

**Original Article****Brain abscess: Epidemiological study in a Pediatric Neurosurgery Department of Bangladesh**Mahbub AA<sup>1</sup>, Mukherjee SK<sup>2</sup>, Arman DM<sup>3</sup>, Ekramullah SM<sup>4</sup>, Ziauddin M<sup>5</sup>, Raihan MF<sup>6</sup>, Rahman MN<sup>7</sup>, Shykot ZH<sup>8</sup>, Muktadir MR<sup>9</sup>, Rahman M<sup>10</sup>**Conflict of Interest:** There is no conflict of interest relevant to this paper to disclose.**Funding Agency:** Was not funded by any institute or any group.**Contribution of Author:** Principal Investigator- Dr. Abdullah Al Mahbub**Manuscript Preparation-**Dr. Md. Farid Raihan, Dr. Md. Ziauddin, Dr. Ziaul Hoq**Data Collection-** Dr. Md. Ruhul Muktadir, Moshir Rahman,**Editorial Formatting:** Prof. Sk. Md. Ekramullah, Dr. Sudipta Kumar Mukherjee, Dr. D. M. Arman,**Copyright:** ©2021bang.BJNS published by BSNS. This published by BJNS. This article is published under the creative commons CC-BY-NC license. This license permits use distribution (<http://creativecommons.org/licenses/by-nc/4.0/>)reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.**Received:** 01 March, 2021  
**Accepted:** 26 July, 2021**Abstract****Background:** Brain abscess is a relatively uncommon but life-threatening infection in children. It can originate from contiguous site infections (eg, chronic otitis media, mastoiditis, sinusitis, meningitis), from distant pathologic states (eg, cyanotic congenital heart disease, chronic lung infections), after head trauma or neurosurgical procedures, or from cryptogenic sources. Predominant etiologic microorganisms vary depending on these predisposing factors. Proper selection of antimicrobial agents with good penetration of the central nervous system and with adequate coverage of both anaerobic and aerobic bacteria is critical for the medical management of brain abscess. Delay in surgical drainage can be associated with high morbidity and case-fatality rates.**Methods:** The study was carried out at Department of Paediatric Neurosurgery, NINS&H, Dhaka from November 2017 to till date. Data collection sheet was used to collect

the necessary information. Subjects was included from a NINS Pediatrics neurosurgery electronic registry. Structured questionnaire was used to collect the necessary information. Risks and benefits of this study were explained to the patient and patient's legal guardian/parents in an easily understandable local language. Informed written consent was taken from each guardian before data collection.

**Results:** Most of the patients were within >5 years age group 21 (38.3%). Second large were <2 years age group 19 (34.5%). According to gender. 33 (60%) patients were males and 22 (40%) patients were females. Distribution of subjects among OPD patients and admitted patients. 41 patients were admitted indoor among 55 patients. Predisposing factors were identified in 24 of 41 admitted cases. 11 abscesses developed in a child with cyanotic congenital heart disease (CCHD) and 2 occurred after head trauma. 2 abscesses were secondary to ear infections. In 28 patients, the abscess was drained through a burr hole, without the need for craniotomy; the other 4 underwent open craniotomy. 9 patients improved only with conservative management. Among the admitted patients, 34 patients were discharged from the ward in clinically stable conditions and 7 patients expired.**Conclusion:** Advances in the diagnosis and treatment of brain abscess and subdural empyema with neuroimaging techniques such as computerized tomography, magnetic resonance imaging, magnetic resonance spectroscopy, the availability of new antimicrobials, and the development of novel surgical techniques have significantly contributed to the decreased morbidity and mortality associated these infections.

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### Introduction:

Brain abscess is an uncommon infection during childhood. Overall, about 25% of brain abscesses occur in children, mostly in the 4- to 7-year age <sup>1</sup>. Brain abscesses in children were traditionally associated with congenital heart defects and with infections of the face, head or brain. The clinical presentation of a brain abscess may be subtle and influenced by many factors, such as the child's age and the location of the abscess. The classic triad of headache, fever and focal neurological signs is demonstrated in only 9–28% of the paediatric cases <sup>2</sup>. Prior to the computerized tomography (CT) imaging era, as well as in areas where CT is not readily available, diagnosis and treatment have been – and still are – often delayed.

With the improvement of microbiological laboratory techniques, anaerobic bacteria are now more commonly detected (40–100% of cases) <sup>3</sup>. The causative organisms commonly isolated are diverse, including aerobic and anaerobic streptococci and staphylococci, but with specific pathogens being more common in specific groups. Gram negative organisms such as the Citrobacter group are more prevalent in neonates and infants when compared with Streptococcus pneumoniae, as well as increasing rates of Methicillin Resistant Staphylococcus aureus in nosocomial infections, shunts and penetrating trauma <sup>4</sup>.

