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Original Article

Socio-demographic Characteristics of Patients with Intracranial Infection

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ABSTRACT

Introduction: *Intracranial infections involve pathogens invading the brain or surrounding tissues, causing conditions like meningitis and brain abscesses. Swift diagnosis and treatment are vital due to risks like neurological deficits, seizures, and fatality. Symptoms encompass severe headaches, fever, altered mental state, and neurological issues. Timely medical action, often using antibiotics or antivirals, is crucial to alleviate intracranial infection's potentially severe outcomes.* ***Aim of the study:*** *This study aimed to assess the socio-demographic characteristics of patients with intracranial infection.* ***Methods & Materials:*** *Conducted in Dhaka, Bangladesh, from March to September 2006, this observational study took place at BSMMU and Dhaka Medical College Hospital's CT sections. It involved 50 patients suspected of intracranial infections or needing complication evaluation via spiral CT. Random sampling was employed, recording demographic and clinical data for subsequent MS Office analysis.* ***Results:*** *The male-female ratio of the participants was 2:1. Ages ranged from 1 to 69, with most CT patients aged 31 to 50. Over 20% were students, employed, or housewives. Common symptoms included fever (24%), headache (20%), and vomiting (16%), while CT revealed abnormal meningeal enhancement (11.5%), cerebral edema (7.5%), and ventricular dilatation (8.5%).* ***Conclusion:*** *Intracranial infection tends to affect younger males. Occupational diversity within the study population suggests that occupation might not pose a significant risk factor for such infections. Common features of these cases include fever, headache,*

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vomiting, abnormal meningeal enhancement, cerebral edema, and ventricular dilatation.

Keywords: *Socio-demographic Status, Intracranial Infection, CT, Cerebral Edema, Ventricular Dilatation*

INTRODUCTION

Computed tomography (CT) has emerged as a contemporary and advanced imaging technique in the field of radiology, providing detailed insights into the body's internal structure[1]. This modality generates high-quality cross-sectional images in various planes. The advent of multislice spiral CT has surpassed the limitations of traditional spiral CT, enabling rapid multi-planar reconstructions (MPR) and three-dimensional (3D) visualizations[1]. Craniotomy, a well-established neurosurgical procedure performed for over a century, involves intracranial intervention. Intracranial infections, encompassing conditions like brain abscesses, meningitis, and subdural or epidural infections, present serious post-craniotomy complications[2]. The impact of intracranial infections on patient outcomes is significant, leading to heightened morbidity and mortality rates, extended hospital stays, increased healthcare expenses, and often necessitating multiple surgical interventions[3-6]. White blood cell count or neutrophil count remain important indicators of infection, supplemented by clinical judgment; however, their specificity might not be notably high[7]. Effective treatment for intracranial infections includes surgical drainage and antibiotic therapy[8]. Yet, drug penetration into the brain is challenged by the blood-brain barrier (BBB)[9]. Additionally, cerebrospinal fluid (CSF) drainage through lumbar puncture is limited. Therefore, identifying risk factors for post-craniotomy intracranial infections holds significant value in enabling timely prevention. Currently, over 10 high-risk factors are documented, primarily concerning surgical site infection following craniotomy[1]. Notably, seasonal impact and postoperative oral infection risk factors haven't been analyzed. Previous studies from the 1980s noted seasonal variation in arterial blood pressure[10]. Additionally, Herweh et al. found an association between hypertensive intra-cerebral hemorrhage and increased air pressure through a global cohort study[11]. Regarding oral infection, a study highlighted brain abscesses as potential complications of odontogenic infections, summarizing related cases[12]. However, the relationship between oral infection and intracranial infection lacks verification through case-control studies. The objective of this current study was to assess the socio-demographic characteristics of patients with intracranial infection.

METHODS & MATERIALS

Conducted from March 2006 to September 2006, this cross-sectional observational study took place in the radiology and imaging (CT section) departments of BSMMU and Dhaka Medical College Hospital in Dhaka,

Bangladesh. The study enrolled a total of 50 patients suspected of intracranial infections or with pre-diagnosed cases for complication evaluation, utilizing spiral CT scans. Sample selection employed a random sampling technique, while demographic and clinical data were meticulously recorded. The study obtained ethical committee approval from the respective hospital and secured proper consent from participants. Exclusion criteria covered patients without craniotomy, severe organ dysfunction, malignancies, metabolic or systemic blood disorders, spinal deformities, those who discontinued treatment, were unsuitable for lumbar puncture, or underwent nonsurgical interventions. All collected data, demographic, and clinical, underwent processing, analysis, and dissemination using MS Office tools.

RESULT

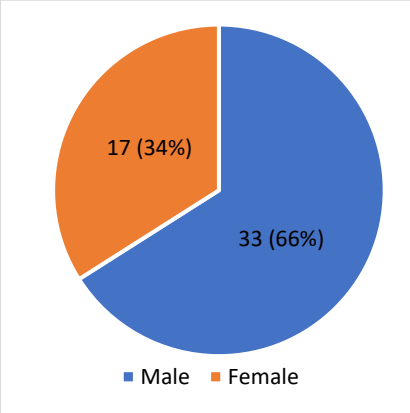

Figure 1: Distribution of Participants as Per Gender (*n*=50)

This study enrolled a total of 50 patients suspected of intracranial infections or with pre-diagnosed cases for complication evaluation, utilizing spiral CT scans. Among the total participants, 66% were male whereas the rest 34% were female (**Figure 1**).

