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## COMPREHENSIVE STUDY ON DEMOGRAPHY OF HYPOSPADIAS CASES IN RURAL BENGAL OF INDIA

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### ABSTRACT

Disorders of the external genitalia are especially troubling for parents because of the unconscious emotional significance of these reproductive structures and, probably, the consequent impact of deformities on future generations. The development of the genitourinary system is complex. The urinary system includes the kidneys, ureter, the bladder and the urethra. In terms of their development, the kidney and the ureter develop from intermediate mesoderm. The bladder and the urethra develop from the urogenital sinus. Numerous anomalies of the urethra exist with wide diversity, either as isolated defect or as a part of external genitalia anomalies or in combination with other disorders. To find out the associated congenital abnormalities in genito-urinary system due to hypospadias in paediatric age group. In this regard: (a) to find out the different types of hypospadias (b) To identify the possible causes. (c) To find out the anatomical changes.

**Material and Methods** Patient presenting with hypospadias will be selected at Surgery OPD of BMC&H in June 2014 to June 2015 with 100 patients. Following procedures will be adopted for evaluation. (a) History

(b) Clinical examination. (c) Routine investigation. (d) Special investigation: Ultrasonography, MCU.

**Results:** Found eleven variants in different age group Types of Hypospadias Anterior, Middle and Posterior, and Subtypes of glanular, coronal, sub coronal, distal penile, proximal penile, midshaft, perineal, penoscrotal, Scrotal, Perineal.

**Conclusion:** The most frequent congenital anomaly associated with hypospadias was persistent prostatic utricle in 18% cases followed subsequently by undescended testis (9% cases), inguinal hernia (8% cases), congenital heart disease in 4% of cases, anorectal malformation in 2% cases, musculo-skeletal anomaly in 2% cases, cleft palate in 1% case, cerebral palsy in 1% case and vesico-urethral reflux in 1% case.

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### INTRODUCTION

Disorders of the external genitalia are especially troubling for parents because of the unconscious emotional significance of these reproductive structures and, probably, the consequent impact of deformities on future generations.

Boys and men with urethral anomalies develop a variety of emotional responses related to the condition. They may begin to avoid situations that are part of everyday life, such as using a public urinal. This feeling of being "different" and "inferior" can generate a range of negative emotions such as depression, anxiety, insecurity, frustration, anger, confusion, humiliation, shame and powerlessness. With time, the experience of these negative emotions can profoundly impair the psychological, social and sexual functioning of the young boy and the man he becomes (1). The urethra is a tube which connects the urinary bladder to the outside of the body. The urethra has an excretory function in both sexes, and also a reproductive function in male, as a passage for semen.

The development of the genitourinary system is complex. The urinary system includes the kidneys, ureter, the bladder and the urethra. In terms of their development, the kidney and the ureter develop from intermediate mesoderm. The bladder and the urethra develop from the urogenital sinus. Numerous anomalies of the urethra exist with wide diversity, either as isolated defect or as a part of external genitalia anomalies or in combination with other disorders. Congenital anomalies of the urethra in boys usually involve anatomic abnormalities of the penis and vice versa. In girls, urethral anomalies may exist without other external genital abnormalities. Surgical repair is needed when function is impaired and/or cosmetic correction is desired. Hypospadias is the most common urethral anomaly in boys usually associated with three anatomical anomalies, namely ventral opening of the external urethral meatus, ventral curvature (chordee) of penis and hooded foreskin. Based on the location of meatus hypospadias is divided into distal (glandular, coronal, subcoronal), middle (distal penile, mid shaft, proximal penile) and proximal (penoscrotal, scrotal and

perineal) forms (Fig.1) (2) (3) The greater understanding of the psychological and emotional issues related to hypospadias repair has led to this procedure being performed at an earlier age. The goal of surgical reconstruction is to bring slit-like meatus to the tip of glans, correct associated chordee if present, to create a conical-shaped glans and to achieve cosmetically acceptable penis (4).

**Aims and Objectives**

To find out the associated congenital abnormalities in genitourinary system due to hypospadias in paediatric age group. In this regard:

- (a) To find out the different types of hypospadias, (b) To identify the possible causes, (c) To find out the anatomical changes.

**MATERIAL AND METHODS**

STUDY AREA: Burdwan Medical College & Hospital, Burdwan, STUDY POPULATION: Male paediatric patient with hypospadias, STUDY PERIOD: June 2014 to June 2015, SAMPLE SIZE: 100 patients, SAMPLE DESIGN: By simple random sampling method cases will be selected from hypospadias patients attended at Surgery OPD of BMC&H. STUDY DESIGN: Cross sectional study, STUDY SELECTION CRITERIA: (A) INCLUSION CRITERIA: (a) only male child (b) children within age group of 0-12 years (c) children attending surgery & urology OPD (B) EXCLUSION CRITERIA: (a) female child, (b) children >12 years of age, (c) children having other anomalies of genitourinary region e.g. epispadias, undescended testis etc.

