



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Prevalence of hypertension in 1247 children with CKD: a report from the first Iranian pediatric CKD registry



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Introduction – 1

Chronic kidney disease (CKD) is a public health concern for adult and pediatric patients¹

¹Lancet 2013; 382: 158–69

Introduction – 2

High BP is both an important **cause** and effect of CKD and affects a large portion of CKD patients²⁻⁷

²J Pediatr 2006; 149: 671–675

³BMC Nephrol 2016; 17: 13

⁴Pediatr Nephrol 2014; 29: 2387–2394

⁵Am J Kidney Dis 2004; 44: 1017–1023

⁶Pediatr Nephrol. 2016;31:2137–2144

⁷Pediatr Nephrol. 2013;28:401–408.

Introduction – 3

Despite the importance of blood pressure (BP) control in pediatric CKD , hypertension (HTN) is known to be **underdiagnosed** and **undertreated**⁸.

The prevalence of pediatric CKD has been estimated as ranging from **15 to 74.7** cases **per one million** children⁹

⁸Hypertension. 2008;52:631–637

⁹Pediatr Nephrol 2007;22(12):1999–2009

Introduction – 4

The aims of our study were to determine the prevalence and distribution of high BP in 1247 pediatric patients with CKD, and also to compare the prevalence of HTN in children who underwent renal replacement therapy (RRT) with those on conservative treatment.

Material & Methods-1

This **cross-sectional** study was carried out from **January 1991 -December 2009**.

The data collection was based on information in the Iranian Pediatric Registry of chronic kidney disease (IPRCKD) core data set

The inclusion criteria of the study were:

- (1) estimated creatinine clearance (eCCI) ≤ 75 mL/min/1.73m² body surface area according to Schwartz's formula^{13, 14} for at least 3 months :
- (2) age <19 years at the time of registration.

¹³ Paediatrics. 1976; 58: 259-63

¹⁴ J Pediatr. 1984; 104: 849-54

Material & Methods-3

BP readings **<90th percentile** are categorized as **normotensive**, those ≥ 90 th and **<95th percentiles** as prehypertensive, and those with **systolic and/or diastolic BP over the 95th percentile** was defined as **hypertensive**.

Material & Methods-5

All the Iranian Pediatric Nephrology Units
potentially involved in caring of children and
adolescents , **was invited to report** index cases.



Material & Methods-6

The patients were categorized into those with CKD classification described by the Clinical Practice Guidelines of the National Kidney Foundation's **Kidney Disease Outcomes Quality Initiative (KDOQI guidelines) at CKD stages 2–5¹⁶**

¹⁶ Am J Kidney Dis 2002; 39: S1–S2 66(suppl1)

Results-1

From January 1991 to December 2009, **1247** children were registered (662 boys, 585 girls)

The mean age at registration of patients was 7.69 ± 4.72 years; range 3 months to 18 years.

¹⁶ Am J Kidney Dis 2002; 39: S1–S2 66(suppl1)

Results-2

At the entry into the registry,

41(3.28%) children were in CKD Stage 2,

94 (7.54%) in CKD Stage 3,

176 (14.11%) in CKD Stage 4

and 936 (75.06%) were in CKD Stage 5.

