A Prospective Study on Pediatric Hypertension in Libyan Patients with Kidney Diseases

Yassmin A Alteer[1], Naziha R Rhuma[2], Azza M Kara[3 (*)]

[1] ***Dept. of pharmacology, faculty of pharmacology, Tripoli University, Tripoli - Libya***

[2] ***Nephrology unit, Tripoli children hospital, Tripoli University, Tripoli - Libya***

[3] ***Dept. of general pediatric, Tripoli children hospital, Tripoli University,Tripoli - Libya***

Abstract

Background: *Hypertension (HT) in children is an increasing concern of health care proffesionals.in particularly, hypertension presented with chronic kidney disease. Secondary HT is more common in children than primary type. Aims of the study are: to determine the prevalence and common underlying causes of hypertension in patients with kidney diseases and relationship between age, gender, obesity,*

(*) Email: azzakara6@yahoo.com

drugs, and other factors and to evaluates the patterns of antihypertensive prescribed for children.

Patients and methods *our study was based on survey and measurement of blood pressure in pediatric patients who referred to nephrology clinic. HT screening was performed on 73 children aged from 3 months to 17 years.* ***Result*** *The total number of patient in this study is 73, 45(61.6%) were males, and 28 (38.3%) were females. The majority (27.4%) were adolescent between age 13-15 years with SBP 127.9±15.9 mm hg (mean ±SD) and DBP 77.97±9.5 mmhg (mean ±SD).*

Conclusions: *our study found that nephrotic syndrome and chronic kidney disease, where the highest renal disease associated with high blood pressure. BMI was the most highlighted risk factor detected that representing in total nearly 43% of all children in this study. ACEIs (Enalapril) was the most used anti HT agents about 90% of children prescribed Enalapril for them.*

Key words*:* *Hypertension, systolic blood pressure, diastolic blood pressure, nephrotic syndrome.*

1 Introduction

Hypertension (HT) is one of the major contributors to CVS, renal and CNS morbidity and mortality [1]. It is more common in adults than in children. This being seen with increasing frequency in pediatric patients recently. Basically HT is defined as average systolic BP (SBP) and /or diastolic BP (DBP) ≥ 95th percentile for gender, age, and height on 3 occasions[2]. There is no simple target BP reading that indicates high BP in children because what is considered normal BP changes as children grows up. There are 2 types of HT in children, primary (essential HT), and secondary HT which is more common in pediatric patients. It is most often caused by renal disease, coarctation of aorta, or endocrine disease. Primary HT commonly associated with positive family history of HT or CVS disease. Most of primary HT with no obvious cause, most children over the age of 6 years fall into this category. Secondary HT is more prevalent in children than in adults. The updated classification of HT in children was published in August 2004 by the national BP education program [3]. Staging of HT in pediatric follows the percentile classification **[3]**. The updated guidelines also incorporate accurate numbers corresponding to the 50th, 90th, 95th, and 99th BP percentiles corresponding to age [4].HT is classified into Prehypertensive (above normal), Hypertension stage 1 and stage 2 hypertension **[3], [1]**. Also it is classifying according to clinical presentation into mild to moderate, severe, and hypertensive crisis **[5], [6], and [7]**. The indication of therapy should be started with a single agent according to national BP education program [8]. Approved international children antihypertensive agents must be used. Severe symptomatic HT should be treated with intravenous anti-hypertensive drugs such as Diuretic, beta-adrenergic blockers, calcium channel blockers, angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers **[9],[10],[11],[12]**.