**Parameters to Be Studied:** In my study, I want to focus on the following issues:

- (1). To determine the different positions of external urethral meatus in hypospadias cases. (2) To know whether any associated congenital anomalies present or not (3) To assess any complications arising out of hypospadias.

**Study Tools:** Patient presenting with hypospadias will be selected at Surgery OPD. Following procedures will be adopted for evaluation. (a) History (b) Clinical examination. (c) Routine investigation. (d) Special investigation: Ultrasonography, MCU

All collected data will be analyzed by appropriate statistical methods later on.

**RESULTS**

The numbers of patients in the following age group category were as follows: in 0-2 year's category 10 patients, in 2-4

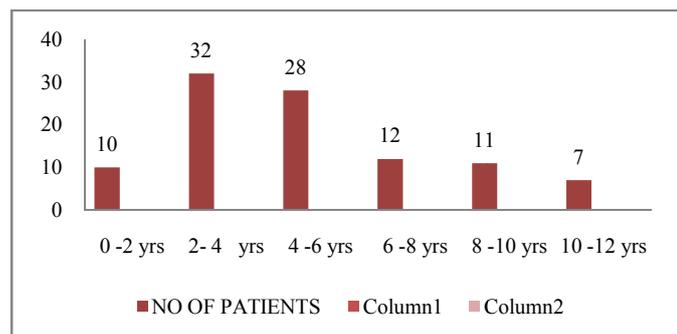


Figure 1 Age Distribution of Patients

years category 30 patients, in 4-6 years category 28 patients, in 6-8 years category 12 patients, in 8-10 years category 11 patients and in 10-12 years category 7 patients. So the maximum numbers of patients were in the age group of 2-4 years followed by in the age group of 4-6 years.

**Table 1** Age Distribution According To Types of Hypospadias

Age distribution of patients	Total No of Cases	No of cases in each type of hypospadias		
		Anterior	Middle	Posterior
0-2 YRS	10	0 (0%)	3 (30%)	7 (70%)
2-4 YRS	32	12 (37.5%)	20 (62.5%)	0 (0%)
4-6 YRS	28	28 (100%)	0 (0%)	0 (0%)
6-8 YRS	12	12 (100%)	0 (0%)	0 (0%)
8-10 YRS	11	11 (100%)	0 (0%)	0 (0%)
10-12 YRS	7	7 (100%)	0 (0%)	0 (0%)
TOTAL	100	70	23	7

Table 1 shows that in 0-2 yrs age group all the posterior hypospadias cases were included (70%) including 3 middle hypospadias cases (30%). In the 2-4 yrs age group 12 cases of anterior hypospadias (37.5%) & 20 cases of middle hypospadias (62.5%) were included. Above the age of 4 yrs all the cases were anterior hypospadias (100%).

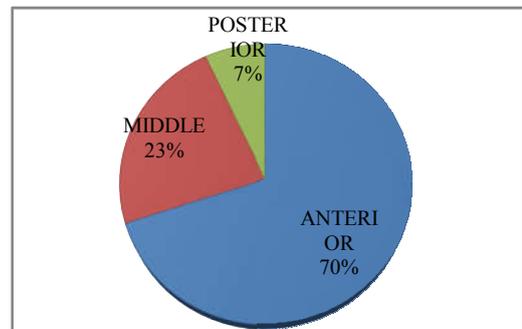


Figure 2 Types of Hypospadias

**Table 2** Distribution of hypospadias cases into different types

Types of hypospadias	No of cases
Anterior	70 (70%)
Middle	23 (23%)
Posterior	7 (7%)
Total	100 (100%)

Table 2 shows that the cases were divided into three broad groups: anterior, middle and posterior. Anterior hypospadias was present in 70 patients (70%), middle hypospadias was present in 23 cases (23%) and posterior hypospadias was present in 7 cases (7%). So the maximum number of patients were in the anterior hypospadias category followed successively by middle and posterior hypospadias.

