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## Frequency of hypertension among children having acute kidney injury (AKI) at A Tertiary Care Hospital.

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**ABSTRACT... Objectives:** To know the frequency of hypertension among children having acute kidney injury (AKI) at a tertiary care hospital. **Study Design:** Descriptive, cross-sectional study. **Setting:** Department of Pediatric Medicine, Nishtar Hospital, Multan, **Period:** 1st January to 31 December 2019. **Material & Methods:** A total of 718 children with AKI were included from department of Pediatric medicine, Nishtar Hospital, Multan. Once registered, study variables were noted along with systolic and diastolic blood pressure. **Results:** Of these 718 study cases, majority, 439 (61.1%) were male, 435 (61.0%) belonged to rural areas, 443 (61.7%) from poor socioeconomic status and 551 (76.7%) mothers were illiterate. Mean age was  $4.33 \pm 2.56$  years whereas mean body mass index was  $23.58 \pm 3.17$  kg/m<sup>2</sup>. Overall, family history of AKI was noted in 165 (23.0%) children. Hypertension was noted in 228 (31.8%) cases. **Conclusion:** Very high frequency of hypertension was seen in children presenting with AKI.

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### INTRODUCTION

Acute kidney injury (AKI) is described as a reversible escalation in the blood concentration of creatinine and nitrogenous waste products and by the incompetence of the kidneys to adjust fluid and electrolyte homeostasis properly.<sup>1,2</sup> The incidence as well as AKI related morbidity and mortality is increasing worldwide.<sup>3</sup> In the recent years, a more standardized definition of the AKI has granted a more precise evaluation about the epidemiological aspects of AKI.<sup>4</sup> Advancements in the last few decades have also helped a lot in real time stratification and prevention of AKI among children at the healthcare facilities. Emergence of modern verified clinical scores have also advanced our capacity to forecast AKI, providing us logical context for using biomarkers among hospitalized cases.<sup>5</sup> New non-invasive tools helping diagnosis and predictive biomarkers are in use around the globe to assist our abilities to diagnose and predict outcomes and recover of AKI.<sup>4</sup>

According to “Acute Kidney Injury Network” (AKIN), abrupt (within 48 hours) reduction in renal functions are described as<sup>6</sup> 1) absolute increase in serum creatinine > 0.3 mg/dl from baseline or ii) increase in serum creatinine > 50% (1.5 fold from baseline) or iii) decline in urine output (oliguria < 0.5 ml/kg / hour for > 6 hours). In majority of the patients, baseline creatinine is not available. AKI has been found to be non-oliguric or even polyuric among 10-15% of the patients that may be the cause of a missed diagnosis on clinical evaluation if clinician is relying on daily urine volume solely.<sup>4,7</sup> Glomerulonephritis can also present among children having AKI and might progress to “rapid glomerulonephritis” (RPGN). Common clinical features of AKI are hypertension, oedema, hematuria (frequently gross), and a rapid rise in blood urea nitrogen and creatinine levels.<sup>8</sup> TresaV et al<sup>9</sup> reported 37.1% of the children with AKI to have hypertension.

This study was done to determine the frequency

of hypertension among children having AKI at a tertiary care hospital. As there is no such study done in our local population on this topic, the results of our study were thought to report useful baseline data of our local population which will be compared with that of being reported from different parts of the world. This work will also help clinicians to anticipate morbidities like hypertension and treat them early to avoid further complications.

## MATERIAL & METHODS

This descriptive, cross-sectional study was done at the Department of Pediatric Medicine, Nishtar Hospital, Multan, from 1<sup>st</sup> January to 31 December 2019. Approval from "Institutional Ethical & Research Committee" was taken. Informed consent was sought from parents/guardians of all study participants.

A total of 718 children of both gender with AKI and aged less than 12 years were enrolled during the study duration. AKI was labeled as an abrupt (within 48 hours) reduction in kidney function defined by absolute increase in serum creatinine equal or more than 0.3 mg/dl and decreased urine output. Children as known cases of chronic kidney disease (CKD) on hemodialysis, or having chronic obstructive pulmonary disease, congenital heart diseases, metabolic disorders and those having malignancies, or having cerebral palsy, febrile seizures or epilepsy were excluded. Systolic and diastolic blood pressure (BP) was measured and noted in all the patients. Hypertension was documented. Hypertension was diagnosed if a child's BP was > 95<sup>th</sup> percentile for height, age and gender, two different occasions 24 hours apart.

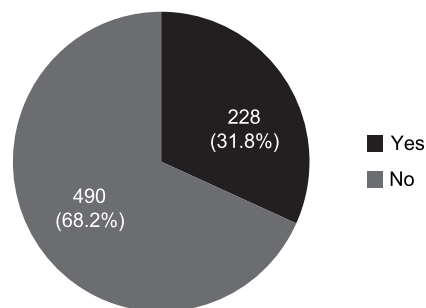
SPSS version 20.0 was used for data analysis. Mean and standard deviation calculated for age and body mass index (BMI) while frequencies and percentage for gender, age groups, residential status, educational status of mother and hypertension. Effect modifiers like age of patients, gender of patient, educational level of mothers and residential status were controlled by making stratified tables. Post stratification chi-square test was applied considering P value <

0.05 as significant.

