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Evaluation of Blood Pressure in Children with Hydronephrosis in Comparison with Healthy Children

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Abstract

Background: Nowadays hypertension (HTN) is a common finding in children. Also, hydronephrosis is a common clinical condition that is referred to physicians. Kidney disease is the most common reason of secondary HTN in children.
Objectives: In this study, the researchers aimed at evaluating the relationship between HTN and hydronephrosis in children.
Methods: This was a case-control study that was done on children older than four years old. The case group included children with hydronephrosis that referred to the pediatrics clinic of Amirkabir hospital in Arak, Iran. At the same time, healthy children with the same demographic condition were entered in the control group.
Results: This study was done on 328 children in case (108 children: 42 males and 66 females) and control (220 children: 98 males and 122 females) groups. The mean age of these children was 7.52 ± 2.48 years old. Overall, 95.4% of the case group and 85% of the control were in the normal range of diastolic blood pressure (P-value = 0.013) and 99.1% of the case group and 89.5% of the control group were in the normal range for systolic blood pressure (P-value = 0.007).
Conclusions: It could be concluded that hydronephrosis and HTN had a relationship.

Keywords: Child, Hypertension, Hydronephrosis

1. Background

Obstruction lesion in the urinary tract could occur in any section of the meatus to infundibulum of the calyx. Most causes of this obstruction are congenital (1). Obstruction in the urinary tract may be identified by ultrasonography during pregnancy (2). Systolic and diastolic blood pressure usually increase from the one to eighteen years old. Hypertension in children is defined as blood pressure being greater than 95th percentile considering age, gender, and height (3). Kidney disease is the most common reason for secondary HTN in children (4, 5). Blood pressure of less than the 90th percentile is normal and blood pressure between 90th and 95th is pre-HTN (6).

Because HTN can cause major organ damage and early diagnosis can prevent this damage, in this study, the researchers compared blood pressure in healthy children and children with hydronephrosis.

2. Methods

This was a case control study that was done on children older than four years old. The case group included children with hydronephrosis that referred to the pediatrics clinic of Amirkabir hospital in Arak, Iran. At the same time, healthy children without any problem in their kidney and urinary system and with the same demographic condition (age, gender, socioeconomic status, etc.) entered the control group.

Blood pressure and height of children were measured. For measuring the blood pressure, standard methods and citizen digital blood pressure monitor were used (REFCH-311B).

3. Results

In this study, 108 children with hydronephrosis entered the case group and 220 healthy children entered the control group. The mean age of these children was 7.52 ±

Table 1. Children's Age

Group	Mean	Standard Deviation	P-Value
Case	7.28	2.43	0.233
Control	7.63	2.51	
Total	7.52	2.48	

Table 2. Children's Gender

Group	Gender, No. (%)		P-Value
	Male	Female	
Case	42 (38.9)	66 (61.1)	0.330
Control	98 (44.5)	122 (55.5)	
Total	140 (42.7)	188 (57.3)	

Table 3. Children's Weight

Group	Mean	Standard Deviation	P-Value
Case	25.47	10.65	0.244
Control	26.95	10.94	
Total	26.46	10.85	

Table 4. Children's Height

Group	Mean	Standard Deviation	P-Value
Case	122.51	10.65	0.178
Control	125.12	16.78	
Total	124.27	16.49	

2.48 years old (Table 1). In this study, 140 children (42.7%) were male and 188 (57.3%) were female (Table 2). The mean weight of these children was 26.46 ± 10.85 kg (Table 3). The mean height of these children was 124.27 ± 16.49 cm (Table 4).

This study showed that 10 children of the control group (4.5%) had diastolic HTN, blood pressure of 23 children in the control group (10.5%) was in the pre-HTN range, and blood pressure of five children in the case group (4.6%) was in the pre-HTN range (Table 5).

Also, this study showed that 12 children of the control group (5.5%) had diastolic HTN, blood pressure of 11 children in the control group (5.0%) was in the pre-HTN range, and one child in the case group (0.9%) had blood pressure in the pre-HTN range (Table 6).

Table 5. Diastolic Blood Pressure in Children

Group	Diastolic BP, No (%)			P-Value
	Normal	Pre HTN	HTN	
Case	103 (95.4)	5 (4.6)	0 (0)	0.013
Control	187 (85.0)	23 (10.5)	10 (4.5)	
Total	290 (88.4)	28 (8.5)	10 (3.0)	

Table 6. Systolic Blood Pressure in Children

Group	Systolic BP, No (%)			P-Value
	Normal	Pre HTN	HTN	
Case	107 (99.1)	1 (0.9)	0 (0)	0.007
Control	197 (89.5)	11 (5.0)	12 (5.5)	
Total	304 (92.7)	12 (3.7)	12 (3.7)	

4. Discussion

Although prevalence of chronic kidney disease in children is less than adults, in these children the prevalence of HTN is 10 times more than healthy children (7). Furthermore, HTN and CKD have a relationship with each other. The function of the kidneys is basic for keeping fixed the blood pressure. Therefore, with a decrease of kidney function, blood pressure will increase (8, 9).