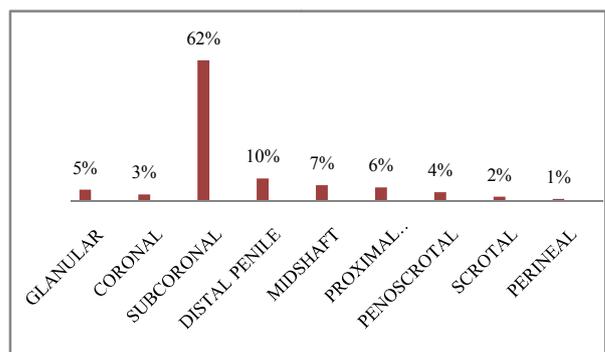
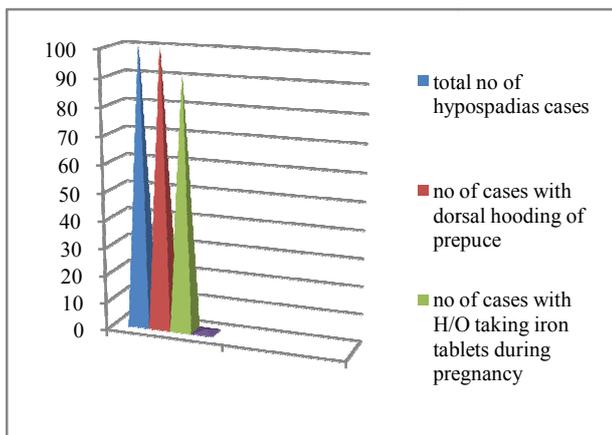


Figure 3 Subtypes of Hypospadias

**Table 3** Distribution of hypospadias cases according to different subtypes

Types of Hypospadias	Subtypes	No of Cases
Anterior	Glanular	5 (5%)
	Coronal	3 (3%)
	Subcoronal	62 (62%)
Middle	Distal penile	10 (10%)
	Midshaft	7 (7%)
	Proximal penile	6 (6%)
Posterior	Penoscrotal	4 (4%)
	Scrotal	2 (2%)
	Perineal	1 (1%)
Total		100

Table 3 shows that anterior hypospadias were divided into glanular, coronal and subcoronal categories; middle hypospadias were divided into distal penile, midshaft and proximal penile categories; posterior hypospadias were divided into penoscrotal, scrotal and perineal categories. The number of patients in each of the subgroups were as follows: glanular 5 cases (5%), coronal 3 cases (3%), subcoronal 62 cases (62%), distal penile 10 cases (10%), midshaft 7 cases (7%), proximal penile 6 cases (6%), penoscrotal 4 cases (4%), scrotal 2 cases (2%) and perineal 1 case (1%). From the above data, it is found that the maximum number of patients had hypospadias in the subcoronal region followed successively by distal penile and midshaft regions and only one case had perineal hypospadias.



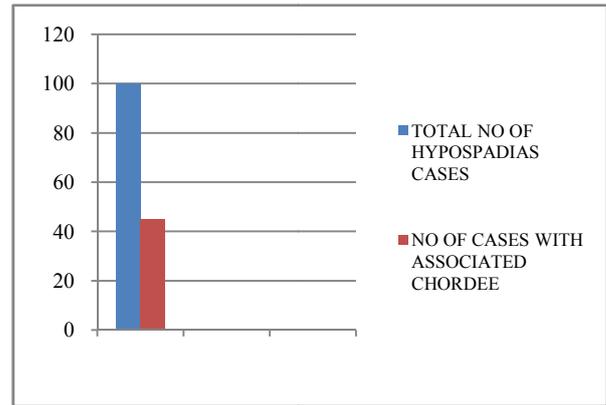
**Figure 4** Distribution of dorsal hooding of prepuce, maternal H/O smoking & maternal H/O iron tablet intake in hypospadias cases

**Table 4** Association of hypospadias cases according to maternal H/O smoking, maternal H/O iron tablet intake & presence of dorsal hooding of prepuce

No of hypospadias cases	No of cases in whom dorsal hooding of prepuce were present	No of cases in whom the mother had smoked during pregnancy	No of cases in whom the mother had taken iron tablets throughout the periconceptional period
100	100 ( 100%)	1 ( 1%)	91 ( 91%)

Table 4 shows that out of total 100 hypospadias cases, one case was associated with maternal H/O smoking, 91 cases were associated with maternal H/O iron tablet intake during pregnancy & all the 100 cases were associated with dorsal hooding of prepuce.

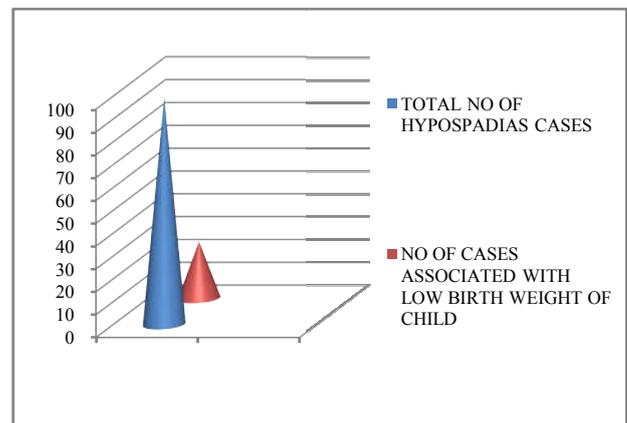
Table 5 shows that all the middle & posterior hypospadias cases had chordee whereas only 15 cases (21.42%) of anterior hypospadias were associated with chordee.



