Factors Associated with Postoperative Complications in Hydrocephalic Infants Diagnosed at Bernard Mevs Hospital in Port-au-Prince, Haiti, from 2011 to 2013

Floreine-Jemima Joseph[1], *Joseph Bernard Jr*[2], *Sylvio Augustin Jr*[3]

OBJECTIVE: **Complications worsen the prognosis of hydrocephalic children who undergo surgery. The main objective of this study was to determine factors associated with postoperative complications in Haitian infants with hydrocephaly.**

METHODS: **This was a cross-sectional study conducted on hydrocephalic infants diagnosed in a Haitian hospital from 2011 to 2013. Records were consulted to gather key variables that were evaluated in relation to the occurrence of postoperative complications. Any variable whose *P* value was less than 0.05 for the Mantel-Haenszel χ^2 test was considered a factor associated with postoperative complications.**

RESULTS: The prevalence of hydrocephalus in our sample was 6.6%. Of the 131 cases of hydrocephalus surveyed, 75 were selected. The sex ratio was 1.02, and the age group from 1 to 6 months old was the most affected (52% of cases). The increase in head circumference (96% of cases) was the most common clinical sign. A total of 70.7% of the infants underwent imaging work-up, and 26.7% had central nervous system malformations. A total of 84% received surgical treatment, and one third of the operated infants presented with complications, the most common being infection (8%). Postoperative mortality was 6.7%, and 40% of operated infants had no postoperative care after medical discharge. Ventriculoperitoneal shunt was more significantly associated with complications than endoscopic third ventriculostomy (odds ratio 3.25, *P* = 0.03).

CONCLUSIONS: **Hydrocephalus in Haitian infants is diagnosed late and inadequately investigated, treated, and monitored. Ventriculoperitoneal shunts are significantly related to more postoperative complications than endoscopic third ventriculostomy.**

INTRODUCTION

Hydrocephalus is the result of abnormal dynamics of cerebrospinal fluid (CSF), leading to its accumulation in the ventricles and subarachnoid space.[1] The underlying mechanisms are an increase in the CSF secretion, obstruction to its circulation, and/or impairment in absorption.

Regardless of the etiology, the treatment of choice for hydrocephalus in infants is surgery.[2] Various techniques exist, and the choice depends on many factors, such as age, type of hydrocephalus, and the presence or absence of intracranial hypertension.[3]

Among surgical treatment choices, the internal bypass via CSF shunt is the most common,[4] followed by endoscopic third ventriculostomy (ETV).[5,6] These types of treatment significantly improve the prognosis of hydrocephalus but still have some complications: infection, obstruction, disconnection of the shunt, catheter migration, etc. The major complication of shunts is infection. In a particular study, 8.7% of shunts showed dysfunction in the month after surgery.[7]

ETV is the treatment of choice for obstructive hydrocephalus (stenosis of the aqueduct of Sylvius, Dandy-Walker malformation, Chiari II malformation, etc.).[5,6] This technique is used to reestablish a normal CSF flow by windowing the third ventricle's floor. It requires no implant, and its infection rate is relatively low.[8-10]

Key words
- Complications
- Haiti
- Hydrocephalus
- Surgery

Abbreviations and Acronyms
CI: Confidence interval
CNS: Central Nervous System
CSF: Cerebrospinal fluid
ETV: Endoscopic third ventriculostomy
HR: Hazard ratio
VPS: Ventriculoperitoneal shunt

From the Departments of [1]*Neurology,* [2]*Infectiology, and* [3]*Surgery, University Notre Dame of Haiti, School of Medicine, Port-au-Prince, Haiti*

To whom correspondence should be addressed: Floreine-Jemima Joseph, M.D. [E-mail: floreinejoseph@yahoo.fr]

Citation: World Neurosurg. (2017) 103:386-390.
http://dx.doi.org/10.1016/j.wneu.2017.04.073

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

Surgery in hydrocephalic children carries the risk of complications. The factors predicting their occurrence should be assessed to be proactive and prevent them.

In Haiti, there are few data on pediatric neurosurgery,[11,12] and virtually none that can assess the risk of pediatric morbidity due to hydrocephalus and predictors of postoperative complications. The main objective of this study was to determine the prevalence of hydrocephalus among hospitalized children at Bernard Mevs Hospital and factors associated with postoperative complications in Haitian infants with hydrocephaly.

