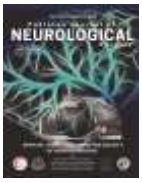

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Original Article

Incidence and Predisposing factors of Brain Abscess in Children at a Tertiary Care Center Dera Ghazi Khan

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ABSTRACT

Objective: A cross sectional study was aimed to investigate the incidence and predisposing factors of brain abscess in children.

Material and Methods: The study was conducted in the departments of Neurosurgery and Pediatric Surgery, Ghazi Khan Medical College and Hospital DG khan. Thirty two children with brain abscess were enrolled in the study. A diagnosis of brain abscess was made on clinical and radiological basis. T-test and chi square were applied to see the association between variables.

Results: Most common location of Abscess was found as frontal in 21.9% patients, temporo parietal in 53.1% patients and occipital in 25.0% patients. Streptococci was the most common microorganism on culture reported, noted in 46.9% patients. Major predisposing factors (p = 0.000) and location of abscess (p = 0.003) were the effect modifiers for microorganism on culture reports.

Conclusion: Streptococci was the most common abscess causing microorganism causing about 47% of total abscess causing pathogens. Main predisposing factors were: otitis media, cyanotic heart disease and post head injury otorrhea.

Keywords: Brain abscess; Children; Otogenic brain abscess; Otitis media, Seizures; Streptococci.

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INTRODUCTION

A serious brain parenchyma infection is brain abscess which may prove itself as a life threatening infection.[1] Common mode of transmission isan infection of contiguous structures of the body (dental infection, otitis media, sinusitis, mastoiditis) secondary to hematogenous spread from a remote site (especially in patients with cyanotic congenital heart disease), after skull trauma or surgery, and, rarely, following meningitis.[2] Predisposing factors

of brain abscess are infections of the middle ear, congenital heart disease, paranasal sinus, mastoid, face, orbit, penetrating skull injury, scalp, and surgery of the cranium for dermal sinuses, ventriculo-peritoneal shunts and altered immune function.[3]

A clinically brain abscess may be influenced or subtly by a number of factors which may include location and age of patients.[4] Only 28% of cases demonstrated in classic triad of focal neurological signs, fever and headache.[5] Before the time of computerized tomography and when imaging techniques are not available early diagnosis and treatment usually delayed. But with the development of microbiological laboratories it is not difficult to detect anaerobic bacteria.[6]

Abscess causing organisms like aerobic and anaerobic staphylococci and streptococci are diverse in nature but in specific groups, some pathogens are more common like gram negative pathogens are more frequent in infants as compare to streptococcus pneumonia.[7] Similarly, Methicillin Resistant Staphylococcus aureus rate is increasing in nosocomial infection, penetrating trauma and shunts.[8]

In cases of brain abscess, the surgical management is a treatment of choice but in selected cases (neurologically intact patient, brief illness and small size abscess) only medical therapy is successful and sufficient.[9] The mortality rate due to brain abscess is about 60% in the 1970s, but in recent years this proportion is declining significantly. In the last 10 years, only few studies are conducted on brain abscess in children, even in well-developed countries.[10]

This study was conducted to evaluate the incidence and predisposing factors of brain abscess in Pakistani population because the limited research was done on Pakistani population before. This study will be an initiative towards modern research and will be helpful to fulfill the population based research gap.

MATERIAL AND METHODS

Study Design & Setting

A cross-sectional study was conducted in the departments of Neurosurgery and Pediatric Surgery Ghazi Khan Medical College and Hospital from September 2018 to September 2019 after taking permission from the Hospital ethical board and obtaining informed written consent from their guardians.

Inclusion Criteria

Children of age 3 to 17 years radiologically confirmed brain abscess were included in the study. Non probability consecutive sampling technique was used.

Exclusion Criteria

Age more than 17 years. His previous surgery were excellent.

Data Collection

Clinically and radiologically diagnosed cases of brain abscess included in the study. Study variables gender, age of patients, diagnostic laboratory results, clinical presentation, associated anomalies, microbiological features, computed tomography findings, culture reports, surgical management and treatment outcomes were noted on predesigned proforma.