**Figure 5** Distribution of chordee among hypospadias cases

**Table 5** Distribution of each type of hypospadias according to presence of chordee

Types of hypospadias	No of cases	No of cases in whom chordee were present
Anterior	70	15 ( 21.42%)
Middle	23	23 ( 100%)
Posterior	7	7 ( 100%)
Total	100	45 (45%)

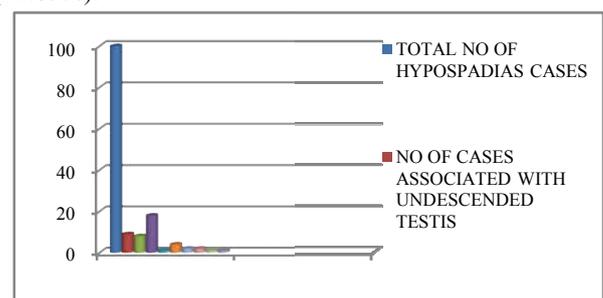


**Figure 6** Distribution of low birth weight children among hypospadias cases

**Table 6** Distribution of each type of hypospadias according to low birth weight of the child

Types of hypospadias	No of cases	No of cases in whom low birth weight were present at birth
Anterior	70	16 ( 22.85% )
Middle	23	6 ( 26.08%)
Posterior	7	3 ( 42.85%)
Total	100	25 ( 25%)

Table 6 shows that the maximum frequency of low birth weight was associated with posterior hypospadias (42.85%) followed by middle (26.08%) & anterior variety (22.85%).



**Figure 7** Distribution of different types of congenital anomalies among the hypospadias cases

**Table 7(a)** Distribution of each type of hypospadias according to association with undescended testis

Types of hypospadias	No of cases	No of cases associated with undescended testis
Anterior	70	4 ( 5.71% )
Middle	23	3 ( 13.04% )
Posterior	7	2 ( 28.57% )
Total	100	9 ( 9% )

**Table 7(b)** Distribution of each type of hypospadias according to Table association with inguinal hernia

Types of hypospadias	No of cases	No of cases associated with inguinal hernia
Anterior	70	3 ( 4.28% )
Middle	23	3 ( 13.04% )
Posterior	7	2 ( 28.57% )
Total	100	8 ( 8% )

Table 7(a) shows that undescended testis was most frequently associated with posterior hypospadias (28.57%) followed subsequently by middle (13.04%) & anterior (5.71%) hypospadias.

Table 7(b) shows that inguinal hernia was most frequently associated with posterior hypospadias (28.57%) followed subsequently by middle (13.04%) & anterior (4.28%) hypospadias.

**Table 7(c)** Distribution of each type of hypospadias according to association with persistent prostatic utricle

Types of hypospadias	No of cases	No of cases associated with persistent prostatic utricle
Anterior	70	14 ( 20% )
Middle	23	2 ( 8.69% )
Posterior	7	2 ( 28.57% )
Total	100	18 ( 18% )

**Table 7(d)** shows that vesico-ureteral reflux was only associated with posterior hypospadias (14.28%).

Types of hypospadias	No of cases	No of cases associated with vesico-ureteral reflux
Anterior	70	0 ( 0% )
Middle	23	0 ( 0% )
Posterior	7	1 ( 14.28% )
Total	100	1 ( 1% )

Table 7(c) shows that persistent prostatic utricle was most frequently associated with posterior hypospadias (28.57%) followed subsequently by anterior (20%) & middle (8.69%) hypospadias.

**Table 7(e)** Distribution of each type of hypospadias according association with anorectal malformation

Types of hypospadias	No of cases	No of cases associated with congenital heart disease
Anterior	70	3 ( 4.28% )
Middle	23	1 ( 4.34% )
Posterior	7	0 ( 0% )
Total	100	4 ( 4% )

**Table 7f** Distribution of each type of hypospadias according to to association with congenital heart disease

Types of hypospadias	No of cases	No of cases associated with anorectal malformation
Anterior	70	1 ( 1.42% )
Middle	23	1 ( 4.34% )
Posterior	7	0 ( 0% )
Total	100	2 ( 2% )

Table 7(e) shows that congenital heart disease was most frequently associated with middle hypospadias (4.34%) followed marginally by anterior variety (4.28%).

