The National Ribat University
Faculty of Graduate Studies and Scientific Research

Prevalence of Hypospadias and the Etiological Factors in Sudan 2014

A Thesis Submitted in Partial Fulfillment Required for M.Sc in Human and Clinical Anatomy

By:
Arafa Eltayeb Hassan Abdalla

Supervised by:
Dr. Abbas Gareeballa

2014
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بسم الله الرحمن الرحيم

قال الله تعالى:

(أَيَحْسَبُ الْوَسَانُ أَنْ يُتْشَكَ سُذًى (36) أَلَمْ يُّهْيَ نَفْعَةً مِنْ مَنِيٍّ يُمْلِئُ (37) ثُمَّ كَانَ عَلَّقَةً فَخَلَقَ فَسَوَى (38) فَجَعَلَ مِنْهُ الزَّوْجَيْنِ الزَّمَشَ وَالْوَسَانِ (39) أَلَيْسَ رَلِلَ بِقَادِسٍ عَلَى أَنْ يُحْيِيَ الْمَوْتَي (40).

القيامة 36-40

صدق الله العظيم
Dedication

I would like to dedicate:-

My mother & father blessing and support

My teachers throughout my life whom respect

and participate in my educational journey.
Acknowledgement

I would like to convey my grateful thanks to my supervisor, Dr. Abbas Gareeballa for his help, support useful advice and revising this thesis.

My thankful extended to our godfather professor Tahir Osman for his encouragement, patience, and wide support.
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Abbreviations

C/S Casearain section
DHT Dihydrotestosterone
DDT 1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane
EDCS Endocrine-disrupting chemicals
Fig Figure
HCG Human chorionic gonadotrophin
IVF Invitro fertilization
ICS Intracytoplasmic sperm injection (ICSI)
NVD Normal vaginal delivery
Pt Patient
SPSS Statistical Package for the Social Sciences
UDT Undescending testis
UGBD Urogenital birth defect

مستخلص الدراسة
أجرت هذه الدراسة الوصفية بمستشفى الرباط الجامعي بقسم جراحة الأطفال للذين يعانون من حالات المبال التحتاني الديارى بولاية الهر طوم في الفترة من يناير وحتى ديسمبر 2014.

أهداف هذه الدراسة تتلخص في إقرار معدل حدوث حالة المبال التحتاني الديارى وتحديد بعض المسببات والعوامل المساعدة في حدوثه مع التوزيع الجغرافي للحالات، والنوع الأكثر شيوعاً وجود حالات مصاحبة، وعلاقته عمر الأم، عدد الولادات، طبيعة الحمل، وكيفية الولادة مع نسبة حدوث الحالة. أيضاً علاقة عمر الأب والتاريخ المرضي العائلي لنفس الحالة.

تضرمت هذه الدراسة 80 مريضاً يعانون من المبال التحتاني منذ ولادتهم تتراوح أعمارهم بين 01 و19 أكرههم ومتوسط اعمارهم 7 سنوات.

بالنسبة للتوزيع الجغرافي للولايات 44 (55%) من الخرطوم، 12 (15%) من الجزيرة وغرب السودان، 22 (22%) من شرق السودان، 7 (8.8%) من شمال السودان، 04 (05%) من جنوب السودان و5 (6.3%) من الشمال.

التصنيف على حسب وجود الفتحة الخارجية لمجري البول، الطبيعى هو ان يكون في مقدمه الحشفة وقد تم التصنيف الى المبال القريب، المتوسط والبعيد من الفتحة الطبيعية، في الدراسة النوع الأكثر شيوعاً هو البعيد بتردد 56 (70%)، بليه القريب بتردد 20 (25%) واقليم المتوسط 24 (30%).

الحالات المصاحبة كأنحناء القضيب والخصية الغير نازلة تبين ان انتهاء القضيب مثل أكثر الحالات المصاحبة 41% (14.3%) وعند وجود حالات الخصية الغير نازله بمفردها ولكن تواجده مع بعض مثل (26.2%)،

دراسة علاقة الأم بحدث هذه الحاله من عده جوانب:

 عمر الأم تتراوح بين اصغرهم 19 إلى 55 أكبرهم ومتوسط اعمارهم 32 سنة.

عدد الولادات من 1 إلى 10 ومتوسط 3(41).

