Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2023i1.400
*Biol. Clin. Sci. Res. J., Volume, **2023**: 400*
Original Research Article

INCIDENCE OF ACUTE KIDNEY INJURY IN PATIENTS OF ACUTE GASTROENTERITIS ADMITTED AT LADY READING HOSPITAL, PESHAWAR

HAYAT FS[*1], IKHTIAR Z[2], BADSHAH I[2], HUSSAIN M[2], HADI M[3], KHAN I[4], IKHTIAR H[5], KHAN A[6]

[1]*Department of Medicine, Lady Reading Hospital, Peshawar, Pakistan*
[2]*Department of Internal Medicine, MTI, Lady Reading Hospital, Peshawar, Pakistan*
[3]*Department of General Surgery, MTI, Lady Reading Hospital, Peshawar, Pakistan*
[4]*Department of Surgery, Hayatabad Medical Complex, Peshawar, Pakistan*
[5]*Department of Biochemistry, Kabir Medical College/ Gandhara University, Peshawar, Pakistan*
[6]*Medical Officer, Saidu Medical College, Swat, Pakistan*
**Correspondence author email address: cadtsaleh2501@gmail.com*

(Received, 15th July 2023, Revised 29th August 2023, Published 15th September 2023)

Abstract: *Acute gastroenteritis affects all age groups alike, is a common cause of hospitalization worldwide, and is the most common known cause of preventable acute kidney injury. AKI may be defined as a sudden decrease in kidney function, which results in reduced filtration capability of the kidneys, accumulation of waste products, and their resultant clinical manifestations. The level of insult may range from mild to severe, requiring simple oral rehydration most times, while in a few cases needing intervention in the form of hemodialysis. The elderly population is more prone to develop AKI due to age-related deterioration in renal function. An overall positive outcome has been associated with early hemodialysis in progressively deteriorating AKI and critically ill patients. A prospective observational study was conducted on 40 patients with AKI secondary to acute gastroenteritis admitted to MTI, Lady Reading Hospital, Peshawar, KP, Pakistan, from February 2023 to June 2023. These patients were selected from 142 patients with acute gastroenteritis admitted to MTI, Lady Reading Hospital, Peshawar. Data collected was analyzed using SPSS 20. This study was conducted on 40 patients with a mean age of 39.82±16.54 years. Gender: Our study included 22 (55%) male and 18 (45%) female patients. We observed that 11 (27.5%) patients on dialysis had developed AKI secondary to AGE. We observed that older patients above 40 years of age who developed AKI secondary to AGE had a significantly higher frequency of hemodialysis (47.1%) as compared to patients less than 40 years of age (13%) (P = 0.01). According to the comparison of mortality with age groups, no mortality was seen in the age group of < = 40 years; however, there were 2 mortalities in the age group of > 40 years. One patient expired after 2 sessions, and one expired after 5 sessions and a prolonged stay. Our results showed a significant association between favorable outcomes and dialysis sessions for the less than 40 age group (P = 0.0001) and the more than 40 age group (P = 0.004). Although the overall outcome with dialysis was favorable, with good recovery, the age group of 40 years and above showed significantly higher rates of hemodialysis requirement and more morbidity and mortality compared to the age group of 40 years and less. 40(28.2%) patients with Acute gastroenteritis developed Acute kidney injury. Among these patients, 11 (27.5%) required hemodialysis. This concluded that 29 patients (72.5%) were treated conservatively and discharged with full recovery of renal function. 72.7% requiring hemodialysis were above 40 years of age, proving that the incidence of AKI and its severity increased.*

Keywords: AKI, Acute Kidney Injury, Acute Gastroenteritis, Hemodialysis.

Introduction

Acute gastroenteritis affects all age groups and is a common cause of hospitalization worldwide. Though its etiology may be grouped into infectious and non-infectious, Viral cause remains the most common worldwide (Bányai et al., 2018).

Acute gastroenteritis is the most common known cause of preventable acute kidney injury. AKI may be defined as a sudden decrease in kidney function, which results in reduced filtration capability of the kidneys, accumulation of waste products and their resultant clinical manifestations, and abnormality of body fluid volume status as well as fluctuations in serum electrolyte levels (Jamal et al., 2022). The level of insult may range from mild to severe, requiring simple oral rehydration most times, while in a few cases needing intervention in the form of hemodialysis, with a risk of developing Chronic kidney disease (Bhakthavatchalam et al., 2021; Mostafi et al., 2011).

While the dynamics and consequences of diarrheal diseases may be diverse, AKI, one of the leading and critical consequences, remains lacking insight into its incidence and mechanisms. This may be due to other causes like polypharmacy and multimorbidity, which often overshadow it (Bradshaw et al., 2018).

The incidence of AKI is relatively higher in the elderly as well as its severity and subsequent progression to chronic renal failure (Bogari et al., 2023; Coca, 2010; Ishani et al., 2009). Elderly population is more prone on account of age-related deterioration in renal function, which may contribute to the higher proportion of occurrence of AKI when triggers like Acute Gastroenteritis are present (Yokota et al., 2018). Overall a positive outcome has been associated with early hemodialysis in progressively deteriorating AKI and critically ill patients (Lee et al., 2023; Schiffl et al., 2002).