Table 7(f) shows that anorectal malformation was most frequently associated with middle

**Table 7(g)** Distribution of each type of hypospadias according to association with cleft palate

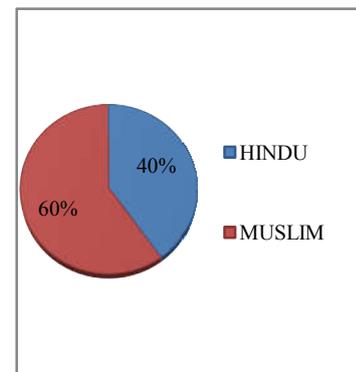
Types of hypospadias	No of cases	No of cases associated with cleft palate
Anterior	70	1 ( 1.42% )
Middle	23	0 ( 0% )
Posterior	7	0 ( 0% )
Total	100	1 ( 1% )

**Table 7(h)** Distribution of each type of hypospadias according to association with Cerebral palsy

Types of hypospadias	No of cases	No of cases associated with cerebral palsy
Anterior	70	1 ( 1.42% )
Middle	23	0 ( 0% )
Posterior	7	0 ( 0% )
total	100	1 ( 1% )

Table 7(g) shows that cleft palate was only associated with anterior hypospadias (1.42%).

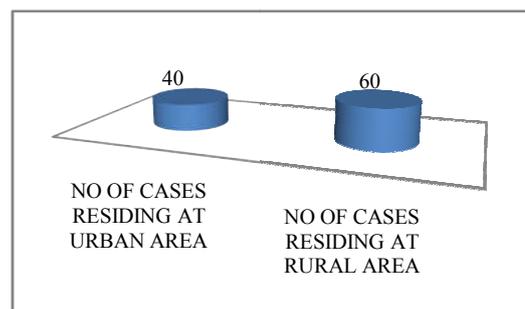
Table 7(h) Distribution of each type of hypospadias according to association with Cerebral palsy



**Figure 8** Classification of Cases

**Table 8** Distribution of each type of hypospadias according to ethnicity

Ethnicity	Total no of cases	No of cases in each type of hypospadias		
		anterior	middle	posterior
HINDU	40	27 (67.5%)	10 (25%)	3 (7.5%)
MUSLIM	60	43 (71.66%)	13 (21.66%)	4 (6.67%)
TOTAL	100	70	23	7



**Figure 9** Classification of hypospadias cases according to living area

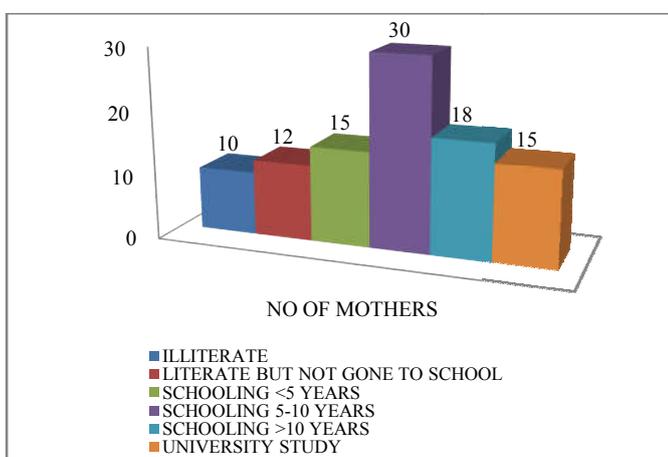
**According To Ethnicity**

Table 8 shows that the frequency of anterior hypospadias was more common in muslims (71.66% versus 67.5% in hindus) but the frequency of middle & posterior hypospadias was more common in hindus (25% & 7.5% respectively) than muslims.

**Table 9** Distribution of each type of hypospadias according to area of living

Area of living	Total no of cases	No of cases in each type of hypospadias		
		Anterior	Middle	Posterior
Urban area	40	27 (67.5%)	11 (27.5%)	2 (5%)
Rural area	60	43 (71.67%)	12 (20%)	5 (8.33%)
Total	100	70	23	7

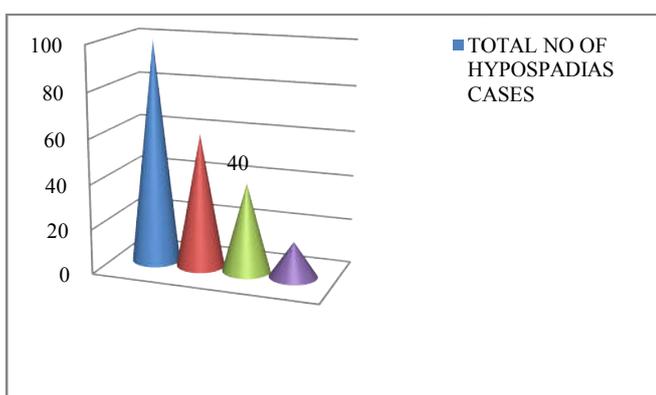
Table 9 shows that the frequency of both anterior & posterior hypospadias was more common in rural area (71.67% & 8.33% respectively) than compared to urban area (67.5% & 5% respectively) whereas the frequency of middle variety was more common in urban area (27.5%).