وطبيعه الحمل كانت 79 حالة (من غير تحفيز) إلى واحدة فقط بتجهيز هرموني.
وكيفية الولادة كانت 70 (87.5%) ولادة مهبلية طبيعية و 10 (12.5%) ولادة قيصرية.

اما علاقه الاب بالحاله تضمنت:

عمر الاب يتراوح بين 25 اصغرهم الي 65 اكبرهم ومتوسط اعمارهم 40.41.
التاريخ المرضي لنفس الحاله في العائله تبين وجود 6 حالات، 5 من درجه القرابه الأولي وواحد من الدرجة الثانية.
Abstract

Eighty patients who admitted to Alshorta hospital, pediatric surgical unit in 2014 were included in this retrospective hospital based study.

In our study the mean of patient’s age was 7.4, with the range of 17, minimal maximal age 19..age 2

Regarding the type of hypospadias, the commonest type is the distal with the frequency 56 (70%). Followed by the proximal type with frequency 20 (25%). The least representation was for the mid shaft frequency of 4 (5%).

According to the associated conditions, the chordee found in 33pt (41.3%) and it was the commonest association. The UDT was not found. Both chordee and UDT were found in 26 (32.5%) of patients.

Of the 80 patients, 44 of them were live in Khartoum state with the percentage of 55%, followed by Aljazerra 12 pt with the percentage of 15%, western Sudan had the same percentage. 7 of them were from eastern Sudan with the percentage 8.8%. 5 were from north Sudan with the percentage 6.3%

Regarding the risk fators releated to the mother:

The mean of mother’s age was 32, with the range of 36, minimal age 19 with the percentage of 1.3%. The maximum age was 55 with the percentage of 2.5%. 
The mother parity mean was 3.41, with the range 10, minimal of 1 with the percentage of 11.3%. The maximum deliveries 11 with the percentage of 1.3%. The standard deviation was 1.99.

In 79 of mothers, the pregnancy was spontaneous, and one induced by hormonal therapy.

The mode of delivery was NVD in 70 (87.5%) of mothers, and 10 (12.5%) by C/S.

Regarding the risk factor related to the father:

The mean of father’s age was 40.41, with the range of 40, minimal age 25 with the percentage of 1.3%. The maximum ages was 65 with the percentage of 1.3%. The standard deviation was 9.41.

Regarding the family history of similar conditions, 6 of pts had +Ve history, 5 of them were 1st degree and 1 was 2nd degree relation. the rest of the pts were -Ve.
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Appendix
1. Introduction and Objectives

1.1. Introduction:

Hypospadias is a condition in which the opening of the urethra is on the underside of the penis, instead of at the tip. The urethra is the tube through which urine drains from your bladder and exits your body.\footnote{1}

Hypospadias are among the most common birth defects of the male genitalia (second to cryptorchidism), but widely varying incidences have been reported from different countries, from as low as 1 in 4000 to as high as 1 in 125 boys.\footnote{2}

Prevalence of hypospadias is the number of live-born infants with hypospadias per 10,000 live-born male infants. (Live-born infants are the infants born with any evidence of life).

Hypospadias is one of the most common birth defects in the United States, affecting as many as 1 in 125 newborn males.\footnote{3} Before 1970, hypospadias occurred about once in every 250 live male
The reason that the birth prevalence of hypospadias has doubled in recent years is not known, but the increase does not appear to be limited to the United States. There are reports of upward trends in rates of hypospadias from other industrialized countries, including Norway, Denmark, Japan, and The Netherlands. Recent evidence suggests that the birth prevalence of hypospadias has stabilized.

Hypospadias is one of the most common congenital defects in humans. The molecular events required in the genitourinary tract for normal development of the external genitalia are just beginning to be elucidated. Identifying the cause of hypospadias may be relevant not only in the field of pediatric urology, but also for worldwide public health. This article discusses the possible causes of hypospadias and the genes and growth factors involved. The potential effects of genetic susceptibility and environmental pollutants are also discussed.

There is increasing in the prevalence of hypospadias world wide, but the etiological factors are not clear.

Many studies done to correlate the risk factor so as to prevent it is occurrence.
1.2. Objectives:

1.2.1. General Objective:
To assess the prevalence of hypospadias and associated condition in Ribat university hospital in 2014.