The management of brain abscess is both surgical and medical, or medical alone in selected cases. Surgical drainage with antimicrobial therapy is the treatment of choice for most brain abscesses. For carefully selected patients (brief illness, neurologically intact patient with small size abscesses) medical therapy alone can be successful. Before the 1970s, overall mortality rates from brain abscesses were as high as 30–60% but have declined markedly in more recent reports <sup>5</sup>. In the last decade, only a handful of studies on brain abscess in children were published, and even fewer from countries with well-developed health systems. The objective of this study was to characterize the nature of brain abscesses diagnosed and treated in a modern public health system to identify changes in risk factors, clinical manifestations and outcome in children. Here we study about epidemiological study of brain abscess in Pediatric Neurosurgery department, National Institute of Neurosciences, Bangladesh.

### Materials and Methods:

The aims and objectives of this study was to find out epidemiology of brain abscess in our population. We also compared our result with other previous study result. The study was carried out at Department of Paediatrics Neurosurgery, NINS&H, and Dhaka from November 2017 to till date. This study was a retrospective study. Data collection sheet was used to collect the necessary information. Subjects was included from a NINS Pediatrics neurosurgery electronic registry. Structured questionnaire was used to collect the necessary information. Risks and benefits of this study were explained to the patient and patient's legal guardian/parents in an easily understandable local language. Informed written consent was taken from each guardian before data collection. Statistical analysis was done by using SPSS software version 24.0. (IBM).

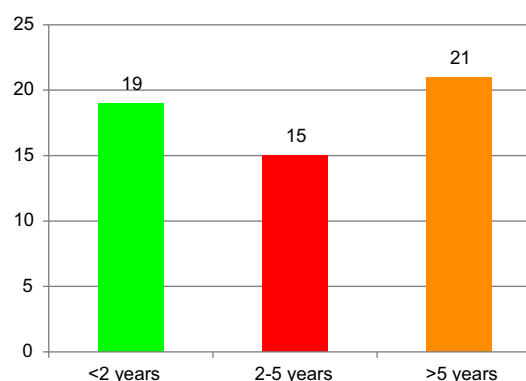
Statistical significance will be set at p-value <0.05 at 95% level of confidence interval.

### Results:

**Table-I**  
*Distribution of study subjects according to age (n=55)*

Age (Year)	Frequency (n)	Percentage
< 2	19	34.5
2-5	15	27.2
>5	21	38.3

Table I shows distribution of the study patients according to age. Here most of the patients were within >5 years age group 21 (38.3%). Second large were <2 years age group 19 (34.5%).

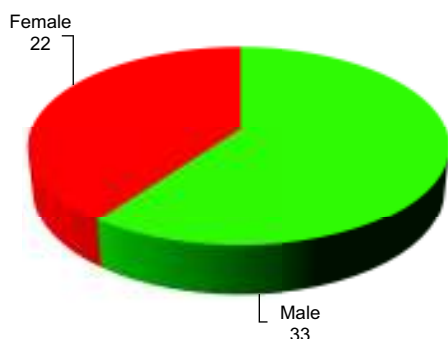


**Fig.-1 : Distribution of the study patients according**

**Table-II**  
Distribution of study subjects according to gender (n=55)

Sex	Frequency (n)	Percentage
Male	33	60
Female	22	40

Table II shows distribution of the study subjects according to gender. 33 (60%) patients were males and 22 (40%) patients were females.

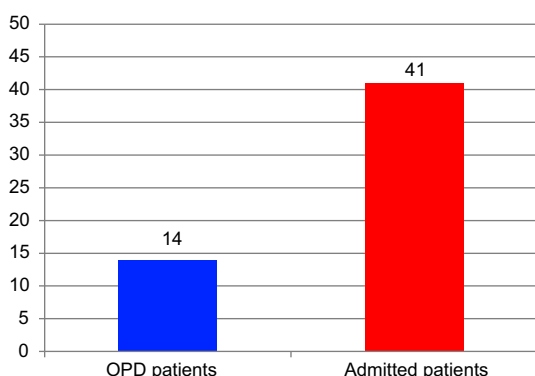


**Fig.-2:** Distribution of the study patients according to gender

**Table-III**  
Distribution of subjects among OPD patients and admitted patients (n=55)

OPD/Admitted	Frequency (n)	Percentage
OPD	14	25.4
Admitted	41	74.5

Table III shows distribution of subjects among OPD patients and admitted patients. 41 patients were admitted indoor among 55 patients.

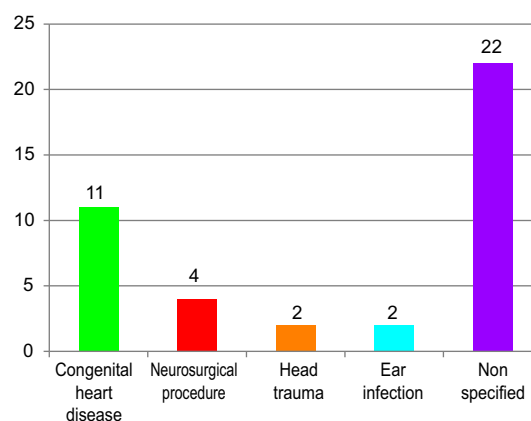


**Fig.-3:** Distribution of subjects among OPD patients

**Table-IV**  
Distribution of different aetiologies of brain abscess among the admitted subjects (n=41)

Different aetiologies	Frequency (n)	Percentage
Congenital heart disease	11	26.8
Neurosurgical procedure	4	9.4
Head trauma	2	4.9
Ear infection	2	4.9
Non-specified	22	53.6

