

# TH Prevalence of Ventriculoperitoneal Shunt Infection, One Hospital Experience

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**Abstract:** The usage of cerebral spinal shunts is considered the most common way of surgical treatment in hydrocephalus patients. There have been many complications associated with shunts. Infection is considered the most common complication. *S.epidermis* is generally accepted as the most common pathogen. This study is intended shed light on pathogens found in our institution among patients who needed shunt reviewing secondary to confirmed infection.

**Methods:** This is a cross-sectional single institution study. Patients who needed shunt review from 2008 until 2012 (68 patients) were included initially. 27 patients had positive lab results for shunt infections.

**Results:** Males constituted the majority of study subjects (63%) compared to females (37%). Pediatric patients were 85.2% of our study sample. Congenital hydrocephalus (44.4%) was the main etiology. *Staphylococcus epidermidis* was the main organism where it was found in 33.3% of patients. *Staphylococcus aureus* was found in 18.5% of patients.

**Conclusion:** The Prevalence of shunt infection is higher in our population compared to worldwide numbers. The results of our study are consistent with published research in terms of organism prevalence.

**Keywords:** TH prevalence, *Staphylococcus epidermidis*, main etiology.

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## 1. INTRODUCTION

The main surgical modality in cerebral spinal fluid diversion for hydrocephalus patients is the placement of a CSF shunt<sup>(1, 2)</sup>. Shunts are prone to many complications such as obstruction, infection, skin erosions and allergy to some materials used in the shunt itself (silicone)<sup>(3)</sup>. After 1 year of shunt placement 25-35% of inserted shunts face the consequence of malfunctioning.<sup>(4,5)</sup>Infection is considered to be the most serious problem that might affect the shunt. The rates of infection vary among different papers<sup>(6)</sup>. An infection rate of 5-7 is considered to be acceptable<sup>(5)</sup> although there are some reports as being between 2.2% and 39 %. Shunt infections are bacterial in nature. According to the literature the pathogen that accounts for the vast majority is the streptococci (*epidermis* 60-75 % and *aures*)<sup>(5, 7)</sup>. Gram negative enteric bacteria and *Pseudomonas spp.* account for about 5–10 %<sup>(8)</sup>.*Candida spp.* Is responsible for the fungal shunt infection where it is being accountable for 1-75 of infections. There have been some reports of 25 %<sup>(9)</sup>.One study conducted locally gave a different result than those reported worldwide. In this study *Pseudomonas Auerginosa* constituted 50% of infections and *Staphylococcus Epidermidis* made only 18.2%.<sup>(10)</sup>

## 2. METHODOLOGY

King Abdulaziz Medical City in Riyadh (KAMC-Riyadh) is a 1000-bed specialized health care institution that covers a wide range of secondary and tertiary care specialties. The neurosurgery service takes care of patients in need of surgical intervention for many types of conditions such as aneurysms, tumors of central nervous system, deep brain stimulation, shunt placement for hydrocephalus patients and many other conditions. Neurosurgical patients can be found in different wards in the hospital where some are admitted to the surgical tower, pediatric wards or other wards. Our study included all patients who underwent shunt revision from 2008 until 2012. 68 patients have identified through the Health information record disk, out of which 28 patients (41%) have fulfilled the inclusion criteria. The criteria for diagnosis of shunt infection were established according to either the presence of positive cultures of CSF and/or shunt hardware or clinical evidence of infection with a negative culture but positive CSF parameters, including positive smear, low level of serum

glucose (40 mg/dL), and high white blood cell count (10/mm<sup>3</sup>) with polymorphonucleosis. The symptoms for infection include headache, fever, elevated peripheral leukocyte count, and elevated C-reactive protein level. If criteria was met infected shunt was removed, external ventricular drain was placed and empirical vancomycin treatment was initiated.

### 3. RESULT

Males constituted the majority of study subjects (63%) compared to females(37%). Pediatric patients were 85.2% of our study sample.

Congenital hydrocephalus (44.4%) was the main etiology. *Refer to table 1*

Cause	Frequency	Percent
Congenital/idiopathic	12	44.4
Chiari type 2/myelomeningocele	1	3.7
Meningitis	1	3.7
Vascular malformation	1	3.7
Neoplasm	3	11.1
Post-operative	1	3.7
Trauma	3	11.1
Ventricular cyst	3	11.1
Dandy walker syndrome	1	3.7
Brain Abscess	1	3.7
<b>Total</b>	<b>27</b>	<b>100.0</b>

Staphylococcus epidermidis was the main organism where it was found in 33.3% of patients. Staphylococcus aureus was found in 18.5% of patients. *Refer to table 2*

Organism	Frequency	Percent
Acinetobacter baumannii	1	3.7
Candida albicans	2	7.4
Candida krusei	1	3.7
Candida parapsilosis	2	7.4
Staphylococcus epidermidis	9	33.3
Enterobacter aerogenes	1	3.7
Escherichia coli	1	3.7
Enterococcus faecalis	1	3.7
Klebsiella pneumoniae	1	3.7
Pseudomonas aeruginosa	2	7.4
Staphylococcus aureus	5	18.5
Streptococcus mitis	1	3.7
<b>Total</b>	<b>27</b>	<b>100.0</b>

### 4. DISCUSSION

Infection is considered the most common complication causing shunt failure and a main contributor to post-operative morbidity and mortality.<sup>(11,12)</sup> Since the establishment of shunting surgery in 1950s, CSF diversion systems have seen dramatic changes and improvements. Yet, these advancements couldn't prevent the high rate of shunt failure to continue as such.<sup>(13)</sup> Literature have demonstrated the link between some perioperative variables and the rate of shunt infection. Among these variables CSF leak postoperatively, patient prematurity, the exposure of shunts to the surgeon's gloves.<sup>(14)</sup> Studies conducted in developing countries have shown high incidence reaching 24.6%.<sup>(15,16)</sup> Our findings are coherent with most studies that show that most documented pathogens in CSF cultures causing shunt infections are due to *S. epidermidis* or *S. aureus* which reach up to 70% of these cultures presenting during the first 2 months after shunt surgery.<sup>(17)</sup> Limitations found in our study were, the little number of cases included, incomplete documentation in patient files which prevented thorough investigation of risk factors associated and finally the retrospective, single institution experience nature of the study.

## 5. CONCLUSION

The results of our study -where S.epidermis and S.aures are most prevalent- organisms are consistent with published research in terms of organism prevalence. The Prevalence of shunt infection is higher in our population compared to worldwide numbers.

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