

# Evaluation of the Pediatric Neurogenic Bladder Dysfunction of the Patients in King Abdulaziz University Hospital, Jeddah Saudi Arabia

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## Abstract

A neurogenic bladder results from conditions that affect either the central or peripheral nervous system. This study reviewed all of the pediatric neurogenic patients in the King Abdulaziz University Hospital from 2008 to 2018, using their medical records and histories. The patients' ages were between one month and 16 years during their first diagnosis. Patients with more than 50% missing data were excluded. A total of 678 patients were diagnosed with neurogenic bladder during the study period. But only the data of 212 patients were processed for statistical analysis. The patients' median age was 9 years. The causes of neurogenic bladder in these patients were 1) spina bifida in 110 patients (51.8% of the sample population), 2) non-neurogenic neurogenic bladder (Hinman syndrome) in 40 (18.8%) cases, 3) bilateral hydronephrosis in 72 (33.9%) patients, and 4) urine incontinence, which was the main complain in 132 (62%) patients. Sixty-four (30%) patients had urine retention and were dependent on catheter. Spina bifida was the main cause of neurogenic bladder in this study group. Upper tract status of the patients during their presentation had affected the complication rates and the decisions to administer surgical intervention.

## Keywords

Pediatric neurogenic bladder; Neurogenic bladder surgical intervention; Upper tract deterioration; Pediatric; Neurogenic bladder

## Introduction

Neurogenic bladder (NGB) results from a variety of conditions that affect either the central or peripheral nervous system. Thus, its manifestations differ accordingly. The prevalence and incidence of NGB in the Middle East are unknown due to scarce epidemiological reports from the region<sup>[1]</sup>.

There are different causes of NGB, which range from mechanical to functional, such as spina bifida, spinal cord injuries, pelvic surgery cerebral palsy, spinal dysraphisms, tumors, and anorectal malformations. Multiple sclerosis, Parkinsonism, stroke, autonomic neuropathy, and cerebral palsy were also noted as causes<sup>[2]</sup>.

Neurogenic bladder can lead to a progressive damage of the renal system, if untreated, putting the patients to be constantly at risk in developing upper urinary tract damages. Thus, the early detection and management of the condition will prevent major harm to the upper urinary tract and will improve the patients' quality of life, as suggested in previous studies<sup>[3]</sup>.

The main goals of the NGB management is to achieve continence, avert renal complications, such as urinary tract infections (UTIs), and achieve a good quality of life. The initial conservative management includes both medical therapy and the intermittent use of catheter, which causes a decrease in renal complications and the need for a later augmentation surgery. Some patients may need further surgical interventions in order to preserve their upper tract function and to maintain their lower urinary tract function<sup>[4]</sup>.

The aim of this current study was to review NGB in the pediatric population in King Abdulaziz University Hospital (KAUH), to determine its most common causes, and to present its symptoms, the relevant surgical interventions, and its complications.

## Methodology

This study encompassed a retrospective review of all of the KAUH pediatric neurogenic patients from 2008 to 2018. We included patients with pediatric ages from 1 month to 16 years during the time of their first diagnosis. These diagnoses included spina bifida, sacral agenesis, neurogenic bladder post imperforate anus and pelvic operation, Hinman syndrome (non-neurogenic

neurogenic bladder), cerebral palsy, and road traffic accidents. Excluded were the older patients during the time of their presentation and those patients with posterior urethral valve. We also excluded the patient files with more than 50% missing data. All of the data that were used in this study were transferred directly to Microsoft Excel sheet (Microsoft Corp., Redmond, WA USA) and were further coded. Statistical analyses were done using IBM SPSS Statistics for Windows, version 19 (IBM Corp., Armonk, NY USA).

## Results

A total of 678 patients were diagnosed with NGB during this study period. Four-hundred sixty-six patient files were excluded due to the significant lack of data. The patients were followed in more than one hospital. Statistical analyses were done on the data of 212 patients. The ages of the patients ranged from 1 year to 29 years, with a median age of nine years.

The causes of neurogenic bladder in these patients included spina bifida in 110 (51.8%) patients, non-neurogenic neurogenic bladder (Hinman syndrome) in 40 (18.8%) cases, sacral agenesis in 22, imperforated anus in 16, cerebral palsy in 15, road traffic accident in five, pelvic operations in two cases, and spinal tumors in two patients. Bilateral hydronephrosis was diagnosed in 72 (33.9%) patients, while 27 (12.7%) patients had unilateral hydronephrosis. Thirty-six patients (16.9%) had bilateral vesicoureteral reflux. Negative voiding cystourethrogram (VCUG) was found in 147 (69.3%) patients. A nuclear scan was done in all patients, showed unilateral obstruction in eight of these patients. Urinary incontinence was the main complaint of 132 (62%) patients, while 64 (30%) patients had urinary retention and were dependent on catheter use. Anticholinergic medications were given to 141 (66.5%) patients. Constipation was reported by 108 (50.9%) patients. Eighteen patients had fecal incontinence. Most patients (147/69%) did not require any urological surgical intervention, while 18 patients had vesicostomy. Augmentation cystoplasty was carried out in 17 patients, intravesical Botox injection in 21, sacral neuromodulation in three, and ureterostomy in six patients.

The complications observed included renal failure in 15 (7%) patients, stone formation in 73 (34%) patients, and urinary tract infections in 124 (58%) patients. Peritoneal dialysis was required in three patients, while 151 patients did not require any dialysis.