1.2.2. Specific Objectives:
- To determine the prevalence of the hypospadias.
- To identify the common location of hypospadias in Sudan state.
- To determine the common type of hypospadias.
- To determine the associated condition.
- To determine the relationship between the presence of the hypospadias and the mother age.
- To determine the relationship between the presence of the hypospadias and parity.
- To determine the relationship between the presence of the hypospadias and the pregnancy induced by hormonal therapy.
- To determine the relationship between the presence of the hypospadias and the mode of delivery.
- To determine the relationship between the presence of the hypospadias and the father age.
- To determine family history and the genetic factors.
2. Literature Review

2.1. Development of the male urethra:

Hypospadias is a relatively common congenital malformation.

The human penis goes through a natural state of hypospadias as it develops from a primitive, undifferentiated structure into a fully differentiated penile urethra.[7] The urogenital system of the male embryo develops during weeks 8 to 14 following ovulation.[8] At 8 weeks, the external genitalia of both male and female embryos are indistinguishable. Both have a midline genital tubercle just above a urogenital membrane flanked on each side by outer genital swellings and inner urethral fold.[8]

Embryology of the penile urethra. (A) The undifferentiated state. (B) Fusion of the genital folds from posterior to anterior. (C) Closure of the penile shaft skin, leaving behind the median penile raphe. Masculinization is an androgen-driven process, beginning under the influence of human chorionic gonadotropin (hCG), which stimulates the Leydig cells of the fetal testes to produce testosterone.[8] Testosterone is then converted to the more active dihydrotestosterone (DHT) by the enzyme 5-α reductase type II. For DHT to effect masculinizing action on the developing genitalia, it must bind to androgen receptors located in the genital tissues.[9] Cellular signaling through the androgen receptors must be intact.[10] Early effects of testosterone are an
increase in the distance between the anus and genital structures, followed by elongation of the genital tubercle, which will become the penile shaft and glans.\textsuperscript{11} The genital swellings, also called the labioscrotal folds, migrate caudally and start to fuse, forming the scrotum.\textsuperscript{8} A urethral groove developing on the underside of the penis becomes the urethra.\textsuperscript{11} Folds of tissue, called urethral folds, that frame the lateral walls of this groove have inner (endodermal) and outer (ectodermal) edges.\textsuperscript{8,11}

Fusion of the urethral folds, from anterior to posterior, forms the male penile urethra. (A) Elongated genital tubercle with closing of urethral folds at approximately day 57. (B) Urethral folds closed at approximately day 58\textsuperscript{11}. As the urethral groove develops from the posterior to anterior surface, it is soon enclosed by fusion of the endodermal folds to form a tubular penile urethra.\textsuperscript{10,12}

The fusion of the endodermal edges creates an epithelial seam that is subsequently reabsorbed.\textsuperscript{7} The ectodermal edges then fuse over the urethra to fashion the penile shaft skin, leaving behind the median raphe\textsuperscript{11}. The distal, or glanular urethra, develops last by 1 of 2 possible mechanisms.\textsuperscript{12} The classic theory is that the distal portion of the urethra develops as an ingrowth from the tip of the penis until it joins the proximal tubular urethra.\textsuperscript{8,13} Recent evidence, however, suggests that the entire urethra, from base to tip, is formed by continuous extension and fusion of the endodermal urethral groove.\textsuperscript{12,14}

The main defect of hypospadias, the abnormally located urethral opening, is considered a failure of some stage in this orderly process of development. A
normal penile urethra with a meatus at the tip of the glans requires proper formation of the urethral groove, urethral folds, and fusion of the folds with seam formation and seam removal. Failed seam formation during fusion of the urethral folds results in hypospadias, and the site of failure dictates the final position of the urethral meatus.

The 2 features that commonly accompany hypospadias, penile curvature and incomplete foreskin, also represent normal stages of embryologic development. The developing fetal penis is curved ventrally because the penis and the shaft skin grow faster on the dorsal (upper) than on the ventral aspect. Concurrent with urethral development, at about 8 weeks following ovulation, the prepuce (foreskin) arises from the base of the glans, growing primarily on the dorsal surface of the penis. As the prepuce advances distally, it also grows ventrally to completely cover the glans. If the urethral folds fail to fuse, as in hypospadias, the preputial growth is also interrupted. Hypospadias at more distal locations (e.g. distal glanular hypospadias) is associated with fusion of the urethral folds to the base of the glans, at least. Thus, in these very minor degrees of hypospadias, normal preputial development is possible.