Registry[reference]	NAPRTCS[]	Italian Registry []	Belgian Registry[]	ANZDATA []	ESPN/ERA-EDTA[]Registry	UK Renal Registry []	Japanese Registry[]	Present Registry
Period	1994-2007	1990-2000	2001-2005	2003-2008	2008	2004-2008	1998	1991-2009
Population	CKD (GFR <75)	CKD (GFR <75)	CKD (GFR <60	ESRD(RRT)	ESRD(RRT)	ESRD(RRT)	ESRD(RRT)	CKD (GFR <75)
Age range	0-20	0-19	0-19	0-19	0-15	0-15	0-19	0-19
Study sample size	7,037	1,197	143	369	499	428	582	1247
Etiology								
CAKUT	3,361(48%)	689(58%)	84(59%)	127(34%)	182(36%)	184 (43%)	208(36%)	499(40%)
Hypodyspalasia± reflux nephropathy	1,907	516	66	95	.....	135	198	309 (24.7%)
Obstructive uropathy	1,454	173	18	32	.....	49	10	190 (15/2%)
Glomerulopathy	993 (14%)	55 (5%)	10 (7%)	108(29%)	76(15%)	78(18%)	130(22%)	237(19%)
HUS	141(2%)	43(4%)	9 (6%)	9 (2%)	29(6%)	.....	13(2%)	40(3.2%)
Hereditary nephropathies	717(10%)	186(15%)	27(19%)	.....	112(22%)	.....	69(12%)	21(1.7%)
Congenital NS	75	13	5	7		15	34	22(1.76%)
Metabolic disease	.....	.....	5	.....	17	18	.....	.....
Cystinosis	104	22	2	4	.....	.....	2	34(2.7%)
Cystic kidney disease	368(%5)	101(8%)	13(9%)	25(7%)	59(12%)	49(11%)	35(6%)	43 (3.4%)
Ischemic renal failure	158(2%)	49(4%)	3(2%)	8(2%)	11(2%)	....	11(2%)	4(0.3%)
Miscellaneous	1,485(21%)	122(10%)	10(7%)	65(18%)	52(10%)	19(4%)	83(14%)	47(3.8%)
Missing / unknown	182(3%)	40(3%)	.....	16(4%)	37(7%)	65(15%)	34(6%)	228(18.3%)

Results-3

Of 310 children with CKD in **conservative** group, information on BP in 11 patients was not available.

Of the **299** patients in **conservative** group, 131 (**43.81%**) had HTN.

Of 537 children with CKD in **hemodialysis (HD)** group, information on BP in 11 patients was not available.

Of the **526** patients, 412 (**76.73%**) in **HD** group had HTN.

Of **182** children with CKD in **CAPD** group 104 (**57.1%**) and 218 in **transplant group** 158 (**72.5%**) had HTN, respectively.

Results-4

The prevalence of HTN was highest in **ESRD** group compared to the **Preterminal** group ($p < 0.0001$)

Discussion

Pediatric CKD Research Center

A stylized, low-poly silhouette of a mountain range in shades of brown and tan, positioned at the bottom of the slide against a blue gradient background.

Discussion -1

Few studies have characterized the **prevalence** of **HTN** or quantified the association between the degree of **HTN** and progressive kidney damage in children^{17,18,19}

¹⁷ Rockville, MD: Emmes Corporation; 2006.

¹⁸ J Am Soc Nephrol. 2003;14:2618 –2622.

¹⁹ *Hypertension*. 2008;52:631-637

Discussion -2

HTN in children is **rare**, with a prevalence of **3%–9%**; however, in children with CKD, the prevalence rises to **50%**²²⁻²⁵

²²Hypertension. 2012;60(1):43–50.

²³J Am Soc Nephrol. 2003;14(10):2618–2622

²⁴Hypertension. 2008;52(4):631–637

²⁵J Pediatr. 2007;150(6):640–644, 640–644.e1.

Discussion -4

Long-term prospective studies, have demonstrated that **HTN** is one of the most important clinical risk factors for the development and progression of CKD in both **adults** and **children**^{26,27}.

Although CKD is relatively rare in children as compared with adults , **HTN** is highly prevalent.

²⁶ Ann Intern Med. 1995;123:754–762.

²⁷ N Eng J Med. 1996;334:13–18

Discussion -5

The prevalence of **HTN** is **tenfold** higher than in the general pediatric population and known to increase as children progress through the stages of **CKD**, so that **by the time they are on dialysis, 50%-70%** of them will be hypertensive.²⁸⁻³²

28 World J Nephrol. 2015;4(5):500–510.

29 Ren Fail. 2017;39(1):283–289.

30 NAPRTCS 2002 annual report. 2007.

31 Am J Hypertens. 2002;15:53S–56S.

32J Am Soc Nephrol. 2003; 14:2618–2622

Discussion -6

In our study of **1247** patients with CKD, we found a greater **prevalence of HTN** in **HD** group compared to children with early stages of CKD (**76.73% vs 43.81% ; $p < 0.0001$**).