Data Analysis

Computer software SPSS version 23 was used for determination and analysis of study variables. The mean and SD were calculated and presented for numerical data like age and frequency percentages were calculated for categorical data like gender, clinical presentation, diagnostic laboratory findings, computed tomography scan reports. Student's t-test and chi square were applied to see the association between variables. P value ≤ was considered as significant.

RESULTS

Thirty two patients were included, in this study.

Age Incidence

The mean age of the patients was 3.91 ± 1.82 years.

Gender Distribution

There were n=23 (71.9%) males and n = 9 (28.1%) females.

Clinical Information

The most common complaint was headache with papilledema, noted in 17 (53.1%) patients. Vomiting, neurological deficit and seizure were observed in 26 (81.3%), in 5 (15.6%) and in 7 (21.9%), respectively. The most common predisposing factor wasotitis media noted in 13 (40.6%) patients. Cyanotic heart disease and post head injury otorrhea were found in 9 (28.1%) and in 3 (9.4%) patients, respectively. While, no source was noted in7 (21.9%) patients (Table 1).

Table 1: Demographic characteristics and major presenting complaints of the patients.

Variable	Presence
Age	3.91 ± 1.82 years
Gender	
Male	n = 23 (71.9%)
Female	n = 9 (28.1%)
Presenting Complaints	
Headache with papilledema	n = 17 (53.1%)
Vomiting	n = 26 (81.3%)
Neurological deficit	n = 5 (15.6%)
Seizure	n = 7 (21.9%)
Major Predisposing Factors	
Otitis Media	n = 13 (40.6%)
Cyanotic heart disease	n = 9 (28.1%)
Post Head injury Otorrhea	n = 3 (9.4%)
No source found	n = 7 (21.9%)

Location of Abscess was found as frontal in 7 (21.9%) patients, temporo parietal in 17 (53.1%) patients and occipital in 8 (25.0%) patients. Streptococci was the most common microorganism on culture reported, noted in 15 (46.9%) patients (Table 2). Major predisposing factors (p = 0.000) and location of abscess (p = 0.003) were the effect modifiers for microorganism on culture reports.

Table 2. Location of abscess and microorganism on culture.

Variable	Presence
Location of Abscess	
Frontal	n=7 (21.9%)
Temporo parietal	n=17 (53.1%)
Occipital	n=8 (25.0%)
Micro Organism on Culture Reports	
Streptococci	n=15 (46.9%)
Fungal aspergillosis	n=4 (12.5%)
Staph. Aureus	n=5 (15.6%)
Acinetobacter baumannii	n=3 (9.4%)
No growth after 48 hours	n=5 (15.6%)

DISCUSSION

Brain abscess occurs in 4 cases in a million annually out of them 25% occurs in children. This proportion is increasing in survivors of the immunocompromised population, including chemotherapy patient, HIV patients and transplant survivors.[11] But mortality rate is decreasing because of improved diagnostic imaging techniques. Contiguous spread of infection is also decreasing rapidly because of prompt treatment of infection.[12]

In our study major predisposing factors of a brain abscess include otitis media, cyanotic heart disease (CHD) and post head injury otorrhea. In a study conducted by Goodkin et al[13] reported similar findings that CHD and otitis infection are main predisposing factors in children. In contrast, another study was conducted by Carpenter et al[14] in the same institution and reported different findings that major predisposing factor

Table 3: Association of microorganism on culture reports with exposure variables.

