

Determination of Uroflowmetry Nomograms in Healthy Indonesian Children Aged 5 to 15 Years Old in Hasan Sadikin Hospital, Bandung

Jupiter Sibarani¹, Safendra Siregar¹, Henry Stanzah¹ and Ruankha Bilommi^{2*}

¹Department of Urology, Faculty of Medicine University of Padjadjaran, Hasan Sadikin Hospital Bandung, Indonesia

²Department of Pediatric surgery, Mitra Keluarga Kelapa gading general hospital, Jakarta, Indonesia

Abstract

Background: Uroflowmetry is a simple, non-invasive, feasible examination. The standard reference for uroflowmetric nomogram today is still under debate. The normal value of uroflowmetry on children is highly varied in each country, there is has not been any reference to use for normal value of uroflowmetry on children in Indonesia. We aimed to establish uroflowmetry nomograms for healthy Indonesia children in Hasan Sadikin Hospital Bandung based on healthy children uroflowmetry examination between 5 to 15 years of age.

Methods: A total of 302 uroflowmetry examination were performed on healthy Indonesian children with no history of a renal, urological, or neurological disorder between the ages 5 and 15 years old. The voided volume, the maximum and average urinary flow rates were analyzed using statistical software. Linear regression analysis was used to generate nomograms.

Result: Uroflowmetric parameters increased with increasing age, with the effect being more pronounced in girls. There were 2 groups, with group 1 consisting of patients 5 to 10 years old and group 2 consisting of patients 11 to 15 years old. There were 76 boys and 76 girls in group 1 and 75 boys and 75 girls in group 2. In group 1 the maximum and average flow rates were 15.07 ± 6.66 (ml/sec) and 9.29 ± 3.61 (ml/sec) for boys, and 15.23 ± 6.15 (ml/sec) and 9.43 ± 3.29 (ml/sec) respectively, for girls. In group 2 these rates were 16.14 ± 5.06 (ml/sec) and 9.77 ± 3.74 (ml/sec) for boys and 19.38 ± 7.15 (ml/sec) and 11.21 ± 3.41 (ml/sec) respectively, for girls. When comparing uroflow parameters between boys and girls, significantly higher values were obtained in girls regarding Voided volume ($p < 0.001$), Qmax ($p < 0.001$) and Qavg ($p < 0.001$).

Conclusion: Nomograms are important tools to assess the lower urinary tract abnormalities and to evaluate response of either surgical or medical therapy in children. Uroflowmetry is a simple, cost effective and noninvasive. This study provides uroflow parameters for mean maximum flow rate for healthy Indonesian healthy children aged 5 to 15 years old (boys and girls) in Hasan Sadikin Hospital Bandung and will hopefully promote wider application of uroflowmetry testing in the pediatric population.

Keywords: Uroflowmetry; Nomograms; Children

Introduction

Urodynamic study is a basic test to evaluate voiding disorders. Uroflowmetry, as widely used non-invasive urodynamic examination in children, is designed to establish diagnosis and control over complaints of urinary disorders [1-4]. Evaluation symptoms of urinary disorders by non-invasive methods (urine analysis, questionnaire, uroflowmetry and residual urine test) is not only helpful in planning a rational therapy, but it is also useful to evaluate any response to therapy [2-5].

Uroflowmetry is a simple and feasible examination. The standard reference for uroflowmetric nomogram today is still under debate. The normal value of uroflowmetry on children is varied in each country, so there is no any reference to use for normal value of uroflowmetry on children in Indonesia.

Uroflowmetric nomogram on children is still under debate. Some previous studies show relatively different results from each other develop a nomogram for younger man using a relatively small amount of data. Nomogram developed by is confined to older women. All those nomograms were developed for adults; one well-known nomogram for children is Miskole's nomogram. This nomogram was developed from data on 433 micturitions. When bladder has maximum content, the rate of urinary flow is, on average, 16 (ml/s) and 14 (ml/s) in girl and boy, respectively [3-7].

Research on the uroflowmetric nomogram for children today has not been conducted in Hasan Sadikin Hospital. Consequently, it is necessary to conduct research on the uroflowmetric nomogram for

children in polyclinic of Hasan Sadikin Hospital, Bandung.

The objective of present study is to determine the normal value of uroflowmetry on boys and girls at Hasan Sadikin Hospital, Bandung. This study eventually will be producing uroflowmetric nomograms to be used as a benchmark for uroflowmetric examination in Hasan Sadikin Hospital, Bandung.