MATERIALS AND METHODS

Study Design and Participants

This is a cross-sectional study conducted at Bernard Mevs Hospital, located in Port-au-Prince, Haiti. It is a 50-bed hospital that employs 22 physicians, 25 nurses, and 70 consultants/training staff and treats 200 to 300 patients per day. The hospital is equipped with a pediatric ward, a neonatal intensive care unit, and 2 continuously running operating rooms. The study was approved by the ethics committee of Notre Dame University School of Medicine and Health Sciences.

Cases of hydrocephalus were identified from the pediatric ward admission registry. We conducted medical record reviews of all infants aged 0–24 months at the time of their diagnosis of hydrocephalus who were treated at the Bernard Mevs Hospital from January 1, 2011, to December 31, 2013. We excluded infants who were lost to follow-up after initial consultation, whose parents denied management and monitoring, and whose files were incomplete.

Data Collection and Analysis

The following data were extracted: patient sociodemographic information (age, sex), medical history (yes/no for prematurity, meningitis and head injury), current symptoms and signs related to hydrocephalus, and treatment history including the use of imaging, type of surgical treatment, postoperative complications, and length of follow-up. Data were collected by the authors via a standardized chart review form.

Data analysis was conducted with Epi Info 7.1.3.3 (Centers for Disease Control and Prevention, Atlanta, Georgia, USA). We report on the prevalence (95% confidence interval [CI]) of hydrocephalus, of sociodemographic and clinical characteristics, and of types of surgical treatment. We compared the risk of postoperative complications by sociodemographic and clinical characteristics using the χ^2 statistic.

RESULTS

Hydrocephalus Morbidity Rate

From January 2011 to December 2013, there were a total of 1993 pediatric hospitalizations at the Bernard Mevs Hospital, 131 (6.6%) of which were related to hydrocephalus. Table 1 summarizes the annual distribution of pediatric hospitalizations and cases of hydrocephalus annually.

All entries in the pediatric ward admission registry were considered as pediatric hospitalizations. Cases of hydrocephalus were all entries that mentioned "hydrocephalus" in the diagnostic box. We considered as dead those infants whose death occurred during hospitalization and was reported in the pediatric ward admission registry.

Of the 131 cases of hydrocephalus diagnosed during the study period, 50 were excluded because patients were older than 24 months. We consulted 81 records. Two cases were excluded because their files were incomplete and 4 because the data were inconsistent; therefore, 75 cases were included in this study.

Sociodemographic and Clinical Characteristics of the Study Population

The average age of patients with hydrocephalus was 5 months (0 days–18 months). The sex ratio was 1.02. Twenty-two infants (29.3%) had a risk factor for the development of hydrocephalus, the most common one being meningitis (21.3%). Increased head circumference (96%), eye disorders (37.3%), and bulging fontanelle (36%) were the most common warning signs for hydrocephalus in this sample.

Imaging

Fifty-three of the 75 infants (70.67%) had at least one imaging test. Fifty-two (69.3%) had a computed tomography scan, 3 (4%) a transfontanellar ultrasound, and 1 (1.3%) magnetic resonance imaging. Fourteen of the 22 infants for whom no imaging study was found underwent surgery. More than 66% of the infants had the enlargement of the ventricles as main imaging finding, followed by central nervous system (CNS) malformations (26.7%). The CNS malformations found were of different types. Four cases had several CNS malformations. Two patients had nonspecified defects. Aside from CNS malformations revealed by imaging, other abnormalities including a case of clubfoot and one of micrognathia were noted.

Surgical Treatment

Sixty-three infants (84%) underwent surgical treatment. Of the 12 (16%) who did not have surgery, 6 died before surgery was scheduled. The causes of these deaths included respiratory distress in 4 cases, seizures in 3 cases, and febrile diarrhea in 1 case. For the other 6 cases, only 2 cases had specified reasons for nonintervention: a case of nonshuntable hydrocephalus and another case of extreme malnutrition.

Table 1. Annual Distribution of Pediatric Hospitalizations and Cases of Hydrocephalus

Year	2011	2012	2013	Total
Pediatric hospitalizations	682	704	607	1993
Cases of hydrocephalus	26	55	50	131
Specific morbidity of hydrocephalus	3.8%	7.8%	8.2%	6.6%
Specific mortality of hydrocephalus	5 (19.2%)	5 (9%)	15 (30%)	25 (19%)
Cases in study sample	14	36	25	75