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ORIGINAL ARTICLE

INCIDENCE OF HYDROCEPHALUS IN PEDIATRIC AGE IN A TERTIARY CARE CENTRE OF CHHATTISGARH

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ABSTRACT: AIM & OBJECTIVES: Evaluation of incidence of hydrocephalus in various subgroups of pediatric age in a tertiary care centre. **MATERIAL AND METHODS:** A prospective study was conducted in the department of Radio diagnosis, Pt. J.N.M. Medical College, Raipur (C.G.) 50 consecutive cases of hydrocephalus in pediatric age group were evaluated. Cases with hydrocephalus confirmed by CT, from neonate to 14 years of age were included. Relevant investigations done. Relation of type of hydrocephalus and Age group was noted. **RESULT:** Out of 50 cases of hydrocephalus cases, 4%were neonate, 38% were under 6 months of age, 46% were under 1 year, and 78% were less than 5 years of age. Only 6% cases were above 10 year of age. The male to female ratio was 3:2. Maximum cases were of acquired type (62%) followed by congenital type (38%). In acquired type, infective lesions were predominant with 22 case (44%) and neoplastic were 9 cases (18%). Maximum cases (45.8%) in infective hydrocephalus were in 2-5yr age group. Maximum cases in neoplastic type were in 5-10yrs group. In congenital hydrocephalus maximum cases reported at 1-6 months age. Out of total 50 cases, 14 cases (28%) were of communicating type and 36 cases (72%) were non-communicating including 4 cases of dandy walker cyst. According to severity 24%mild, 50% moderate, and 26% severe type of hydrocephalus were found. **CONCLUSION:** Congenital hydrocephalus is prevalent in neonates and infants while hydrocephalus with acquired variety involves children of comparatively older age. Despite recent advances in imaging modalities, outcome remain uncertain which is affected by age groups and etiology of hydrocephalus.

KEYWORDS: Hydrocephalus, Pediatric age, Incidence.

INTRODUCTION: Hydrocephalus is a condition where excess of cerebrospinal fluid (CSF) accumulates within the ventricular system and cisterns of the brain leading to increased intracranial pressure (ICP) and related consequences. This can apparently result from various causes that can affect a fetus, infant, child or adult (Rekate1). With a prevalence of 4.65 per 10 000 births, congenital hydrocephalus is a common neurological diagnosis in children caused by flow obstruction(s), insufficient drainage or excessive CSF production. No international consensus exists concerning classification of hydrocephalus, and a number of different systems are currently in use[1] including cataloging based on age of onset, CSF dynamics and location of CSF accumulation, intracranial pressure(ICP) levels and the presence of symptoms. The most common causes of childhood hydrocephalus vary with age of onset, and include congenital malformation, tumor, cystic(mal-)formation, infection and hemorrhage.[1,2] Congenital hydrocephalus is diagnosed either by prenatal ultrasound(US) and genetic analysis or postpartum by its characteristic clinical presentation combined with US, or more commonly computed tomography(CT) scanning or magnetic resonance imaging(MRI).[2]

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For acquired hydrocephalus specially after infancy CT and MRI technologies are a central part of diagnosing, and also the evaluation of treatment options, follow-up and monitoring of patients.[3] Present study was conducted to know various causes of hydrocephalus in infants and different age groups of children.

MATERIAL AND METHODS: Study was conducted in, Pt. JNM Medical College, Raipur Chhattisgarh. Total 50 consecutive cases of hydrocephalus in pediatric age group were evaluated. All cases were underwent proper history, general and neurological examination and then it was follow by radiological evaluation which included plain skull skigram (Lateral view and posterior-anterior view) and sonography of brain through anterior fontanelle in both coronal and sagittal planes (Used equipment 400 pro series, GE mode). Several measurement or indices have been utilized in assessing hydrocephalus. The most commonly used indices are – ventricular size index: This is the ratio of transverse diameter of frontal horn: Transverse diameter of skull at inner table.

OBJECTIVES: The current study aimed at evaluating pediatric hydrocephalus and age-related differences in etiology at a tertiary care center in Chhattisgarh State.