Variable		Microorganism on Culture Reports						P-value
		Streptococci	Fungal Aspergillosis	Staph Aureus	Acinetobacter Baumannii	No Growth after 48 h	Total	
Age	<2 years	9	3	2	2	1	17	0.430
	>2 Years	6	1	3	1	4	15	
Sex	Male	13	2	2	1	5	23	0.055
	Female	2	2	3	2	0	9	
Headache	Yes	6	2	3	2	4	17	0.588
	No	9	2	2	1	1	15	
Vomiting	Yes	13	4	3	3	3	26	0.301
	No	2	0	2	0	2	6	
Neurological deficit	Yes	3	1	0	1	0	5	0.550
	No	12	3	5	2	5	27	
Seizure	Yes	3	1	1	1	1	7	0.990
	No	12	3	4	2	4	25	
Major predisposing factors	Otitis Media	11	0	0	0	2	13	0.000
	Cyanotic heart disease	4	1	4	0	0	9	
	Post Head injury Otorrhea	0	0	1	2	0	3	
	No source found	0	3	0	1	3	7	
Location of Abscess	Frontal	6	0	0	0	1	7	0.003
	Temporo parietal	9	4	3	0	1	17	
	Occipital	0	0	2	3	3	8	

is CHD but sinus and otitis media are not in large proportion.

In our study most common site of abscess is the temporo-parietal lobe in 53.1% of cases and second common place is the occipital lobe in 25% of children. Borgohain et al[15] reported that the most common location is the cerebellum, which is only study available claimed this finding. In a study by Prasad et al[16] reported temporal lobe is the commonest location of brain abscess in intracranial. This site infection usually results from middle ear infection.

In our study presenting complaints were headache, vomiting, neurological deficit and seizures. Similar presenting complaints vomiting, seizures and fever was reported by Atiq et al[17] in 2006 and main predisposing factor was cyanotic heart disease (CHD). Kafle et al[18] conducted a study on this topic and reported temporal lobe infection in 37.5% patients a common location of abscess transmitted from Otogenic infection, headache as a common presentation and positive culture were found positive in 25.9% of cases.

Fischer et al[19] conducted a study in 1981 on brain abscess in children and observed that common predisposing factors of brain abscess are congenital heart disease, otitis and sinus infection, cystic fibrosis and closed head injury. The mortality rate decreased to a significant level from 36% to 14% within years due to prophylactic antibiotics and early diagnosis. But early diagnosis of brain abscess and timely treatment of brain abscess in children is still a challenge.

Canpolat et al[20] completed an observational study and concluded that brain abscess in children is a life threatening condition presenting with nausea vomiting and headache. In this study, a more common position wasa frontal lobe with a 12.5% mortality rate. He recommended that in children with brain abscess an early diagnosis and prompt treatment is necessary to overcome the mortality.

Limitations of Study

Lack of literature about exact statistics of brain abscess in our region and shortage of time are limitations of our study. This study was conducted on smaller sample sizes because of shortage of time. Studies with larger sample required to fulfill the literature insufficiency.

Recommendations

School based clinics and screening programs along with community awareness about the causes, predisposing factors and treatment compliance after diagnosis of disease are recommended.

CONCLUSION

Streptococci was the most common abscess causing microorganism causing about 47% of total abscess causing pathogens. Main predisposing factors were the otitis media, cyanotic heart disease and post head injury otorrhea.