The male-female ratio of the participants was 2:1. In analyzing as age of the total participants, the youngest one of the patients was 1 year and the oldest one was 69 years. Most of the patients who underwent CT of the brain were from 31 to 50 years (**Table I**).

Table – I: Distribution of Participants as Per Age (*n*=50)

Age (Year)	*n*	%
1-10	7	14
11-20	5	10
21-30	6	12
31-40	15	30
41-50	8	16
51-60	4	8
61-70	5	10

Upon analyzing the occupational statuses of all participants, it was observed that over 20% of the patients were either students, employed individuals, or housewives (**Table II**).

Table II: Occupation Status of Participants (*n*=50)

Occupation	*n*	%
Student	13	26%
Services	12	24%
Housewife	11	22%
Business	7	14%
Cultivation	5	10%
Pre-school	2	4%

In the study, complaints such as fever 24%, headache 20%, vomiting 16% and

various neurological complaints were found suspected as intracranial infections (**Table III**).

Table – III: Analysis of Patients Based on Presenting Complaints (*n*=50)

Complaints	*n*	%
Fever	12	24
Headache	10	20
Vomiting	8	16
Drowsiness	2	4
Convulsion	5	10
Circulatory collapse	1	2
Neurological deficits	4	8
Restlessness	4	8
Neck rigidity	6	12
COMA	1	2
Malaise	3	6
Hemiparesis	1	2
Rash	2	4

An analysis of CT findings of intracranial infection revealed that the findings of abnormal meningeal enhancement (11.5%) were the highest among all, followed by cerebral oedema (7.5%) and mild ventricular dilatation with subarachnoid space enlargement (8.5%), exudate in basal cistern showed (6.5%) which was noticeable (**Table IV**).

Table – IV: Pattern of CT Findings (*n*=50)

CT findings	*n*	%
Cerebral oedema	15	7.5
Abnormal meningeal enhancement	23	11.5
Mild ventricular dilatation and subarachnoid space enlargement	17	8.5
Dural calcification	2	1
Exudate in basal cistern	13	6.5
Parenchymal calcification	2	1
Ring enhancement	7	3.5
Brain atrophy and hydrocephalus	1	0.5
Normal	7	3.5

DISCUSSION

This study aimed to assess the socio-demographic characteristics of patients with intracranial infection. Intracranial infection remains a prevalent clinical challenge in our country despite advancements in effective control methods. Notably, the study identified key complaints: fever (24%), headache (20%), and vomiting (16%). Among the patients, 66% were male and 34% were female. Age spanned from one year to 69 years, with a substantial portion (46%) of patients aged 31-50 undergoing brain CT scans. This age distribution indicated a prevalence among the middle-aged. The analysis of gender distribution in intracranial infection revealed that women were less frequently affected compared to males, corroborating findings from previous studies[13,14]. On analysis of the nature of diseases, it was observed that encephalitis (6%), tubercular meningitis

(6.5%) and pyogenic meningitis (7%) were the most common intracranial infections in any age group. From this study, it was clear that now in Bangladesh the incidence of tuberculoma (1.5%) and brain abscess (2%) are greatly reduced because of the availability of high-quality antibiotics as well as early detection of intracranial infection by advanced diagnostic facilities like CT. On analysis of CT findings of intracranial infection, it was found that the findings of abnormal meningeal enhancement (11.5%) were the highest among all, followed by cerebral oedema (7.5%) and mild ventricular dilatation with subarachnoid space enlargement (8.5%), exudate in basal cistern showed (6.5%). Ring enhancement (3.5%), parenchymal calcification (1%) and brain atrophy with hydrocephalus (0.5%). Intracranial infection was diagnosed according to the definitions of the Centers for Disease Control (CDC)[15]. In this study, normal findings of CT were found in 7 (3.5%) cases. In recent hospital, practice patients with suspected intracranial infection (mainly meningitis) with papilledema are advised to do a CT scan before lumber puncture to exclude the possibility of raised intracranial pressure. Clinically suspected intracranial infection having normal CT findings thus helps the clinician to exclude other possibilities and support to allow for early therapy. The incidence of mortality in intracranial infection cases in the age group <5 years was 85%, which was high compared to the age group >5 years. This finding followed the 2013 study, where the incidence of patients who died at the age of <5 years, which was 65%, had a poor outcome and a high risk of mortality. The previous study stated that 50% of the types of diseases suffered by the age group <5 years were included in the types of diseases that could be prevented by giving vaccines[16]. The incidence of intracranial infection mortality according to gender in this study was not different. This finding did not follow the data in Yogyakarta, Indonesia from a study conducted in 1999 where the incidence of intracranial infections in males was more than in females with a ratio of 3:1[17]. Another study also found that male patients had a higher risk of having meningitis[18].

Limitation of the study

This was a single-centered study with small-sized samples. Moreover, the study was conducted over a very short period. So, the findings of this study may not reflect the exact scenario of the whole country.

Conclusion & Recommendation

Upon analysis of the socio-demographic characteristics of patients with intracranial infection, a noticeable trend emerges. The male-female ratio among participants leans towards males. The age range spans a wide spectrum from infancy to late adulthood, with a concentration of cases falling within the 31 to 50-year range, evident in those undergoing brain CT scans. The participants' occupational diversity is evident, with a significant portion comprising students, employed

individuals, or housewives. Common symptoms observed encompass fever, headache, vomiting, and other assorted complaints. The CT findings underline prevalent observations such as abnormal meningeal enhancement, cerebral edema, mild ventricular dilatation with subarachnoid space enlargement, and the presence of exudate in the basal cistern.

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Conflict of Interest

The authors declare no conflict of interest.

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