Additional risk factors for hypospadias include maternal age >35, primiparity, and use of assisted reproductive technology, such as in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). The reasons for these associations with hypospadias are not yet understood. Paternal subfertility, as evidenced by low sperm motility and abnormal sperm morphology, has been found to a greater degree in fathers of boys with hypospadias. This has prompted speculation that hypospadias in some boys
born after ICSI might reflect inheritance of mutant genes that are the root cause of subfertility in their fathers.\textsuperscript{[17]}

There is a growing concern that exposure to hormonally active agents in the environment, also known as endocrine disruptors, might be contributing to declining reproductive health in humans, and in particular, males.\textsuperscript{[19,20-21]} Endocrine disruptors are synthetic or natural substances that can interfere with hormone systems by mimicking, blocking, or otherwise altering the normal action of hormones during critical periods of embryonic or fetal development.\textsuperscript{[21]} Humans are continually in contact with endocrine-disrupting chemicals (EDCs) that are present in food and the environment.\textsuperscript{[7]}

2.2. Prevalence of hypospadias:

The study include changes in prevalence of hypospadias in Denmark during a 29-yr period and to investigate whether maternal age was associated with the prevalence of hypospadias.

Among 921,745 boys born alive from 1977 to 2005, they identified 3490 boys with hypospadias. The prevalence increased from 0.24% in 1977 to 0.52% in 2005, prevalence was 0.38% in sons of mothers aged 25 yr, 0.37% in sons of mothers aged 26–30 yr, 0.39% in sons of mothers aged 31–35 yr, and 0.39% in sons of mothers 35 yr, found That hypospadias prevalence was increasing in Denmark from 1977 to 2005. Increased maternal age did not explain this event\textsuperscript{[30]}.

2.3. Etiology of hypospadias:
The multi-factorial etiology of hypospadias is becoming more defined with ongoing investigation. Implicated factors include testosterone biosynthesis defects, 5 alpha-reductase type 2 mutations, androgen receptor mutations (rare), IVF (progesterone administration or endocrine abnormalities associated with infertility), and environmental agents that can disrupt the male sex hormone axis. It also seems that the incidence of hypospadias is on the rise, both in the United States and in Europe. [33]

2.4. Seasonal pattern of hypospadias occurrence:

The study of live birth deliveries in Mashhad city located in northeast Iran in maternity hospital from Oct 2006 to Sep 2008. This study included only solitary hypospadias cases. During two years 6149 babies were born in our hospital; 25 cases (0.4%, 4 in 1000 live births) of hypospadias were identified. Hypospadias occurred in 0.76% of male deliveries. Most cases of hypospadias were born in summer and winter was the season which least number. Prevalence in this population was intermediate (4 in 1000 live births). Seasonal pattern of occurrence as an environmental factor in this study was that about half of the affected babies were born in summer and least figure of occurrence was recorded in winter. This is the first report on seasonal pattern of hypospadias occurrence. The conception age and first trimester of pregnancy in these births were in winter and must be attributed to cold environment as a cause of hypospadias [34].
2.5. Classification of hypospadias:

The position of the urethral meatus forms the basis of anatomic classification, the newborn with hypospadias has a displacement of the urethral meatus from the tip of the glans penis to the ventral surface, or underside, of the penis, scrotum, or perineum. The location of the urethral meatus is used to classify the hypospadias into subgroups. Most boys with hypospadias have a subcoronal or proximal glanular meatus, primarily because this is the region of the last stage of fetal urethral development. Classification systems do not take into account the degree of penile curvature or other individual features or anomalies; thus, they do not always correlate directly with severity of the condition or extent of surgical repair that might be required.

Most forms of hypospadias are immediately recognized during physical examination of the newborn. Suspect hypospadias when there is incomplete formation of the foreskin. Look for corroborating features, such as a penile raphe that is displaced from the midline and a glans that is tilted downward. The meatus might appear to be pinhole-sized, but is usually patent. The majority of hypospadias cases are glanular, coronal, or subcoronal. Use specific, anatomically descriptive terms to designate the location of the ectopic meatus.

Variations of hypospadias from mild to severe. Glanular (meatus is on the dorsal surface of the glans penis). Coronal (meatus is at or just below the coronal margin). Distal (meatus is on the distal third of the penile shaft). Penoscrotal (meatus is at the base of the shaft, in front of the scrotum). Scrotal
(meatus is on the scrotum or between the genital swellings). Perineal (meatus is below the scrotum)[23].

