve Palsy is the only Cranial Nerve dysfunction and Neurological deficit noticed in patients with Idiopathic Intracranial Hypertension. In the present study it was noted in 41% of patients. Study done by Radhakrishna et al,^[6] showed a prevalence of 17.1%.

VisualAcuity-24 patients had decreased visual acuity either unilaterally or bilaterally as measured by Snellen's chart. Best vision was 6/6 and worst visual acuity recorded was 5/60 in patients who had subsequent deterioration of vision and had to be taken up for surgery. 13 of this patients were wearing correction glasses prior to onset of headache, for refractory errors. None of them had earlier prescription to compare the previous visual acuity. Only 11 patients were detected newly to have decreased visual acuity. Literature suggests that there is reduced central visual acuity and that too in 1/4th of Patents.

Three of our patients were pregnant during our study, 1 in first trimester and 2 in second trimester. All the

3 had history of consumption of oral contraceptives prior and also had headache prior to conception. One patient was detected to have IIH prior to pregnancy and was on Acetazolamide, while other 2 patients were detected only after conception.

Eight patients were on chronic drug use. Five had oral contraceptive pills and 3 steroids. Among Five, 4 had taken them regularly during preceding 1 year. Among 3 patients who had taken steroids 2 had taken for nephritic syndrome 10 years prior to onset but discontinued and was not on drugs now. One patient had taken steroids for bronchial asthma through all routes, inhalation, oral and systemic.

Visual field defects - The most common field defect noted is enlargement of blind spot, and this finding correlated with those patients who had papilledema. It is the most common visual field defect noted by literature. Apart from blind spot enlargement one patient had arcuate scotoma. Field defects other than blind spot enlargement, like arcuate scotoma, and

centrocecal scotoma, with temporal and altitudinal field defect were also noted by Michael Wall et al.^[16] CSF opening pressures were elevated in all patient (>250mm CSF) in our study. CSF was abnormal with raised proteins and normal sugar and cell count in 11 patients. Increased CSF protein was found in 8 of 70 patients by Sklas et al,^[17] and many of them were receiving medical treatment.

The most common imaging finding in MRI was empty sella, which was seen in 71% patient in our study (11% alone& others in combination), which was followed by. Flattening of posterior globe in 65% % and perioptic nerve sheath widening 54%. Transverse sinus stenosis (left) was noted in 6 patients. There was no thrombosis. Study by Friedman and Jacobson,^[18] noted similar MRI changes, however peri optic nerve stealth widening and kinking of optic nerve was noted in majority of patient.

Table 9: Comparison of MRI findings with other studies

Study	Peri optic nerve sheath widening	Empty Sella	Flattening of posterior sclera
Jasem Youssef Al-Hashel ^[9]	46%	69.7%	76.9
Present Study	54%	71%	65%

Limitations of the Study

1. The sample size was small.
2. Future research with more extensive data collection could provide a more clear evidence of the Risk factors, Clinical characteristics and MRI brain imaging findings.

Recommendations For Future Work

Large sized studies in Indian population are required to understand the clinical characteristics and MRI brain imaging features more clearly. Studies to explore the risk factors in the Indian setting are required for effective management strategies

CONCLUSION

In our study we analyzed the demographic features, clinical presentation, and investigations including MRI Brain features, CSF opening pressure of IIH patients, following conclusions were observed. Majority of our patients were in 2nd – 3rd decade. There was high female preponderance in our study. Obesity was the most common risk factor. Headache is the universal presenting symptom in all patients, followed by diplopia and visual disturbances. Nearly all of them had papilledema as a predominant finding, followed by lateral rectus palsy but no other focal neurologic deficits. Typical imaging findings of IIH were present in majority of patients. All of our patients had elevated CSF opening pressure. Small number of patients had raised abnormal CSF with raised proteins and normal cell count and sugar levels. The mean CSF opening pressure in Obese patients was found to be significantly higher than Non obese, there was a statistically significant association between the two.

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