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Journal of Paediatric Surgeons of Bangladesh

Editorial

Pediatric Fluid Prescription, Close Monitoring and Raising Awareness

Intravenous (IV) fluids are frequently used in hospitalized children, mainly to maintain hydration and hemodynamic stability, as well as to replace glucose. In children fluid management in shock remains controversial. Fluid resuscitation is a central component of shock treatment.[1] Historically, low sodium content fluids have been used for both maintenance and deficit replacement. However, there are risks associated with fluid therapy, especially iatrogenic hyponatremia. More recent evidence supports the use of fluid with higher sodium content with adequate glucose to prevent hyponatremia.[2] In children, indications for intravenous fluid should be prescribed under the four broad principles of 1) meeting maintenance requirements, 2) replacing deficit, 3) replacing ongoing losses, 4) resuscitation to correct inadequate circulating volume leading to clinical shock.[3]

Safety measures for a child with an IV infusion include assessing the IV site every hour for patency. In children experiencing shock, accurate assessment of fluid responsiveness is crucial for effective management. Because over- or under-resuscitation can lead to adverse outcomes.[4] Infused volumes and signs of fluid overload should be carefully assessed and documented frequently. For newborns calculate routine iv maintenance fluids using the following formula a) Day 1-60ml/kg/day, b) Day 2- 90ml/kg/day, c) Day 3- 120ml/kg/day, d) Day 4- 150ml/kg/day. Maximum rate at 150ml/kg/day aiming to titrate it down gradually. In pediatrics we give the maintenance IV fluids requirement according to weight in kg (Table-I).

The recommended fluid to be infused as maintenance for well children with normal hydration is: 0.9% sodium chloride with or without 5% glucose + 20mmol potassium chloride /L.[5] Alternative maintenance fluid options include Hartmann's with glucose 5%. The development of hyponatremia is an uncommon but well recognized complication of incorrect fluid prescribing and is often due to excessive fluids being prescribed as well as the prescribing of hypotonic solutions (e.g. 0.18% saline + dextrose).

Monitoring all children on IV fluids should ideally be weighed prior to the commencement of therapy and then measure weight daily after that. Children with ongoing dehydration may need regular weights to assess hydration status. Ensure you request this on the treatment orders. Serum electrolytes and glucose

Table-I: *Calculate routine maintenance fluids using hourly (4/2/1 rule) / the Holliday Segar formula according to weight in kg:*

Weight	Hourly fluid requirements	Daily fluid requirement*
3 – 10kg	4 ml/kg	100 ml/kg
10 – 20kg	40 + 2 ml/kg above 10 kg	1000 + 50 ml/kg above 10 kg
> 20kg	60 + 1 ml/kg above 20 kg	1500 + 20 ml/kg above 20 kg

*100mL/hour (2500mL/day) is the normal maximum amount.

should be checked preferably before commencing the infusion (typically when the IV is placed). Recommended to be repeated at least every 24 hours if IV therapy is to continue. Seek senior medical help if electrolytes are deranged.[6] Stop fluids and check plasma electrolytes if clinical signs suggestive of hyponatremia develop. These features include nausea, vomiting, headache, irritability, altered level of consciousness, seizure and apnoea.[7]

Regarding awareness when prescribing IV fluids in children, pediatric surgeons should remember the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment. They must recognize fluids with a similar sodium concentration to plasma are most appropriate. The safe use of intravenous fluid requires accurate prescribing, and close monitoring of observations including daily weights. Consider consultation with local pediatric team when unsure of which/how much fluid to use, baby is not responding to iv fluids treatment, electrolyte abnormalities, using a non-standard fluid, significant co-morbidities are present, fluid resuscitation >20mL/kg required. The Association of Pediatric Surgeons of Bangladesh should raise awareness about training and educational resources to contribute to the evolution of fluid management.

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Original Article

Cancer Status in Pediatric Population of Chittagong, Bangladesh

Aziz TT[1], Hayee S[2], Pulock OS[3], Haider M[4], Banu T[5]

Abstract

Background: Cancer is increasing at an alarming rate worldwide and Bangladesh is no exception. The lack of data on cancer especially in the pediatric age group representing almost half the population of Bangladesh persuaded us to undertake this study.

Methods: A cross-sectional study has been conducted in Chittagong Medical College & Hospital (CMCH); the only tertiary hospital in Chittagong and Chattagram Ma-O-Shishu Hospital (CMOSH); the largest private hospital in Chittagong. From 3rd July to 18th July, data on 704 diagnosed cancer patients were collected. Type of cancer in respect of age & sex and Socio-demographical profile was determined.

Results:Out of 704 cancer patients, 74 (10.51%) were in pediatric age group. Male to Female ratio was 1.74:1. We found 1.35% (1) of the pediatric cancer patientswere infants whereas 40.54% (30) were children and 45.95% (34)were Adolescents. Leukemia is the commonest (47.29%) pediatric malignancy followed by lymphoma (16.2%) irrespective of sex. In female, Leukemia (59.52%) & ovarian cancer (14.29%) are the most common according to our study whereas in male, Lymphoma (34.38%) and leukemia (34.37%) were the most frequently diagnosed. 8.1% (6) of our study subjects had metastasized cancer. 17.57% (13) of the patients had family history of cancer. 63.51% of the cancer patients were from rural area and 36.49% from urban area. Other than Chittagong Metropolitan (31.08%) area, 21.62% of the patients came from Cox's Bazar. 77.03% of the patients were in the income range <10,000 BDT (<119.25 USD).

Conclusion: Most of the pediatric cancer patients came from rural areas and belonged to poor income families. Family history of cancer was found in thirteen cases. Irrespective of age and sex Leukemia was the commonest type of cancer. Our study provides a gross overview of pediatric cancer status in Chittagong. Further implementation of the study can help to address the research gap in pediatric cancer.

Keywords: Cancer, Children, Malignancy, Family History

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Introduction

The shifting pattern of global disease burden from infectious diseases to non-communicable diseases has been notable over the last decade.[1] Cancer, a non-communicable disease, is the second leading cause of death worldwide.[2]WithAge standardized (ASR) incidence rateof 197.9 per 100,000 and ASR mortality rate of 101.1 per 100,000 worldwide; cancer is a substantial cause of alarm.[3] Additionally, each year the numbers keepincreasing. Though cancer is more common in adults, the occurrence in children is not insignificant at all. Approximately300,000 pediatric cancer patientsare diagnosed yearly with Lower Middle Income Countries (LMIC) shouldering the bulk amount of it.[4, 5]

The scenario of Bangladesh, an LMIC is not much different withASR incidence rate of 105.7per 100,000 and ASR mortality rate of 77.1per 100,000 due to cancer.[6] 12% of total deaths in Bangladesh areattributed to cancer.[7]A hospital based cancer registry started at National Institute of Cancer Research Hospital and Oncology Department of Bangabandhu Sheikh Mujib Medical University with the technical

assistance of WHO since 2005 onwards.[16]However, In Bangladesh a proper national cancer registry is yet to be formed and till date these registries couldn't cover the whole Country. Thus the actual scenario of cancer status in Bangladesh might be much worse than what is portrayed.

The pediatric population i.e. 0-19 age group consists 43.9% of the total population of Bangladesh.[8] Lack of data on pediatric age group can be considered as a major blind spot on the health status of a population. However cancer data for less than half of the population of Bangladesh in the existing registry is not adequate. The lack of country-specific cancer data especially in the pediatric population persuaded us to undertake this study. In our study, we wanted to find out the scenario of pediatric cancer in Chittagong division, southern part of Bangladesh.

Methodology

A hospital based, descriptive cross-sectional study was conducted in Chittagong Medical College Hospital (CMCH) and Chattagram Maa-O-Shishu Hospital (CMOSH) from 3rd July to 18th July 2018, a total of 15 days. CMCH is the largest and the only tertiary level public hospital in the Chittagong division of Bangladesh. This 1313 bedded hospital serves a catchment area with population of approximately 30 million and is funded by the government.[9, 10]

CMOSH is a private non-profit semi charitable hospital situated in Chittagong Metropolitan with 650 bed capacity.[11] Data of 704 cancer patients with confirmed diagnosis were collected from 17 Departments of CMCH and 7 Departments of CMOSH in the 15 day time frame. Among them only the patients aged 0 to 19 years were included in this study. Data was collected by face to face interview of patients and/or their legal guardians using a semi-structured questionnaire. The questionnaire included socio-demographic profile (age, sex, location, education level and occupation & monthly income of the legal guardian) and family history. The diagnosis (Tumor site group, Histological variants and Metastasis) were confirmed and recorded from the hospital records. Tumor site and histology were coded according to the 3rd edition of the International Classification of Childhood Cancer (ICCC-3). Data were analyzed by software of Statistical Packages for Social Sciences (SPSS) version 16.

Results

74 pediatric cancer patients were identified among the 704 data. Demographic data of them showed, 56.76% female and 42.24% male patients. Age distribution displayed, 1.35% of the 74 patients were infant (28days-1year), 12.2% toddler (>1-3 years), 40.29% children (>3-10 years) and 45.95% adolescent(>10-19 years). (Table 1)The mean age of the pediatric cancer patients being 9.8 (Standard Deviation ± 5.5) and median age 9years. Age distribution according to gender showed, majority of the male patients were children (43.75%) and adolescents (43.75%). In case of females, adolescents were prominent (47.62%). (Fig 1)Majority of the cases were from rural area (63.51%) whereas 36.49% were from urban area. Highest percentage(31.08%) of the cancer patients came from Chittagong Metropolitan area followed by Cox's Bazar(21.62%), the coastal district of Bangladesh. Financial condition of majority was subpar. 77.03% of the patients came from lower income family having monthly income less than 10000 BDT (~119.2 USD).Small businessman(21.62%) followed by service holders (16.22%) were the top two professions of the legal guardians.64 patients of the total were in school going age. Among them, 46were literate and pursuing education at school. (Table I)

Categorizing different types of cancer according to their histopathology types we found, 35 (47.3%) patients suffering from leukemia, of which acute lymphoid leukemia was the highest (68.57%) followed by acute myeloid leukemia (28.57%). In our study, Hodgkin's lymphoma (58.33%) was more common than non-Hodgkin's lymphoma (41.67%). Among the many histopathological variants of cancer in bone we only found, Ewing's tumor &related sarcomas of bone(50%) and osteogenic sarcoma(50%) among the study population.The only histopathological type for the renal tumor was nephroblastoma. (Table II)

Sex specific frequency varied for site groups, with leukemia (59.52%) & germ cell, trophoblastic and ovarian tumor (14.29%) being more common in girls. In male, lymphoma (34.38%) and leukemia (31.25%)

Table 1 : *Demographic profile of the pediatric cancer patients*

Characteristics and Category	Number	Percentage
Gender		
Male	32	43.24%
Female	42	56.76%
Age		
Infant	1	1.35%
Toddler	9	12.16%
Children	30	40.54%
Adolescent	34	45.95%
Monthly Income		
<5000	27	36.49%
5000 – 10000	30	40.54%
10000 - 20000	13	17.57%
20000 – 30000	3	4.05%
30000 - 40000	1	1.35%
Area Distribution		
Rural	47	63.51%
Urban	27	36.49%
Occupation		
Small Businessman	16	21.62%
Service Holder	12	16.22%
Farmer	9	12.16%
Housemaid	6	8.11%
Unemployed	6	8.11%
Rickshaw Puller	5	6.76%
Day Laborer	4	5.41%
Garments Worker	4	5.41%
Banker	2	2.70%
Businessman	2	2.70%
Others	8	10.81%
Chittagong Metropolitan	23	31.08%
Cox'sBazar	16	21.62%
Fatikchari	5	6.76%
Bashkhali	5	6.76%
Satkaniya	5	6.76%
Patiya	4	5.41%
Ranguniya	3	4.05%
Rohingya Camp	3	4.05%
Anowara	2	2.70%
Mirsharai	2	2.70%
Noakhali	2	2.70%
Comilla	1	1.35%
Boalkhali	1	1.35%
Khagrachari	1	1.35%
Lohagara	1	1.35%
School going age		
Educated	46	71.87%
Illiterate	18	28.13%
Non School going age	10	13.51%

were the most frequently diagnosed (Fig 3). In case of lymphoma, the gender difference was more prominent (male: female=11:1). In our study, leukemia was the highest in children (45.71%), closely followed by in adolescents (34.29%). However, in regards to lymphoma, 66.67% belonged to adolescent age group while only 11.11 % among the toddlers. Furthermore, bone tumor (66.67%), germ cell tumor & tumor of gonads (85.71%) were frequent in adolescents (Table III).However, renal tumor (75%) & soft tissue tumor (60%) were mostly seen in children. Moreover, irrespective of sex and age groups, leukemia (47.3%) was the commonest type of cancer, followed by lymphoma (16.2%), germ cell tumor, trophoblastic tumor & tumor of gonad (9.5%) and tumor of bone (8.1%) (Table IV).

Among our study population we encountered 8.1% (6) patients who had metastasized cancer. Family history of cancer was seen in 17.57% of the patients. (Figure 2).

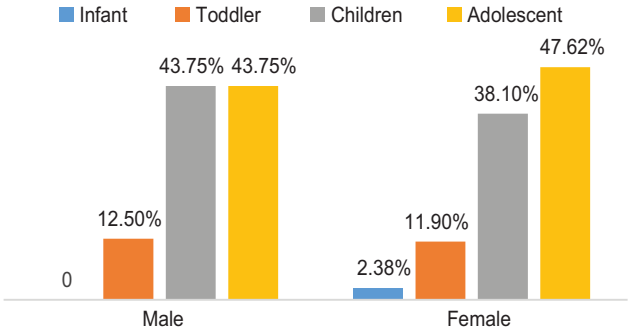


Figure 1: *Age pattern in male & female*

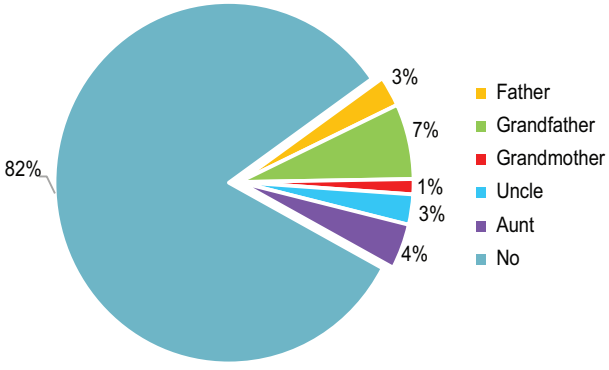


Figure 2: *Family history of Cancer patients*

Table II: *Distribution of cancer according to site and histopathology type*

Site Group	Histopathology Type		Number	Percentage
Leukemias	Acute Lymphoid Leukemia		24	68.57%
	Acute Myeloid Leukemia		10	28.57%
	Chronic Myeloid Leukemia		1	2.86%
	Total		**35**	**100%**
Lymphomas	Hodgkin Lymphoma		7	58.33%
	Non Hodgkin Lymphoma (except Burkitt Lymphoma)		5	41.67%
	Total		**12**	**100%**
Bone	Ewing's tumor and related sarcomas of bone		3	50%
	Osteogenic Sarcoma		3	50%
	Total		**6**	**100%**
Soft Tissue & other extra osseous sarcomas	Rhabdomyosarcoma		4	80%
	Fibrosarcoma		1	20%
	Total		**5**	**100%**
Brain	Astrocytoma		1	50%
	Intracranial Intra Spinal embryonal tumor	Primitive Neuro endocrine Tumor	1	50%
	Total		**2**	**100%**
Germ Cell tumor, Trophoblastic Tumor, Tumor of Gonad	Gonadal Carcinoma	Adenocarcinoma	1	14.29%
		Cystadenocarcinoma	1	14.29%
	Malignant Gonadal Germ Cell Tumor	Yolk Sac Tumor	1	14.29%
		Dysgerminoma	1	14.29%
		Mixed Germ Cell Tumor	1	14.29%
		Embryonic Carcinoma	1	14.29%
	Intracranial Intraspinal Germ Cell Tumor	Intracranial and Intraspinal teratoma	1	14.29%
	Total		**7**	**100%**
Renal Tumor	Nephroblastoma/ Wilm's Tumor		4	100%
	Total		**4**	**100%**
Other Malignant Epithelial Neoplasm	Thyroid Carcinomas	Papillary Carcinoma	1	50%
	Adrenocortical Carcinomas	Neuroblastoma	1	50%
	Total		**2**	**100%**
Other and unspecified carcinomas	Colon	Adenocarcinoma	1	100%
	Total		**1**	**100%**

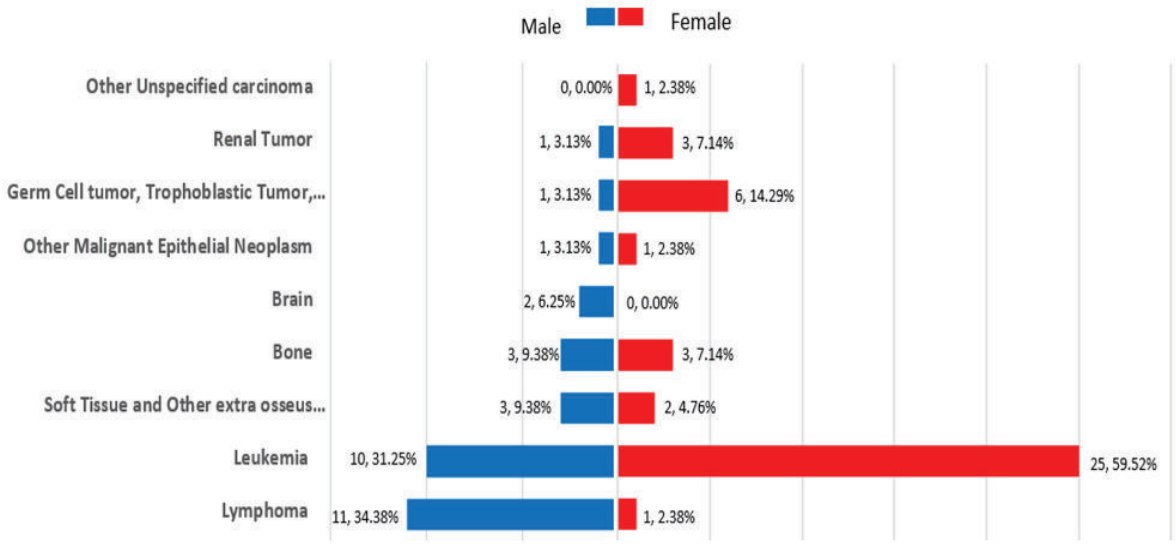


Figure 3: *Cancer Frequency in Male vs Female*

Table 3: *Distribution of different cancer types according to age group*

Age Group	Infant			Toddler			Children			Adolescent		
	No	% In Age Group	% of Site	No	% In Age Group	% of Site	No	% In Age Group	% of Site	No	% In Age Group	% of Site
Leukemia	1	100%	2.86%	6	66.67%	17.14%	16	53.33%	45.71%	12	35.29%	34.29%
Lymphoma	0	0%	0%	1	11.11%	8.33%	3	10%	25%	8	23.53%	66.67%
Bone	0	0%	0%	0	0%	0%	2	6.67%	33.33%	4	11.76%	66.67%
Soft Tissue & other extra osseous sarcomas	0	0%	0%	0	0%	0%	3	10%	60%	2	5.88%	40%
Brain	0	0%	0%	0	0%	0%	2	6.67%	100%	0	0%	0%
Germ Cell tumor, Trophoblastic Tumor, Tumor of Gonad	0	0%	0%	1	11.11%	14.29%	0	0%	0%	6	17.65%	85.71%
Renal Tumor	0	0%	0%	1	11.11%	25%	3	10%	75%	0	0%	0%
Other Malignant Epithelial Neoplasm	0	0%	0%	0	0%	0%	1	3.33%	50%	1	2.94%	50%
Other unspecified carcinomas	0	0%	0%	0	0%	0%	0	0%	0%	1	2.94%	100%