RESULTS: Total 50 cases comprised of neonates to 14 years of age included. In present study, 2 cases were under 1 month of age, one of them was of 2 days and having Dandy Walker cyst with meningomyelocele, the another one was of 13 days and had aqueductal stenosis with lumber meningocele. 19 cases (38%) were under age of 6 months and 78% cases were less then 5 years of age when registered. Only 3 cases were above 10 years of age. (Table 1). There was male preponderance. 62% were male and 38% were female so the male to female ratio was found to be 3:2. (Figure1) Cases were distributed according to severity of hydrocephalus in mild, moderate and severe type. Moderate degree of hydrocephalus was 50% whereas mild and severe degree of hydrocephalus were 24% and 26% respectively. (Figure2) Distribution of cases according to communicating and non-communicating type also done. 28% communicating, 64% non-communicating type cases were found whereas 8% cases were of Dandy Walker malformation.

Overall, 38% cases were congenital and 62%cases were of acquired origin. (Table 2) Most of the congenital cases were secondary to aqueductal stenosis. 2 cases of congenital aqueductal stenosis and one case of DWS was associated with lumber meningocele. There was one case of Chiari malformation. In acquired cases infective lesion predominated the list. One case of hydrocephalus due to 4th ventricle outlet obstruction with intraventricular neurocysticercosis was also seen in infective group. (Table 2) Various signs and symptoms related to hydrocephalus were noted. Enlargement of head, vomiting, fever, convulsion, headache, excessive irritability and impaired consciousness were the most common frequent presenting features. (Table 3) All cases underwent CT examination and diagnosis was finalized.

Clinical correlation between congenital hydrocephalus and milestones was also taken into account and it was found that 50% cases with aqueductal stenosis, and all cases of Dandy walker cyst and Arnold Chiari type 2 malformation had delayed milestones. In acquired hydrocephalus, the picture was variable in this respect. Majority of cases with infective cause had either delayed milestones or regression in milestone. In contrast majority of cases with neoplastic lesion had shown normal milestones.

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OBSERVATION:

Age group	No. of cases	Aqueduct stenosis	DWS	Chiari Malform.	Infective hydroceph.	Neoplastic
0-1 months	2	12(85%)	1(25%)	1(100%)	-	-
1-6 months	17	1(7.5%)	2(50%)	-	3(13.6%)	-
6 months–1 yr.	4	1(7.5%)	1(25%)	-	2(9.1%)	-
1-2 years	5	-	-	-	3(13.6%)	1(11.1%)
2-5 years	11	-	-	-	10(45.5%)	1(11.1%)
5-10 yrs	8	-	-	-	3(13.6%)	5(55.6%)
10-14 yrs	3	-	-	-	1(4.5%)	2(22.2%)
Total	**50**	**14(100%)**	**4(100%)**	**1(100%)**	**22(100%)**	**9(100%)**

Table 1: Distribution of male and female cases according to age

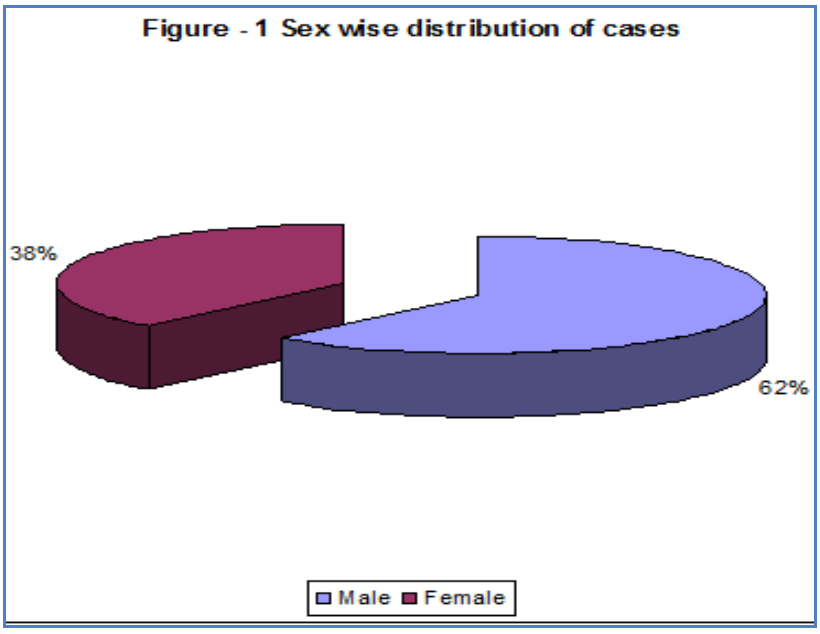

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Figure – 2 Distribution of cases according to degree of severity of hydrocephalus