## RESULTS

Out of a total of 718 study cases, 439 (61.1%) were male and 279 (38.9%) female. Overall mean age was  $4.33 \pm 2.56$  years (ranging 1 to 11 years). Mean age among male and female cases were  $4.55 \pm 2.86$  and  $3.99 \pm 1.97$  years respectively ( $p=0.045$ ). Most cases, 553 (74.2 %) were less than 5 years of age, 435 (60.6%) belonged to rural areas and 443 (61.7%) had poor socioeconomic status. A total of 551 (76.7%) mothers of patients were illiterate whereas family history of AKI noted in 165 (23.0%). Overall mean BMI was  $23.58 \pm 3.17$  kg/m<sup>2</sup> and obesity was present in 129 (18.0%) of our study cases.

Figure-1 shows that hypertension was noted in 228 (31.8%) of our study cases.



**Figure-1. Frequency of hypertension among study cases (n = 718)**

Hypertension was stratified with regards to gender, age, residential status, family history of hypertension, obesity, level of maternal education and obesity (Table-I). Male gender, age less than 5 years, socioeconomic status as poor, family history of hypertension and obesity were found significantly associated with the presence of hypertension.

## DISCUSSION

The incidence of AKI is rising while the etiological aspects of AKI have shifted from a primary kidney disease to multifactorial causes.<sup>4,10</sup> In developed countries, standard definitions of AKI has provided better understanding of epidemiology as well as outcomes related to pediatric population involved.<sup>11,12</sup>

Study Variables		Hypertension		P-Value
		Yes (n= 228)	No (n= 490)	
Gender	Male (n=439)	164 (71.9%)	275 (56.1%)	0.005
	Female (n=279)	64 (28.1%)	215 (43.9%)	
Age in Years	<5 (n=553)	206 (90.3%)	347 (71.8%)	<0.001
	> 5 (n=165)	22 (9.7%)	143 (28.2%)	
Residential Status	Rural (n=435)	146 (64.0%)	289 (59.0%)	0.356
	Urban (n=283)	82 (36.0%)	201 (41.0%)	
Socioeconomic Status	Poor (n=443)	172 (75.4%)	271 (55.3%)	<0.001
	Middle Income (n=275)	56 (24.6%)	219 (44.7%)	
Maternal Literacy	Illiterate (n=551)	168 (73.7%)	383 (78.2%)	0.348
	Literate (n=167)	60 (26.3%)	107 (21.8%)	
Family History of AKI	Yes (n=165)	76 (33.3%)	89 (18.2%)	0.002
	No (n=553)	152 (66.7%)	401 (81.8%)	
Obesity	Yes (n=129)	98 (43.0%)	31 (6.3%)	<0.001
	No (n=589)	130 (57.0%)	459 (93.7%)	

On the other hand, in developing countries, limited data is available about the epidemiology and factors affecting the outcome of AKI among children.<sup>13,14</sup> Presence of AKI is high among critically ill children.<sup>15</sup> Recent data suggest that AKI is found among 5% and 27% of non-critically and critically ill pediatric cases, respectively.<sup>16</sup> To make the scenario worse, AKI as well as fluid overload are independently linked with worse outcomes like mortality.

Diagnosis of AKI is dependent upon urine output and creatinine measurement which is challenging to note among children. However, discovery of novel biomarkers and modern risk stratification tools are leading us to advanced detection and diagnostic approaches. As we known, no exact treatments is endorsed, strategies aiming towards prevention of AKI are a subject of discussion while more and more evidence suggests that detecting AKI early can lead to improved outcomes.<sup>16</sup>

Of these 718 study cases, 439 (61.1%) were male. Tresaet al<sup>9</sup> reported 60.3% male gender predominance. Esezobor C et al<sup>17</sup> from Nigeria also reported 68.6% male gender predominance in children with AKI. Alkandari O et al<sup>18</sup> from Canada found 53% male cases. Prophan P et al<sup>19</sup> has also found 66% male cases. Local data from Karachi by Moorani KN et al<sup>20</sup> showed 56.6%

male presence among children having AKI.

In this study, mean age of our study cases was  $4.33 \pm 2.56$  years while most, 77.2 % cases were aged less than 5 years. Tresaet al<sup>9</sup> recorded  $7.5 \pm 4.4$  years mean age of the cases with AKI while Esezobor et al<sup>17</sup> from Nigeria noted this to be 4.8 years. A study conducted in Canada by Alkandari et al<sup>18</sup> reported  $5.0 \pm 5.5$  years mean age of the children having AKI. Local data<sup>20</sup> has revealed 4.7 years mean age which is closer to what we found.

We noted hypertension to be present in 31.8% cases. Tresa et al<sup>9</sup> has reported 37.1% hypertension in pediatric AKI. Esezoboret al<sup>17</sup> has reported 50 % hypertension in children with AKI. Kidney and BP abnormalities are commonly linked with AKI. Other risk factors must be elucidated to develop follow-up recommendations and reduce cardiovascular risk.<sup>21</sup>

## CONCLUSION

Very high frequency of hypertension seen in children presenting with AKI. Hypertension was significantly associated with gender, age, socioeconomic status, family history of hypertension and obesity. All clinicians treating such patients should always screen these children for early diagnosis and timely management of






hypertension which will protect these children from future adverse events and will improve their quality of life.

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### AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Afsheen Asghar Khan	Methodology, Data interpretation.	
3	Rushan Hassan	Data analysis.	
4	Madiha Naz	Data collection, Data analysis.	
5	Bushra Iqbal	Literature review, Introduction.	
6	Ali Rehan Nasir	Literature review, Discussion.	