Table 4: *Top Cancers irrespective of age & sex*

Site Group	Number	Percentage
Leukemia	35	47.30%
Lymphoma	12	16.22%
Germ Cell Tumor, Trophoblastic Tumor, Tumor of Gonad	7	9.46%
Bone	6	8.11%
Soft Tissue & other extra osseous sarcomas	5	6.76%

Discussion

Cancer is a generic term for a large group of diseases characterized by the growth of abnormal cells beyond their usual boundaries that can then invade adjoining part of the body and/ or spread to other organs. 9.6 million People worldwide were estimated to die from cancer in 2018.[12]Similarly; cancer is a major cause of death in children in the world, the recorded incidence of which is increasing every year. In United States, childhood cancer is the number one cause of death (53%) in children.[2] There are about 160000 children and adolescents who are diagnosed as cancer worldwide, 80% of which belongs to low and middle income countries (LMICs). These countries have about 5% of the universal resources for treatment and control of cancer.[5]Furthermore, only one in five low and middle income countries (LMICs) have the necessary data to drive cancer policy.[13] Global estimation of childhood cancer incidence (0-14 years) vary from 160,000 to 240,000 cases per year due to missing of data from LMICs and differences in estimation methods.[14, 15] There are no formally established childhood cancer registry is Bangladesh and no specific data about the incidence rate of different cancer in children. Previous study showed that, most childhood cancer patients died without a proper diagnosis and medical treatment, also more than 50% of the diagnosed cancer patients died within 5 years of diagnosis.[16]Though there are no specific registries, it is estimated that the incidence of pediatric cancer in Bangladesh is about 13000 cases per year.[17] Therefore, there is an urgent need to identify research priorities to find out the incidence and prevalence of different types of pediatric cancer and develop a protocol for treatment.

Previous studies showed the incidence rates were slightly higher in boys than girls that varied with age, region and diagnostic group.[4,18] But in our study, percentage of diagnosed cancer were slightly higher in female (Male: Female = 0.76:1)

In children aged (0-14 years), the leading types of cancers were Leukemia, BNS tumor, closely followed by Non Hodgkin Lymphoma.[3,4] Even though our finding regarding Leukemia was similar to the previous study, the following top two cancer types were lymphoma and Germ Cell tumor, trophoblastic tumor and tumor of gonads (testes and ovary).

In global compilation of pediatric cancer data, leukemia incidence (16.4 per million) in Low Income Countries (LICs) are less than that of the incidence rate in Middle Income Countries (36.5 per million) (MICs) and High Income Countries (40.9 per million) (HICs) that probably be due to marked deficiency of diagnosis, registration and reporting of cancer found in LICs.[19] Also a data a from our neighboring country India showed the age specific incidence rate of Leukemia in male and female were 24.8 and 28.7 in Bangalore and 56.1 and 28.6 in New Delhi.[20] Whereas our study alluded 31.25% and 59.52% of male and female diagnosed with Leukemia.

According to GLOBOCAN 2018, Leukemia, Brain and Nervous System tumor, Non Hodgkin Lymphoma and Thyroid Cancers are top cancers in Female while in our study, Leukemia, Germ Cell, Trophoblastic and Tumors of Gonad (Ovarian cancer), Bone marrow and renal Tumors are more common in female of 0-19 years of age.[3]

In case of male, GLOBOCAN 2018 data showed Leukemia, Brain and Nervous System tumor, Non Hodgkin Lymphoma and Hodgkin Lymphoma and Testicular tumor were the common cancer. However in our study it was Lymphoma, Leukemia, Soft Tissue and extra osseous tumor, Bone tumor and Brain and nervous system tumor.[3]

A study done in BSMMSU (the largest specialist pediatric oncology center in Bangladesh) by Islam A et. al, in 2012 explored a relative incidence of ALL (Acute Lymphoblastic Leukemia), Non Hodgkin Lymphoma and AML (Acute Myeloblastic Leukemia) in children respectively 58%, 11% and 10%.[21] Also another study done by Allen E J Yeoh et. al, showed ALL was 26% of all cancers and 78% of Leukemia's in patient under 15 years of age.[22] However in our study, ALL was 31.09% of all cancers and 68.57% of all leukemia. Also Hodgkin Lymphoma was more common (58.33%) than Non Hodgkin Lymphoma.

Where a population based 10 years long study represented high frequency of Leukemia (36.1%) in 0-4 years and Lymphoma (22.5%) in 15-19 years of age, our study evaluated, high proportion of Children (3 to 10 years) in Leukemia and Adolescents (10 to 19 years) in Lymphoma.[4]

Moreover a 5 year study conducted in Dhaka, Bangladesh showed a similar result as us where top cancers in Adolescents were Leukemia, Lymphoma, Bone and Gonadal Cancer.[23]

A study on metastatic solid tumor showed that, out of 10,938 patients 3009 patients that is about 1/3rd had

metastasis. But in our study, a small percentage of metastasized cancer (8.1%) was reported.[24]

Previous study in Australia demonstrated 22% of cancer survivors having 1st degree and 66% having 2nd degree relatives' diagnosed with cancer, where in our study, only one-fifth(17.57%) had positive family history.[25]

Conclusion

Demographic data indicated majority of the cancer patients hailed from rural areas and belonged to poor income families. The frequency of cancer increased with age, children and adolescents constituting the bulk number. Aside from Chittagong metropolitan area, a great number came from Cox's Bazar, a coastal area.Irrespective of age and sex majority of our patients had leukemia. In respect to gender leukemia was one of the top most cancers inboth male and female, but other top cancer types varied. Lymphoma, soft tissue & other extra osseous sarcomas and bone tumors were more common in male. Whilegerm cell tumor, trophoblastic tumor & tumor of gonad and nephroblastoma were more common in females. We observed a miniscule percentage of patients having metastasis.Family history of cancer was found in thirteen cases.

Limitations

Our sample size was not adequately large to show the real picture of cancer status in Chittagong. However, for a 15 day data collection period, the data is sufficient enough. Implementing the study in large scale is one of our future goals. Recall bias might be another limitation of this study as some data were collected by face to face interviews. Also this study might be affected by temporal bias.

Regardless of the limitations, this study gives an overview of the cancer scenario to some extent. Our finding emphasizes the need for national and regional initiatives to develop and strengthen cancer registries for knowing the actual cancer burden to give better management of the cancer patients.

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Original Article

Snodgrass Procedure (TIP), game changing procedure: A single Surgeon's Experience

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Abstract

Background: Hypospadias is the most common congenital anomaly of male urogenital tract. Different aspects of hypospadias such as its etiology, classification and treatment have been a place of discussion. More than 300 methods have been tried for correction of hypospadias. No single technique has been accepted as gold standard because of diversity of results of different methods and different outcome. The of surgical technique depends on the surgeon's personal experience and training.

Aim: The aim of our study is to see the outcome of Snodgrass procedure in distal hypospadias as well of proximal hypospadias where the urethral plate is adequate and having minimal chordee.

Methods: This is a retrospective study conducted in a single unit of Dept. of Pediatric Surgery DMCH and a private hypospadias center by a single surgeon where total 96 patients out of 152 were operated by Snodgrass (TIP) procedure from July 2022 to September 2023. Data were analyzed and results were compared with other recently published studies.

Results: Out of 96 patients, 7 patients developed single UC fistula among which 3 healed spontaneously and 3 needed repair after 6 months.

5 patients developed meatal stenosis who required regular dilation with the help of the tip of a feeding tube lubricated with 2% jesocaine jelly and low potential steroid ointment.

2 patients developed partial glans disruption and 4 patients lost epidermal layer of skin, all of which healed spontaneously without residual scar.

Conclusion: The TIP or Snodgrass technique is the most popular option for distal hypospadias and proximal hypospadias without severe chordee and having good outcomes.

Keywords: Snodgrass, hypospadias, single surgeon.

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Introduction

Hypospadias is the most common congenital defect of male urogenital system. The incidence is about 1 in 250-300 male live births.[3]

For the last 100 years continuous innovation and understanding of the developmental background of hypospadias has brought so many concepts of urethroplasty in the field of hypospadias surgery.

More than 300 methods have been tried for correction of hypospadias defects. But none of them fulfill the expectation. For the long while Thiers Duplay urethroplasty technique have been practiced.[8] In 1932 after invention of peri meatal base flap procedure known as Mathieu technique became popular and widely practiced all over the world till the introduction of Tabularized incised plate (TIPU) technique in 1994 by W. Snodgrass.[7,9]

Since then, this new concept was hugely accepted and mostly practiced in majority of the center for correction of distal hypospadias. It is easy to apply in

most cases of distal hypospadias with minimum chordee and many of the cases of proximal variety also in some selective cases of redo urethroplasty having intact urethral plate.

No single technique has been accepted as gold standard because of diversity of results of different methods and different outcome.

Which fails to show the conclusive evidence of absolute superiority on one technique over other.

Snodgrass procedure simplifies decision making algorithm where neourethra is formed only by urethral plate with a good functional and cosmetic result.[10]

Comparing with distal hypospadias, proximal hypospadias has a gross anatomical and functional difference with a much higher rate of complication.

Snodgrass procedure can be applied in many cases of proximal hypospadias where the urethral plate is adequate and having minimal chordee.

It has been shown that in many recent literatures there is a great variation of complications (0%-30%).[6]

The aim of our study is to see the outcome, determine the incidence of complications along with the evaluation of the causative factors related to complications.

Materials and Methods:

This is a descriptive retrospective case series, conducted in a single unit of Dept. of Pediatric Surgery DMCH and a private hypospadias center by a single surgeon.

All the hypospadias patients with minimal or no chordee, urethral plate >8mm & glans width >14 mm who underwent urethroplasty by Snodgrass procedure were included in the study.

Per-operative findings suggesting other suitable procedures and lost cases during follow up were excluded in the study.

Total 96 patients out of 152 were operated by Snodgrass (TIP) procedure from July 2022 to September 2023.

These surgical data were evaluated, analyzed and results were compared with other recently published studies.

Operation Technique:

After proper pre-operative evaluation and preparation patients were selected for first case (in OT list). Size of urethral plate before and after giving incision, glans width and penile length- all were measured by slide calipers.

A stay suture was placed on the dorsal aspect of the glans for traction and fixation of stent, other two were placed on lateral wings of preputial skin and another two-stay suture were placed on glans wings for facilitating proper glans apposition and hemostasis.

6Fr-8Fr Romson feeding tube was used as urethral stent.

Hemostasis was maintained by application of torniquet (in many cases), epinephrine-soaked gauze (in all cases) and minimal use of low voltage diathermy.

1 ml of lignocaine mixed with adrenalin was infiltrated into the ventral glans for hemostasis and maintaining the spongio-corporal space during glans wings formation.

Two longitudinal parallel deep incisions were made along the junction of penile skin and urethral plate and a circumferential sub-coronal incision was made keeping about 1 cm of inner preputial skin collar. Then degloving done by strictly maintaining the subdartos plane.

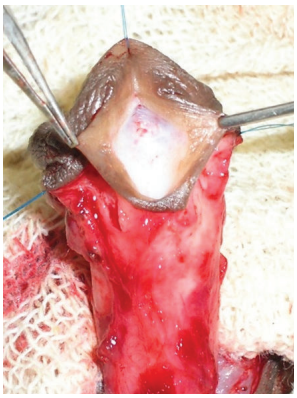
Regarding the assessment of chordae, the patients who has apparently no chordae, we did not do artificial erection test.

But those clinically having mild to moderate chordee, we routinely performed erection test before and after degloving of penile skin & patients having $>20^0$ chordee after degloving were corrected by dorsal plication.

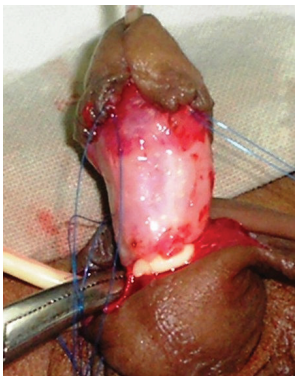
A longitudinal relaxing incision was given on the urethral plate which was strictly maintained in the midline, deep enough down to corpora cavernosa with tenotomy scissor/BP blade, started 2-3 mm proximal to the tip of the glans and ends at 3-5 mm beyond the meatus which widens the urethral plate at least two times, which facilitated tension free neourethra formation without the need for additional skin.



Marking for incision



Midline incision on UP



Glans apposition



Final appearance

Tube was made in two layers; first layer was made mostly with 7/0 vicryl and in some cases with 6/0 vicryl in interrupted subcuticular stitches. The second layer was made with the same suture material with continuous suture to bury the first suture line.

In many cases a dartos pedicle flap was applied for 2nd protective layer harvesting from proximal ventral penile shaft or dorsal preputial skin.

Glanular apposition was done in two layers –

Inner spongy layer was opposed with a master stitch by 6/0 vicryl, which was given just above the coronal sulcus at about 2-3 mm depth to the surface epithelium, taking equal amount of spongious tissue from both the wings, which made a conical shaped glans in almost all cases.

Outer epithelial layer was opposed by 7/0 vicryl in continuous or interrupted fashion.

The glans apposition should be done so snugly that it allowed the tip of the mosquito forceps easily.

During Glanuloplasty most distal point should never exceed the midpoint of glans and the glans fusion length should be within 2.5 to 6.5 mm (mean 4.5 mm).

Finally, phalloplasty was done with excision of all redundant preputial skin and dartos tissue in subcuticular suturing with 7/0 or 6/0 vicryl. We made penopubic angle for pronouncing the penile length.

Dressing done with two layers of surgin pad (inner 50mm, outer 60mm size) or with tegaderm.

Urethral stent was connected to a Foley's catheter (size 14Fr/16Fr). Patient was kept in hospital with parenteral antibiotics (ceftriaxone, kacin ± Fluclox) and with adequate pain killer and stool softener.

Patient was discharged on 3rd POD with oral antibiotic, analgesics, purgatives and bladder sedative.

Check dressing done on 5th POD if it was soaked. Otherwise in all patient dressing was removed on 7th POD along with the urethral stent.

Average time of surgery was 110 minutes.

Follow-up schedule:

Total follow-up period was 6 months and scheduled on 2nd week, 6th week and 6 months.

Clinical findings on follow-up were recorded as per pre-designed data sheet.

Normal looking circumcised penis with vertical slit like meatus considered as good cosmesis. Penis with skin blob or skin tethering considered as cosmetically unacceptable.

Results:

Age of the patients:

Age (years)	Number	Percentage (%)
<2	24	25
2-6	44	45.83
6-12	28	29.16

Types of hypospadias (according to the site of meatus):

Type	Number
Coronal/Subcoronal	68
Distal to mid penile	18
Proximal	06
Redo	04

Penile length ranges from 3.5cm to 10.5cm (mean 7cm).

Width of urethral plate ranges from 7 mm to 12 mm and 14mm to 20mm before and after midline incision on urethral plate respectively.

Degree of Chordae:

Total 32 patients having mild to moderate chordae. Only 8 patients needed dorsal plication.

Complications:

In our study total 7 patients developed single UC fistula among which 3 healed spontaneously and 3 needed repair after 6 months.

5 patients developed meatal stenosis who required regular dilation with the help of the tip of a feeding tube lubricated with 2% jesocaine jelly and low potential steroid ointment.

2 patients developed partial glans disruption.

4 patients lost epidermal layer of skin, all of which healed spontaneously without residual scar.

Complication	Number	Percentage	Total
UC fistula	7	9	
M. Stenosis	5	5	16(16.6%)
Glans disruption	2	2	
Loss of Epidermis	4	4	

Discussion:

The aim of hypospadias repair is to make a functionally & cosmetically normal penis that will be able to be straight during erection with adequate single stream during micturition. More than 300 surgical techniques with many modifications have been tried to get optimum results. Still surgical correction remains uncertain and unclear in many aspects.[11]

In our center majority of the cases were distal hypospadias and a few were proximal variety who had minimal chordae with wide urethral plate (UP) were being treated by Snodgrass technique or TIPU.

According to the European society of Urology the ideal time of hypospadias repair is 6 months to 18 months.[26]

In our study the mean age of operation was 5 years. In our country there is a social fear in general population regarding operation that surgery in younger children is associated with higher rate of morbidity and mortality. Thats why most of the guardians are reluctant to come within the mentioned age groups.

The mean age of other studies in this sub-continent like S. Asad et al was around 3 years and that of O. Sarhan et al was 6 years.[1,27]

The mean operation time was 110 minutes a bit higher than other studies[2] because we gave more time for proper phalloplasty. The penile length of our study cases ranges from 3.5 cm to 10.5cm. It is our observation that in smaller penis surgical repair is a bit challenging which is facilitated by the use of magnification but the result is encouraging. We always measure the width of the UP before and after making midline incision on UP. The measurement before incision was ranging from 7mm to 12 mm and after incision it was ranging from 14mm to 20mm. Most of the time by making the incision deep enough up to the corporal tissue the width of UP increased near to double- which facilitated to make neourethra tension free.

In most of the cases neourethra were constructed with 7/0 vicryl cutting body needle in subcuticular inverting interrupted stitches with a 2nd layer burying the stitch line of the first layer with 7/0 or 6/0 vicryl in continuous fashion. There are many studies on single layer vs double layers neourethra formation along with interrupted vs continuous stitching- but overall result is same.