Subjects and Methods

This study was conducted at Child Clinic and Urologic Action Room of Hasan Sadikin Hospital, Bandung. Subjects engaged in this study are required to meet inclusive criteria as follows: Children aged 5-15 years.

Meanwhile, the exclusive criteria set are children with neurological and psychological disorders, voided volume < 50 ml (according to

***Corresponding author:** Ruankha Bilommi, Division of Pediatric Surgery, Faculty of Medicine, Padjadjaran University, Hasan Sadikin General Hospital, Bandung, Indonesia, Tel: 6281319426287; E-mail: rbilommi@gmail.com

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standardized ICSS) and urological disorders or history of urinary tract stones.

In this study, we found 302 children who met inclusive criteria. Sampling was done by using non-probability sampling techniques or random retrieval techniques. Children were divided into 4 groups according to gender and age 5-10 years (Figure 1) to 11-15 years (Figure 2). All children are subject to directly uroflowmetric examination in Urologic Action Room of Hasan Sadikin Hospital. In the course of examination, the uroflowmetry should be placed in quiet and closed site. The hydration state of child was assessed based on children appearance, and we just included children with good hydration state. We did not assess the subject with any nutritional scoring. When urinating, boys were in a standing position and girls were in a sitting position under uroflowmetric examination. Qmax, Qwave, Voided Volume, Time To Qmax, and Flow Time may be observed in uroflowmetric output (Figure 3).

Results

Descriptive analysis

Descriptive data analysis is designed to provide a view of the object of study based on the data and variables obtained from subject group under study to be shown in a frequency distribution (Table 1).

Distribution of uroflowmetric parameter frequencies based on age and gender: The Table 2 suggests that uroflowmetric parameter in children with lifespan of 5-15 years (Figures 4-6) has higher rate for girls than that of boys. This is consistent with two previous studies by Gupta et al. [5], Kajbafzadeh et al. [4] Women will have higher maximum value of urinary stream due to their shorter urethra [8-11].

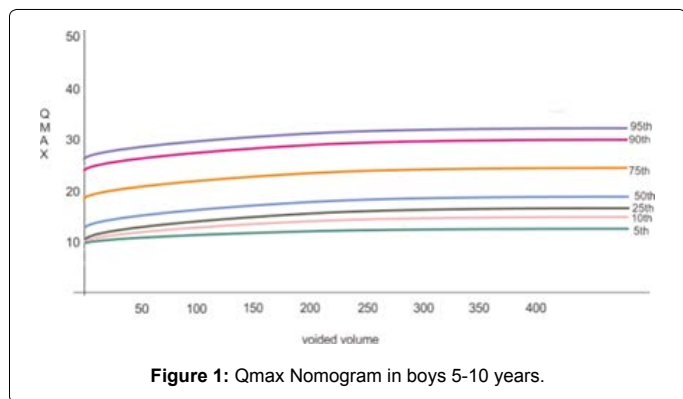


Figure 1: Qmax Nomogram in boys 5-10 years.

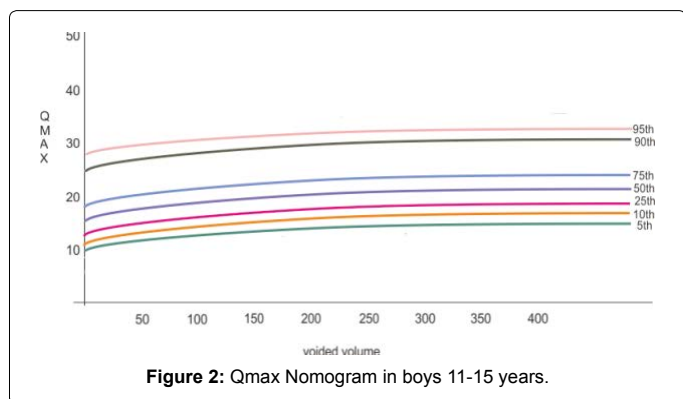


Figure 2: Qmax Nomogram in boys 11-15 years.