2.6. **Risk factors:**

In most cases, the cause of this birth defect is not fully understood. Treatment with hormones such as progesterone during pregnancy may increase the risk of hypospadias.[24] Certain hormonal fluctuations, such as failure of the fetal testes to produce enough testosterone or the failure of the body to respond to testosterone, increase the risk of hypospadias and other genetic problems. Sometimes hypospadias is inherited[24].

There may also be an increased risk of hypospadias in infant males born to women of an advanced age or those who used *in vitro* fertilization (IVF) to conceive. The connection to IVF, may be due to the mother's exposure to progesterone, a natural hormone, or to progestin, a synthetic form of progesterone, administered during the IVF process.[24,25]

Prenatal testosterone, converted in the genital skin to dihydrotestosterone, causes migration of skin fibroblasts to fully enclose the urethral groove in fetal males, normally resulting in an enclosed penile urethra by the second trimester of pregnancy. Failure of adequate prenatal androgen effect is therefore thought to be involved in many cases, making severe hypospadias a very mild form of intersex (under-virilization of a genetic male). Since postnatal androgen deficiency can only be demonstrated in a minority of cases, it has been proposed that transient deficiency of testosterone can occur during critical periods of fetal
genital development, due to elevation of anti-müllerian hormone or more subtle degrees of pituitary-gonadal dysfunction. More recently, abnormalities of transcription factors have been proposed.[26]

In a minority of cases a postnatal deficiency of, or reduced sensitivity to, androgens (testosterone and dihydrotestosterone) can be demonstrated. These are often associated with a chordee, and in severe cases a residual perineal urogenital opening and small phallus. This combination of birth defects is referred to as pseudovaginal perineoscrotal hypospadias and is part of the spectrum of ambiguous genitalia. Treatment with testosterone postnatally does not close the urethra[27].

Genetic factors are likely involved in at least some cases, as there is about a 7% familial recurrence risk[27,28]. A 2010 found a 2.5 times increase in the condition for boys with a specific genetic defect that was carried on the X (maternally contributed sex) chromosome.

Rare iatrogenic urethral injuries similar to hypospadias after procedures such as surgery, catheterization, or circumcision have been reported[28].

The risk factors for cryptorchidism and hypospadias, study includes . 6,177 boys with cryptorchidism, 1,345 with hypospadias and 23,273 male controls born live in Denmark from 1983 to 1992 to determine the effects of cryptorchidism and hypospadias on the presence of the other abnormality in an individual, the presence of the abnormalities in an older brother, birth weight, weeks of gestation, maternal history of stillbirth, parity, twin birth, parental age, nationality and professional status, found that birth weight was the principal
determinant of cryptorchidism and hypospadias. Twins were at lower risk for both abnormalities than singletons in the same birth weight classes. There are indications of separate genetic as well as common environmental causes of cryptorchidism and hypospadias[31].

2.7. Maternal exposure to DDT in malaria area:

The risk of external urogenital birth defects(UGBD) in newborn boys from a malarial area currently sprayed with technical 1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane (DDT), as increased fetal oestrogenic or anti-androgenic exposure might be involved in the pathogenesis of increased prevalence of human male reproductive tract anomalies, Of the newborn boys 10.8% (357) had UGBDs; a multivariate logistic model showed that mothers who lived in villages sprayed with DDT between 1995 and 2003 had a significantly greater chance (33%) of having a baby with a UGBD than mothers whose homes were not sprayed, conclude that Maternal exposure to DDT by living in a DDT-sprayed village was associated to having male offspring with one or more UGBDs.[32]

2.8. Management:

First degree hypospadias are primarily a cosmetic defect and have little effect on function except for direction of the urinary stream. If uncorrected, a second or third degree hypospadias can make urination messy, necessitate that it be performed sitting, impair delivery of semen into the vagina (possibly creating
problems with fertility), or interfere with erections. In developed countries, most hypospadias are surgically repaired in infancy[28].

Surgical repair of first and second degree hypospadias is nearly always successful in one procedure, usually performed in the first year of life by a pediatric urologist or a plastic surgeon[28].

When the hypospadias is third degree, or there are associated birth defects such as chordee or cryptorchidism, the best management can be a more complicated decision. A karyotype and endocrine evaluation should be performed to detect intersex conditions or hormone deficiencies. If the penis is small, testosterone or human chorionic gonadotropin (hCG) injections may be given to enlarge it before surgery[29].

Surgical repair of severe hypospadias may require multiple procedures and mucosal grafting. Preputial skin is often used for grafting and circumcision should be avoided before repair[29].