We follow this strategy in cases of relatively thin UP, we usually use continuous suture and in thick UP with more supporting tissue we use interrupted stitching. Theoretically interrupted inverting subcutaneous stitching should have good result and having more surgeon satisfaction.[28]

We use the dartos flap as a water seal protective layer from dorsal preputial dartos or from proximal dartos layer according to its availability and feasibility. But whenever the neourethra construction was satisfactory with good apposition by 2nd stitch layer, we usually did not use the dartos flap and it was observed that there was no increased evidence of fistula formation.

In our study total 7 patients (7.5%) developed UC fistula among which 3 healed spontaneously and remaining 4 needed subsequent surgical corrections.

The overall complication rate of UC fistula in different study group was 7.88%, ranging from 0-14%.[13,15,18,22,23]

Superficial skin infection, perimeatal thin skin, and narrow UP along with the less amount of supporting spongeous tissue of UP are the contributing factors in the development of UC fistula.

In different institutes of our country, the incidence of UC fistula is a bit higher than the western countries.

MS Mahmud et. Al shows the UC fistula rate was 15.09%.

According to online survey in our country the overall incidence of UC fistula was 24.5%.

Another study in Gujrat, India Archana A. shows UC fistula rate was 16%.

Irfan U Khakllak et Al from Ahmedabad, Pakistan showed the incidence of UC fistula was 17%.

Probable causes of increased incidence of UC fistula were lack of surgical experience (10-30 cases/year done by individual surgeon), 85% surgeons are not habituated with magnification, lack of use of fine suture materials and fine instruments & increased incidence of wound infection.

Second most common complication in our study was meatal stenosis, which was about 5% (5 patients out of 96).

In comparison to other series the reported rates of meatal stenosis was ranging from 2%-12%. A large meta-analysis showed that there is geographical variation of meatal stenosis. It showed 1.8% in North America, 3.4% in Europe and 8.2% in the rest of the world. [24, 25, 26]

In our study population the first stitch was applied at a point 2-3mm proximal to the lower limit of the 'V' marking and the midline incision over the UP did not reach the tip of the glans. We tried to maintain the length of glans fusion ranges from 2.5mm to 6.5mm (mean 4.5mm). Probably these factors had contributed to the less incidence of meatal stenosis.

Out of 96 patients, 2 patients developed glans dehiscence among which 1 was corrected surgically.

4 patients developed epidermal skin loss which was healed spontaneously.

No stricture or complete disruption of neourethra and gross skin necrosis were found in our series.

During the follow up many of our patients did not come at 3 months and 6 months follow up schedule. In these cases we collected the data over telephone and videos of urinary flow via what's app.

Patients who developed UC fistula were advised to urinate occluding the fistula opening with the fingertip along with meatal dilation impregnated with lubricant and low potential steroid ointment which helped to heal the fistula spontaneously.

We used surgin pads as pressure (moderate) dressing in two layers (inner 50 & outer 60) which gave good post operative hemostasis & reduced the edema. This gave a good dressing accepted by the guardians.

Conclusion:

The TIP or Snodgrass technique is a widely used procedure applicable for most of the distal variety hypospadias without severe chordae. Where the width of the urethral plate is more than 7mm, along with deep midline incision increases the width around double and interrupted inverting subcuticular stitching along with the help of magnification during neourethra formation reduce the complication rate. Special attention has been paid for phalloplasty in each patient in order to get a good cosmetic outcome, which included – excision of excess redundant skin ± aggregated dorsal dartos tissue and application of subcuticular continuous stitch with 7/0 vicryl for penile shaft coverage and most importantly formation of Peno-scrotal and peno-pubic angles whenever needed.

Limitations:

Classical method of Snodgrass technique were not applied to all patients. There are some surgeon's modifications in many cases. All the patient did not strictly maintain the follow up schedule. Urinary flow was measured either by direct visual impressions or by indirect video clips and not justified by uroflowmetry.

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Original Article

Surgical Management and Outcome of Neural Tube Defects in Children

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Abstract

Introduction: Neural tube defects (NTDs) are common congenital malformations that affect the entire central nervous system. Proper surgical management of affected children may lead to a meaningful and productive life, and deficiently managed cases of NTDs can be a catastrophic condition not only for patient but also for the patient's family.

Methodology: This prospective observational study was conducted in the Department of Paediatric Surgery, Sylhet M.A.G. Osmani Medical College & Hospital during the period from March, 2018 to August, 2020. Thirty children with a neural tube defect during the study period were included. Associated with life threatening major congenital malformations were excluded. The surgical management protocol used for different sites of NTDs was studied.

Results: The ages of the patients ranged from 1 day to 9 years with the median age of 3.5 days. There were 21 (70.0%) male and 9 (30.0%) female with a ratio of male to female was 2.33:1. Tendency to neural tube defect was more frequent in male than that of female (p=0.028). The types of NTDs were myelomeningocele (73.3%), encephalocele (10.0%), lipomeningocele (10.0%) and meningocele (6.7%). The sites of neural tube defects were lumbosacral (76.7%), occipital (10.0%), sacral (6.7%), lumber (3.3%) and cervical (3.3%). The nature of neural tube defects was ruptured in (60.0%) and not ruptured in (40.0%). Associated birth defects in this study were hydrocephalus in 56.7%, club foot in 16.7%, cervical prolapse in 6.7% and kyphosis in 6.7% cases. Associated neurological defects were lower limb paresis and paralysis in 83.3%, Urinary incontinence in 50.0% and faecal incontinence abnormality in 40.0% of cases. Postoperative complications were wound infection in 10.0%, wound dehiscence in 16.7%, CSF leakage in 23.3% and meningitis in 10.0% cases. The overall mortality rate was 6.7% of cases. Outcome of this study was recovery without complication in 66.7%, recovery with complications in 26.7% and death in6.7% of cases. Recovery without complication was more frequent than recovery with complications and death.

Conclusion: Lumbosacral myelomeningocele was the most common type of NTD. There was recovery without complication in most cases after operation. Early operation is associated with recovery without complication.

Keywords: surgical management of NTDs, outcome of NTDs, neural tube defects, myelomeningocele, encephalocele, meningocele

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Introduction:

Neurulation, one of the earliest and most crucial events in human development, generates the neural tube, the rudiment of the entire adult central nervous system (the brain & spinal cord). NTDs account for the most common congenital anomalies of central nervous system and results from failure of the neural tube to close spontaneously between 3rd and 4th weeks of development.[1] The prevalence rate of NTDs in India is 7.48/1000 live births.[2] This is one of the serious congenital malformation responsible for infant disability, morbidity and mortality.[3]

NTDs may be classified as open or closed on the basis of the presence or absence of the exposedneural tissue. Open NTDs include anencephaly, spinal rachischisis or spina bifida aperta/cystica (i.e. myeloschisis, myelomeningocele and meningocele) and encephalocele. Closed NTDs include spina bifida occulta, lipomatous malformations (e.g. lipomas and lipomeningocele), split cord malformations, neurenteric cysts, dermal sinuses, tethered spinal cord and sacral agenesis. Open NTDs are more common than closed NTDs.[4]

Anencephaly and spina bifida are account for up to 95% of all NTDs.[5] The incidence of meningocele is 5% while myelomeningocele is 90-95% in all spina bifida cases, which is the most severe birth defect compatible with survival.[6,4,7] About 70-80% of encephaloceles occur in the occipital region and the nasal and parietal ones are less common.[9]

The presentation of spina bifida is usually with fluid filled sac commonly at the lumbosacral region (45-50%), but it can be at any site from cervical to sacral region.[6,7]

Individuals with spina bifida have substantially enhanced survival rate due to recent improvements in medical and surgical management. However, these patients continue to be at increased risk for morbidity and mortality throughout their life. These patients experience varying degrees of motor and sensory dysfunction of lower limbs and failure of anal and urethral sphincters.[9]

The incidence of hydrocephalus associated with myelomeningocele ranges from 80-95%.[4] Other associated anomalies include skeletal abnormalities (i.e. kyphosis, scoliosis), genito urinary anomalies (20% cases) (renal cysts, duplication of genitourinary tract and undescended testes), Chiari II malformation (>90%), club foot and congenital heart disease (VSD).[7,4,1] In spite of numerous progresses that have been done towards understanding the causation of the majority of the cases still unknown. Certain epidemiologic genetic studies have suggested some high risk groups. These include maternal age of <20y or >35y, a past history of having a fetus with NTDs, poor socioeconomic status, gross nutritional deficiency (folic acid), two extremes of parity (primipara and grand multipara) and lack of proper ANC.[3,10] Adequate Folic acid consumption during early pregnancy prevents the occurrence and recurrence risk of NTDs by 50%-70%.[11,4] Paternal occupational factors like agriculture, painting, welding have also been linked with increased risk of NTDs.[3]

Association of genetic factors is also advocated in many cases. The risk of 1st child having spinal abnormality is around 0.1%-0.2%. But having one affected sibling the risk of a 2nd child is 2%- 5%, and the risk of 3rd affected child is compounded to 10%-15%.[3] Numerous teratogens have been implicated in the etiology of NTDs, like radiations, hyperthermia, heat exposure and hot-tub, hypervitaminosis A, viral infections, drugs like carbamazepine, valproic acid and use of folic acid antagonists (methotrexate).[3,5]

The severity of NTDs depends on the level and degree of spinal cord exposure. The symptoms are ranging from mild cosmetic symptoms to severe paralysis, chronic infections, incontinence or retention. Patients are also at increased risk of developing hydrocephalus that requires ventriculo-peritoneal (VP) shunts.[11]

The prognosis is also dependent to the level of the lesion. So, defining of lesion localization with maternal ultrasonography at mid-trimester is useful to predict the short and long term outcomes.[12]

The standard of care includes diagnosis in utero by proper ANC, proper counseling of the parents, caesarian section rather than vaginal delivery, surgical closure as early as possible. Continued monitoring for the development of hydrocephalus is necessary, with surgical intervention as needed.[11]

In the management of myelomeningocele, the patient without overt clinical hydrocephalus, most surgeons used to repair the myelomeningocele only. But that may result subsequent hydrocephalus in 65 to 85% within 6 months and also can cause breakdown of repair and CSF leakage. To prevent this complication some surgeons begins to do repair of myelomeningocele and introduction of VP shunt at least 3 days after the initial repair. This gives better result. But also increase hospital stays and imposes an additional operative trauma within a short interval. It also increases the incidences of wound related complications. Significant improvement has been shown in the management of myelomeningocele by practicing simultaneous placement of VP shunt during repair of myelomeningocele. This decreases the hospital stay, prevents failure of the repair, prevents or delays the development of subsequent hydrocephalus.[13]

Objectives:

General objective:

To observe the outcome of surgical management of the neural tube defects (NTDs) in children.

Specific objective:

To record the different types of NTDs, to evaluate the different types of post-operative complications, to manage the different modalities of post-operative complications, to observe the overall surgical outcome of NTDs.

Methodology:

This prospective observational study was conducted in the Department of Paediatric Surgery, Sylhet M.A.G. Osmani Medical College & Hospital during the period from March, 2018 to August, 2020. Thirty children with a neural tube defect during the study period were included. Associated with life threatening major congenital malformations were excluded.

Study Procedure

All the admitted patients with NTDs has been assessed. Patient has been advised for CBC, BT, CT, Blood grouping and Rh typing, Urine R/M/E, X-ray lumbosacral spine both A/P and lateral view, Chest x-ray P/A view, USG of the lesion, USG of brain, USG of whole abdomen and 2D echocardiography to detect the extent of the disease, associated anomalies and to prepare the patient for surgical management needed according to types. Closure includes partial excision of the sac, water tight closure of the dura and reconstruction. Tension-free closure of the skin has been ensured after keeping a tube drain in situ. Most of the patients with NTDs were operated ≤7 days of admission. The follow-up schedules were on 15th POD, at monthly upto 6 months and at 1 year after operation. In the follow-up we looked for CSF leakage from the wound and wound infection, paralysis of lower limbs or club foot, incontinence of urine and faeces, hydrocephalus. The prognosis was recorded by taking detailed history from the parents and proper physical examination of the patients.

Statistical analysis

Data were processed manually and analyzed by the help of Microsoft Office Excel and statistical package for social sciences (SPSS) version 25.

Qualitative data were presented as frequency and percentage; and quantitative data were presented as mean and standard deviation.

Chi-square ($\div^2$) test was done to find out the level of significance between two categorical variables. A probability value (p) of <0.05 was considered statistically significant.

Ethical consideration

An approval of the study protocol was obtained from the institutional Ethical Review Committee of Sylhet M.A.G. Osmani Medical College, Sylhet before the commencement of the study.

Operational definition:

Recovery without complication: Recovery from primary pathology without complication.

Recovery with complication: Recovery from primary pathology with some complications.

Results:

Table 1 : *Showed the distribution of the patients on the basis of age group.*

Age	Number	%
1-7 days	20	66.7
8-30 days	4	13.3
<30 days	6	20.0

Table 2: *Showed the frequency distribution of patients according to gender.*

Gender	Number	%
Male	21	70.0
Female	9	30.0

Table 3: Showed the gestational age of the patients. Preterm birth was in 6 (20.0%) patients, who were associated with recovery with complications and morality.

Gestational age	Number	%
Term	24	80.0
Preterm	6	20.0

Table IV *showed the periconceptional folic acid supplementation in NTD.*

Folic acid supplementation	No.	%
Yes	3	10.0
No	27	90.0

Table V *Showed the distribution of the patients according to type of neural tube defects. Patients with myelomeningocele have more associated birth defects.*

Type of NTDs	Number	%
Meningocele	2	6.7
Myelomeningocele	22	73.3
Encephalocele	3	10.0
Lipomeningocele	3	10.0

Table VI: *Showed the distribution of the patients according to the site of neural tube defects. The patients who had been developed postoperative complications, the defect was presented in the lumbosacral region.*

Site of NTDs	Number	%
Lumbosacral	23	76.7
Sacral	2	6.7
Occipital	2	10.0
Cervical	1	3.3
Lumbar	1	3.3

Table VII *Revealed that the nature of neural tube defects was ruptured in 18 (60.0%), among them 7 (23.3%) developed post-operative complications. Morbidity and mortality was more in ruptured cases.*

Nature of NTDs	Number	%
Ruptured	18	60.0
Not-ruptured	12	40.0

Table VIII *Associated congenital defects*

Associated congenital defects	Number	%
Hydrocephalus	17	56.7
Club foot	5	16.7
Cervical prolapse	2	6.7
Kyphosis	2	6.7
No	12	40.0

Table IX *Associated neurological defects*

Associated neurological defects	Number	%
Lower limb paresis/paralysis	25	83.3
Urinary incontinence	15	50.0
Faecal incontinence	12	40.0
No	5	16.7

Table X Age of child during surgical management

Age	Number	%
≤ 7 days	20	66.6
>7 days	10	33.3

Table XI *Postoperative complications*

Postoperative complications	Number	%
Wound infection	3	10.0
Wound dehiscence	5	16.7
CSF leakage	7	23.3
Meningitis	3	10.0
No	20	66.7

Table XII Treatment of postoperative complications

Treatment of postoperative complications	Number	%
Conservative		
Antibiotics	10	33.3
Regular dressing	8	26.7
Surgical		
Secondary closure	6	20.0

Table XIII Treatment of associated anomalies

Treatment of associated anomalies	Number	%
V-P shunt	12	40.0
Physiotherapy	25	83.3
Other	4	13.3
No	5	16.7

Table XIV *Duration of hospital stay*

Duration of hospital stay	Number	%
≤ 10 days	20	66.7
>10 days	10	33.3

Table XV *Follow up at 15 days after operation*

Outcome	Number	%
Wound infection	3	10.0
Lower limb paresis/paralysis	23	76.7
Faecal incontinence	10	33.3
Urinary incontinence	13	43.3
Hydrocephalus	15	50.0

Table XVI *Follow up at 1months, 3 months, 6months and 12 months after operation*

Outcome	1m	3m	6m	12m
Lower limb paresis/ paralysis	76.7%	76.7%	76.7%	70.0%
Faecal incontinence	33.3%	33.3%	33.3%	33.3%
Urinary incontinence	43.3%	43.3%	43.3%	43.3%
Hydrocephalus	60.0%	60.0%	60.0%	60.0%

Table 17 *Outcome (n=30)*

Outcome	Number	%
Recovery without complication	20	66.7
Recovery with complications	8	26.7
Death	2	6.7

Discussion:

Goswami et al., (2015) found that age at presentation of neural tube defect ranged from 1 day to 5 years. In this study the ages of the patients ranged from 1day to 9 years with the median age of 3.5 days. There were 20 (66.7%) patients in the age group of 1-7 days, 4 (13.3%) patients in the age group of 8-30 days and 6 (20.0%) patients in the age group of above one month. Delaying in presentation yet might be due to delayed referral, financial problems and sometimes folk cultural and religious beliefs, that NTDs are a punishment from God. This study showed that there were 21 (70.0%) male and 9 (30.0%) female with a ratio of male to female was 2.33:1. Tendency to neural tube defect was more frequent in male than that of female (p=0.028). Rai et al., (2016) found that the frequencies of a male child affected to that of the female child were more with a ratio of 1.38:1 in neural tube defects. Many studies revealed that females are more affected than males.[5, 18]

This study showed that preterm birth in 6 (20.0%) patients and term birth in 24 (80.0%) patients of NTD. But Gedefaw et al., (2018) found preterm birth was more common in NTD (69.4%). In another study Yin et al., (2020) also found preterm birth was more common in NTD (84.5%).

It is mostly accepted that inadequate intake of natural folate, or its synthetic form folic acid, before and during early pregnancy is associated with increased risk of spina bifida.[20,21] In this regards we found most of the mother of the patients did not take periconceptional folic acid supplementation (90.0%) and only 10.0% of mother of the patients take periconceptional folic acid supplementation; difference was statistically significant (p<0.001). Motah et al., (2017) found none of the mothers of baby with NTDs in their series was supplemented for folic acid before pregnancy and most of them who took folic acid did not do so during the critical period. Alatise et al., (2006) reported that only 3 mothers in their series took folic acid before pregnancy. This might have been due to several reasons; lack of experience, and most of the time, the mothers were not even knowing that they were pregnant during the critical period.

In our study myelomeningocele (73.3%) was the most common neural tube defects and others were encephalocele (10.0%), lipomeningocele (10.0%) and meningocele (6.7%). Gedefaw et al., (2018) found that 54.1% were cases of anencephaly; 40.5%, spina bifida; and 5.4% encephalocele. The frequency of spina bifida was in higher proportion compared to anencephaly reported in the study of Rai et al., (2016). However, many studies have reported equal incidences of these two forms of NTD.[22, 23]

The site of neural tube defects was lumbosacral in 23 (76.7%) cases, occipital in 3 (10.0%) cases, sacral in 2 (6.7%) cases, lumber in 1 (3.3%) cases and cervical in 1 (3.3%) cases. Motah et al., (2017) found the presenting sites for NTDs at lumbosacral in 47.7% of cases, lumber in 41.3% of cases, sacral in 6.6% of cases, and thoracolumbar in 4.3% of cases.