In this study, the researchers compared blood pressure in children with or without hydronephrosis. The study found a relationship between children with or without hydronephrosis in systolic and diastolic blood pressure.

Ameur et al. reported that bilateral hydronephrosis could increase blood pressure and cause renal failure by inappropriate production of renin and chronic urinary retention (10).

Carlstrom et al. reported that all hydronephrotic mice had a salt-sensitive HTN and their HTN correlated with the degree of hydronephrosis (11).

Munoz et al. reported that young patients with hydronephrosis may experience an episode of acute hypertensive (12).

4.1. Conclusion

According to the current results, it could be concluded that hydronephrosis has a relationship with systolic and diastolic HTN and it seems that this relationship for systolic HTN is stronger than diastolic HTN. Therefore, in the treatment of hydronephrosis, systolic and diastolic HTN should be considered. Future studies on this topic are recommended.

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References

1. Lameire N, Van Biesen W, Vanholder R. Acute renal failure. *Lancet*. 2005;**365**(9457):417–30. doi: 10.1016/S0140-6736(05)17831-3. [PubMed: 15680458].
2. Yousefichaijan P, Dorreh F, Rafeie M, Sharafkhah M, Safi F, Amiri M, et al. Congenital anomalies of kidney and upper urinary tract in children with congenital hypothyroidism; a case-control study. *J Renal Inj Prev*. 2015;**4**(4):120–6. doi: 10.12861/jrip.2015.26. [PubMed: 26693499]. [PubMed Central: PMC4685982].
3. Pakniyat A, Yousefichaijan P, Parvizrad R, Qaribi M. Hypertension in children in emergency department. *J Renal Inj Prev*. 2016;**5**(3):171–3. doi: 10.15171/jrip.2016.36. [PubMed: 27689117]. [PubMed Central: PMC5040007].
4. Gavrilovici C, Boiculese LV, Brumariu O, Dimitriu AG. [Etiology and blood pressure patterns in secondary hypertension in children]. *Rev Med Chir Soc Med Nat Iasi*. 2007;**111**(1):70–81. [PubMed: 17595849].
5. Kapur G, Ahmed M, Pan C, Mitsnefes M, Chiang M, Mattoo TK. Secondary hypertension in overweight and stage 1 hypertensive children: a Midwest Pediatric Nephrology Consortium report. *J Clin Hypertens (Greenwich)*. 2010;**12**(1):34–9. doi: 10.1111/j.1751-7176.2009.00195.x. [PubMed: 20047628].
6. Yousefichaijan P, Khosrobeigi A, Soltani M, Ghandi Y, Mojtahedi F. Evaluation of blood pressure in children with idiopathic overactive bladder syndrome. *Saudi J Kidney Dis Transpl*. 2018;**29**(3):540–4. doi: 10.4103/1319-2442.235177.
7. Olowu WA. Pre-treatment considerations in childhood hypertension due to chronic kidney disease. *World J Nephrol*. 2015;**4**(5):500–10. doi: 10.5527/wjn.v4.i5.500. [PubMed: 26558187]. [PubMed Central: PMC4635370].
8. Horowitz B, Miskulin D, Zager P. Epidemiology of hypertension in CKD. *Adv Chronic Kidney Dis*. 2015;**22**(2):88–95. doi: 10.1053/j.ackd.2014.09.004. [PubMed: 25704344].
9. Gallibois CM, Jawa NA, Noone DG. Hypertension in pediatric patients with chronic kidney disease: management challenges. *Int J Nephrol Renovasc Dis*. 2017;**10**:205–13. doi: 10.2147/IJNRD.S100891. [PubMed: 28794651]. [PubMed Central: PMC5538700].
10. Ameur A, Zarzur J, Jira H, Touiti D, el Alami M, Abbar M. [Hydronephrosis arterial hypertension. Report of 4 cases]. *Ann Urol (Paris)*. 2002;**36**(3):157–61. French. [PubMed: 12056086].
11. Carlstrom M, Wahlin N, Sallstrom J, Skott O, Brown R, Persson AE. Hydronephrosis causes salt-sensitive hypertension in rats. *J Hypertens*. 2006;**24**(7):1437–43. doi: 10.1097/01.hjh.0000234126.78766.00. [PubMed: 16794495].
12. Munoz AI, Baralt JF, Melendez MT. Arterial hypertension in infants with hydronephrosis. Report of six cases. *Am J Dis Child*. 1977;**131**(1):38–40. [PubMed: 835520].