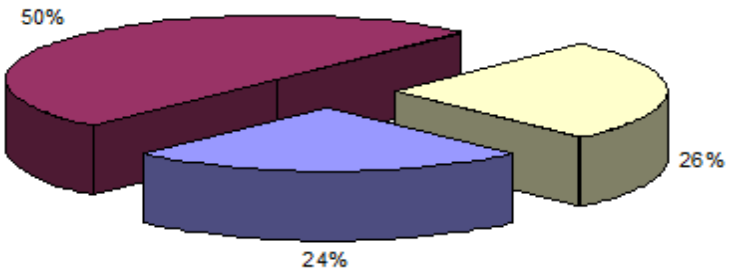
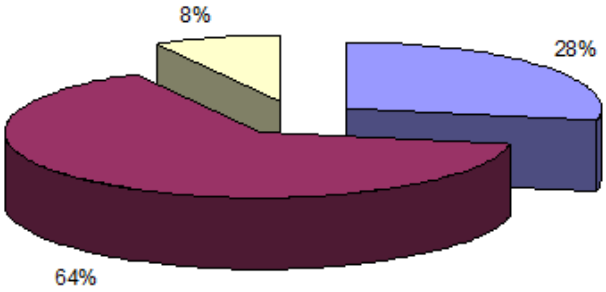


Figure – 3 Distribution of cases according to communicating/non-communicating hydrocephalus



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Distribution of cases	No. of Patients	Percentage
Congenital causes of hydrocephalus		
• Aqueductal stenosis • Aqueductal stenosis + LMC • Dandy walker cyst • Dandy walker cyst+LMC • Arnold chairy malformation type II	12 2 3 1 1	24 4 6 2 2
Total	19	38
Acquired causes of hydrocephalus		
a. Infective/ Inflammatory b. Neoplastic	22 9	44 18
Total	31	62
Total no. of case	50	100

Table 2: Distribution of cases according to etiology

Symptom/Sign	No. of patients	Percentage (%)
Enlargement of head	16	32
Headache	11	22
Vomiting	25	50
Fever	30	60
Cough	8	16
Impaired conscious level	10	20
Convulsions	22	44
Incontinence	2	4
Dimness of vision	4	8
Difficulty in Walking	4	8
Excessive irritability	12	24
Involuntary movement	1	2
Significant past history	7	14
Significant family history	2	4

Table 3: Incidence of various signs and symptoms

DISCUSSION: Hydrocephalus has been known since 1811 when Cooke reported a case. Since then, definition, etiology, symptoms, classification, and treatment options are debated more often. The incidence of congenital hydrocephalus is about 0.2–0.5/1000 live births. A higher incidence has been reported in elderly primiparous mothers. In developed countries, the incidence of congenital hydrocephalus has been estimated at 0.5 cases per 1000 live births and the incidence of neonatal

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hydrocephalus has been estimated at 3-5 cases per 1000 live births, with a male predominance.[4] Comparing the developing countries with developed countries, an incidence of congenital hydrocephalus greater than or equivalent to that in developed countries would be expected, but non-congenital (Acquired) etiologies of hydrocephalus in children are expected to be different.

The post-hemorrhagic cause associated with prematurity being the most common in Western countries and post-infectious hydrocephalus (PIHC) being more common in developing countries. Non-genetic structural defects can occur for several reasons. Hydrocephalus is strongly associated with spina bifida, and this defect is caused by a deficiency of folates/folic acid in the maternal diet. Multivitamin supplements during pregnancy have singly been shown to reduce the risk of hydrocephalus. Low maternal age has been associated with a higher risk of hydrocephalus, probably because younger mothers do not undergo prenatal screening. Sign and symptoms are the main guiding force to the parents of the hydrocephalic child for seeking medical advice.

There is a rise of concern of the parents for early treatment so majority of the cases come for it in early age. Age at the time of presentation was similar to other authors. In the study of Abdullah & Naing.[5] age range was 1 day to 13 years and they found 30% cases between 0-30 days. O' Tuncer et al.[6] also found majority of their cases between 3 months and 3 years. Regarding sex distribution of cases, there was male preponderance with male to female ratio of 3:2. Similar observations were found other studies also like Salvador et al.[4] Abdullah et al[5] and O' Tuncer et al.[6]

The presentation of hydrocephalus differs in the case of the neonate and infant compared with the older child or adult. Prior to closure of the cranial sutures and obliteration of the fontanelle, hydrocephalus results in disproportionate head growth. Clinical symptoms are often subtle and include general irritability, poor feeding and slow attainment of milestones. clinical signs include bulging of the fontanellae, wide separation of the cranial sutures, prominence of scalp veins, and "setting sun" of the eyes.[7]

In present study, enlargement of head, was most common feature in infants and young children. In study of Kumar et al.[8] clinical presentation was quite similar with present study.