This study revealed that the nature of neural tube defects was ruptured in 18 (60.0%) and not ruptured in 12 (40.0%) cases. This result was consistent with the study of Motah et al., (2017); where neural tube defects were ruptured in 52.2% of cases and un-ruptured in 47.8% of cases.

Associated congenital defects in this study were hydrocephalus in 56.7%, club foot in 16.7%, cervical prolapse in 6.7% and kyphosis in 6.7% cases. Motah et al., (2017) also found associated birth defects were

hydrocephalus (65.3%), bilateral talipes calcaneovalgus (18.4%), bilateral talipes equinovarus (16.3%) and several other less frequent defects.

Associated neurological defects were lower limb paresis/ paralysis in 83.3%, Urinary incontinence in 50.0% and faecal incontinence in 40.0% of cases. Motah et al., (2017) reported neurological defects associated with NTD were lower limb paresis/ paralysis in 65.33%; and urinary incontinence and faecal incontinence deficit in 61.2% of cases Kumar and Singh, (2003) and Alatise et al., (2006) had been reported similar results. Sphincteric dysfunctions were more frequent in patients presented with myelomeningocele.

The definitive procedure for NTDs is operative closure of the defect within. Closure includes partial excision of the sac, water tight closure of the dura mater and reconstruction. None of the patient in this study had been operated within 72hrs of age. The ages of the child during operation are d"7 days for 20 (66.7%) patients and >7 days for 10 (33.3%) patients.

Postoperative complications in this study were wound infection in 10.0%, wound dehiscence in 16.7%, CSF leakage in 23.3% and meningitis in 10.0% cases. Treatment of postoperative complications was administration of antibiotics (33.3%), regular dressing (26.7%) and physiotherapy (10.0%) for cases as conservative treatment; and 6 (20.0%) patients required surgical management (e.g. secondary closure). The 10 (33.3%) patients who had developed postoperative complications were operated after 7 days of age, and the defect was presented in the lumbosacral region. Among them, myelomeningocele was in 7 (23.3%) patients and lipomeningocele was in 3 (10%) patients. The overlying skin was ruptured in 7 (23.3%) patients and not ruptured in 3 (10%) patients. Motah et al., (2017) observed patients with complications following surgery were 55.1%. The most common post-operative complication was wound infections (44.9%). Others were wound dehiscence (40.8%), CSF leakage (20.4%) and meningitis/sepsis (32.7%).

Conclusion:

Neural tube defects (NTDs) are more common in male child in this study. Myelomeningocele is the most common type and lumbo-sacral was the most frequent clinical type of neural tube defects (NTDs). Associated common birth defect is hydrocephalus and neurological defect is lower limb paresis/ paralysis. Recovery without complication is more frequent than recovery with complications and death. Early operation is associated with recovery without complication and less morbidity.

Limitations of the study:

This study was not without limitations. The limitations of the study were-

None of the patient have been operated before 72hrs of life, lack of opportunity for MRI facility, lack of expert neonatal neurosurgeon, lack of dedicated neonatal anaesthesiologist, several surgeons performed the operation, lack of opportunity for NICU support, lack of multidisciplinary approach, follow up period was short.

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Original Article

Neonatal Surgical Situation in Bangladesh: Challenges and Way Forward

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Abstract

The neonatal period is the most vulnerable time for a child. Although neonatal morbidity and mortality have declined over the last few decades, the outcome of neonatal surgery is still relatively poor in Bangladesh compared to other low- and middle-income countries. Still, neonatal surgery is not getting its due attention in the national health policy. Here, challenges are multifactorial. In developed countries, intrauterine diagnosis, planned delivery, better pediatric anesthetic support, improved neonatal intensive care, and prompt surgical management have been shown to significantly improve neonatal surgical outcomes. This article addresses various problems of delivering neonatal surgical services in Bangladesh and proposes solutions. It is crucial that prompt surgical management be a key focus in improving neonatal and infant health indices.

Keywords: Neonatal surgery, Manpower, Neonatal transport, Neonatal intensive care unit, Minimally invasive surgery, Challenges, Follow-up, Research

Introduction

Neonatal surgery is delicate and sophisticated in every aspect. Most neonatal surgeries are performed during the first ten days of life.[1] For successful survival, neonatal surgeries require surgical management by pediatric surgeons in medical centers with facilities for pediatric anesthesia, radiology, and specialized nursing care.[2] Prolonged duration of surgery, perioperative blood loss, and hypothermia adversely affect the outcome.[3]

The average global rate of neonatal deaths was 16.8 per 1,000 live births in 2023.[4] The neonatal mortality rate for Bangladesh in 2023 was 21.56 deaths per 1000 live births, which declined from 27/1000 to 21/1000 live births between 2017 and 2023.[5] Congenital anomaly is currently the fifth leading cause of neonatal mortality worldwide.[2] Congenital anomaly comprises 7% of neonatal deaths, and most of these are curable.[6,7,8] The most common surgical conditions in the newborn involve the gastrointestinal tract.[2] Complications related to birth defects are responsible for around 12.7% of neonatal deaths in Bangladesh, making it an emerging public health concern.[6,7]

This paper addresses the burden and outcome of neonatal surgical conditions in Bangladesh to plan and implement strategies to improve outcomes.

Health Care System of Bangladesh

Bangladesh has a well-structured health care system with three tiers of primary health care – Upazila Health Complexes (UHC) at the sub-district level, Union Health and Family Welfare Centers (UHFWC) at the Union (collection of few villages) level, and Community Clinics (CC) at the village level.[10] The provision of surgical services starts at the Upazila (sub-district) level and goes upward.[11] Upazila Health Complexes provides limited surgical services depending on specialist doctors, skilled staff, and proper equipment availability. Pediatric and neonatal surgery is often

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performed at district and general hospitals, and nowadays, limited Special Care Newborn Unit (SCANU) facilities are available in some places here.[11,12]

At the tertiary level, health facilities are delivered through the specialized surgical specialty and sub-specialty care.[11] A SCANU and a Pediatric Intensive Care Unit (PICU) are vital components of hospital care for critically ill children, significantly reducing morbidity and mortality rates. According to the DGHS Health Bulletin 2023, there are currently 59 functional SCANUs across 50 district hospitals in Bangladesh. Additionally, the country has about 22 hospitals equipped with PICUs, highlighting the widespread availability of these essential life-saving facilities.[12] Among the prominent institutions offering these vital services are the renowned Dhaka Shishu (Children) Hospital, Bangabandhu Sheikh Mujib Medical University (BSMMU), Chattogram Maa-o-Shishu Hospital Medical College, Institute of Child and Mother Health, Combined Military Hospital, Square Hospital, Bangladesh Specialized Hospital, United Hospital Limited, Dr. MR Khan Shishu Hospital & Institute of Child Health, BIRDEM General Hospital 2 (Child and Mother), Women's and Children's General Hospital, Central Hospital, Dhaka Pediatric-Neonatal & General Hospitals for Children, Labaid Hospital, and Delta Hospital.[12] These hospitals have a strong track record of successfully performing operations on neonates and children. Collectively, these institutions represent a beacon of hope and excellence in pediatric and neonatal healthcare within Bangladesh. These hospitals regularly operate on neonates and children and are equipped with NICU and PICU facilities.[11,12]

Bangladesh has a shortage of doctors, nurses, midwives, and health technicians of various kinds. 68% of Bangladesh's medical doctors work in the private sector.[9,10] In 2021, the health workforce is bent towards doctors, with a doctor-to-nurse ratio of 1:0.77 and a doctor-to-technologist ratio of 1:0.35, highlighting the limited number of technologists available in relation to their medical counterparts.[9] Meanwhile, in 2014, the healthcare landscape reflected a different balance, with a composite ratio of doctors to nurses to technologists at 1:0.4:0.24, illustrating a more diversified workforce distribution that included a stronger emphasis on nursing and technological roles.[10] The inadequate number of appropriately trained human resources for health in Bangladesh is a decisive limiting factor.

Antenatal Checkup

According to "the WHO antenatal care (ANC) model (2016)", there are four timely ANC visits that aim to reduce maternal and child mortality.[13] During 2007–2014, globally, only 64% of pregnant women attended the WHO-recommended minimum of four contacts for ANC.[13] Bangladesh Demographic and Health Survey (BDHS) data 2019-20 shows that the four ANC coverage rates rose to 47% from 31% in 2010.[14] In 2022, 88% of pregnant women received at least one ANC from a trained provider.[5]

In most countries, one ultrasound scan before 24 weeks of gestation (mid-trimester scan) is recommended as part of standard prenatal care for pregnant women to estimate gestational age, rule out structural abnormalities or congenital anomalies, improve detection of fetal anomalies and multiple pregnancies, and improve a woman's pregnancy experience.[13] In the Salomon study, over one-half (56%) of malformations and significant anomalies were identified before 24 weeks of gestation.[15] Parveen (2018) conducted a study in the Gynecology Department of Bangabandhu Sheikh Mujib Medical University, where (125/705) 17.7% of women had congenital anomalies in their babies.[16]

Newborn Care

Essential newborn care (ENC) includes hygienic care, thermal control, eye and cord care, early and exclusive breastfeeding support, immunization, early identification of danger signs, and resuscitation with a bag and mask if needed.[17,18] ENC should be applied after the baby is born and continued for the first seven days after birth.[13]

The Burden of Disease

The most common congenital anomalies encountered at Dhaka Medical College Hospital were anorectal malformation (ARM), Hirschsprung's disease, gastroschisis, omphalocele, intestinal atresia, meconium ileus, volvulus with malrotation, infantile pyloric stenosis, prune belly syndrome, neonatal injury, congenital diaphragmatic hernia, posterior urethral valve, ectopia vesicae, oesophageal atresia, tracheoesophageal fistula, and conjoint twin.[2] Similarly, at Dhaka Shishu Hospital, Hasan et al. (2022) noted that anorectal malformations and gastroschisis were the most prevalent anomalies.[3] This information provides a comprehensive understanding of the landscape of congenital anomalies in our country.

Time of Presentation

According to a study by Ekwunife et al. (2022), the duration of presentation from the onset of symptoms ranged from 1 hour to 26 days (mean 34.7 ±21.1 hours).[19]

Hanif et al. (2020) observed early presentation in ARM, gastroschisis, omphalocele major, and meconium ileus.[2] Early onset of symptoms, rapid deterioration of patients' condition in intestinal obstruction, and straightforward approach to diagnosis were probably the causes of early presentation. On the other hand, the presentation was late in Hirschsprung disease and malrotation because of variability in the onset of symptoms and lack of specificity.[2,20]

One of the most pressing issues in neonatal surgical services in Bangladesh is the late presentation of cases.[2,3] These babies often arrive at referral centers in critical condition, with hypothermia, sepsis, and hemodynamic instability. This late presentation not only complicates the surgical intervention but also significantly increases the postoperative morbidity and mortality rates.[2,21,22] This underscores the urgent need for strategies to address this challenge.

Neonatal Birth Trauma

Several factors contribute to the occurrence of birth trauma, with instrumental delivery, fetal presentation (vertex presentation), early preterm birth, high birth weight (>4000 g), and male sex being the primary predisposing factors.[23,24,25] These factors, when present, significantly increase the risk of birth trauma. In fact, scalp injuries alone account for 80% of all birth traumas.[25] Other prevalent birth traumas include clavicular fractures, brachial plexus injuries, and intracranial hemorrhage.[25] This knowledge can help us identify and manage these cases more effectively.

Surgical Procedures

Ekwunife et al. (2022) recommended that the most common procedures were intestinal resection and anastomosis in 29.6%, colostomy in 21.1%, primary repair of anterior abdominal wall defect in 12.7%, and silo or modified silo application in 6.9% neonates.[26] This finding was similar to other studies.[2,3,19] Here, various modalities of management were used.[2,3,26]

Minimally Invasive Surgery in Neonates

Minimally invasive surgery (MIS) has been increasingly accepted as a treatment modality for neonatal surgical conditions.[27] Neonatal MIS, which includes both laparoscopic and thoracoscopic procedures, is now used for a variety of surgeries such as laparoscopic pyloromyotomy, laparoscopic Ladd's procedure for malrotation, repair of diaphragmatic hernia, and complex biliary reconstructions in neonates.[27,28] The ability to visualize the opposite patent processus vaginalis in inguinal hernias makes MIS a superior option to open herniotomy.[29]

Challenges Faced in Neonatal Surgery in Bangladesh:

1. Shortage of Skilled Manpower

In Bangladesh, 6.78 registered Physicians and 0.058 anesthesiologists are available per 10,000 people0.[12] The Lancet Commission on Global Surgery recommended 20 specialist surgeons and anesthesiologists per 10,000 population.[30] However, in Bangladesh pediatric surgical workforce is exceptionally low. There was only one pediatric surgeon for two lakh children.[12] Nowadays, very few dedicated pediatric anesthesiologists are present in Bangladesh.

2. Urgent Need to Address Insufficient Infrastructure, Equipment, and Facilities

Modern technology plays a vital role in improving the outcomes of neonates in developed countries. Intravenous infusion pumps, radiant warmers, incubators, mechanical ventilators, and extracorporeal membrane oxygenators are commonly used in modern surgical NICU.[18,19,20] The need for such equipment poses a substantial challenge in achieving positive outcomes in neonatal surgery.

3. Inadequate Documentation and Research

More data and research are needed on neonatal surgical problems. Birth defects have not been included in Bangladesh's national census so far. The actual data regarding neonatal surgical patient load in Bangladesh is not available, but this burden is increasing and contributing significantly to the causal list of neonatal mortality.[3]

4. Lack of Awareness

In addition to the challenges mentioned above, there needs to be more awareness and understanding among the general population, especially among health policy planners in Bangladesh, regarding neonatal surgical issues. Many parents and caregivers may not recognize the early signs and symptoms of

neonatal surgical conditions, leading to delayed or inadequate care for affected infants. Increasing awareness about the importance and necessity of early detection and timely intervention for neonatal surgical problems is crucial for improving outcomes and reducing neonatal mortality in the country.

5. The Severe Impact of Low Budget Allocation in the Health Sector and Scarcity of Investment

The national budget is BDT 7,970 billion for the 2024-25 fiscal year. 41,4.07 billion Tk, or 5.27% of the proposed budget, has been allocated to the health sector.[31] This lack of critical public funding severely hampers access to surgical services. Governments and donor agencies must pay more attention to funding and supporting research studies in neonatal surgical diseases.

6. Out-of-Pocket Payment System

Government hospitals cannot provide completely free primary health care.[10,11] Patients bear the costs of medicine, laboratory investigations, and some additional unseen costs.[10,11] Insurance makes up a small share of the total source of healthcare financing in Bangladesh.[21] However, government expenditure on health is about 34% of the total health expenditure (THE), the remaining (66%) being out-of-pocket expenses.[10,32]

7. Gender Bias

Gender bias is prevalent among Bangladeshi societies, with a clear preference for baby boys over girls. In numerous instances, girls may not receive necessary medical and surgical treatment, or it may be discontinued altogether.

8. Fear, Beliefs & Superstitions

Fear of surgery is observed in many cases. Some believe that surgery will bring lots of complications and worse outcomes. Seeking treatment from traditional and spiritual healers is common in rural areas.[33] In Bangladesh, almost 87% of the mothers sought care for their newborns, of which 38% sought care from homeopaths, 37% from village doctors, 17% from trained providers, 5% from government health facilities, and 3% from herbalist/spiritual healer.[33]

9. Consanguineous marriage

Consanguineous marriage refers to marriage between first or second cousins.[35] Becker (2002) recommended that among the offspring of first-cousin parents, birth defects' prevalence increased from 3–4% to 5.7–6.8%.[34,35] In the Teknaf region of Bangladesh, 17.6% of marriages were consanguineous.[36]

10. Gestational Age and Birth Weight

Prematurity and low birth weight are two independent variables for neonatal surgical mortality.[2, 3, 37] A report by Puri et al. (2019) showed that prematurity and low birth weight increase the odds of neonatal surgical mortality by 3.38 and 3.41 times, respectively.[37] Hasan et al. (2022) demonstrated in their study that 54% of neonates were premature.[3]

11. Delivery at Home and Distance from Hospital

The practice of childbirth at home is widespread in Bangladesh; 57.2% of total births still take place at the household level, and among them, 70.3% of children are born with the help of Traditional Birth Attendants (TDA) in 2022.[38] Relative to other births, a medically trained provider is more likely to assist first-order births. Congenital anomalies in such children are not easily determined at birth.[16] It was to be shown that late presentation of neonates was a risk factor for surgical outcomes.[2]

12. Late Presentation and Poor Transportation

More than 60% of births are usually at home in many parts of the country.[39] Many of these neonates are brought to the hospital several days or sometimes weeks after the onset of illness with severe fluid and electrolyte deficits, anemia, sepsis, and malnourishment.[39]

On the other hand, the neonates who are delivered in the Upazila Health Complexes or Community Clinics are referred to specialist centers after significant delays, often not well resuscitated, and transported in suboptimal conditions from far locations on poorly maintained roads.[10,11] Besides, surgical intervention in such babies often leads to high postoperative morbidity and mortality.

13. Difficulty with Anesthesia

The lack of trained anesthesiologists in low- and middle-income countries is confirmed by a survey conducted by Dubowitz et al. (2010), and undergoing general anesthesia is a significant risk for patients (mainly infants and children) in developing countries.[20] General anesthesia for the sick newborn is often turbulent, prolonged, and practiced in a state of lack of appropriate anesthetic equipment and inappropriate drugs in most centers in Bangladesh.[40, 41,42]

14. Challenges of MIS

Ergonomic problems cause surgeons discomfort and fatigue, leading to imprecise movements that may cause surrounding organ injury.[29] Market-driven

instrumentation limitations remain an essential issue in developing neonatal MIS.[27,28] The low volume of MIS procedures performed on neonates acts as a deterrent to attract manufacturing companies to develop smaller, more sophisticated instruments.[43]

15. Poor Follow-up

Follow-up of patients treated in the hospital is usually inferior.[2,3,33] Many of the neonates do not come back after initial surgery, which means that the long-term outcome of treatment is challenging to evaluate and document.

Proposed Solutions to Improving Neonatal Surgical Care in Bangladesh:

The average mortality from neonatal surgery in most centers of LMIC countries is 20%-30%.[3,21] Most of these neonatal surgical deaths are avoidable if the care providers take the necessary steps.