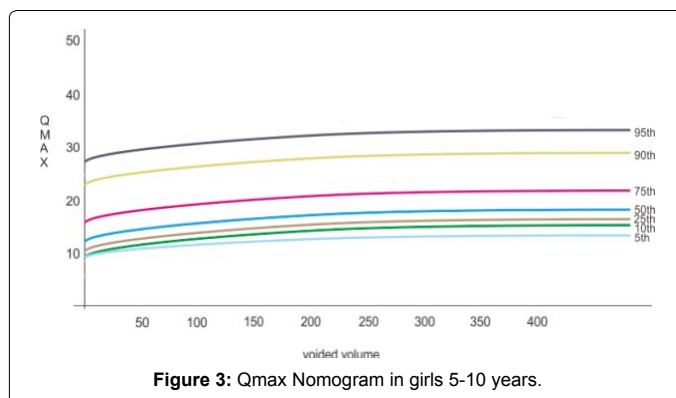


Figure 3: Qmax Nomogram in girls 5-10 years.

Mean+Uroflowmetric Parameter SD	Age 5-10 Years	
	Male	Female
Voided Vol (ml)	119.24 ± 56.97	113.04 ± 48.91
Qmax (ml/sec)	15.07 ± 6.66	15.23 ± 6.15
Qavg (ml/sec)	9.29 ± 3.61	9.43 ± 3.29
Time to Qmax (secs)	6.01 ± 4.00	5.97 ± 4.19
Flow time	12.88 ± 4.69	11.89 ± 4.48

Table 1: Distribution of uroflowmetric parameter frequencies, age 5-10 years.

Mean+Uroflowmetric Parameter SD	Age 11-15 Years	
	Male	Female
Voided Vol (ml)	137.79 ± 59.36	151.59 ± 62.32
Qmax (ml/sec)	16.14 ± 5.06	19.38 ± 7.15
Qavg (ml/sec)	9.77 ± 3.74	11.21 ± 3.41
Time to Qmax (secs)	7.33 ± 7.53	5.76 ± 4.92
Flow time	13.85 ± 7.68	13.40 ± 5.17

Table 2: Distribution of uroflowmetric parameter frequencies, age 11-15 years.

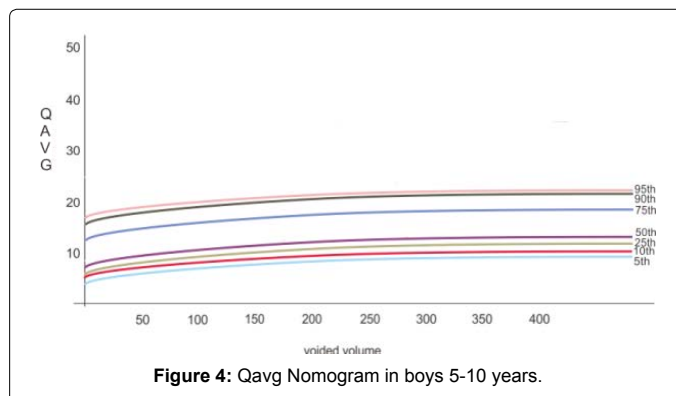


Figure 4: Qavg Nomogram in boys 5-10 years.

Nomograms for Qmax and voided volume were developed by using a percentile regression method; the percentile observed is 5th, 10, 25, 50, 75, 90, 95 and they are developed separately between boys and girls.

Discussion

The results of the study and the data analysis suggest that there is good correlation between voided volume and Qmax or Qavg in both boys and girls at lifespan of 5-15 years and the correlation power range from moderate to strong. When voided volume is high, likewise Qmax [12,13]. In addition, there is correlation between voided volume and Qavg in both boys and girls at lifespan of 5-15 years (Figure 7) and the

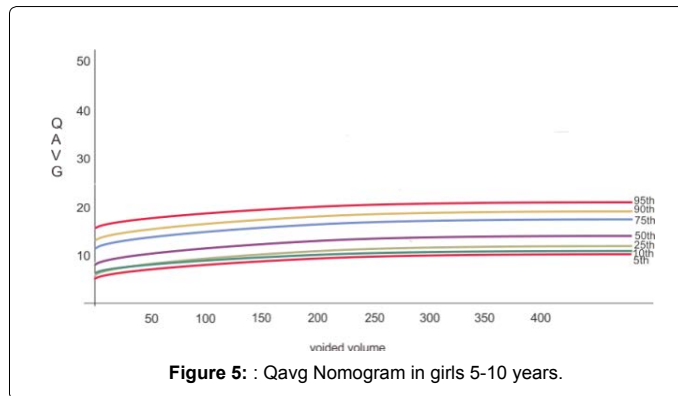


Figure 5: : Qavg Nomogram in girls 5-10 years.