Table IV shows distribution of different aetiologies of brain abscess among the admitted subjects

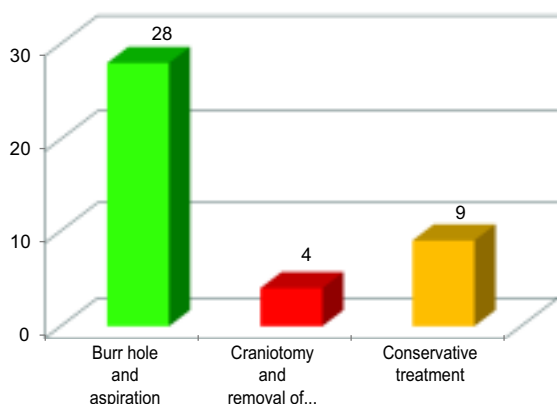


**Fig.-4:** Distribution of different aetiologies of brain abscess among the admitted subjects

**Table-V**  
Distribution of different management strategies among the admitted subjects (n=41)

Management strategies	Frequency (n)	Percentage
Burr hole and aspiration	28	68.2
Craniotomy and removal of abscess wall	4	9.0
Conservative medical treatment	9	22.8

Table V shows distribution of different management strategies among the admitted subjects. 28 patients underwent burr hole and aspiration. Craniotomy and removal of abscess wall was in 4 patients. 9 patients were managed with only medical treatment.



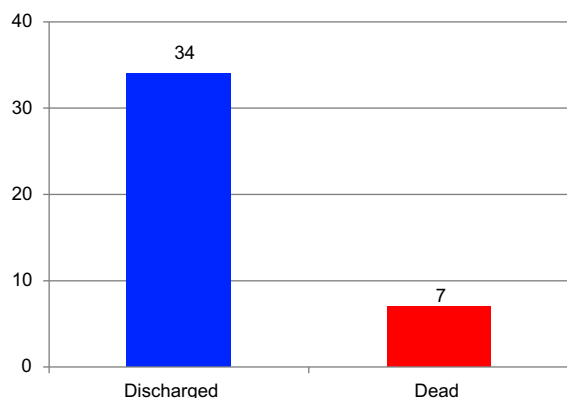
**Fig.-5:** Distribution of different management strategies among the admitted subjects

**Table-VI**

Distribution of outcomes among the admitted subjects (n=41)

Discharged/Dead	Frequency (n)	Percentage
Discharged	34	83
Dead	7	17

Table VI shows distribution of outcomes among the admitted subjects. 34 patients were discharged from the ward in clinically stable conditions and 7 patients expired.



**Fig.-6:** Distribution of outcomes among the admitted subjects

**Discussion:**

Brain abscesses are uncommon in children. In our study, 55 children with a diagnosis of brain abscess were identified from 2017 to date. 33 of the 55 (60%) were male patients. The patient population included two neonates, 19 children aged less than 2 years, 15 children aged 2–5 years and 21 children older than 5

years. 41 patients were admitted indoor among 55 patients, other 14 patients were referred to other institutes due to lack of vacant bed.

Predisposing factors were identified in 24 of 41 admitted cases. 11 abscesses developed in a child with cyanotic congenital heart disease (CCHD) and 2 occurred after head trauma. 2 abscesses were secondary to ear infections. 4 cases occurred following other neurosurgical interventions. These neurosurgical processes included VP shunt placement and supratentorial SOL surgery. In 22 cases, aetiology was non specified.

32 patients underwent surgical intervention. In 28 patients, the abscess was drained through a burr hole, without the need for craniotomy; the other 4 underwent open craniotomy. Empirical antibiotic regimen was same in almost all patient and a third generation cephalosporin, anaerobic coverage with metronidazole and vancomycin. 9 patients improved only with conservative management.

Among the admitted patients, 34 patients were discharged from the ward in clinically stable conditions and 7 patients expired.

A major shortcoming of our study is that, microbiological reports was not kept in our database at it's preliminary time. Our plan is to publish more data regarding microbiology as well as our information in future period , as our data entry system is improving day by day.

**Conclusion:**

Advances in the diagnosis and treatment of brain abscess and subdural empyema with neuroimaging techniques such as computerized tomography, magnetic resonance imaging, magnetic resonance spectroscopy, the availability of new antimicrobials, and the development of novel surgical techniques have significantly contributed to the decreased morbidity and mortality associated these infections<sup>6</sup>. Determination of point of entry and source of infection is paramount to adequate treatment. A high index of suspicion along with typical clinical presentation of headache, seizures, or focal neurologic signs can lead to early diagnosis so that effective therapy can be instituted as soon as possible.

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