1. Community Awareness

Community awareness regarding neonatal complications and practices for care-seeking have the potential to bring about significant improvements in neonatal health. By leveraging the expertise of Traditional Birth Attendants (TBA) and Community Health Care Providers (CHCP), we can enhance facility-based delivery and improve newborn care practices in Bangladesh. Training the staff of rural hospitals to recognize life-threatening neonatal conditions and refer such cases early and adequately is a crucial step. The Association of Pediatric Surgeons of Bangladesh (APSB) could play a pivotal role in generating awareness across the continent through symposia, workshops, and meetings on neonatal surgical problems, instilling hope for a brighter future.

2. Data Collection, Aggregation & Dissemination

Neonatal surgical data should be collected from every level, and a national database should be established. The database should be open for all to access.

3. Research

Regular publication of research results in relevant journals, Web sites, and other communication media would go a long way in raising awareness of neonatal surgical problems. With proper documentation and published research, it may be easier to convince healthcare providers, the international community, and governments to pay particular attention to this important aspect of child health.

4. Equipment and Facilities

Each divisional city needs one dedicated children's hospital, which will have the budget for appropriate equipment and facilities for neonatal surgery. The provision of a well-equipped NICU with trained staff is mandatory for improved morbidity and mortality rates of neonatal surgery.

5. The role of government and healthcare planners

Neonatal surgical services are expensive and require a lot of capital expenditure, which is only feasible with active government involvement. Governments need to encourage the setting up of dedicated children's hospitals and provide funding for research into various aspects of child health. This would go a long way in improving the outcome of newborn babies with surgical diseases, which should be a right of every child born in Bangladesh and not a privilege.

6. Coordination and Collaboration between the Ministries

Coordination and collaboration between ministries could be an effective way to tackle the situation and devise strategic ways. Finding common goals with other ministries and executing collaborative programs will save time, money, and effort. Development and implementation of treatment protocols and guidelines and collaboration across centers are needed to ensure continuous neonatal surgical quality improvement for a sustained good outcome.

7. The Role of International Community

Regional and international collaboration is a crucial part of our strategy. It is important to note that international funding agencies have a significant role to play. By recognizing that neonatal surgical conditions also cause significant morbidity and mortality, these agencies can provide funding for neonatal surgical research and help train and incentivize pediatric surgeons and other support staff. Their support will be instrumental in our collective efforts to improve neonatal surgical care in Bangladesh.

8. Training

Neonatal surgical training, a crucial component of the pediatric surgical curriculum, should be emphasized. The Association of Pediatric Surgeons of Bangladesh (APSB) and the government should regularly organize training, symposia, and workshops to ensure the dissemination of this vital knowledge.

9. Ensure Four Antenatal Checkup and confirm Prenatal Diagnosis

Four ANC visits with one ultrasound scan before 24 weeks of gestation can reduce maternal and child mortality. Bangladesh still ensures a higher uptake rate of timely four ANC visits with its government and non-government organizational initiatives. Prenatal diagnosis of complex congenital anomalies allows planning for delivery and early post-natal treatment, which is associated with a better outcome.

10. Immediate Referral of Neonatal Surgical Emergencies

Immediate and appropriate surgical attention is not commonly available here due to illiteracy, ignorance, and poverty. Modernized sophisticated perioperative care significantly reduces morbidity and mortality in neonatal surgery.[39]

11. Transport

Infants under 1.8kg in weight are best transported in a portable incubator at a temperature of 40 °C and an oxygen concentration of 50%.[40,42] The infant should be transported lying flat on its side.[42] The accompanying nurse must be able to suck out the pharynx and clear the air passages at a moment's notice. However, postoperative mortality significantly varied with age and anomaly ($P < 0.001$) but not by distance traveled ($P = 0.565$).[44]

12. Dealing with Rare and Complex Diseases

Due to their rarity, neonatal surgical conditions are often challenging to manage.[26] A thorough understanding of congenital anomalies and neonatal pathophysiology is essential to the practicing pediatric surgeon. In addition, the surgeon must be conscious of functional abnormalities of the esophagus, stomach, intestines, diaphragm, and abdominal wall.[45]

13. Provision of Major Neonatal Surgery under Local Anesthesia

General anesthesia carries considerably higher mortality for the most critically ill neonates, where perioperative health resources are limited.[40] Hagander et al. (2015) observed that local infiltrative anesthesia has emerged as an alternative to general anesthesia for neonates.[46] Caudal anesthesia has also proven beneficial for neonatal surgery in the perineal region.[46] Evaluation of intraoperative monitoring of pain scores to ascertain the adequacy of analgesia.[42]

14. Advancement of Minimally Invasive Surgery (MIS) in Neonates

MIS in neonatal surgery has been safe and effective and provides the same benefits as its open counterparts. A newer concept of "gasless laparoscopy" eliminates the risks of pneumoperitoneum in neonates.[47] Two mm instruments are now available in many advanced centers, obviating the need for trocar insertion.[43]

15. Prevention and Treatment of Neonatal Birth Trauma

It is challenging to deliver a large baby via spontaneous vaginal delivery and is traumatized by instrumental devices during health workers' assistance. CS delivery reduces the risk in these cases from birth trauma.[23] Midwives must be trained and posted to maternity centers in our health facilities.

16. Other Solutions to be Ensured

- Gender Equity & Social Inclusion
- Parents Support Group
- Uninterrupted Electricity, Water, Oxygen, and Nitrous Oxide Supply in the Hospital
- Control of the Body Temperature
- Maintenance of hydration by Fluid and Electrolyte balance
- Prevention and Treatment of Infections
- Improvising newer surgical techniques
- Maintain Follow-up schedule

Conclusion

Neonatal surgery, a crucial tool in addressing congenital anomalies and birth defects in Bangladesh, is currently facing substantial challenges within the healthcare system. However, there is significant potential for improvement. Addressing these challenges requires a comprehensive approach, including improving antenatal care, raising awareness, ensuring timely referrals, and increasing the availability of skilled healthcare professionals, particularly in pediatric surgery. It's crucial that the government, healthcare providers, international organizations, and the community come together in collaborative efforts to enhance the survival and well-being of neonates with surgical conditions in Bangladesh. By implementing these solutions and addressing the multifaceted issues, Bangladesh can significantly improve neonatal surgical care, reduce neonatal mortality, and ensure a healthier future for its most vulnerable newborns.

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Original Article

Ultrasonographic guided Fine Needle Aspiration Cytology (FNAC) in the Diagnosis of Intra-abdominal Solid Mass in Children

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Abstract

Background: Ultrasound guided needle biopsy is rapidly growing and important diagnostic technique in radiology practices throughout the world. It has become an accurate, safe and widely accepted technique for confirmation of suspected malignant masses and characterization of many benign lesions in various intra-abdominal locations. It also decreases patient costs by obtaining the need for an operation, decreasing the duration of hospital stay, and decreasing the number of examinations necessary during a diagnostic evaluation.

Objectives of the study: To establish ultrasound guided FNAC as an accurate method of diagnosis of intra-abdominal solid mass and to find out the correlation between FNAC with histological findings.

Material and Methods: This was a prospective comparative study. The study has been carried out in the department of pediatric Surgery Sher-e-Bangla Medical College Hospital, Barisal and Radiology & Imaging Department, SBMCH. This study was conducted from November 2022 to January 2024 (15 months). Forty five cases, all undergone both FNAC and open biopsy. Among them 24 cases were male; 21 were females. Age ranges from 3 months to 14 years. Data, collected on predesigned data collection sheet for each individual case was compiled on a master chart from which data were analyzed using a computer based software, Statistical Package for Social Science (SPSS) to arrive at definitive conclusion in respect to objective of this study. Prior to the commencement of this study, the thesis protocol was approved by the Thesis Committee, SBMCH.

Result: Out of 45 cases cytological diagnosis, 10 cases were found to be benign. Among them 4 cases non-neoplastic and 6 neoplastic (benign) and 33 malignant; 01 was found suspicious of malignancy and 01 was unsatisfactory for cytological examination. Comparison of cytological with histological diagnosis of all patients, 9 cases were benign and 36 cases were malignant. In the final histopathological diagnosis shows that out of 10 benign lesions diagnosed cytologically, 01 case was found malignant histologically(i.e. False negative 01).33 malignant cases were diagnosed cytologically, all were confirmed histologically(i.e.no false positive). 01 suspicious case was reported cytologically, but found malignant histologically. 01 unsatisfactory case was proved malignant histologically.

Conclusion: Ultrasound imaging can easily and precisely visualize the intra-abdominal mass lesion and sonography aided fine needle aspiration cytology can be regarded as the investigation of choice for early confirmation and exclusion of neoplastic diseases in cases presenting with intra-abdominal masses. It allows morphological evaluation of all doubtful lesions without time consuming and costly surgery, but without impairing the diagnostic reliability.

Key Word: Ultrasonography, Cytology, Histopathology

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Introduction:

Many diagnostic modalities are now available for the diagnosis of tumour in children. Diagnostic workup should be based on the clinical presentation and include only those modalities that will provide pertinent information and will occasion the least discomfort. These include imaging studies and Biopsies.[1]

The critical diagnostic step in any tumour is obtaining proof of its criteria. No logical treatment plan can be formulated until an accurate diagnosis is made and this often requires biopsy. The success of FNAC requires close cooperation between clinician and experienced cytopathologist. Diagnosis is based on a limited amount of material. Adequate materials must be obtained for a diagnosis.[2]

The filled of FNAC is relatively new in our country in the diagnosis of solid mass in pediatric age group. Recently it is getting popularity. A few reports have been published from our country to evaluate the role of FNAC in the diagnosis of various clinical conditions.[3]

The technique of fine needle aspiration (FNA) was developed at Memorial Hospital in New York City in the 1920. Aspiration needles vary in diameter from the skinny Chiba needle (0.9mm) to 1.2 to 1.8mm size needles.[2]

Ultrasound guided needle biopsy is rapidly growing and important diagnostic technique in radiology practices throughout the world. It has become an accurate, safe and widely accepted technique for confirmation of suspected malignant masses and characterization of many benign lesions in various intraabdominal locations. It also decreases patient costs by obtaining the need for an operation, decreasing the duration of hospital stay, and decreasing the number of examinations necessary during diagnostic evaluation.

Traditionally, ultrasound-guided needle biopsy has been used for the biopsy of large, superficial, and cystic masses. Currently, however, because of improvements in instrumentation and biopsy techniques, Small, deeply located, and solid masses can also undergo accurate biopsy. Studies have shown that a histological diagnosis can be made confidently in 90% of cases, even when the mass is 3 cm or smaller.[4]

Both ultrasonography and computed tomography (CT) can be used as guidance methods for percutaneous needle insertion. The choice of method depends on multiple factors, including lesion size and location, relative visibility of the lesion by the two imaging methods, and equipment availability. Biopsy of many masses can be done with easy under either ultrasound or CT guidance.

In this study I will evaluate the role of FNAC in the diagnosis of intra-abdominal solid mass in children. I will perform this study with USG guidance and compare them with clinical and histological findings after laparotomy.

Objectives of the study:

To establish ultrasound guided FNAC as an accurate method of diagnosis of intra-abdominal solid mass, its nature and find out the correlation between FNAC with histological findings.

Materials and methods:

This was a prospective comparative study. The study has been carried out in the department of pediatric Surgery, Sher-e-Bangla Medical College Hospital, Barisal and Radiology & Imaging Department, SBMCH. This study was conducted from November 2022 toJanuary2024 (15 months). Forty five cases, all undergone both FNAC and open biopsy.

Selection of patient: A total of 45 admitted patients with intra-abdominal masses during study period satisfying the inclusion and exclusion criteria of study were selected. After admission, thorough clinical examination were performed, ultra-sonographic examination in the department of Radiology& Imaging, Sher-E-Bangla Medical College Hospital; and those found to have mass were subjected to FNAC, among them 24 cases were male; 21 were females. Age ranges from 3 months to 14 years.

Inclusion criteria: All admitted patients 0-14 years old having intra- abdominal solid masses. Aspiration only was done which was diagnostic, and which obviated open biopsy was considered satisfactory. Only cases with clinical and/or histological confirmation by open biopsy with were included in this study Exclusion criteria: patient age above 14 years. Masses other than solid. USG not be done. Patient not consenting to the protocol.

Prior to the commencement of this study, the thesis protocol was approved by the Thesis Committee, SBMCH.

A routine investigations including complete blood count, bleeding profile done in each case. By taking of verbal informed consent of the patient's legal guardian, FNAC was performed aseptic technique with sedation and local anesthesia, by using 21-23 gauze needle attached with disposable 10 ml syringe under ultra-sonographic guidance. Slide was made and sent

to department of pathology for cytological examination. Biopsy taken during laparotomy in pediatric surgery OT in SBMCH and sent for histopathological examination in department of pathology in Sher-E-Bangla medical college. Data collected on predesigned data collection sheet for each individual case was compiled on a master chart from which data were analysed using a computer based software, Statistical Package for Social Science (SPSS) to arrive at definitive conclusion in respect to objective of this study.

Results:

The present study was under taken to evaluate the effectiveness of fine needle aspiration cytology in the diagnosis of intra-abdominal solid mass in pediatric age surgical practice and compare the results of FNAC with those of excision biopsy. A total of 45 cases were selected having intra-abdominal solid masses or pain in abdomen and ultrasonography examination revealed masses in various abdominal sites. Age of the patients ranged from 03 months to 14years. All the patients were admitted in the department of pediatric surgery, Sher-E-Bangla Medical College Hospital, during the period of November 2022 to January 2024. US guided FNAC and laparotomy followed by excision biopsies performed in all cases.

Table I : *Age distribution of the patient. (n=45)*

Age group	No. of patients	Percentage
3 m-1 year	13	28.9
2-5 year	11	24.4
6- 10 year	11	24.4
11- 14 year	10	22.2

Table I: shows, the maximum incidence in age group 3 m to lyr. 13(28.9%), and in age group 2 to 5 yrs. (24.4%), 6 to 10 yrs. (24.4%) are same and the second incidence.

Table II: Sex distribution of patient (n= 45)

Sex	No. patients	Percentage
Male	24	53.3
Female	21	46.6

This table shows a slight predominance of male over female in the ratio of 14: 1

Table III: *Cytological diagnosis (n=45)*

Cytological diagnosis	No. of cases	Percentages
Non Neoplastic	4 6	8.9 13.3
Neoplastic(Benign)		
Malignancy	33	73.3
Suspicious of Malignancy	1	2.2
Unsatisfactory	1	2.2

Table III: shows cytological diagnosis. Out of 45 cases, 10 cases were found to be benign. Among them

4 cases non-neoplastic and 6neoplastic (benign) and 33 malignant; 01 was found suspicious of malignancy and 01 was unsatisfactory for cytological examination.

Table IV: *Histological Diagnosis (n = 45)*

Histological Diagnosis	No. of cases	Percentage
Non Neoplastic and	9	20
Neoplastic (Benign)		
Malignant	36	80

Table IV: shows histological diagnosis of all patients Histologically 9 cases were benign and 36 cases were malignant.

Table V: *Comparison of cytological and histological diagnosis (n=45)*

Cytological	Diagnosis		Histological	Diagnosis
Diagnosis	No, of cases	Percentage	No, of cases	Percentage
Benign	10	22.2	9	20
Malignant	33	73.3	36	80
Suspicious of Malignancy	01	2.2		
Unsatisfactory	01	2.2		

Comparison of cytological with the final histopathological diagnosis shows that out of 10 benign lesions diagnosed cytologically, 01 case was found malignant histologically (i.e.false negative 01).33 malignant cases were diagnosed cytologically, all were confirmed histologically (i.e. nofalse positive). 01 suspicious case was reported cytologically, but found malignant histologically. 01unsatisfactory case was proved malignant histologically.

Among forty five cases in this study minor discomfort and mild pain have been complained by two patients, but significant hematoma and no other complications have resulted. So FNAC is a safe procedure with minimum of no complication. Among 45 cases, 1 case was unsatisfactory and 1 case was suspicious of malignancy in cytological examination. So, 43 cases were considered to evaluate the accuracy of FNAC.

Table VI: *Histological pattern of mass in patients by age (n=45)*

Age in years	No. of cases	Pattern of tumour	Percentage
3m-1yr	13	5-Wilm' tumour	11.1
		2-Germ cell tumour	4.4
		(1 Yolk sac tumour 1 Malignant Teratoma)	2.2
		2-Inflammatory pseudocyst	2.2
		2-Neuroblastoma	4.4
		1-Non-Hodgkins	4.4
		Lymphoma	2.2
		1-Poly Cystic kidney	2.2
2-5yr	11	5-Wilm' tumour	11.1
		2-Germ cell tumour (1 Yolk sac tumour)	4.4
		1-Hodgkin's Lymphoma	2.2
		1-Non-Hodgkins Lymphoma	2.2
		1-Fibrosarcoma	2.2
		1-Neuroblastoma	2.2
		1-Rhabdomyo-sarcoma	2.2
6-10yr	11	5-Non-Hodgkin's Lymphoma (1-Ovarian Lymphoma)	11.1
		2-Hodgkin's Lymphoma	4.4
		2-Serous cyst adenoma of ovary	4.4
		1-Yolk sac tumour (Adenocarcinoma)	2.2
		1-Neurofibroma	2.2
11-14yr	10	2-Non-Hodgkin'sLymphoma	4.4
		2-Rhabdomyo-sarcoma(1-EmbryonalRhabdomyosarcoma)	4.4
		2-Germ cell tumour (Yolk sac tumour)	4.4
		1-Adenocarcinoma of caecum	2.2
		1-Mucinous cyst adenoma of | 2.2ovary	2.2
		1-Intestinal Tuberculosis	2.2

Table VI: shows Non-Hodgkin's Lymphoma was the commonest and 5 in Number within 6-10 years age group children.

Table VII : *Comparison of diagnostic accuracy of FNAC with histopathological Findings between present study and Name of author other studies:*

Name of author	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Overall value
Robert et al 1983[5]	100%	100%			100%
Tailor.SR.et al 1984[6]	76%	100%			
Obers.et al 1991[7]	100%	100%			100%
Smith. 1993[8]		99.7%			
Duesenbery.et al 1995[9]	90%	90%			
Stasi.1998[10]	87%	100%			91%
Lioe. et al 1999[11]	85.4%	100%			94.4%
Lopez. etal.2002[12]	97%	100%	100%	90%	98%
Ahmed. et al.2006[13]	94.11%	100%			95.7%
Baksi. et al 2006[14]	95%	100%	100%	92.3%	96.9%
Anand. et al 2007[15]	92%	98%	97%		
Present study 2024	97.06%	100%	100%	90%	97.67%

Discussion:

Intra-abdominal mass is an important clinical condition in which fine needle aspiration cytology (FNAC) is extremely useful diagnostic technique. Results of this series have also shown a high diagnostic accuracy. Sever all contemporary reports in the literature support this conclusion.