Patients and methods

Our prospective study was based on survey and measurement of BP in children who referred to nephrology clinic at Tripoli Children Hospital (TCH). TCH is a referral hospital provides medical serveries to children in western part of Libya. HT screening was performed on 73 patients aged from 3months to 17 years coming for follow up in nephrology clinic. Mean age was (10 ± 4.44 years). The following patient data, age, gender, weight, height, BMI, by using growth charts and Zscore of BMI provided by the centers for disease control CDC [3], [13] were measured in each patient. BMI was calculated as weight in (kg)/Height [3]. Family history of hypertension, and past medical history were recorded. HT was measured according to National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents [3]. The hypertension in children and adolescents was defined as average systolic BP (SBP) and/or average diastolic BP (DBP) ≥ 95th percentile for gender, age, and height on ≥3 occasions. Prehypertension in children is defined as average SBP or DBP levels that are ≥90th percentile but <95th percentile. A patient with BP levels >95th percentile in a physician's office or clinic, who is normotensive outside a clinical setting, has "white-coat hypertension." Ambulatory BP monitoring (ABPM) is usually required to make this diagnosis [4] .

Statistics analysis

Data coded then analysed using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). Simple descriptive statistics as frequencies and percentage for categorical variables, and mean with the standard deviation (SD) for quantitative variables were performed.

Result

This study included 73 children 45(61.6%) were male and 28(38.3%) were female. The majority (27.39%) were adolescent between ages 13-15 years. The age of these children rang from 3months to 17 years coming for follow up in nephrology clinic. Mean age was (10 ± 4.44 years).

Table 1: Socio-demographic characteristics and clinical data of children screening for HT at nephrology unit:

Character	Data
Total (n)	73
Age (mean±SD)	10 ±4.44 years
Gender	
Male	45(61.6%)
Female	28(38.3%)
Height (M)	1.32(±0.23)
Weight (KG)	38.11(±19.21)
SBP mmhg (mean ±SD)	127.94(±15.89)
DBP mmhg (mean±SD)	77.97(±9.5)

Table 2: The mean and total percent of different age groups

NO	Age	Mean (± SD)	Number (%)
1	Infant (< 2 years)	1 (±0.72)	4(5.47)
2	Children (3-5 years)	4.2 (±0.97)	9(12.3)
3	Children (6-9 years)	7.2(±1.06)	18(24.65)
4	Children (10-12 years)	11(±0.77)	16 (21.91)
5	Adolescent (13-15 years)	14.2(±0.83)	20 (27.39)
6	Adolescent (16-18 year)	16.3(±0.51)	6 (8.2)

