

## Research Article

# Magnitude of Hydrocephalus in Neonates: Its Surgical Management and Complications

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**Abstract: Objective:** : To determine magnitude of congenital or acquired hydrocephalus and its possible management and complications.

**Materials and Methods:** This Hospital based Retrospective observational study was conducted in department of pediatric surgery King Edward medical university / Mayo hospital Lahore from January 2021 to March 2022.

All patients presented from neonatal life till 3 months of age with hydrocephalus due to congenital or acquired reasons were included in this study. There were 55 male and 28 female patients with male predominance. A detailed Proforma was made giving patients information, associated congenital or acquired anomaly and surgical management of hydrocephalus. All patients were operated on elective operation theatre list. Post-operative complications were noticed on admission files and addressed.

**Results:** During the study period, 83(n=1) patients with hydrocephalus were admitted in department of pediatric surgery Mayo hospital Lahore. Among these patients, 56(67.5%) patients have hydrocephalus associated with myelomeningocele while 10(12%) patients with encephalocele. 11(13.3%) patients showed hydrocephalus due to post tuberculosis meningitis while 3(3.6%) patients with Arnold chiari 2 malformation. 1(1.2%) patients presented with hydrocephalus due to Congenital obstruction of cerebral aqueduct while 2(2.4%) with Intracranial hemorrhage ventriculoperitoneal shunting was performed in 55(66.3%) patients to treat hydrocephalus. Conservative management of hydrocephalus was done in 24(28.9%) patients while in 4(4.8%) patients ventricular taping was done. Wound infection was major post-operative complication and was noted in 13 (15.7%) patients.

**Conclusion:** Ventriculo peritoneal shunting is main treatment modality for obstructed hydrocephalus. Major complication of ventriculo peritoneal shunting is infection which can be prevented by proper prophylactic antibiotics as well as sterile environment of operation theatre.

**Keywords:** Hydrocephalus, congenital, Myelomeningocele, Management, Ventriculo- peritoneal shunting, complications, Wound infection, Spina bifida.

## INTRODUCTION

A worldwide survey done by WHO every year 3-6% children are born with congenital anomalies [1]. Globally 2.4 million children died in neonatal age and about 20 -30 % of them have congenital anomalies [2]. Children with congenital anomalies contribute to long term disability and morbidity which impacts significant burden on individuals, family, health system, and society [3]. Among congenital anomalies hydrocephalus is the most common anomaly having high morbidity and mortality [4]. Hydrocephalus is “ventricular dilatation due to imbalance between cerebrospinal fluid production in ventricles and its absorption to systemic circulation” [5]. Incidence of hydrocephalus is about 0.9 per 1,000 births [6]. Congenital hydrocephalus is associated with spina bifida and other associated congenital anomalies. Acquired hydrocephalus results from intracranial hemorrhage, trauma and post infectious reasons. Currently more data is available regarding surgical management of hydrocephalus in adults. Very less

data is available regarding management of obstructed hydrocephalus in children especially neonates. This current study was conducted to know magnitude, surgical management and complications of hydrocephalus in neonates in the hospital.

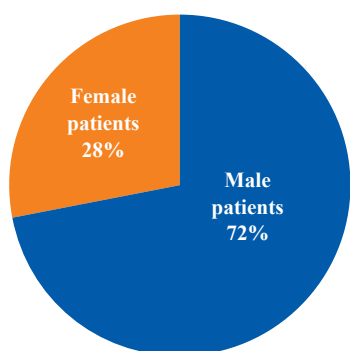
## MATERIALS AND METHODS

This research study was conducted at NICU department of pediatric surgery King Edward medical university / Mayo hospital Lahore from January 2021 to March 2022. As it was a retrospective study, so no ethical approval from IRB was needed. Pediatric surgery department is receiving neonates born with different congenital anomalies referred from pediatric medicine units as well as from affiliated hospitals. During study period total 286 neonates with different congenital anomalies were admitted in department. Out of these 83 patients were having hydrocephalus due to different congenital or acquired anomalies. A prescribed Proforma was designed providing patients information, associated congenital or acquired anomaly and surgical management of hydrocephalus. All patients were operative on elective operation

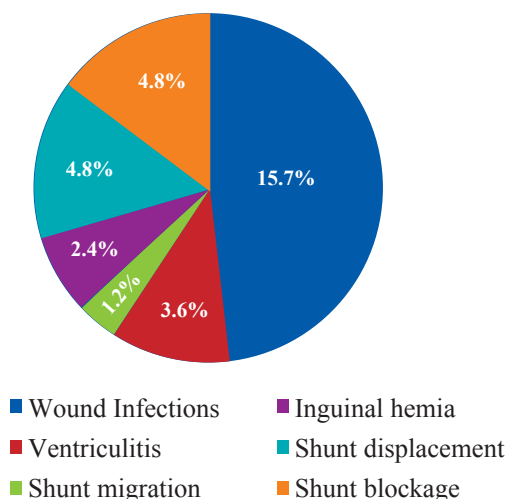
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theatre by consultant pediatric surgeons. Post operatively patients were kept in NICU of the department on injectable broad spectrum antibiotics for minimum 5 days. Post-operative complications were noted and addressed timely. Criteria of ventriculoperitoneal shunting were made on size of cortical thickness on cranial ultrasound. Cortical thickness less than 2 cm were candidates of ventriculoperitoneal shunting and cortical thickness more than 2 cm were candidates for conservative management of hydrocephalus. Conservative management was done in communicating hydrocephalus with acetazolamide dose of 5 to 10 mg per KG body weight for 1 to up to 2 years. Mothers were trained to mix calculated dose of acetazolamide in feed of babies. Ventricular tapping was done in patients with active state of meningitis and ventriculitis. 22 number burr hole was used to drain CSF from lateral ventricles followed by 3<sup>rd</sup> generation cephalosporin antibiotics in meningitis dose.