A total of 45 admitted patients with intra-abdominal masses during study period satisfying the inclusion criteria of study were selected in this study. This study performed in the Department of pediatric Surgery, Sher-E-Bangla Medical College Hospital. Age ranges from 3 months to 14 years with a mean age of 5.58 + 4.42 years. Peak incidence was 6 to l10 years (33.3%). In this study the number of male patients was 24 (53.3%) and female patients were 21 (46.7%), with a male female ratio of 1.14:1 The male predominance was low in this study in comparison with other study (Smith.et al 1993[8] showed 1.74:1; Taylor. et al 1983[6], 1.32: 1; Robert.et al1982[5], 1.67:1; Annand. et al 2004[15], 1.6: l;)

Site distribution of solid masses in this study was lymphoid tissue (Nodal, extra nodal-gut, ovary etc.) 12 (26.67%) which was the highest incidence and consistent with other studies (Robert et al 1982[5] 43.75%; Higher incidence Suzannf.et al 1983 21.05%.); Renal (22.2%), Germen/ Ovary(22.2%), Retroperitoneal tissue (8.9%), Urinary bladder/smooth muscle(6.7%), Intestine (4.4%), Fibrous tissue of lower abdomen (2.2%),and others (Inflammatory pseudocyst, Neuro fibroma)(6.7%).Lymphoid tissue originated mass show highest incidence followed by Renal (22.2%) and Germ cell/Ovary(22.2%) in this study which is also higher in other studies (Annand. et al 2004[15], 49.59%; Robert. CT al 1982[5], 43.75%)

Patients with intra-abdominal solid mass undergone FNAC and the cytological reports were categorized into four groups: a) Benign, b) for malignancy and d) Malignant, c) Suspicious Unsatisfactory/Inadequate. In the present study satisfactory materials for cytological examinations were obtained from 44 cases and l case showed unsatisfactory smear. The unsatisfactory smear was found inadequate for diagnosis because of scarcity of cellular element. Cytological assessment showed (22.2%) benign, (73.3%) malignant. Out of 10 benign lesions 1(2.22%) lesion was found malignant histologically (i.e. false negative-=01). All (33) malignant cases were confirmed histologically (i.e.no false positive). 01(2.229%) suspicious case reported cytologically, malignant histologically. 01 unsatisfactory case was malignant proved by histologically.

The case suspicious for malignancy diagnosed as Rhabdomyosarcoma, benign chronic non-specific lymphadenitis (False negative) and unsatisfactory case both were diagnosed non-Hodgkin's lymphoma,

The 9 benign (6neoplastic 3 inflammatory) lesions were serous cystadenoma 2, mucinous cyst adenoma 1, Retro-peritoneal lipoma 1,Neurofibroma 1, Polycystic kidney 1, and Inflammatory pseudocyst 2,Intestinal tuberculosis 1.and 36 malignant tumours were NHL 9, HL 3,Wilms tumour 9, Germ cell tumour 7, Neuroblastoma 3,Rhabdomyosarcoma 3, Adenocarcinoma of caecum 1,Fibrosarcoma 1. In this study the incidence of malignant tumour was higher than benign tumour and the highest incidence of malignant tumour was the lymphoma, peak incidence of NHL in age group 6 to 10 years, male child's were more affected than female which is consistent with other studies (Higher incidence in Das. et al 1990).The second most common tumour in child was wilms tumour and peak incidence in age group 0 to1 year. Male child was more affected than female.

The third one was the Germ cell tumour and female children's were more affected than male considering the definitive diagnosis of benign and malignant, the sensitivity of this study is 97.06% for the malignancy and specificity is100% for the absence of malignancy. The positive predictive negative predictive value and overall diagnostic accuracy in this series ans100%, 90% and 97.67% respectively. These findings are roughly Consistent with other studies.

The number of suspicious. False positive and false negative results and unsatisfactory Smears were consistent with the previous studies. The scan be reduced with increasing experience and practice.

FNAC was a1q performed with sedation and local anesthesia. Among 45cases no patient showed unacceptability to FNAC in this series.

In this study morbidity of FNAC showed negligible. Only two patients did complain minor discomfort and mild pain at the site of aspiration. So, this study shows FNAC is a safe procedure with minimal complications.

Conclusion:

Ultrasound imaging can easily and precisely visualize the intra-abdominal mass lesion and sonography aided fine needle aspiration cytology can be regarded as the investigation of choice for early confirmation and exclusion of neoplastic diseases in cases presenting with intra-abdominal masses. It allows morphological evaluation of all doubtful lesions without time consuming and costly surgery, but without impairing the diagnostic reliability.

Overall, US guided FNAC is a highly accurate, minimally invasive, sate, inexpensive and rapid definitive diagnostic procedure in intra-abdominal solid mass diagnosis in children. So, it will be the first line of investigation in the evaluation of intra-abdominal solid mass in pediatric surgical practice.

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Original Article

Evaluation of BATICH Score for the management of Paediatric Blunt Abdominal Trauma

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Abstract

Introduction: Blunt abdominal trauma is a frequent reason for hospital admission and a significant cause of death in children. Early diagnosis is important to reduce the mortality and morbidity. Computed tomography (CT) scan is currently the best diagnostic, but due to the cost and availability of CT scan, a non-invasive scoring system calculated using readily available parameters such as physical examination findings, abdominal ultrasound, and routine laboratory parameters may be useful. The aim of the study was to evaluate the association of Blunt Abdominal Trauma in Children (BATiCH) score between conservative and operatively treated patients of paediatric blunt abdominal trauma.

Methods: It was a hospital based prospective comparative observational study carried out in Paediatric Surgery Department of Chittagong Medical College Hospital (CMCH) from June 2021 to September 2023. Patients with blunt abdominal trauma were enrolled prospectively as per set inclusion and exclusion criteria. Physical examination findings, abdominal ultrasound, and routine laboratory profile were recorded. Patients were discharged when discharge criteria were achieved, and they were followed up for 1 month after discharge. BATiCH score was compared between patients who needed laparotomy and those who were treated conservatively.

Results: Mean ±SD BATiCH score was 8.74 ±3.324 in conservative treatment group and 15.25 ±2.315 in surgical treatment group (p<0.001). Median (IQR) length of hospital stay was 5 (4-8) days in conservative treatment group and 20 (12.5-25.5) days in surgical treatment group (p<0.001). The length of hospital stays (days) of the patients according to BATiCH score ≤7 and >7. Median (IQR) length of hospital stay was 4 (3-6.25) days in patients with BATiCH score ≤7 and 7.5 (5-12) days patients with BATiCH score >7 (P=0.001)

Conclusion: BATiCH score was significantly greater in patient who needed laparotomy after blunt abdominal trauma than those of patient, treated conservatively.

Key words: Blunt abdominal trauma, Children, BATiCH score, conservative treatment, laparotomy

Introduction

Trauma is one of the leading causes of childhood mortality. More than 20 million children are injured each year globally and unintentional injury is the leading cause of death for children in all age groups over 1 year of age. Blunt abdominal trauma is a frequent cause for the presentation of children to the Emergency Department. Children are prone to sustain injuries to intra-abdominal organs after blunt abdominal trauma because of their different anatomy and relatively immature musculoskeletal system.[1] The presence of multiple scoring systems for assessing injured children helps in categorizing blunt abdominal traumas (BAT), and such scoring systems have made it easy to predict patients who need rapid intervention.[2] Among children, the computed tomography (CT) scan is considered by many of the criteria standard for assessing intra-abdominal injury in hemodynamically stable patients.[3] CT scan however has multiple

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disadvantages.[4] Karam and Sanchez proposed a score, Blunt Abdominal Trauma in Children (BATiCH) score, that would allow ruling out of significant intra-abdominal organ injuries following blunt abdominal traumas (BAT) that can be a helpful adjunct in the assessment of the presence of abdominal trauma in children and can help to determine which patients might benefit from a computed tomographic scan and/or further treatment and which might not.[5,6] The present study was designed to find out the association of this score between patients who needed laparotomy and those who were treated conservatively for blunt abdominal trauma.

Material and Methods

It was a hospital-based prospective comparative observational study carried out in the Department of Paediatric Surgery, Chittagong Medical College Hospital, Chattogram, Bangladesh from June 2021 to September 2023 after approval from the Ethical Committee (CMC/PG/2022/876). Children below 12 years of age with blunt abdominal trauma admitted to the Paediatric surgery ward were enrolled consecutively. Patients with blunt abdominal trauma with a history of laparotomy done elsewhere were excluded. Ten parameters with the best negative predictive values were used to build BATiCH score. The following points were attributed for these items: abnormal abdominal ultrasound (4 points), abdominal pain (2 points), peritoneal irritation (2 points), hemodynamic instability (2 points), aspartate aminotransferase >60 IU/L (2 points), alanine aminotransferase >25 IU/L (2 points), white blood cell count (1 point), > 9.5x 103 /cumm, LDH >330 IU/L (1 point), lipase >30 IU/L (1 point), and creatinine >50 µg/L (1 point).

The general objective was to assess the usefulness of the BATiCH scoring system in the management of patients with paediatric blunt abdominal trauma. The specific objectives were to compare the BATiCH score between conservative and operatively treated patients of paediatric blunt abdominal trauma and compare the length of hospital stay and mortality.

After admission, clinical assessment (Pulse, Blood pressure, Temperature, Respiratory rate, GCS, hemodynamically stability, sign symptoms of peritoneal irritation) was done and the following investigations were performed (initial workup): Abdominal Ultrasonography, AST (aspartate aminotransferase), ALT (alanine aminotransferase), LDH (lactate dehydrogenase), serum Lipase, Complete blood count (white blood cell count), Serum Creatinine. The patient was discharged after fulfillment of discharge criteria (feels well, afebrile for 24 hours, regular normal bowel movement, tolerating oral feeding for 24 hours, normal vitals parameter). All patients in the study were monitored until discharge or death to observe the outcome. Patients was followed up 1 month from discharge.

All relevant data were recorded on a pre-tested data sheet after getting informed written consent for the study. Normally distributed data are presented as mean ±SD and skewed data are presented as median and interquartile range (25%–75%). Between these groups, continuous (age, length of hospital stay, BATICH score) and categorical variables (sex, period of occurrence of trauma, complication, solid organ injury, PICU referral, mortality, types of treatment conservative vs laparotomy) were analyzed. Student's t-test was used to analyze normally distributed continuous variables, while the Mann–Whitney U-test was used for skewed distributed continuous variables. Categorical variables were compared using the Chi-square test. $P<0.05$ was considered statistically significant. Statistical analysis was performed using SPSS 25.0 software (IBM Inc., New York, USA).

Results

Among a total of 42 patients, 34 were treated conservatively, and 8 needed laparotomies. The mean age in the conservative group was 07.16 ± 03.19 years vs 07.87 ± 03.75 years in the surgery group. 70.6% were male in the conservative group and 50% were male in the surgery group.

Most of the injuries were due to road traffic accidents and falls from height (Table 1). Battery rickshaw was the largely affected vehicle and tree were the place from where fall from height occurred mostly. From 6 AM to 6 PM was the vital time for maximum injuries. Road was the main place of accidents. Some associated injuries were found in both treatment groups of patients. The difference was statistically not significant ($p>0.05$) among the treatment groups.

Table 1: *Injury details of two treatment groups (n=42)*

	Conservative Group n (%)	Surgery Group n (%)
Mechanism of injury		
Road Traffic Accident	21 (61.8%)	04 (50.0%)
Fall from height	10 (29.4%)	02 (25.0%)
Fall of heavy object	02 (05.9%)	01 (12.5%)
Assault	01 (02.9%)	01 (12.5%)
Vehicle type (n=26)		
Battery Rickshaw	13 (61.9%)	02 (40.0%)
CNG/ Three wheelers	03 (14.3%)	01 (20.0%)
Motor vehicle	04 (19.0%)	01 (20.0%
Others	01 (04.8%)	01 (20.0%)
Fall from height (n=12)		
From tree	05 (50.0%)	02 (100%)
From building/structure	04 (40.0%)	00 (00%)
Same level-slipping/stumbling	01 (10.0%)	00 (00%)
Time of occurrence		
12 PM-6 PM	20 (58.8%)	04 (50.0%)
6 PM-12 AM	03 (08.8%)	01 (12.5%)
12 AM-6 AM	02 (05.9%)	01 (12.5%)
6 AM-12 PM	09 (26.5%)	02 (25.0%)
Place of occurrence		
Home	06 (17.6%)	01 (12.5%)
Road	22 (64.7%)	04 (50.0%)
Play ground	01 (02.9%)	01 (12.5%)
Tree	05 (14.7%)	02 (25.0%)
Associated injury		
Present	16 (47.1%)	02 (25.0%)
Absent	18 (52.9%)	06 (75.0%)

ns= not significant; P value reached from Chi-square test

In conservative treatment group, 29 (85.3%) patients had no organ injury (table II). On the other hand, in surgical treatment group, each patient had some organ injury. Statistically highly significant (p<0.001) difference was found between the groups concerning organ injury. But in case of complications, maximum patients of both groups had no complications (p>0.05).

Table 2: *Distribution of organ injury and complicationsof two study groups (n=42)*

	Conservative Group n (%)	Surgery Group n (%)
Organ injury		
Absent	29 (85.3%)	0 (0.0%)
Stomach	0 (0.0%)	01 (12.5%)
Small gut	0 (0.0%)	02 (25.0%)
Liver	02 (5.9%)	02 (25.0%)
Kidney	02 (5.9%)	01 (12.5%)
Small & Large gut	0 (0.0%)	01 (12.5%)
Liver & Spleen	01 (2.9%)	0 (0.0%)
Others	0 (0.0%)	01 (12.5%)
Complications		
Absent	30 (88.2%)	06 (75.0%)
Infection	04 (11.8%)	02 (25.0%)

ns= not significant; hs= highly significant
P value reached from Chi squar

The mean ±SD BATiCH score was 8.74 ±3.324 in the conservative treatment group and 15.25 ±2.315 in the surgical treatment group (Figure 1). The p-value shows a statistically highly significant difference between the treatment groups (p<0.001).

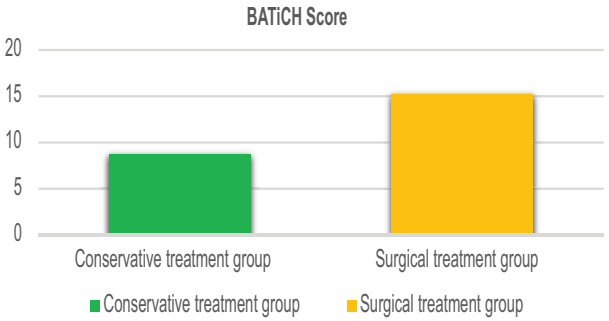


Figure 1: *Mean ±SD BATiCH Score of the treatment groups (n=42)*

Median (IQR) length of hospital stay was 5 (4-8) days in conservative treatment group and 20 (12.5-25.5) days in surgical treatment group (Figure 2). According to p value, statistically highly significant difference was found between the study groups (p<0.001).

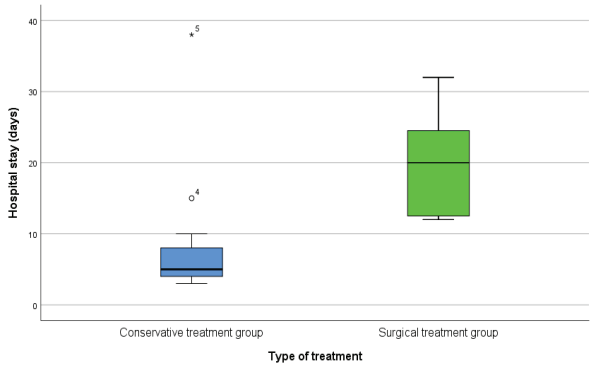


Figure 2: *Length of Hospital stay of the patient groups (n=42)*

Median (IQR) length of hospital stay was 4 (3-6.25) days in patients with BATiC score d"7 and 7.5 (5-12) days patients with BATiC score >7 (figure 3). According to p value, statistically highly significant difference was found (p=0.001).

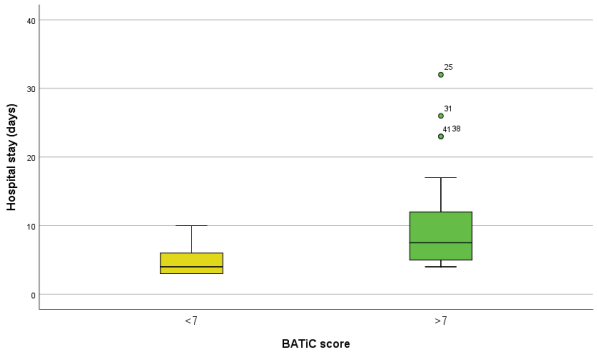


Figure 3: *Length of Hospital stay of the patients according to BATiCH score (n=42)*

Discussion

Trauma is a condition that is time sensitive. Assessment, resuscitation, and definitive care are crucial, especially in the first hour of trauma management. There is evidence that earlier decisive care in trauma centers reduces mortality and patient suffering. [2] The BATiCH score was based on the original score by Karam et al. designed to rule out abdominal injury. 5 The present study reveals that the BATiCH score was significantly greater in patients who needed laparotomy after blunt abdominal trauma than in patients treated conservatively.

In this study, the mode of injury was road traffic accident in the majority of cases (61.8%), followed by fall from height (29.4%). Chowdhury et al. found that the most common mechanisms of abdominal injuries were also RTA (42.86%), fall (26.53%), and "stab or cut injury" (18.37%).[7] Another study by Qadri et al. narrated that road traffic accidents [52 (54.16%)] and falls from height [40(41.66%)] were the most common mode of injury observed in both male and female children that led to paediatric trauma.[8] It indicates that there is a lack of safety precautions in daily life and during movement in the paediatric age group.

Concerning the time of presentation after trauma of the patients shows majority of the patients came after the golden time of trauma. In the conservative treatment group, 21 (61.8%) patients, and in the surgical treatment group, 6 (75.0%) patients came to the hospital after > 6 hours of trauma. There was no statistically significant (p=0.734) difference between the groups regarding time of presentation after trauma. As this center is a tertiary care center, many of the cases were referred from other primary, and secondary care centers this explains the reason for some delays. However, this type of outcome indicates that appropriate trauma management facilities are lacking in the locality and the injured patient had to travel a long distance to reach the appropriate trauma care center. There is a need for more trauma care centers in this country.