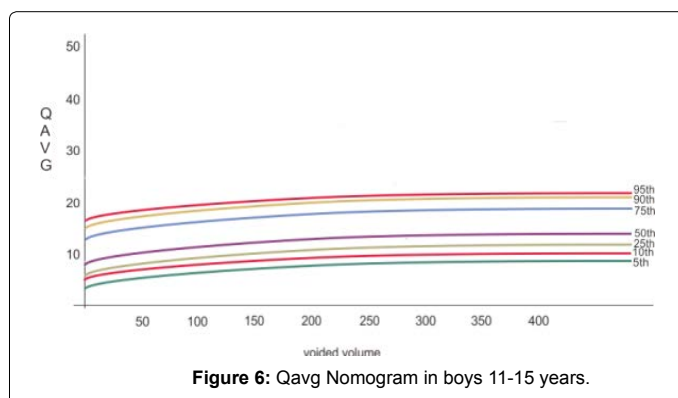


Figure 6: Qavg Nomogram in boys 11-15 years.

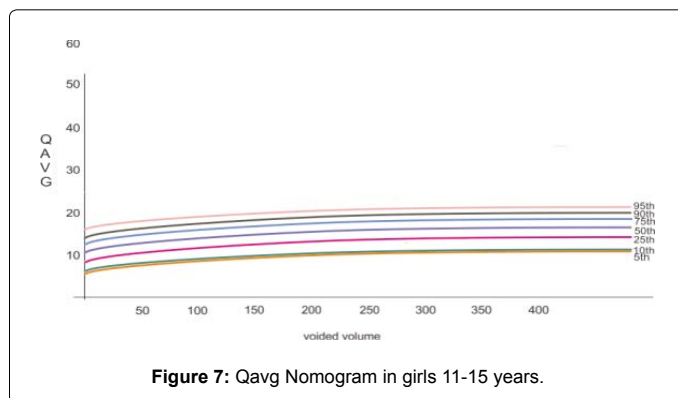


Figure 7: Qavg Nomogram in girls 11-15 years.

correlation power range from moderate to strong [14-16].

Conclusion

Based on the results of data analysis derived from both gender and age range, we found significant correlation between voided volume and Qmax, and correlation power ranging from moderate to strong. It implies that voided volume and Qmax have good correlation, when voided volume is high, and vice versa.

Nomogram in percentile is useful for diagnosing urinary flow disorders through the wide range of voided volume. This study provides reference for mean maximum flow rate on normal boy and girl in Hasan Sadikin Hospital, Bandung. This uroflowmetry is a screening test for urinary disorders in children.

Summary

Introduction

Uroflowmetry is a simple, non-invasive, feasible examination. The normal value of uroflowmetry on children is highly varied in each country. there is has not been any reference to use for normal value of uroflowmetry on children in Indonesia.

Objective

The aim of this study is to establish uroflowmetry nomograms for healthy Indonesian children between 5 to 15 years of age.

Study design

- ◆ **Subject :** A total of 302 uroflowmetry examination
- ◆ **Patient :** Healthy Indonesian children with no history of a renal, urology, or neurological disorder between the ages 5 and 15 years old.
- ◆ **Materials :** The voided volume and the maximum and average urinary flow rates were analyzed.
- ◆ **Methods. :** This study is prospective study, cross sectional with analytic statistical results using Linear regression analysis was used to generate nomograms.

Results

Comparing uroflow parameters between boys and girls, significantly higher values were obtained in girls regarding Voided volume ($p < 0.001$), Qmax ($p < 0.001$) and Qavg ($p < 0.001$).

Discussion

This study provides uroflow parameters for mean maximum flow rate for healthy Indonesian healthy children aged 5 to 15 years old (boys and girls) in Hasan Sadikin Hospital Bandung and will hopefully promote wider application of uroflowmetry testing in the pediatric population. Based on the results of data analysis derived from both gender and age range, we found significant correlation between voided volume and qmax in healthy Indonesian children aged 5 to 15 years old (boys and girls) in Hasan Sadikin Hospital, Bandung, and correlation power ranging from moderate to strong. It is implying that voided volume and qmax have good correlation. When voided volume is high, and vice versa.

Conclusion

Nomograms are important tools to asses the lower urinary tract abnormalities and to evaluate response of either surgical or medical therapy in children.

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