Discussion -7

In the NAPRTCS registry cohort, **76% of children on chronic dialysis** had HTN ^{33,34}

Other studies confer a similar prevalence of **HTN** in patients on dialysis, **as demonstrated in our series** ^{33, 34}.

³³J Am Soc Nephrol. 2014;25(8):1630–1646

³⁴Am J Kidney Dis. 2005;45(2):309

Conclusions-1

Our survey identified a **high prevalence HTN** in pediatric CKD patients.

These patients remain at risk for target organ damage.

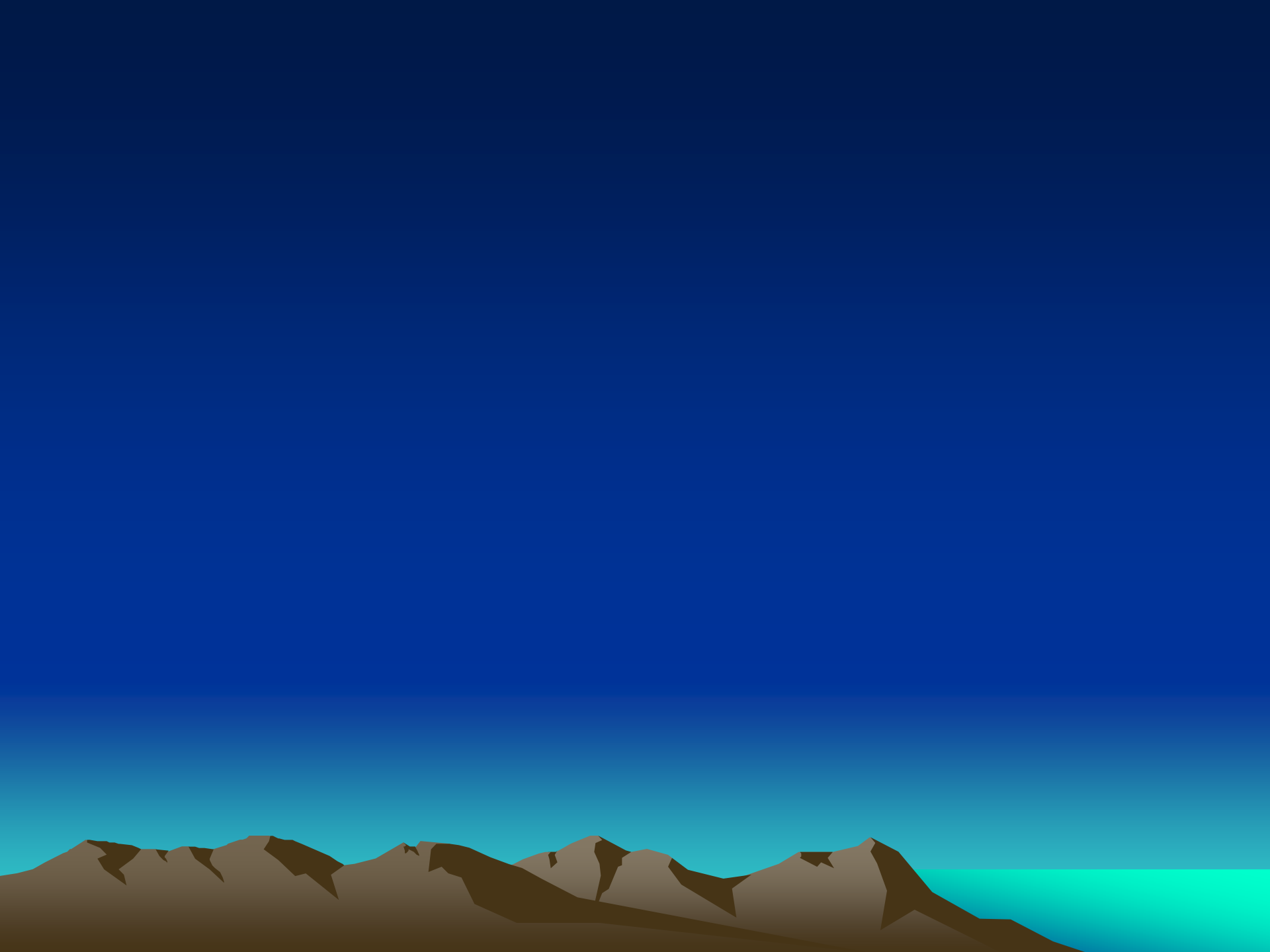
Children with ESRD have **highest prevalence of HTN compared to conservative management group.**