**Figure 10** Classification of Hypospadias Cases According To Their Mothers' Educational Status

**Table 10** Distribution of each type of hypospadias according to their mothers' educational status

Educational status of mother	Total no of cases	No of cases in each type of hypospadias		
		Anterior	Middle	Posterior
Illiterate	10	7 (70%)	2 (20%)	1 (10%)
Literate but not gone to school	12	8 (66.67%)	3 (25%)	1 (8.33%)
Schooling <5 years	15	11 (73.33%)	3 (20%)	1 (6.67%)
Schooling 5-10 years	30	21 (70%)	7 (23.33%)	2 (6.67%)
Schooling >10 years	18	13 (72.22%)	4 (22.22%)	1 (5.55%)
University study	15	10 (66.67%)	4 (26.67%)	1 (6.67%)
Total	100	70	23	7



**Figure 11** Classification of hypospadias cases according to place and mode of delivery

Table 10 shows that the frequency of posterior hypospadias was maximum in illiterate mothers (10%) whereas the frequency of middle variety was maximum in university study mothers (26.67%) meanwhile the frequency of anterior hypospadias was maximum in schooling <5 yrs mothers (73.33%).

**Table 11** Distribution of each type of hypospadias according to the place and mode of delivery

Mode of delivery	Total no of cases	No of cases in each type of hypospadias		
		Anterior	Middle	Posterior
Caesarean section	16	7 (43.75%)	6 (37.5%)	3 (18.75%)
Normal delivery	84	63 (75%)	17 (20.24%)	4 (4.76%)
Total	100	70	23	7

Table 11 shows that the frequency of middle and posterior hypospadias was more in case of caesarean section (37.5% & 18.75% respectively) than in case of normal delivery (20.24% & 4.76% respectively) whereas the frequency of anterior hypospadias was more in case of normal delivery (75% versus 43.75% in case of C/S).

**DISCUSSION**

In our study 60% of patients presented at the age group of 2 to 6 years. L.F.M. van der Zanden *et al.* (5) in their landmark study on hypospadias have shown that in western countries age of presentation was highest in the first two years of age. On the contrary Mansoor Khan *et al.* (6) have shown that age of presentation was maximum in the age group of 2 to 6 years. The later study was from a developing nation like India. As India is a developing country with less awareness regarding health, age of presentation was later than developed countries.

In our study we have found that the most common type of hypospadias is anterior hypospadias which accounts for 70% of cases and most common subtype is subcoronal variety which accounts for 62% of all the cases. Barcat *et al.* (7) and Duckett *et al.* (8) also showed similar results.

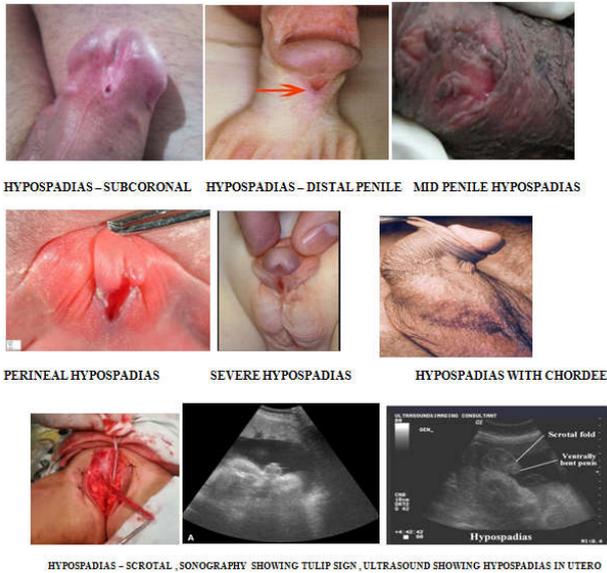
In my study only one mother had history of occasional smoking. Carmichael SL *et al.* (9) in their study showed that smoking has no significant effect on having a hypospadias child.

In my study I have found that all the cases were associated with dorsal hooding of prepuce. David *et al.* (10) in their study also showed similar results.