REFERENCES

1. Acar M, Sutcu M, Akturk H, Muradova A, Torun SH, Salman N. Evaluation of short-term neurological outcomes in children with brain abscesses. Turk Neurosurg. 2018; 28: 79-87.
2. Jain A, Arora N, Meher R, Passey JC, Bansal R. Intracranial complications of CSOM in pediatric patients: A persisting problem in developing countries. Int J Pediatr Otorhinolaryngol. 2017; 100: 128-31.
3. Singh A, Abhinay A, Prasad R, Mishra OP. Neonatal brain abscess: Clinical report and review of Indian cases. J Clin Neonatol. 2016; 5: 213-7.
4. Nicolosi A, Hauser W, A, Musicco M, Kurland L, T: Incidence and Prognosis of Brain Abscess in a Defined Population: Olmsted County, Minnesota, 1935–1981. Neuroepidemiology. 1991; 10: 122-131. Doi: 10.1159/000110257
5. Acar M, Sutcu M, Akturk H, Muradova A, Torun SH, Salman N. Evaluation of Short-Term Neurological Outcomes in Children with Brain Abscesses. Turk Neurosurg. 2018; 28 (1): 79-87. Doi: 10.5137/1019-5149.JTN.18672-16.1. PMID: 27858396.
6. Mameli C, Genoni T, Madia C. Brain abscess in pediatric age: a review. Childs Nerv Syst. 2019; 35: 1117–1128. https://doi.org/10.1007/s00381-019-04182-4
7. Zhang Z, Cai X, Li J, Kang X, Wang H, Zhang L et al. Retrospective analysis of 620 cases of brain abscess in Chinese patients in a single center over a 62-year period. Acta Neurochir. 2016; 158: 733–739.
8. Sonneville R, Magalhaes E, Meyfroidt G. Central nervous system infections in immunocompromised patients. Curr Opin Crit Care, 2017; 23 (2): 128–133.
9. Shovlin CL, Condliffe R, Donaldson JW, Kiely DG, Wort SJ. On behalf of the British Thoracic Society. British Thoracic Society clinical statement on pulmonary arteriovenous malformations. Thorax. 2017; 72: 1154–1163.
10. SahbudakBal Z, Eraslan C, Bolat E, Avcu G, Kultursay N, Ozkinay F et al. Brain abscess in children: a rare but serious infection. Clin Pediatr (Phila). 2018; 57 (5): 574–579.
11. Shachor-Meyouhas Y, Bar-Joseph G, Guilburd A. Brain abscess in children – epidemiology, predisposing factors and management in the modern medicine era. Acta Paediatr. 2010; 99: 1163-1167.
12. Ciurea AV, Stoica F, Vasilescu G. Neurosurgical management of brain abscesses in children. Childs Nerv Syst. 1999; 15: 309–317.
13. Goodkin HP, Harper MB, Pomeroy SL. Intracerebral abscess in children: historical trends at Children's Hospital Boston. Pediatrics, 2004; 113: 1765–1770.
14. Fischer EG, McLennan JE, & Suzuki Y: Cerebral abscess in children. Am J Dis Child. 1981; 135: 746–749.
15. Borgohain R, Talukdar R, Ranjan K. Otogenic brain abscess: A rising trend of cerebellar abscess an institutional study. Indian J Otol. 2015; 21: 286-9.
16. Prasad R, Biswas J, Singh K, Mishra OP, Singh A. Clinical profile and outcome of brain abscess in children from a tertiary care hospital in Eastern Uttar Pradesh. Ann Indian Acad Neurol. 2020; 23: 303-7.

17. Atiq M, Ahmed US, Allana SS, Chishti KN. Brain abscess in children. Indian J Pediatr. 2006; 73 (5): 401-4. Doi: 10.1007/BF02758560. PMID: 16741324.
18. Kafle P, Sharma MR, Shilpakar SK, Sedain G, Pradhanang A, Shrestha RK, et al. Pediatric brain abscess clinical profile, management and outcome at tertiary care centre in Nepal. JCMS Nepal. 2018; 14: 102-6.
19. Fischer EG, McLennan JE, Suzuki Y. Cerebral Abscess in Children. Am J Dis Child. 1981; 135 (8): 746–749. Doi:10.1001/archpedi.1981.02130320060020.
20. Canpolat M, Ceylan O, Per H, et al. Brain Abscesses in Children: Results of 24 Children From a Reference Center in Central Anatolia, Turkey. Journal of Child Neurology, 2015; 30 (4): 458-467. Doi: 10.1177/0883073814549247.

Additional Information

Disclosures: Authors report no conflict of interest.
Human Subjects: Consent was obtained by all patient(s)/participant(s) in this study.
Conflicts of Interest:
In compliance with the ICMJE uniform disclosure form, all authors declare the following:
Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Syed Shahid Bokhari	1. Study design, data collection and methodology.
2.	Muhammad Asif Qureshi	2. Paper writing, referencing, and data calculations.