Due to the difficulties and lower success rates of surgical repair of the most severe degrees of under virilization, some of these genetically male but severely undervirilized infants have been assigned and raised as girls, with feminizing surgical reconstruction[29].
3. Materials and Methods

3.1. Study Design:

It is an observational descriptive retrospective hospital based study.

3.2. Study Area and Duration:

The study was conducted at the Ribat University Hospital.

The study was held during the period from January 2014 to December 2014.

3.3. Study Population:

3.3.1. Inclusion criteria:

80 patients diagnosed as hypospadias and admitted to the Peadiatric Surgical Unit for purposes of surgical intervention.

3.3.2. Exclusion criteria:

- Patients diagnosed as epispadias.

3.4. Study variables:

1. Patient age
2. Residence.
3. Type of hypospadias.
4. Associated condition.
5. Mother age.
6. Parity (number of deliveries)
7. Status of pregnancy (hormonal therapy).
8. Mode of delivery.
10. Family history of similar condition and the degree of relation.

3.5. Sampling:

3.5.1. Sample type:
Simple random sampling.

3.5.2. Sample size and technique:
were collected to fulfill the research requirements. 80 patients’ records

3.6. Data collection:

3.6.1. Data collection tools:
Data collection sheets were used to include the study variables (appendix).

3.6.2. Data Analysis:
Data was analyzed by using SPSS computer program, version 19.

3.6.3. Data Management:
Data was analyzed as mentioned above, and then it was presented and described by using the text, table charts, diagrams, graphs and figures.

3.7. Ethical Considerations:
Consents were delivered to the Pediatric surgical department and to statistic for records at the above mentioned hospital to precede the data collection.

4. Results

Eighty patients who admitted to Ribat University Hospital, pediatric surgical unit in 2014 were included in this retrospective hospital based study.

The mean of patients age was 7.4, with the range of 17, minimal age 2 with percentage of 2.5%

The maximum age was 19 with the percentage of 2.5%. The standard deviation was 4.13.

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>32</td>
<td>40.00</td>
</tr>
</tbody>
</table>

Table (4-1): Patients age during the study period
Of the 80 patients, 44 of them were live in Khartoum state with the percentage of 55%, followed by Aljazerra 12 pt with the percentage of 15%, western sudan had the same percentage. 7 of them were from eastern sudan with the percentage 8.8%. 5 were from north sudan with the percentage 6.3%.

Table (4-2): Resident of study population

<table>
<thead>
<tr>
<th>State</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khartoum</td>
<td>44</td>
<td>55.0</td>
</tr>
<tr>
<td>Jazerra</td>
<td>12</td>
<td>15.0</td>
</tr>
<tr>
<td>western sudan</td>
<td>12</td>
<td>15.0</td>
</tr>
<tr>
<td>estern sudan</td>
<td>7</td>
<td>8.8</td>
</tr>
<tr>
<td>north sudan</td>
<td>5</td>
<td>6.3</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig (4-1): Resident of study population
Regarding the type of hypospadias, the commonest type is the distal with the frequency 56 (70%). Followed by the proximal type with frequency 20 (25%). The least representation was for the mid shaft frequency of 4 (5%).

Table (4-3): type of hypospadias among study population

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal</td>
<td>20</td>
<td>25.0</td>
</tr>
<tr>
<td>Midshaft</td>
<td>4</td>
<td>5.0</td>
</tr>
<tr>
<td>Distal</td>
<td>56</td>
<td>70.0</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig(4-2): Type of hypospadias among study population
According to the associated conditions, the chordee found in 33pt (41.3%) and it was the commonest association. The UDT was not found. Both chordee and UDT were found in 26 (32.5%) of patients.

**Table (4-4): Hypospadias associated conditions**

<table>
<thead>
<tr>
<th>Association</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>21</td>
<td>26.3</td>
</tr>
<tr>
<td>Chordee</td>
<td>33</td>
<td>41.3</td>
</tr>
<tr>
<td>Both</td>
<td>26</td>
<td>32.5</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig (4-3.1): Hypospadias associated conditions
Fig (4-3.2): Hypospadias associated conditions
The mean of mother’s age was 32, with the range of 36, minimal age 19 with the percentage of 1.3%. The maximum age was 55 with the percentage of 2.5%. The standard deviation was 7.63.