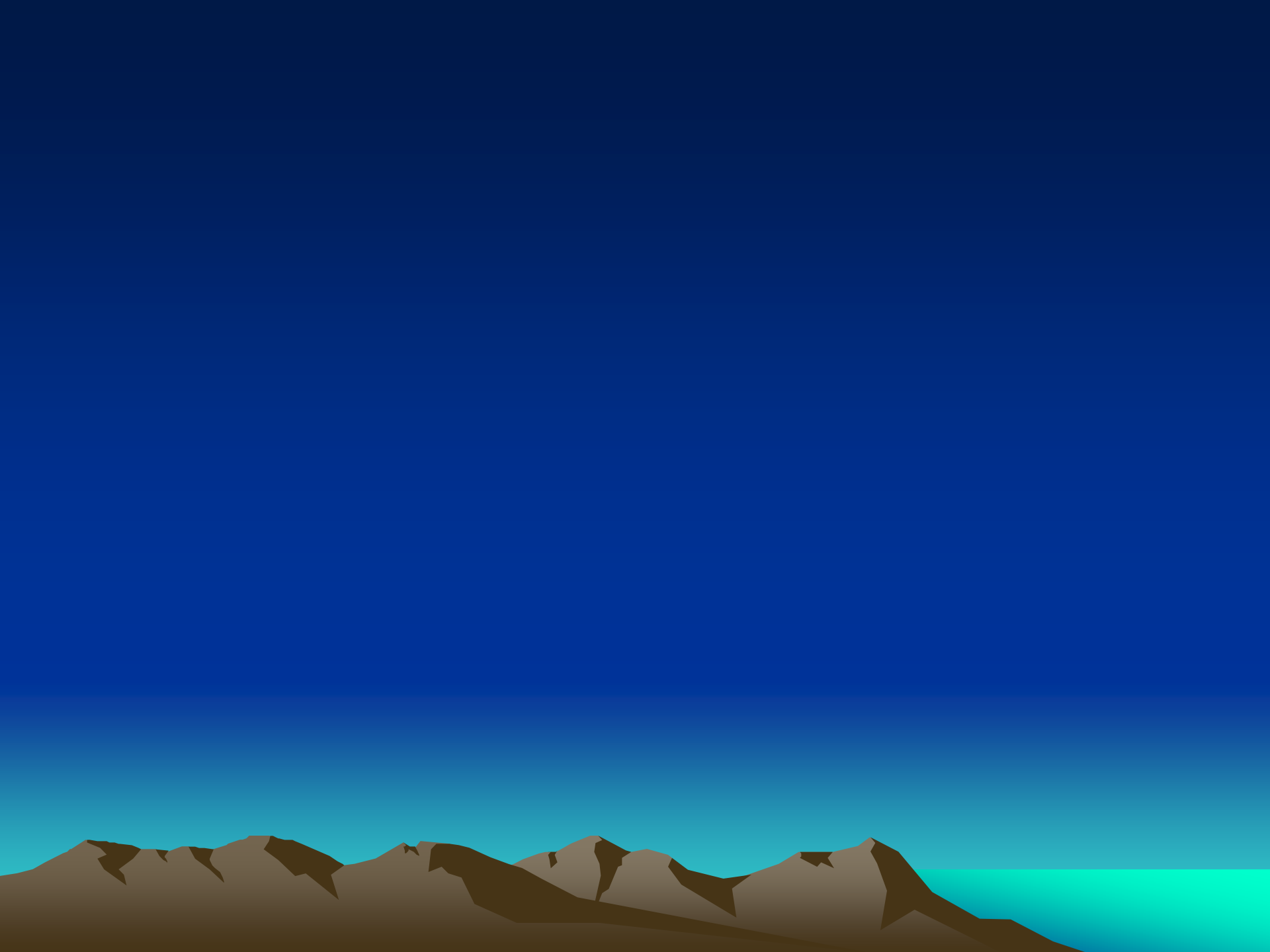
Conclusions-2

These findings **underscore** the urgent necessity to develop **novel strategies** for screening programs, improving the recognition of **HTN** by **24-h ambulatory BP monitoring (ABPM) 24-h** , early detection, prevention and treatment of **HTN and CKD**



**Thanks all for your
attention**





Introduction – 2

High BP is both an important **cause** and effect of CKD and affects a large portion of CKD patients, increased risk of developing cardiovascular disease (CVD), such as left ventricular hypertrophy (LVH)²⁻⁵ and increased risk for neurocognitive impairment^{6,7}

²J Pediatr 2006; 149: 671–675

³BMC Nephrol 2016; 17: 13

⁴Pediatr Nephrol 2014; 29: 2387–2394

⁵Am J Kidney Dis 2004; 44: 1017–1023

⁶Pediatr Nephrol. 2016;31:2137–2144

⁷Pediatr Nephrol. 2013;28:401–408.

Material & Methods-2

Childrens' BPs were classified according to the National High Blood Pressure Education Program (NHBPEP) Fourth Report on the diagnosis, evaluation, and treatment of high BP in children and adolescents¹⁵

¹⁵ *Pediatrics*. 2004;114:555–576.

Material & Methods-4

The **presence of HTN** was defined as having hypertensive range BP (systolic or diastolic) or a self-report of a history of high BP plus current treatment with antihypertensive medications.

Additionally, **controlled BP** was defined as a current use of antihypertensive medication with BP below the 90th percentile and a self-reported **history of HTN**; **uncontrolled BP** was defined as BP (systolic or diastolic) ≥ 90 th percentile and current use of antihypertensive medication.

Material & Methods-7