In my study I have found that all the middle and posterior hypospadias cases were associated with chordee or ventral curvature of penis [ 30 out of 30 cases, 100%] while only 21.42% [ 15 out of 70 cases] cases of anterior hypospadias were associated with chordee. So in my study 45% of all hypospadias patients had chordee. These results are closely related to that of El Mageed *et al.* (11), as 50% of their patients had skin chordee and 10% of them had fibrous chordee. Hence, it can be stated that skin chordee that is corrected just by degloving of penile shaft skin represents a high percentage of ventral penile curvature in distal and mid shaft hypospadias patients.

In my study I have found that 25% of cases were associated with low birth weight of which maximum (3/7=42.85%) of cases were associated with posterior hypospadias followed by middle [6/23=26.08%] & anterior [16/70=22.85%] variety.

Incidence of low birth weight baby in India accounts for 22.6% of cases (12). Hussain N *et al.* (13) in their landmark study have shown that there was a significant association of hypospadias with poor intrauterine growth. In my study, the incidence of hypospadias cases was slightly higher than that of national average and also there was higher association with severe forms than milder forms. So there might be some association between low birth weight child and incidence of hypospadias cases.



In my study 60 % cases belonged to muslim ethnicity. Regarding types of hypospadias, the distribution of cases were similar between this two groups. Arjun Singh *et al.* (14) in their study have shown that the incidence of congenital anomalies in muslims is higher(1.77%) as compared to hindus(1.48%). More prevalence of consanguinity among Muslims probably appears to be one of the important contributory factors. Our study corroborates with this finding.

In my study 40% cases had urban habitation while 60 % were from rural area. Anterior and posterior hypospadias were more common among rural patients where as middle variety was more frequent among urban cases. Olea *et al.* (15) in their study have shown that factors related to residence in an agricultural setting may be an important source of inadvertent exposure to pesticides. My study findings also corroborate with this results.

In my study I have found that posterior hypospadias was maximum in illiterate mothers (10%) whereas middle variety was maximum in university study mothers (26.67%) meanwhile anterior hypospadias was maximum in schooling <5 yrs mothers (73.33%). My study also shows that 10% of mothers were illiterate and 15% of mothers had university study. Mariana F. Fernandez *et al.* (16) in their study also showed similar results.

In my study 60% of mothers had institutional delivery and 40% had home delivery. NFHS-3(2011) data shows that the state of West Bengal had institutional delivery rate of 43%. On the other hand, the incidence of caesarean section in West Bengal as a whole accounts for 12.8% (Shewli Shabnam *et al.* (13)). In my study, 16 mothers (26.67%) had undergone caesarean section of which the maximum association was with posterior hypospadias variety followed by middle and anterior variety. Aschim *et al.* (17) also showed similar results.

Now coming to the different congenital anomalies associated with hypospadias cases, my study shows that the most frequent congenital anomaly associated with hypospadias was persistent prostatic utricle in 18% cases followed subsequently by undescended testis (9% cases), inguinal hernia (8% cases), congenital heart disease in 4% of cases, anorectal malformation in 2% cases, musculo-skeletal anomaly in 2% cases, cleft palate in 1% case, cerebral palsy in 1% case and vesico-ureteral reflux in 1% case. It is also seen that undescended testis and inguinal hernia were most frequently associated with posterior hypospadias (28.57% each) followed subsequently by middle and anterior variety. (18) (19) (20)

## SUMMARY AND CONCLUSION

In my study, I have found out the following results:

In our study 60% of patients presented at the age group of 2 to 6 years.

1. The most common type of hypospadias is anterior hypospadias which accounts for 70% of cases and most common subtype is subcoronal variety which accounts for 62% of all the cases.
2. Only one mother had history of occasional smoking.
3. All the cases were associated with dorsal hooding of prepuce.
4. All the middle and posterior hypospadias cases were associated with chordee [30 out of 30 cases, 100%] while only 21.42% [15 out of 70 cases] cases of anterior hypospadias were associated with chordee. So in my study 45% of all hypospadias patients had chordee.
5. 25% of cases were associated with low birth weight of which maximum (3/7=42.85%) of cases were associated with posterior hypospadias followed by middle [6/23=26.08%] & anterior [16/70=22.85%] variety.
6. 60 % cases belonged to muslim ethnicity and the remaining 40% were hindus.
7. 40% cases had urban habitation while 60 % were from rural area.
8. Posterior hypospadias was maximum in illiterate mothers (10%) whereas middle variety was maximum in university study mothers (26.67%) meanwhile anterior hypospadias was maximum in schooling <5 yrs mothers (73.33%). My study also shows that 10% of mothers were illiterate and 15% of mothers had university study.
9. 60% of mothers had institutional delivery and 40% had home delivery. 16 mothers (26.67%) had undergone caesarean section of which the maximum association was with posterior hypospadias variety followed by middle and anterior variety.
10. The most frequent congenital anomaly associated with hypospadias was persistent prostatic utricle in 18% cases followed subsequently by undescended testis (9% cases), inguinal hernia (8% cases), congenital heart disease in 4% of cases, anorectal malformation in 2% cases, musculo-skeletal anomaly in 2% cases, cleft palate in 1% case, cerebral palsy in 1% case and vesico-ureteral reflux in 1% case.