Table (4-5): The mother age in the study period

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>2</td>
<td>2.50</td>
</tr>
<tr>
<td>21-30</td>
<td>41</td>
<td>51.25</td>
</tr>
<tr>
<td>31-40</td>
<td>29</td>
<td>36.25</td>
</tr>
<tr>
<td>41-50</td>
<td>5</td>
<td>6.25</td>
</tr>
<tr>
<td>51-60</td>
<td>3</td>
<td>3.75</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The mother parity mean was 3.41, with the range 10, minimal of 1 with the percentage of 11.3%.

The maximum deliveries 11 with the percentage of 1.3%. The standard deviation was 1.99.

Table (4-6): Mother parity (number of deliveries)

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>9</td>
<td>11.3</td>
</tr>
<tr>
<td>2.00</td>
<td>21</td>
<td>26.3</td>
</tr>
<tr>
<td>3.00</td>
<td>18</td>
<td>22.5</td>
</tr>
<tr>
<td>4.00</td>
<td>14</td>
<td>17.5</td>
</tr>
<tr>
<td>5.00</td>
<td>11</td>
<td>13.8</td>
</tr>
<tr>
<td>6.00</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>7.00</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>10.00</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>11.00</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig(4-4): Mother parity (number of deliveries)
In 79 of mothers, the pregnancy was spontaneous, and one induced by hormonal therapy.

**Table (4-7): The nature of mother’s pregnancy**

<table>
<thead>
<tr>
<th>Pregnancy</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous</td>
<td>79</td>
<td>98.8</td>
</tr>
<tr>
<td>Induction</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig (4-5): The nature of mother’s pregnancy
The mode of delivery was NVD in 70 (87.5%) of mothers, and 10 (12.5%) by C/S.

**Table (4-8): The mode of delivery among the mothers**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVD</td>
<td>70</td>
<td>87.5</td>
</tr>
<tr>
<td>C-S</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Fig (4-6): The mode of delivery among the mothers
The mean of father’s age was 40.41, with the range of 40, minimal age 25 with the percentage of 1.3%, the maximum age was 65 with the percentage of 1.3%.

The standard deviation was 9.41.

**Table (4-9): Father age**

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-30</td>
<td>15</td>
<td>18.75</td>
</tr>
<tr>
<td>31-35</td>
<td>12</td>
<td>15.00</td>
</tr>
<tr>
<td>36-40</td>
<td>23</td>
<td>28.75</td>
</tr>
<tr>
<td>41-45</td>
<td>12</td>
<td>15.00</td>
</tr>
<tr>
<td>46-50</td>
<td>9</td>
<td>11.25</td>
</tr>
<tr>
<td>51-55</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>56-60</td>
<td>7</td>
<td>8.75</td>
</tr>
<tr>
<td>61-65</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Regarding the family history of similar conditions, 6 of pts had +Ve history. 5 of them were 1st degree and 1 was 2nd degree relation. The rest of the pts were -Ve.

Table (4-10): History of similar condition in the family

Table (4-11): Degree of relation in the similar condition
Fig (4-7): History of similar condition in the family
Fig (4-8): Degree of relation in the similar condition
5. Discussion

Eighty patients who admitted to Ribat University Hospital, pediatric surgical unit in 2014 were included in this retrospective hospital based study.

The mean of patients age was 7.4, with the range of 17, minimal age 2 years with percentage of 2.5%, and the maximum age was 19 with the percentage of 2.5%. The standard deviation was 4.13. That reflected the late presentation of Sudanese patients, that the surgical repair of first and second degree hypospadias, usually performed in the first year of life by a pediatric urologist or a plastic surgeon [28].

Eighty patients, 44 of them were live in Khartoum state with the percentage of 55%, followed by Aljazerra 12 pt with the percentage of 15%, western Sudan had the same percentage, 7 of them were from eastern Sudan with the percentage 8.8% and 5 were from north Sudan with the percentage 6.3%.

Khartoum represented the center of Sudan so they are many different tribes and people came for many reasons. This like retrospective study done in Elribat University Hospital, department of Paediatrics surgery, for patients who underwent hypospadias surgical repair in the period January 2006 to June 2007. Fifty patients in this study. Regional distribution of the patients showed that 52% of the patients live in Khartoum state, the capital, while 48% were from the peripheries [36].
Regarding the type of hypospadias, the commonest type is the distal with the frequency 56 (70%). Followed by the proximal type with frequency 20 (25%). The least representation was for the mid shaft frequency of 4 (5%).