Number (%) of patient

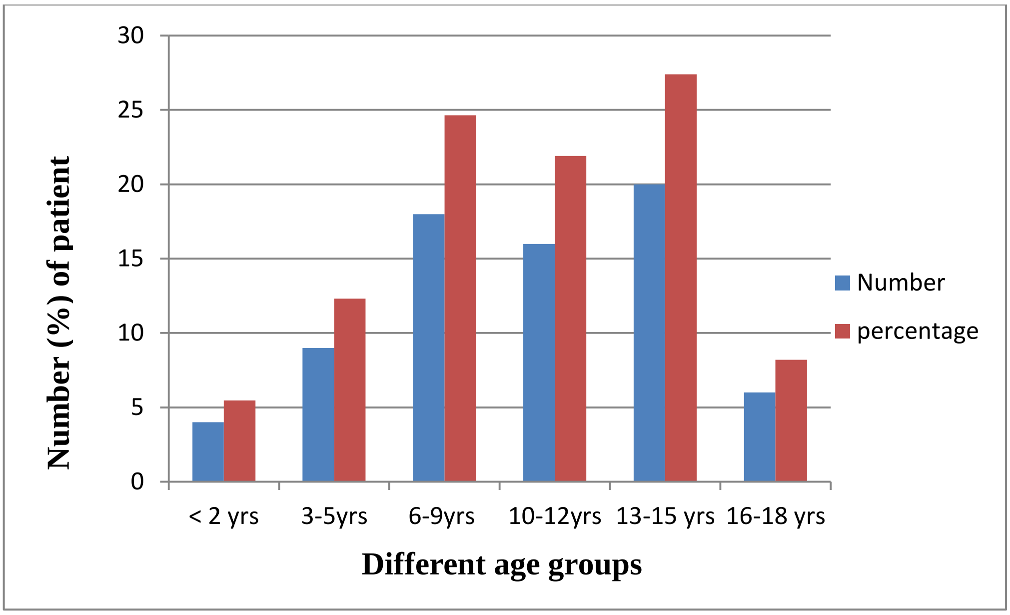

Chart 1: shows correlation of various age groups and percentage into total No

Body mass index (BMI) in all selected cases was 19.89 ±5.16. Male presented (16.4%) categorized under obese, 19.2% were overweight, the remaining 19.2% were healthy, and 5 patient were under weight. For female patients 3 were obese, other 5 females were overweight, 15 patients (20.05%) were healthy and 5 patients were under weight.

Table 3: Body Mass Index Categories for Males and Females in this study respectively:

NO	Body mass index	Mean ±SD Males	Number (%)	Mean SD Female	Number %
1	Obese	25.11±2.8	12(16.4)	29.6±4.2	3(4.1)
2	Over weight	21.65±2.1	14(19.2)	27.7±2.1	5(6.8
3	Healthy	18.1±1.9	14(19.2)	16.6±2.23	15(20.5)
4	Under weight	14.66±1,08	5(6.8)	13.3±0.11	5(6.8)

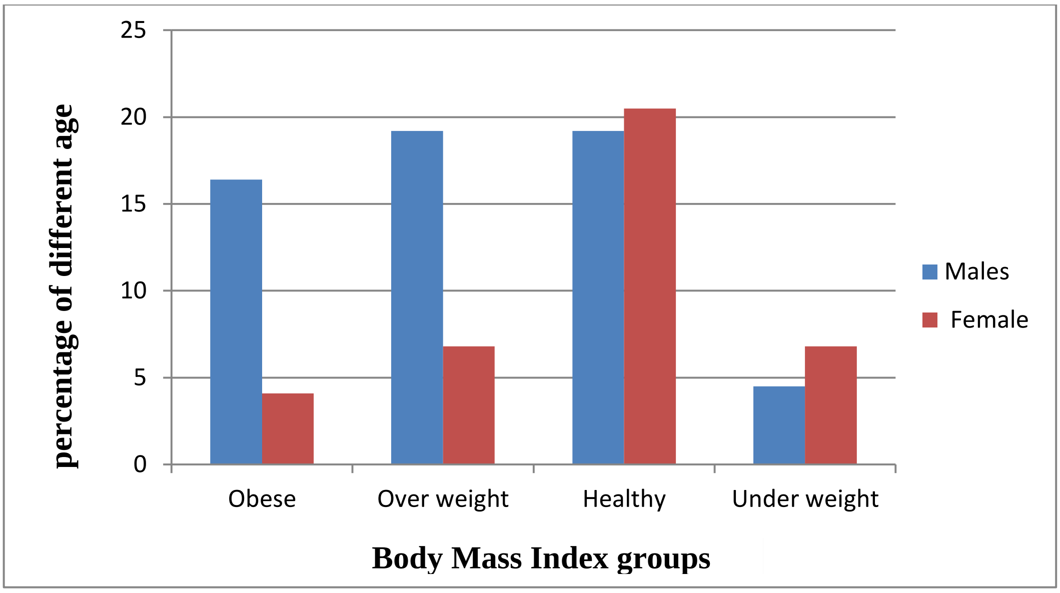

Chart 2: categories for male and female calculated as% from $total^{no73}$

Blood Pressure systolic and diastolic BP were 127.94±15.89 and 77.97±9.5 respectively pre

-hypertensive represented nearly 10.95%, stage 1 in 34patients (46.5%) and 26(35.61%) were classified as stage 2 only 5(6.48%) had normal BP. Different renal disease is shown in table 4

Table 4: Renal diseases reported in all pediatric patients in our study

NO	Renal Diseases	Number (%)
1	Congenital defect	9(12.3)
2	Urinary tract infection	11(15)
3	Glomerulonephritis	8 (10.9)
4	Chronic kidney disease	25 (34.2)
5	Nephritic syndrome	38 (15)
6	End stage renal disease	18 (19)
7	Kidney nephrectomy	1(1.3)
8	Renal transplant	4(5.4)

Blood pressure in nephrology unit was measured by electronic equipment (Dinamap).