In this study, the mean ±SD BATiCH score was 8.74 ±3.324 in the conservative treatment group and 15.25 ±2.315 in the surgical treatment group. The p-value shows a statistically significant difference between the treatment groups (p<0.001). Similarly, their study by de Jong et al. found median BATiC scores of patients with and patients without intra-abdominal injury were 9.2 (range, 6.6-15.4) and 2.2 (range, 0.0-10.6) respectively (p < 0.001).6 This high BATiCH score indicates significant intraabdominal trauma which might need surgery. Hence the BATiCH score can be a dependable tool for the assessment of trauma severity and the need for surgery in paediatric blunt abdominal trauma

Regarding the length of hospital stay of the patients between the treatment groups. The median (IQR) length of hospital stay was 5 (4-8) days in the conservative treatment group and 20 (12.5-25.5) days in the surgical treatment group. A statistically significant difference was found between the study groups (p<0.001). De Jong et al. also stated that abdominally injured patients stayed in the hospital for a longer period (9.1 days [0-93 days] vs. 1.9 days [0-

89.5 days], p<0.01).6 So more BATiCH scores indicate more prone to hospital stay.

In this study, there is no event of PICU admission, readmission, or conversion to surgical procedure. BATiCH score seems to be a useful tool in the management of blunt trauma abdomen in paediatric age.

This study had some limitations such as; ultra sonographies were performed by multiple operators, surgery was done by multiple surgeons, laboratory tests were done by different laboratories, severity of organ injuries were not evaluated and there was no comparison to other scoring system.

Conclusion

BATiCH score is significantly greater in patients who need laparotomy after blunt abdominal trauma than in patients treated conservatively, which can help determine treatment approach whether conservative or operative in blunt trauma abdomen of the paediatric age group. Moreover, this may help to predict the probable hospital stay whether prolonged or short duration, and may help in the counseling and clinical management of paediatric blunt abdominal trauma patients.

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Original Article

Understanding the Epidemiology of Labial Adhesion among Paediatric Age-groups in Bangladesh: A Single-center Cross-Sectional Study

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Abstract

Background: Labial adhesion (LA) is the most frequently encountered medical condition in paediatric surgery clinics among prepubertal girls. The highest incidence of LA occurs in toddler age groups, specifically between 1 and 3 years of age. This condition is usually asymptomatic and often arises without any other pathology affecting the upper genital tract.

Objective: The aim of this study is to fill the gap in epidemiological data by investigating the prevalence, age at presentation, and patterns of labial adhesion among paediatric age groups in Bangladesh.

Methods: A total of 345 cases of LA were seen during the study period on paediatric patients from 2017 to 2024 in a private care setting in Chattogram, Bangladesh. A comprehensive semi-structured questionnaire was used to collect sociodemographic information related to age, age groups, place of living, family history of LA, primary identifier, and referral system. Types of labial adhesion, clinical presentations, and associated anomalies were included as clinical questions in the questionnaire, ensuring a thorough data collection process. Data were analyzed using Microsoft Excel.

Results: A descriptive analysis involving 345 paediatric patients presented the prevalence and pattern of LA across different age groups. The mean age of participants was 29 months (±7 months). The majority of patients were in the toddler group (39.13%), followed by infants (32.75%) and older children (28.12%). The most frequent cases were observed in urban areas (54.2%). The most prevalent type of LA was complete adhesion, which represented 97.67% of cases, particularly among toddlers (41.67%). Furthermore, recurrence of LA was observed in 10.14% of patients, predominantly in older children.

Conclusion: This study highlighted the distribution and patterns of labial adhesion, revealing a higher prevalence among toddlers and in urban areas. Complete labial adhesion was identified as the most common type.

Key words: Labial adhesion, age distributions, complete and partial adhesion, recurrence, prevalence, clinical presentations.

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Introduction

Labial Adhesion (LA), also termed as labial fusion or labial agglutination, is a commonly undiagnosed condition found in pre-pubertal girls.[1] It occurs due to the complete or partial fusion of the adherence of the labia minora or majora in the midline through dense or flimsy adhesions.[1,2] It is usually not found at birth but is thought to arise during the re-epithelization of micro-damaged hypo-estrogenized labial skin.[3] Parents should be aware of this condition and its symptoms to ensure early detection and appropriate management.

The prevalence of labial adhesion can vary across different populations and healthcare settings. It is essential to note that labial fusion is common, especially in the paediatric population, although its prevalence is often uncertain due to its asymptomatic nature.[4,5] For instance, a study by Leung et al. found that thirty-five children (1.8%) were diagnosed with labial adhesion at a paediatric outpatient clinic, with the highest incidence occurring between 13 and 23 months of age.[6] In developing countries, around 2% of pre-pubertal girls aged between 3 months and 6 years have also been reported to experience this condition.[3] Further study showed the prevalence of labial adhesion between the ages of 2 months to 14 years.[7]

Labial Adhesion is a benign gynecological condition which can be seen as one of the most common causes of presentations to paediatric surgery clinics among pre-pubertal girls.[8,9] While the exact cause of labial adhesion is still unknown, this condition is assumed to occur due to the inflammation of the labia in a low-estrogen environment.[10] It is usually not found at birth and is thought to be caused by a hypoestrogenic state, as it is extremely rare in the neonatal period due to maternal estrogen.[3] Likewise, the condition is unusual throughout the reproductive phase when estrogen is sufficiently maintained.[3,10] Infections and poor hygiene, particularly stool contamination, may also trigger the condition.[8]

Complete labial adhesion may be defined as the presence of a midline raphe or a line of fusion joining the labial folds with a small opening remaining for urine to exit.[2,11] Meanwhile, partial labial adhesion remains the partial thickening of labial folds in the midline with a visible space between them (Fig. 1).[2,11]

Labial adhesion mostly affects 2% of young pre-pubertal girls, is most commonly observed between the ages of 3 months and 6 years, with a peak incidence at 1 to 23 months.[3,10] Retrieving data related to the true incidence rate of labial adhesion is a bit challenging due to its asymptomatic nature.[5] However, it is important to note that this condition can be diagnosed incidentally during routine examinations [10]. It is sometimes associated with complaints such as post-void dripping, vaginal discharge, irritation, dysuria, hematuria, local inflammation or trauma to the labial area, and threadworm infestations.[3,5,10]

Literature searches did not yield any information on the epidemiological distribution of labial adhesion in Bangladesh. A study conducted in Bangladesh primarily focused on the treatment of labial adhesion and evaluated the effectiveness of topical betamethasone (90%) and estrogen cream, but it did not provide insights into the burden of the disease.[12] To the best of our knowledge, this is the first study examining the prevalence of labial adhesion

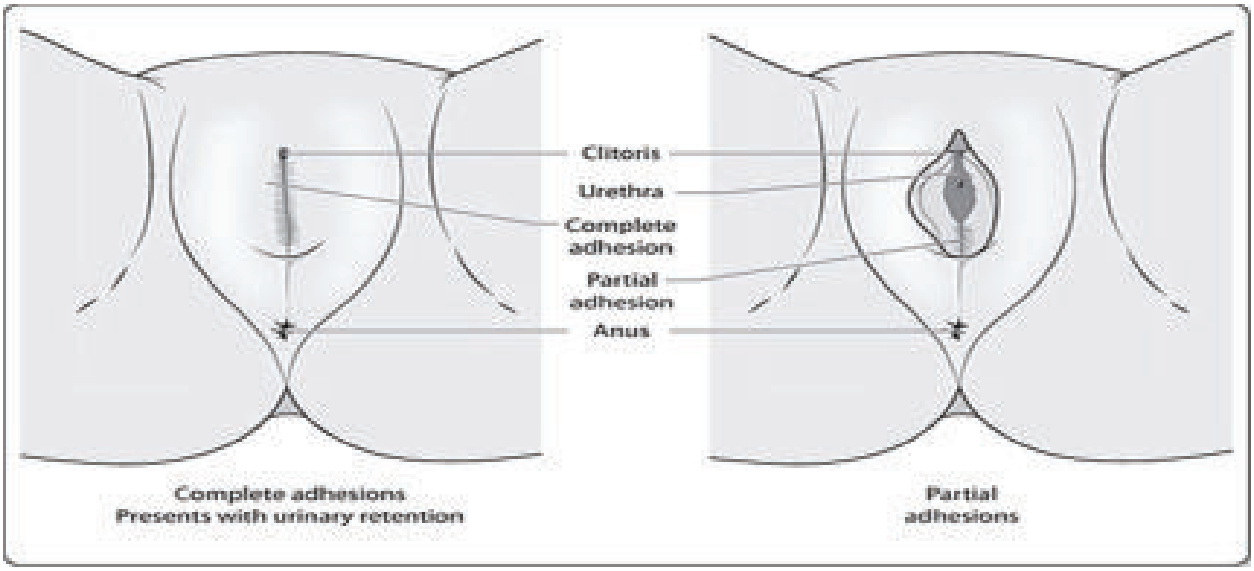


Fig.-1: *Anatomical variation in complete and partial labial adhesions.*

in Bangladesh. Our aim is to address the gap in epidemiological data by investigating the prevalence, age at presentation, and patterns of labial adhesion among paediatric populations in Bangladesh.

Methods & Materials:

Study Design & Data Source: It was a descriptive cross-sectional study conducted on paediatric patients with labial adhesion from 2017 to 2024 in a private care setting in Chattogram, Bangladesh.

Study Population & Selection Criteria: The study included all the patients of the paediatric age group, such as infants (> 28 days- 1 year), toddlers (>1year-3year), and children (> 3 years- 12 years) diagnosed with labial adhesion. A total of 345 patients were diagnosed at our center during the study period. A single paediatric surgeon diagnosed all of them. The inclusion criteria include all patients diagnosed with labial adhesion in paediatric age groups. Female patients above 12 years of age with labial adhesion, other conditions that might affect female genitalia, and uncooperative patients were excluded from the study.

Study instrument: A semi-structured questionnaire included sociodemographic information related to age, age groups, place of living, family history of LA, primary identifier, and referral system. Types of labial adhesion, clinical presentations, and associated anomalies were included as clinical questions in the questionnaire.

Statistical Analysis: Data were analyzed using Microsoft Excel. Categorical data were presented as frequency and percentage, and continuous data as mean and standard deviation.

Ethical Consideration: The study was approved by the Ethical Review Committee of Chittagong Medical College (Memo No: CMC/PG/2021/163).

Results

A descriptive analysis was conducted on 345 paediatric patients to determine the prevalence of labial adhesion, the age at which it presents, clinical presentations, associated abnormalities, and the patterns of labial adhesion across different age groups. Participants ranged widely in age, with a mean age of 29 months (± 7 months). Among the age categories, 135 respondents (39.13%) were in the toddler group (ages greater than 1 year to 3 years), followed by 113 infants (32.75%) and 97 children (28.12%). Most patients diagnosed with labial adhesion (54.2%) were from urban areas, while the remaining 45.79% were from rural areas.

Due to the asymptomatic nature of the disease, the majority of the cases (80.29%) were identified during medical checkups, followed by 19.1% diagnosed by any of the family members. Parents reported labial adhesion in 14.78% of respondents; more than two-thirds of the respondents (253) were referred to our center by other clinicians, while others were referred by relatives (4.93%) or by hospital OPDs (6.96%). Among the study population, 310 cases were newly diagnosed, and 35 cases had received treatment at least once and came to our center with recurrent labial adhesion. In the newly diagnosed cases, most cases (300) were found to have complete labial adhesion, and the rest had partial.

Table 1: *Demographics of the study participants (N=345)*

Characteristics	Number	%
Age (Mean±SD) in months	29 (±7)	
Age Groups		
• Infant (29 days to 1 year)	113	32.75%
• Toddler (>1 year-3 years)	135	39.13%
• Children (>3 years-12years)	97	28.12%
Place of Living		
• Rural	158	45.79%
• Urban	187	54.20%
Primary Identifier		
• Family Members	68	19.71%
• Noticed on a medical checkup	277	80.29%
Positive Family History of Labial Adhesion		
• Yes	14	4.06%
• No	331	95.94%
Source of Referral		
• Parents	51	14.78%
• Referred by Relatives	17	4.93%
• Referred by Clinicians	253	73.33%
• Referred by Hospital OPD	24	6.96%
H/O Burn or Trauma around the perineum	2	0.57%
Poor perineal hygiene	65	18.84%
Diaper use	243	70.43%
Pattern of Labial Adhesion		
• **Newly Diagnosed**	310	(89.86 %)
Complete	300	97.67%
Partial	10	3.23%
• **Recurrent**	35	10.14%
Associated Anomalies		
• Yes	36	10.43%
• No	309	89.57%

N= Number of observations among study participants; SD= Standard Deviation

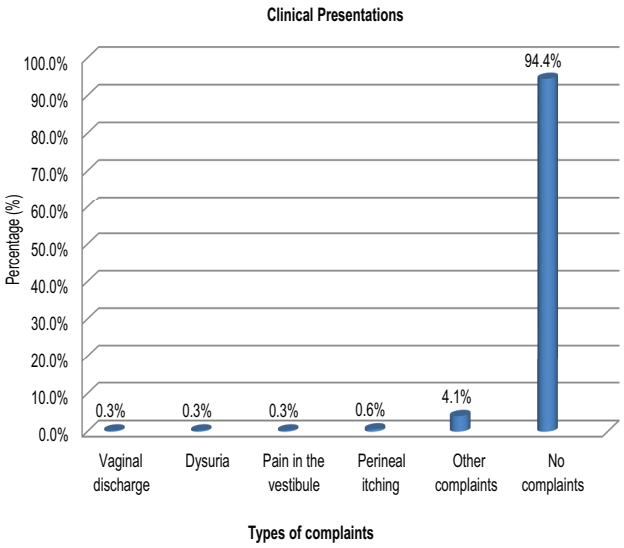


Fig.-2: *Types of Clinical Presentations*

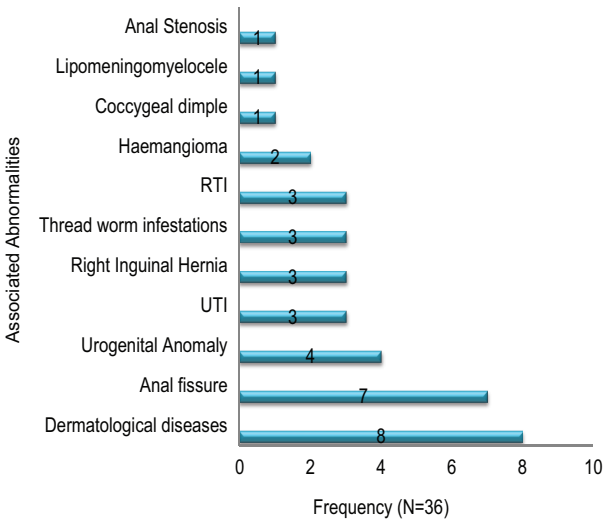


Fig.-3: *Showing prevalence of associated anomalies along with labial adhesion.*

Fig. 2: Describes the variations in clinical presentations of the disease.

Most patients were asymptomatic or had no complaints (94.4%); the others were presented with complaints such as perineal itching (0.6%), dysuria (0.3%), vestibular pain (0.3%), vaginal discharge (0.3%), and some other complaints (4.1%).

The bar plot in Figure 3 indicates the associated anomalies found during diagnosis in our study participants. A total of 36 patients reported having various associated anomalies, including dermatological diseases (8 cases), anal fissure (7 cases), urogenital anomalies (4 cases), threadworm infestation (3 cases), urinary tract infections (3 cases), hernia (3 cases), haemangioma over the perineum (2 cases), lipomeningomyelocele (1 case), and anal stenosis (1 case).

Table 2 provides the distribution of different types of labial adhesion at different age groups. The distribution of labial adhesion varied across different age groups. The majority of toddlers (41.67%) were diagnosed with complete labial adhesion, followed by infants (35.33%) and children (23%). Partial labial adhesion was relatively rare, with only a few cases reported in each group: two in infants, five in toddlers, and three in children. In contrast, recurrent labial adhesions were more common in children (25 cases), compared to newly diagnosed patients.

Table II: *Distribution of different types of labial adhesion across age groups.*

Pattern of Labial Adhesion	Infant (>28days-1year) Frequency (%)	Toddler (>1year-3year) Frequency (%)	Children (>3year-12year) Frequency (%)
Complete	106 (35.33 %)	125 (41.67 %)	69 (23 %)
Partial	2 (20 %)	5 (50 %)	3 (30 %)
Recurrent	5 (14.29 %)	5 (14.29 %)	25 (71.42 %)

Discussion

The worldwide prevalence of labial adhesion has been reported to be 2%.[13] Understanding its epidemiological characteristics—such as age distribution, family history, living conditions, clinical presentation, and associated abnormalities—is essential for improving early diagnosis and implementing preventive measures. The exact cause and accurate incidence rate of labial adhesion remain unclear.[7] Therefore, our study aims to address this knowledge gap by assessing the prevalence and recurrence patterns of labial adhesion among pediatric age groups in Bangladesh. This research has the potential to impact pediatric health and care significantly.

There is an ongoing debate about the peak age of occurrence of labial adhesion.[6] Our findings indicate that the highest prevalence (39.13%) occurs in patients aged between 1 and 3 years. This frequency of labial adhesion in our study settings seems consistent with several previous studies on labial adhesion.[14] We also observed that toddlers have the most extensive presentation of complete adherence to labial folds. As estrogen levels remain low in younger girls, this suggests that early childhood or pre-pubertal age may be critical for labial adhesion.[2,3] However, labial adhesion is extremely rare at birth, similar to our study findings, as we also didn't find any case in the neonatal age group.[6]

Additionally, most of our participants (54.20%) belong to urban areas, which is the opposite of the studies in Egypt and India, exhibiting higher prevalence in rural areas.[15,16] This discrepancy could be attributed to various factors, such as better access to healthcare in urban areas, transportation challenges in rural settings, and greater awareness among urban parents regarding both mild and severe symptoms.[16] Moreover, our study focused on urban-based private healthcare settings, which could contribute to increased urban presentations. Again, strongly perfumed soaps, diapers, and antiseptic wipes are more common in urban areas, which may lead to perineal skin infection, contributing to labial adhesion.[17,18] Poor perineal hygiene can also lead to inflammation, which may erode the epithelium of the labia minora.[19] When this erosion occurs, especially in the absence of estrogen, it can cause the labia minora to fuse in the midline.[19] Another possible consequence is stool contamination of the vulva, which can result in vulvovaginitis and further inflammation.[19] Our study found that 18.84% of participants had difficulty maintaining proper personal hygiene. However, with appropriate attention to hygiene, these issues can be resolved, potentially preventing the formation of adhesions.

In our study, we found that a positive family history was documented in 4.06% of the cases. The majority of patients (277 out of 345) were diagnosed during routine medical checkups. In contrast, Kathpalia SK et al. reported that 60% of cases were brought to a physician's attention after being noticed by their parents.[20] Another study indicated that parents often made incidental findings while bathing or changing their children.[21] This comparison underscores the importance of routine medical checkups for young girls, as well as the need for parental counseling to facilitate early detection and reduce complications related to labial adhesion.