**RESULTS**

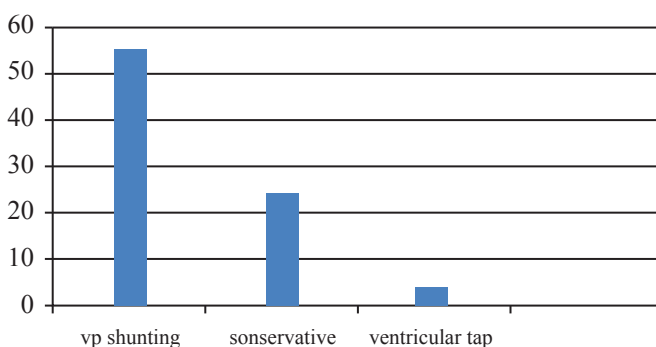


**Fig. (1).** Showing Gender Distribution of Patients.



**Fig. (3).** Showing Post Shunting Complications.

During the study period, 83(n=1) patients with hydrocephalus were admitted. There were 60(72.3%) male patients and 23(27.7%) female patients. (Fig. 1). Out of 83(n=1) patients with hydrocephalus, 56(67.5%) patients have hydrocephalus associated with myelomeningocele while 10(12%) patients with encephalocele. 11(13.3%) patients showed hydrocephalus due to post tuberculosis meningitis while 3(3.6%) patients with Arnold chiari 2 malformation. 1(1.2%) patients presented with hydrocephalus due to Congenital obstruction of cerebral aqueduct while 2(2.4%) with Intracranial hemorrhage (Table 1). Regarding treatment of hydrocephalus patients, ventriculoperiton shunting was done in 55(66.3%) patients to treat hydrocephalus. Conservative management of hydrocephalus was done in 24(28.9%) patients while in 4(4.8%) patients ventricular tapping was done (Fig. 2). Regarding post-operative complications it was noted that there was wound infection in 13 (15.7%) patients. Ventriculitis was observed in 3(3.6%), Shunt migration in 1(1.2%), Inguinal hernias in 2(2.4%), Shunt displacement in 4(4.8%) and Shunt blockage 4(4.8%) patients (Fig. 3).



**Fig. (2).** Showing Different Methods of Treatment for Hydrocephalus.

**Table 1.** Showing Different Causes of Hydrocephalus with Percentages.

Serial No	Causes of Hydrocephalus	No of cases	Percentage
1	Myelomeningocele	56	67.5%
2	Encephalocele	10	12%
3	Arnold chiari 2 malformation	3	3.6%
4	Congenital obstruction of cerebral aqueduct	1	1.2%
5	Post meningitis	11	13.3%
6	Intracranial hemorrhage	2	2.4%
	Total	83	100%

## DISCUSSION

Hydrocephalus is a major congenital or acquired anomaly affecting normal brain development. In this study it is clear that all patients presented from neonatal life till 3 months of age with hydrocephalus with male to female predominance. This is comparable with other studies which state that mostly hydrocephalus presented in neonatal. The mean age of the patient in the study conducted by Pan P. and Blencowe H, *et al.* is 12.12 months and 9.5 months respectively. In another study the mean age is 6.69 months while that other study showed mean age of 8.5 and 3 months respectively life [7, 8]. In the study there are more male patients than females with male to female ratio of 2.6:1. Same finding is noted in some other studies [9-11]. In this study it is noted that mostly patients having hydrocephalus have myelomeningocele 56(67.5%). Similar etiology is seen in various other studies also [12-14]. However some international studies in literature also state that post infectious and post hemorrhagic are the most frequent etiology of neonatal hydrocephalus in developed countries [15]. In Pakistan main cause of hydrocephalus is due to neural tube defect which is alarming. There should be campaign on awareness of folic acid supplementation in pregnancies as well as good antenatal care. Mostly patients in the study are treated with ventriculoperitoneal shunting followed by conservative management and external ventricular tapping. Same results are also evident from other studies [16-20]. In this study the most common post-operative complication is shunt infection 13 (15.7%). Ventriculitis was observed in 3(3.6%), Shunt migration in 1(1.2%), Inguinal hernias in 2(2.4%), Shunt displacement in 4(4.8%) and Shunt blockage 4(4.8%) patients. In contrast to the study some studies have highlighted shunt obstruction as most common post shunting complication [21-22]. Overall there is no mortality in this study. This is because of expert surgical and anesthesia facilities and availability of neonatal intensive care unit facilities for post-operative management of patients in the set up. This is in contrast to some studies showed mortality due to post shunting sepsis [23].

## CONCLUSION

Hydrocephalus in children results in significant clinical and psychosocial morbidity. Myelomeningocele is main cause of non-communicating hydrocephalus. This is a preventable condition and can be prevented by proper antenatal screening. There should be literature and awareness programs on print and social media to educate women and food fortification with folic acid. Ventriculoperitoneal shunting is main treatment strategy to treat non communicating hydrocephalus but should perform in sterile environment to avoid shunt complications.

## AUTHORS' CONTRIBUTION

**Muhammad Kashif Bashir:** Conception and design of the study, Data analysis, Manuscript writing.

**Aisha Ishtiaq:** Data Analysis, Critical review.

**Shazia Bashir:** Designing of the study, Data collection, Data entry and interpretation.

## CONFLICT OF INTEREST

Declared none.

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