Antihypertensive ACEIs prescribed for 90% , Enalapril was prescribed in (80.8%), Diuretic for 51%, vasodilator for 32%, CA-channel blocking agents used in 31.4%, Beta-blockers used in 14.9%, Angiotensin receptor blockers used in 9.5%.

Table 5: Antihypertensive agents prescribed for all patients in this study:

NO	Antihypertensive Class	Number (%)
1	Angiotensin Converting Enzyme Inhibitors	66 (90.3)
2	Diuretic	27 (51)
3	Ca-channel blocker	23 (31.4)
4	vasodilator	24(32.8)
5	Beta blocker	11 (14.9)
6	Angiotensin receptor blockers	7 (9.5)
7	Glycoside	3 (4.1)
8	Centrally acting	2(2.7)
9	ACEI $_s$+ hydrochlorothiazide	3(4.1)

Discussion:

Our prospective study was carried out on 73 patients all were seen in nephrology clinic at TCH, the BP were measured and calculated in percentile for all selected subjects. The mean age of the selected cases was 10.01±4.4, the higher percentage of hypertension was in Patients above 7 years, most of them were males comparing to females (61%.36 VS38.3 %) this finding was also reported by other researchers[12]. The mean of Systolic was 127.94 ±15.89 and for, DBP Was 77.79±9.5, our study found the highest stage 1 then stage 2, which presented in approximately 82.11% of total nephrotic syndrome patients selected for this study. Around 6.84% of subjects were well controlled BP and still keeping on maintenance doses of antihypertensive medications, maybe to avoid sudden rise of their BP. All selected patients n =73 were well known cases with renal/ kidney diseases and most of them the hypertension was secondary to it. As mentioned in literature, there is much closer relationships between HT and kidney disease [15]. Our study found that nephrotic syndrome and chronic kidney disease respectively, where the highest renal disease associated with HT .The other diseases include UTI, congenital defects, almost have the same percentage about 15 % of each. Other studies indicated that the most common underlying cause of second HT in children is renal parenchymal disease, often caused by glomerulonephritis or congenital problems unlike young adults with HT only 5% of HT is secondary HT[15]. American family physician annual comments confirmed that the most common cause of second HT is kidney disease [15].

Obese overweight BMI was the most highlighted risk factor detected that represented in total nearly 43% of all patients in this study. Male presented the highest level than female. The prevalence of HT increases progressively with increasing BMI, and some studies have detected HT in over 30 % of obese children (BMI≥95percentile) [16], [17]. The strong association of high BP with obesity and the marked increase in the prevalence of childhood obesity indicates that both hypertension and pre HT are becoming a significance health issue in the young [10].

The second ranking risk factor in this study was a family history, hereditary (HT, renal disease, DM) were in total reported for almost 70% of total selected patients. About 32% presented nephrotic cases. Our study did not include race factors. ACEIs Enalapril was the most used anti HT agents that 90% of patients prescribed Enalapril for them. As we know retrospective effects of renin angiotensin system blockade is due to a combination of reduced proteinuria and lower intraglomerular pressure through selective dilatation of the glomerular efferent arteriole and anti-inflammatory and ant fibrotic effects [14]. Diuretics were used in high percentage and the handed dosage regime [6]. More over several drugs commonly administered in CKD such as erythropoietin, glucocorticoid and cyclosporineA, independently elevated BP iatrogenic in a dose dependent fashion. The steroid was given to 56 of total cases without any precaution guidance helped to overcome the side effects mainly water retention that lead to increased BP.

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