In older children and adults, the classical symptom complex consisting of raised ICP, headache, vomiting and drowsiness. When hydrocephalus has developed insidiously, cognitive impairment, poor concentration and behavioral changes occur. Visual obscurations and papilledema are more common in adults than in the younger age group. Venkatraman7 In present study, most cases of TB meningitis presented with vomiting (83%), fever (76%), and headache (34%). 6 cases of nontubercular meningitis also presented with fever, cough and convulsions. On blood picture as well as in CSF examination, polymorphs were seen predominantly in non tubercular meningitis. All the cases were under severe category of hydrocephalus. Broad spectrum antibiotic coverage with ventriculo peritoneal shunt done in almost all cases. Chung-Hua-I, Tsa-Chi Taipei et al.[9] also noted similar clinical picture.

DISCUSSION OF AGE DIFF IN DIFF HYDROCEPH: Severity of hydrocephalus is an important aspect for treatment and prognosis so cases were categorize in to mild, moderate and severe type according to ventricular size index. 24% mild, 50% of moderate and 26% severe hydrocephalus was seen. The results were in accordance with Martis et al.[10] In present study, 19 cases (38%) were of congenital variety and 31 cases (62%) were of acquired causes. Study of Kumar R et al.[8] was in accordance with present study.

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Common causes of hydrocephalus in pediatric age found in present study:

Aqueductal stenosis: The growth of the tectum and tegmentum makes the lumen of the neural tube narrow in the region of mesencephalon, leading to narrowing of aqueduct of Sylvius. Scarring and gliosis following infection or hemorrhage can cause acquired aqueductal stenosis. Tumors from the surrounding structures have potential chance to block the aqueduct. Imaging is confirmatory in such situations.[7] In present study, all cases of congenital hydrocephalus secondary to congenital aqueductal stenosis and Arnold-Chiary malformation type II had non-communicating hydrocephalus.

Meningomyelocele: Hydrocephalus complicates open spina bifida in 85–90% of patients. This is usually associated with Chiari malformation. Venkatraman.[7] The reported incidence of primarily congenital hydrocephalus is 0.9 to 1.5 per 1000 births and those occurring with spina bifida and myelomeningocele varies from 1.3 to 2.9 per 1000 per births. We had found one case of Chiari malformation type 2 which was associated with meningomyelocele.

Dandy Walker syndrome: This anomaly comprises agenesis of the cerebellar vermis with cystic dilation of the 4th ventricle, enlargement of the posterior fossa and hydrocephalus. The hydrocephalus manifests in the postnatal period. Additional brain malformations leading to neural developmental delay are reported in 70% of cases. We had 4 cases of DWS all were under 1 yr of age. They had delayed milestones.

Post-meningitic: Hydrocephalus can occur following a range of infectious or inflammatory diseases. Organization of the inflammatory exudates, along with scarring or gliosis can produce obstruction to CSF flow both in the ventricular system and in the subarachnoid spaces, leading to either obstructive or communicating hydrocephalus. Bacterial, parasitic and granulomatous infections like tuberculosis and fungal infections can also lead to hydrocephalus. Low socioeconomic status is a risk factor for all non-genetic (Acquired) defects, including hydrocephalus. Hydrocephalus can be acute causing a large increase in the ICP and rapid deterioration of clinical condition[7].

Tubercular meningitis is the most common cause of communicating hydrocephalus in India.[11] Bhargava et al.[12] also suggested that hydrocephalus is a common entity with CNStuberculosis, accounting for about 83% cases and basal exudates and meningeal enhancement are common findings on CT.[6,8] In present study, incidences of tubercular meningitis as a cause was 24% which was similar to results of Kumar et al,[8] Martis et al.[10] and rashid.[13]

Obstruction due to neoplasm: Hydrocephalus with different types of neoplasm could be diagnosed with precision by CT scan. Out of 9 cases 4 cases were of astrocytoma (44.5%), 2 cases of craniopharyngioma (22.2%), 2 cases of medulloblastoma (22.2%) and one cases of ependymoma (11.2%). Astocyloma was most common neoplasm. Desai et al.[14] also suggested the same.

Hydrocephalus secondary to neoplasm presented as a non-communicating type in all 9 cases (100%).

CONCLUSION: Congenital hydrocephalus is prevalent in neonates and infants while hydrocephalus with acquired variety involves children of comparatively older age. Despite recent advances in imaging modalities, outcome remain uncertain which is affected by age groups and etiology of hydrocephalus.

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