Labial adhesion is usually asymptomatic and no such laboratory tests are necessary to confirm the diagnosis.[3,6] However, in symptomatic cases, individuals may experience inflammation of the affected area, post-void dripping of urine, dysuria (painful urination), hematuria (blood in urine), urinary retention, vaginitis, fibrosis, and rarely, infertility.[3,18,20] Our findings indicate a very low incidence of symptomatic cases: perineal itching occurred in 0.6% of patients, dysuria in 0.3%, vestibular pain in 0.3%, and vaginal discharge in 0.3%. Additionally, 4.1% of cases presented with other symptoms. It is important to note that labial adhesion is not a congenital disorder, but it may be associated with genital and urinary abnormalities in some individuals.[18,20] Among the affected patients, approximately 36 had varying associated anomalies, including dermatological diseases (8 cases), anal fissure (7 cases), urogenital anomalies (4 cases), threadworm infestation (3 cases), urinary tract infections (3 cases), hernia (3 cases), haemangioma over the perineum (2 cases), lipomeningomyelocele (1 case), and anal stenosis (1 case). Recognizing these associated anomalies is crucial, as they can significantly affect the condition. Therefore, a more comprehensive clinical assessment is essential.

Asymptomatic labial adhesion typically resolves with conservative treatment, and surgical intervention is often unnecessary.[18,21] However, it's important to note that recurrence is a common occurrence until the patient reaches puberty.[19,22] Surprisingly, our study did not find a significant association between age group

and recurrence rate; we identified recurrent cases incidentally throughout the study period. A separate study reported a low recurrence rate, with a median of 3.5 months post-surgical correction.[22] However, our study did not focus on the treatment modalities of labial adhesion.

Strengths and Limitations

Our study, the first of its kind in Bangladesh, provides detailed epidemiological data on labial adhesion. It underscores the urgent need for routine medical checkups of pre-pubertal girls and the early identification of any associated anomalies that could worsen the condition. However, the study's design limits its ability to establish a cause-and-effect relationship. Conducted in an urban-based private healthcare center, the study may not fully represent the prevalence in rural areas. The incidental reporting of recurrent cases further hampers our ability to establish the association between age and other factors. Nevertheless, our findings serve as a guide for future researchers, directing them to develop more robust study designs to explore additional associated factors and treatment options in low-resource settings.

Conclusion

This cross-sectional study highlighted the distribution and patterns of labial adhesion. A significant number of cases were found to be isolated, with most being diagnosed as complete labial adhesion. Our findings revealed a higher prevalence in urban areas, possibly due to factors such as healthcare access or lifestyle choices. Our study emphasized the need for early diagnosis and awareness among caregivers. Further longitudinal studies with a larger sample size can be done to evaluate its risk factors and effective preventive measures to avoid its recurrence.

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Case Report

Tubercular ulcer on the dorsum of the penis in a toddler, a case report

Saha DK[1], Hasan KM[2], Majumdar SK[3], Zahid MK[4], Chakraborty AK[5], Rahman SM[6], Reza AKMM[7], Podder S[8]

Abstract:

Primary tuberculosis of the penis is extremely rare. A 2-year, 2-month-old uncircumcised toddler presented with a non-healing ulcer on the dorsum of the root and body of the penis. The diagnosis of tuberculosis was confirmed by histopathology and excellent response to antitubercular chemotherapy. There was no co-existing tuberculous infection elsewhere but there was a history of recent contact with a pulmonary TB patient. The chance of acquiring the disease through direct contact of penile skin with infected sputum. Children are not immune to penile tuberculosis. The possibility of tuberculosis as a cause of chronic ulcer on the penis has to be kept in mind especially in endemic countries. The importance of histopathological examination in the diagnosis of chronic genital ulcer is emphasized.

Key words: Primary; Tubercular ulcer; Dorsum of the penis; Toddler; Histopathology.

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Introduction:

Primary tuberculosis (TB) of the penis is extremely rare.[1,2] Tuberculosis is common infectious disease in Bangladesh. Frequent primary site of this infection is lung and lymph node in this region.[3] Tuberculosis is still a major cause of morbidity in developing countries like India. Cutaneous tuberculosis is also not uncommon in these countries. Tuberculid presents as a cutaneous hypersensitivity response to an underlying focus of tuberculosis. Papulonecrotic tuberulid over the glans penis is a rare occurrence.[4] Cutaneous TB is essentially an invasion of the skin by Mycobacterium tuberculosis, the same bacteria that causes pulmonary TB. Cutaneous TB is a relatively uncommon form of extrapulmonary TB. Even in India, Bangladesh and countries like China where TB still common, cutaneous TB cases are rare 0.1 – 2.5%. Direct infection of the skin or mucus membranes from an outside source of mycobacteria results in an initial lesion called the tuberculous chancre. The chancres are firm shallow ulcers with a granular base. They appear about 2-4 weeks after mycobacteria enter through broken skin.[5] Penile glans may be affected through different mechanisms: primary, as an ulcerative lesion of glans; secondary, which is due to TB of other parts in urinary tract system-usually extended through urethra; and finally, hematogenous. Long ago, circumcision was a risk factor when mycobacterium could enter the wounded glans from affected circumcision operators.[6] Infantile ritual circumcision was in the past a frequent cause of glans ulcer in developed countries. At present primary tuberculosis of the penis is extremely rare in developed countries where infantile ritual circumcision is still practiced, but it is occasionally seen in underdeveloped areas[1]. At present, TB of glans in adults is usually a

primary or secondary form. Primary glans TB can be acquired by either intercourse with a patient suffering from genital TB, or contact with contaminated fabric. The secondary form is the subsequent complication of lung tuberculosis or other organs involvement.[6] We herewith report a case of tubercular ulcer on the dorsum of the root of the penis in a toddler which showed excellent response to short course anti-tubercular chemotherapy, which is also, to our best knowledge, the first case report of tubercular ulcer of the penis in children of Bangladesh.

Case report:

A 2-year, 2-month-old uncircumcised toddler admitted in our department with a painful ulcer over the dorsum of the root and body of the penis for the last 3 weeks. It had initially started as a small nodule which ruptured rapidly forming an ulcer and grew to its present size (Figure 1).



Figure 1: *Ulcer on the dorsum of the root and body of the penis at presentation.*

He came from a low socio-economic status. He had no history of trauma or any other systemic illness. Treatment with various topical and systemic antibiotics had been ineffective. During the whole period of illness he never had any history of fever, cough and hemoptysis, significant bowel and bladder complaints or any other systemic problems. His past medical history was noncontributory but on query mother gave a history of contact with a TB patient. On examination, patient was of average built. He was mildly anemic, had no clubbing and jaundice. BCG scar mark was present in his left upper arm. Local examination revealed a deep and irregular ulceration on the dorsum of the root and body of the penis with a transverse diameter of 3 cm and vertical diameter of 2 cm, having granular appearance, absence of dartos fascia, expose corpora caverosa with some sloughs on the floor and serous discharge. Some crust was present around the ulcer margin. The ulcer was tender, edge was undermined and base was indurated. The redundant preputial skin around the ulcer was edematous. There was bilateral, solitary, inguinal lymphadenopathy measured about 1 × 1 cm, overlying temperature was normal, non-tender, mobile in all directions, free from underlying and overlying structures. Systemic examinations' including respiratory system was normal. A provisional diagnosis of tubercular ulcer was made from the history and clinical examinations because the ulcer didn't heal rather aggravated after getting several antibiotics from different practitioners, a history of contact with a TB patient for about 3 months and high prevalence of TB in Bangladesh.

His hemoglobin was 10.8 gm/dl, ESR = 30 mm in 1st hour, Total count of WBC = 9800/mm^3, differential count of WBC (Neutrophils = 60%, Lymphocytes = 35%, Monocytes = 02%, Eosinophils = 03%), BT = 3 minutes and 10 seconds, CT = 4 minutes and 15 seconds. Chest X-ray P/A view revealed no abnormality (Figure 2). Liver function and renal function tests were within normal limit. Ultrasonography of the KUB region revealed no abnormality. VDRL was non-reactive. Tuberculin (Montoux) test after 72 hours of inoculation was strongly positive (18 mm). Wound swab for culture and sensitivity (aerobic incubation at 37^{0}c for 24 hours) revealed growth of staphylococcus aureus.

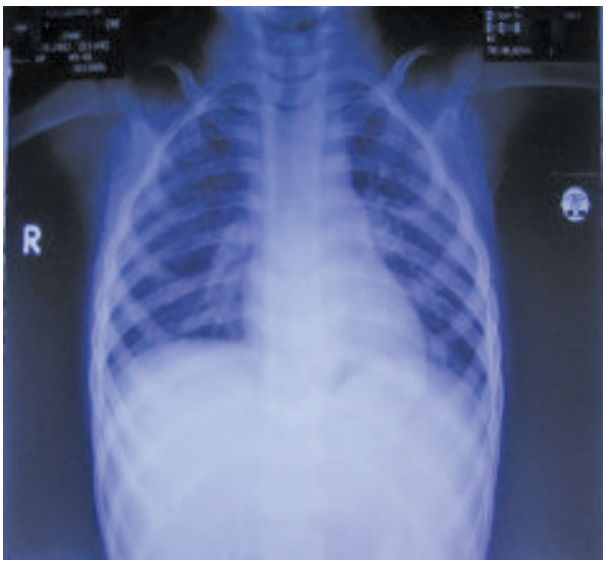


Figure 2: *Chest X-ray P/A view of the patient.*

Excisional biopsy of right inguinal lymph node showed multiple epitheloid granulomata with area of caseation necrosis, compatible with tuberculosis. Incisional biopsy from the ulcer margin at 9-O-clock and 12-O-clock position showed granulation tissue formation, area of hemorrhage and infiltration of acute and chronic inflammatory cells along with multiple epitheloid granulomata with area of necrosis, compatilble with tubercular ulcer wall. The patient was put on oral three drugs regime of Rifampicin (R), Isoniazid (I) and Pyrazinamide (Z) and was followed up monthly. He responded well to this treatment and the ulcer showed significant healing at 1-month of medical treatment (Figure 4). At the end of 2 months, the ulcer had completely disappeared with a very little residual scar on the dorsum of the penis and the left inguinal lymphadenopathy reduced to half of its initial size.



Figure 3: *Photographs showing tubercular ulcer on the dorsum of the penis before anti-tubercular chemotherapy.*



Figure 4: *Photographs showing various stages of healing of ulcer following treatment with anti-tubercular chemotherapy.*

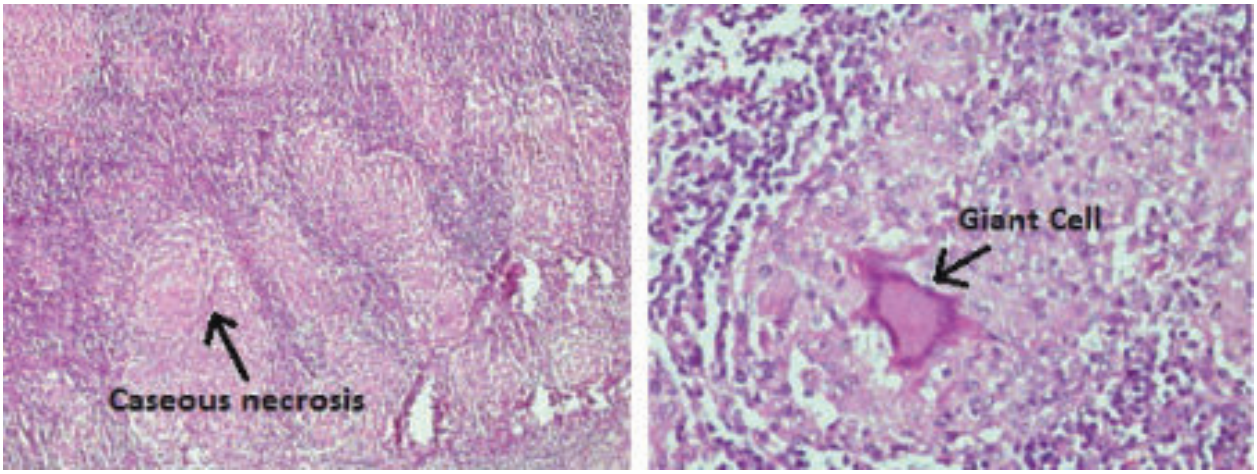


Figure 5: *Photomicrographs showing caseous necrosis and giant cell in inguinal lymph- node.*

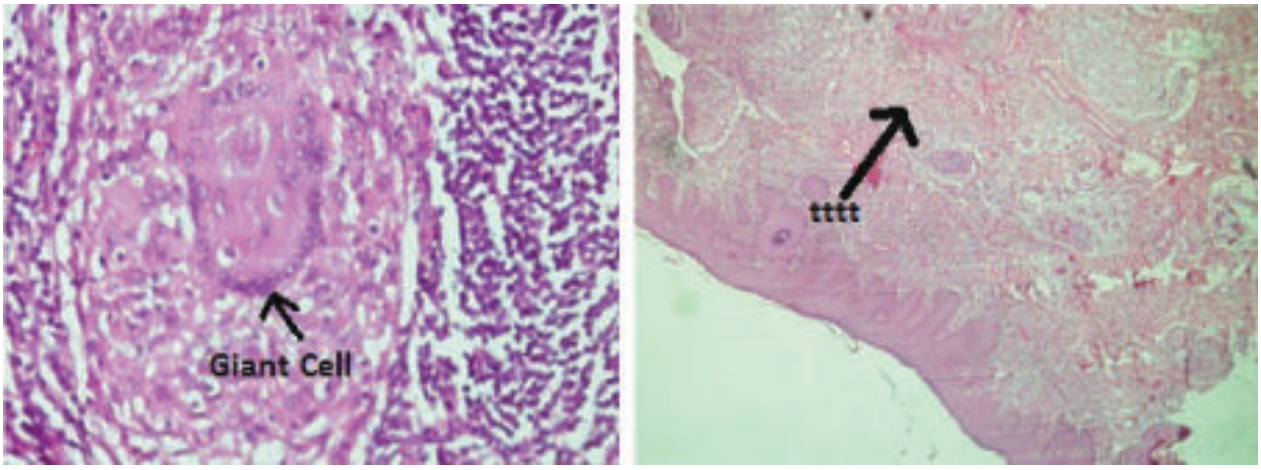


Figure 6: *Photomicrographs showing caseous necrosis and giant cell in biopsy specimen from penile ulcer margin.*

Discussion:

Penile tuberculosis is an extremely rare form of genitourinary tract tuberculosis even in developing countries where the prevalence of tuberculosis is high. Penile tuberculosis was first described by Hellerstrom and later by Bafverstedt and Hageman. In 1896, Darier put forward the concept of tuberculids whereby penile tuberculosis was explained as being the result of a cutaneous hypersensitive response to an underlying focus of tuberculosis. So far, three forms of penile tuberculosis have been identified. The primary form is caused by direct inoculation of mycobacterium in the glans penis during coitus with a patient of genital tuberculosis, oral intercourse with an active pulmonary Koch's patient, wearing of contaminated fabric or at the time of circumcision.[7] The primary cases occur as a complication of ritual circumcision during which the operator sucks the circumcised penis. Some of these have open pulmonary tuberculosis. Sucking was done as a haemostatic and styptic measure but after the turn of the century this act was practically eliminated from the ritual, with the result that tuberculosis of the penis is rarely seen now.[8] The secondary form, also called as tuberculid occurs as a result of either hematogenous spread from a primary focus (commonly lungs) or as a cutaneous hypersensitive response to an underlying focus. The third variety is the result of direct extension through urethra into penile shaft from neighboring genitourinary tubercular foci (prostate, seminal vesicle). An isolated case of penile tuberculosis has been reported as a complication of intravesical BCG therapy in superficial bladder carcinoma, probably due to traumatic catheterization. The causative agents are

Mycobacterium tuberculosis, Mycobacterium Bovis and Mycobacterium Celatum. The lesion presents commonly as a painful ulcer over glans penis. However it may present as a superficial ulcer over the inner lining of prepuce, as a subcutaneous nodule or cold abscess in the corpora cavernosa (Corpora cavernositis).[7]

Biopsy must be done to confirm the diagnosis, in which tuberculide granuloma with giant cells and caseous foci can be seen. To determine whether a TB of glans is a primary or a secondary disease, intravenous pyelography and chest x-ray must be taken.[6] For differentiation from carcinoma penis, histopathological examination is essential.[8] There have been reports of amputation of penis with mistaken diagnosis of carcinomatous ulcer. It is, therefore, suggested that the tubercular etiology should always be included in the differential diagnosis of penile ulcer.[2]

Diagnosis is possible by awareness of the condition, strong suspicion and relevant investigations. An underlying active or healed focus of tuberculosis should be thoroughly searched for.[4]

In this case the lesion was a primary type due to possible contact with a tubercular patient and started as a nodule on the dorsum of the root of the penis which turned rapidly into an ulcer which was progressive despite treatment with several antibiotics and penile bath. Histopathology, negative serologic findings, high ESR, strong tuberculin reaction and excellent response to anti-tubercular chemotherapy confirms the diagnosis of tubercular ulcer. So from this case report, two things must be kept in mind. One is the possibility of tuberculosis as a cause of chronic ulcer on the penis especially in countries where tuberculosis is highly prevalent, and the second one is, if the diagnosis is made earlier and effective chemotherapy is started accordingly, it can lead to complete healing of the lesion without leaving behind any sequlae.

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INFORMATION FOR AUTHORS

Aims and editorial process:

Journal of Paediatric Surgeons of Bangladesh (JPSB) is the official journal of Association of Paediatric Surgeons of Bangladesh (APSB) which is recognized by Bangladesh Medical and Dental Council (BMDC) and has International Standard Serial Number (ISSN) 2077-7469 (print), 2309-1320 (online). The journal publishes articles of authors from any part of the globe, but with special interest in articles from authors from Bangladesh. The content includes, but is not limited to, the field of Paediatric Surgery, Paediatric Urology, Paediatric Onco-surgery, Neonatal Surgery, Minimal Invasive Surgery. It publishes editorial, original articles, special articles, review articles, meta-analyses, systematic reviews, case reports and case series through rigorous peer review. A key goal is to promote postgraduate training and further education in all spectrum of Paediatric Surgery.

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Review	4000	40	6
Special article	2500	20	4
Case report	2000	15	4

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Discuss the influence or association of variables and weakness or pitfalls in the study. It should explore the implications of the findings for future research and clinical practice or policy. Should draw the conclusion according to the objectives of the study. Avoid unnecessary statements.

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