Stages from 2 to 4 were designated as a **preterminal CKD**, while CKD Stage 5 ESRD was defined as either Glomerular filtration rate (GFR) **<15 mL/min/1.73m²** or a need for the initiation of **RRT** by dialysis or transplantation.

¹⁶ Am J Kidney Dis 2002; 39: S1–S2 66(suppl1)

Material & Methods-8

For children <2 years old, the level of loss of renal capacity in each phase of the KDOQI rules was extrapolated contemplating the reference estimations of GFR in children <2 years¹⁶

¹⁶ Am J Kidney Dis 2002; 39: S1–S2 66(suppl1)

Results-3

Of 310 children with CKD in **conservative** group, information on BP in 11 patients was not available.

Of the **299** remaining patients, 131 (**43.81%**) had HTN.

Of 537 children with CKD in **hemodialysis** group, information on BP in 11 patients was not available.

Of the **526** remaining patients, 412 (**76.73%**) had hypertension.

Of **182** children with CKD in **CAPD group** 104 (**57.1%**) and 218 in **transplant group** 158 (**72.5%**) had HTN, respectively.

Discussion -2

Unlike many of the complications of CKD, **HTN** can be present from the earliest stages of the disease and its prevalence increases as GFR progressively declines **20, 21**

- **20 J Am Soc Nephrol 2012; 23:585-578**
- **21 Hypertension 2008; 52:637-631**
-



Discussion -7

The prevalence of HTN is further increased in children on dialysis. In the NAPRTCS registry cohort, **76% of children on chronic dialysis** had HTN **33,34**

Other studies confer a similar prevalence of HTN in patients on dialysis, as demonstrated in our series **33, 34**.



In The Name of God The most Merciful

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