## References

1. Boys with hypospadias: a survey of behavioural difficulties. Sandberg D E, Meyer-Bahlburg M, FL and

- et al.*: s.l. : *J Pediatr Psychol*, 1989, Vol. 14, pp. 491-514 .
2. Hypospadias repair: current principles and procedures. Mouriquand P DE, Persad R and Sharma S.: Suppl 3, s.l. : *Br J Urol*, 1995, Vol. 76, pp. 9-22 .
  3. Long-term outcome following hypospadias repair. Wilcox D and Snodgrass W.: 3, s.l. : *World J Urol*, 2006, Vol. 24, pp. 240-243.
  4. Hypospadias surgery: when, what and by whom? Manzoni G, *et al.* s.l. : *BJU Int*, 2004, Vol. 94, pp. 1188-95 .
  5. Aetiology of hypospadias: a systematic review of genes and environment. L F M van der Zanden, *et al.* 3, s.l. : *Human Reproduction Update*, 2012, Vol. 18, pp. 260-283.
  6. Hypospadias Repair: A Single Centre Experience . M Khan, *et al.* Peshawar : s.n.
  7. Current concepts in of treatment. In: Horton CE, ed. *Plastic and Reconstructive Surgery of the Genital Area*. Barcat J.: Boston : Mass: Little Brown, 1973, pp. 249-62 .
  8. The current hype in hypospadiology. Duckett J W.: 3, s.l. : *Br J Urol*, 1995, Vol. 76, pp. 1-7.
  9. Hypospadias and maternal exposures to cigarette smoke. Carmichael S L, *et al.* 6, s.l. : *Paediatr Perinat Epidemiol*, Nov 2005 , Vol. 19, pp. 406-12.
  10. David A Hatch.: Abormal Development of the Penis and Male Urethra.
  11. Randomized Comparative Study between Mathieu Flip-Flap and Snodgrass Techniques for the Repair of Distal Hypospadias. M A El Mageed, H Ashraf and W El Moiz.: s.l. : *Egypt J. Plast. Reconstr. Surg.*, 2007, Vol. 31, pp. 157-165.
  12. R Chellan, L Paul and P M Kulkarni.: INCIDENCE OF LOW-BIRTH-WEIGHT IN INDIA Regional Variations and Socio-Economic Disparities.
  13. Hypospadias and early gestation growth restriction in infants. Hussain N, *et al.* 3, s.l. : *Pediatrics*, Mar 2002, Vol. 109, pp. 473-8.
  14. Pattern of Congenital Anomalies in Newborn : A Hospital Based Prospective Study. A Singh and R K Gupta.: 1, s.l. : [www.jkscience.org](http://www.jkscience.org), January-March 2009, Vol. 11.
  15. 15. *Inadvertent exposure to xenoestrogens in children*. Olea N, *et al.* 1-2, s.l. : *Toxicol Ind Health*, Jan-Mar 1999, Vol. 15, pp. 151-8.
  16. Human Exposure to Endocrine-Disrupting Chemicals and Prenatal Risk Factors for Cryptorchidism and Hypospadias: A Nested Case-Control Study. M F Fernandez, *et al.* 1, s.l. : *Environ Health Perspect*, Dec 2007, Vol. 115, pp. 8-14.
  17. Risk factors for hypospadias in Norwegian boys - association with testicular dysgenesis syndrome? Aschim E L, *et al.* 4, s.l. : *Int J Androl*, Aug 2004, Vol. 27, pp. 213-21.
  18. Urologic anomalies associated with hypospadias. Khuri F J, Hardy B E and Churchill B M.: s.l. : *Urol Clin North Am*, Oct 1981, Vol. 8, pp. 565-71.
  19. The incidence of intersexuality in children with cryptorchidism and hypospadias: stratification based on gonadal palpability and meatal position. Kaefer M, *et al.* 1003-6, s.l. : *J Urol* 1999, Vol. 162, pp. 1006-7 .
  20. Hypospadias. Gatti J M, Krisch A J and Snyder H M.: s.l. : [medicine.medscape.com/article/1015227-overview](http://medicine.medscape.com/article/1015227-overview).

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