Correlation analysis showed a significant relationship between surgical intervention and the presence of reflux, with a *P* value of 0.004, and between surgical intervention and the use of medication, with a *P* value of 0.014. A significant correlation between complications and several factors, including hydronephrosis, the presence of obstruction based on diethylenetriaminepentaacetic acid imaging results, fecal incontinence, and medication use, with *P* values of 0.001, 0.045, 0.013, and 0.023, respectively.

## Discussion

In this study, spina bifida was found to be the most common cause of pediatric NGB, which supports the results of a study also done also in KAUH in 2006 by Dr. Jameela A. Kari<sup>[5]</sup> and another study by Larijani *et al.*<sup>[6]</sup>. Both studies concluded that spina bifida is the most common cause of NBD in children in Iran (2013). In a multidisciplinary study done in Turkey by Sarica *et al.*<sup>[7]</sup>, it was concluded that 11 (23%) patients out of 47 had suffered from urinary incontinence, while in our study, this number has reached 132 (62%) patients.

Patients with NGB were found to have more frequent UTI episodes, stone formation, and renal failure, in this order. Recurrent UTI in our study had, by far, the highest incidence with 58%, compared to the studies by Sarica *et al.*<sup>[7]</sup> in 2003 in Turkey that reported a 23% of incidence of UTI.

Also, in this study, only 7% of the patients developed renal failure. This low number of failures was due to early diagnoses. On the other hand, a study conducted in India in 2017 showed that renal failure had affected 50% of the patients, and this high incidence was due to the delayed first-time presentation, *i.e.*, only after seven years<sup>[8]</sup>.

Nearly two-thirds of the enrolled patients in our study were prescribed with anticholinergic medications, and they showed significant responses and better outcomes with respect to complications, such as hydronephrosis, lower renal failure rate, fecal incontinence, and obstruction in diethylenetriamine penta-acetic acid. In a study by Lehnert *et al.*<sup>[9]</sup>, it was also shown that 19 of the 21 patients responded to a solely conservative management treatment. In cases of refractory to medical treatment, surgical intervention was performed, and it was found to have a strong significance with the decrease of vesicoureteral reflux incidence in these patients<sup>[5]</sup>.

There were several limitations in our study. First, there was the exclusion of a big sample size due to the lack of data. Second, the focus was only concentrated in one center, and third, there was the lack of follow-up by the patients for the continuation of their treatments.

## Conclusion

Spina bifida was the main cause of NGB in this study. The upper tract status during presentation had affected the decision to administer surgical intervention and the rates of complication. Parents, caring for their children with NGB, were monitored in more than one healthcare facility, a study procedure which significantly affected the gathering of medical data and their availabilities. The presence of one center for these patients would provide a good chance to provide better patient care, clinical follow-ups, outcomes, and Saudi pediatric patient research.

## Summary

We studied pediatric neurogenic bladder cases in the King Abdulaziz University hospital from 2008 to 2018 and assessed their causes, their upper tract status, and the decisions to administer surgical interventions.

## Conflict of Interest

The authors declares that they have no conflict of interest that is related to this study and this article.

## Disclosure

The authors did not receive any type of commercial support either in forms of compensation or financial for this study. The authors have no financial interest in any of the products or devices, or drugs mentioned in this article.

## Ethical approval and consent to participate

The study was approved by the Ethics Committee of the KAUH in Jeddah, Kingdom of Saudi Arabia, also known as the Institutional Review Board of Hospitals.

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## تقييم حالات المثانة العصبية لدى الأطفال في مستشفى جامعة الملك عبد العزيز

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**المستخلص.** المثانة العصبية تحدث نتيجة لوجود خلل في الجهاز العصبي المركزي او الطرفي، و تركز هذي الدراسة على فئه الاطفال المصابين بمثانه عصبية والذين تتم متابعتهم في مستشفى جامعه الملك عبد العزيز بجده، و جرت مراجعة جميع ملفات الاطفال الذين تم تشخيصهم بمثانه عصبية من عام ٢٠٠٨ الى عام ٢٠١٨، وشمل البحث الاطفال من عمر شهر واحد الى ١٦ سنه اiban التشخيص وتم اقصاء الملفات ذات المعلومات غير المكتملة، ومن ثم جمع المعلومات في ملف اكسل وتحليلها احصائيا باستخدام برنامج اس.بي.س.س، وبلغت الحالات التي تم تشخيصها بمثانه عصبية ٦٧٨ طفل وجرى عمل البحث على معلومات ٢١٢ طفل، وكان متوسط عمر الاطفال ٩ سنوات وكانت اسباب المثانه العصبية في الدراسة - الصلب المشقوق في ١١٠ طفل (٥١,٨%) و متلازمه هنمان في ٤٠ حاله (١٨,٨%) و تم تشخيص ارتجاع في الكليتين في ٧٢ طفل (٣٣,٩%) وكانت الشكوى الأساسية من سلس البول عند ١٣٢ طفل (٦٢%)، بينما ٦٤ طفل (٣٠%) كانوا يعانون من احتباس في البول، وكان سلس البول السبب الرئيس لمعظم حالات المثانة العصبية التي تم تشخيصها عند الاطفال، كذلك كان لتضخم الكلى في وقت التشخيص تاثير على قرار التدخل الجراحي وعلى نسبة المضاعفات.