According to the associated conditions, the chordee found in 33pt (41.3%) and it was the commonest association. The UDT was not found alone. Both chordee and UDT were found in 26 (32.5%) of patients.

Like the same study done in Elribat university hospital, department of paediatrics surgery, anterior hypospadias was the commonest type (46%), and associated chordee occurred in most of the patients (88%). The most common associated anomalies found were undescended testicles (20%) and inguinal hernia only in (2%) [38].

The mean of mother’s age was 32, with the range of 36, minimal age 19 with the percentage of (1.3%), the maximum age was 55 with the percentage of (2.5%). The standard deviation was 7.63, there is no relationship between increasing mother age and hypospadias.

Agree with the study done in Denmark from 1977 to 2005, 3490 boys with hypospadias. The prevalence increased from 0.24% in 1977 to 0.52% in 2005, prevalence was 0.38% in sons of mothers aged 25 yr, 0.37% in sons of mothers aged 26–30 yr, 0.39% in sons of mothers aged 31–35 yr, and 0.39% in sons of mothers 35yr. That the prevalence of hypospadias did not differ according to maternal age [37].
Also Carlson has reported that advanced maternal age was associated with increased severity of hypospadias in their population. Several explanations have been postulated for the finding of increased incidence and severity of hypospadias with increasing maternal age\(^{(38)}\).

The mother parity mean was 3.41, with the range 10, minimal of 1 with the percentage of (11.3%), the maximum deliveries 11 with the percentage of (1.3%). The standard deviation was 1.99. Has no significance in increasing risk.

Two studies have examined the combination of maternal age and parity, and both these studies have shown twofold to threefold higher risks of hypospadias among older primiparous women, as compared to younger, multiparous women\(^{(38)}\).

In 79 of mothers, the pregnancy was spontaneous, and one induced by hormonal therapy.

The mode of delivery was NVD in 70 (87.5%) of mothers, and 10 (12.5%) by C/S.

Maternal sub-fertility has been proposed to contribute to higher risks of hypospadias observed among older and primiparous women. Multiple births and fertility treatments, specifically intracytoplasmic sperm injection, are associated with increased risk of hypospadias \(^{(31)}\).
The mean of father’s age was 40.41, with the range of 40, minimal age 25 with the percentage of 1.3%, the maximum age was 65 with the percentage of 1.3%. The standard deviation was 9.41.

Regarding the family history of similar conditions, 6 of pts had +Ve. 5 of them were 1st degree and 1 was 2nd degree relation. the rest of the pts were -Ve.

Our result not like Asklund study showed that fathers of boys with hypospadias have increased frequency of hypospadias, 11% of fathers had hypospadias. They found that positive family history of hypospadias was significant in affected babies, as 44% of neonates had positive background in family\(^{(39)}\).
6.1. Conclusion

The mean of patient’s age considered as late presentation.

Regarding the type of hypospadias, the commonest type is the distal and the chordee was the commonest association.

The mean of mother’s age and the mother parity has no significance in increasing risk of hypospadias.

Most of mothers, the pregnancy was spontaneous and the mode of delivery was NVD.

Regarding the family history of similar conditions there is no significance family history or genetic etiological factor.
6.2. Recommendations

Hypospadias is one of the commonest penile abnormalities in new born males, so must training of midwifes for early examination

The condition has a huge impact on the patient's psychological, emotional and sexual well being, so the parents must present their child early to surgical department.

Evaluation of the risk factor help in the limitation of hypospadias in Sudan.
7. References


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37. Lars Lund a, Malene C, Elsevier B.V.. Department of Urology, Viborg Hospital, DK-8800 Viborg, Denmark


Appendix

The National Ribat University
and scientific researches Faculty of graduate studies
Data Collection Sheet
Prevalence Of Hypospadias And Etiological Factors In Sudan 2014
submitted by:
Arafa Eltayeb Hassan

File no :………………………………………………………………………..

Pt Name: ....................................................

Age: ( ) Resident: ( )

C/O:( ) Type:( )

Assosciation condition : CHordee( ) UDT( ) both( )

Mother : Age,( ) Parity,( )

Pregnancy: Spontaniouss( ), Induction( ),

Mode of delivery:NVD( ), C/S( )

Father: Age,( )

Similar codition,( )

Family history,( )

1 st ( ) 2 nd ( ) 3 rd ( ) degree of relation.