This study aims to determine the percentage of patients who developed Acute Kidney Injury (AKI) due to Acute

[Citation Hayat, F.S., Ikhtiar, Z., Badshah, I., Hussain, M., Hadi, M., Khan, I., Ikhtiar, H., Khan, A. (2023). Incidence of acute kidney injury in patients of acute gastroenteritis admitted at Lady Reading Hospital, Peshawar. *Biol. Clin. Sci. Res. J.*, **2023***: 400*. doi: https://doi.org/10.54112/bcsrj.v2023i1.400]

Gastroenteritis and required hemodialysis. Additionally, we aim to compare the incidence of AKI in young patients (below 40 years) versus old patients (above 40 years) with Acute Gastroenteritis and evaluate the impact of AKI on morbidity and mortality.

Methodology

This prospective observational study was conducted on 40 patients with AKI secondary to acute gastroenteritis admitted to MTI, Lady Reading Hospital, Peshawar, KP, Pakistan, from February 2023 to June 2023. Out of 142 patients with acute gastroenteritis admitted to MTI, Lady Reading Hospital in Peshawar, these patients were selected based on specific criteria. The criteria were as follows: the patients had to be of either sex, aged 18 years or older and 80 years or younger. Additionally, all patients with acute gastroenteritis who developed AKI were included. AKI was defined as an increase in serum creatinine to ≥2 times baseline, known or presumed to have occurred within the prior 7 days, or urine volume <0.5 ml/kg/h for 12 hours (RIFLE criteria). However, AKI caused by conditions other than gastroenteritis was not included. Patients with acute gastroenteritis who also had chronic kidney disease (CKD) were excluded, as were patients with co-morbidities such as diabetes mellitus and hypertension. Patients who presented with the history, signs, and symptoms of acute diarrheal diseases without any prior known kidney diseases or Co-morbidities like Diabetes mellitus and Hypertension to the Emergency Department and all units of Medicine (A, B, C, and D) of MTI, Lady Reading Hospital, Peshawar were selected. A preliminary renal function test, FBS, and HBA1C were sent, and blood pressure readings were taken. A simple Performa was used to record the patient's Biodata, history, and tests with informed consent. Those completing the above criteria were selected and observed over their hospital stay with daily fresh RFTs and urine output record along with recording of intervention in the form of hemodialysis along with prolonged hospital stay and mortalities.
Data collected was entered and analyzed using SPSS 20.

Results

This study was conducted on 40 patients with a mean age of 39.82±16.54 years. Gender-wise, 22 (55%) male and 18 (45%) female patients were in our study. We observed that 11 (27.5%) patients on dialysis had developed AKI secondary to AGE. We observed that older patients above 40 years of age who developed AKI secondary to AGE had a significantly higher frequency of hemodialysis (47.1%) as compared to patients less than 40 years of age (13%) (P = 0.01). According to the comparison of mortality with age groups, no mortality was seen in the age group of < = 40 years; however, there were 2 mortalities in the age group of > 40 years. One patient expired after 2 sessions, one after 5 sessions, and a prolonged stay. We did not observe any statistically significant association between mortality and age groups (P = 0.25). Regarding the comparison between outcome and dialysis, we observed that 1 patient (9.1%) expired after having 2 dialysis sessions, while another (9.1%) expired after having 5 dialysis sessions. Two patients (18.2%) showed improvement after having one session, four patients (36%) showed improvement after having 2 sessions, 29 did not have dialysis sessions and were discharged after improvement, and 3 patients (27.3%) showed improvement after 3 sessions but had a prolonged stay at the hospital. Our results showed a significant association between the outcome and dialysis sessions. In patients with age less than or equal to 40 years, we observed that two patients (who had dialysis showed significant improvement in 2 sessions while one patient showed significant improvement in 3 sessions with prolonged hospital stay (P = 0.0001) while patients having age greater than 40 years 2 patients had expired after dialysis while 2 patients showed significant improvement after 1 session, two patients showed significant improvement after 2 sessions and 2 patients showed significant improvement after 3 sessions with prolonged hospital stay (P = 0.004). Although the overall outcome with dialysis was favorable, with good recovery, the age group of 40 years and above showed significantly higher rates of hemodialysis requirement and more morbidity and mortality compared to the age group of 40 years and less

Table 1: Demographics

Demographic		Statistics
Age (Years)		39.82±16.54
Gender	Male	22 (55%)
	Female	18 (45%)

Table 2: Frequency of hemodialysis in patients who developed AKI secondary to AGE

Dialysis	Frequency	Percent
Yes	11	27.5
No	29	72.5
Total	40	100.0

Table 3: Comparison of hemodialysis between age groups

		Dialysis		Total	P value
		Yes	No		
Age distribution	< = 40 years	3	20	23	**0.01**
		13.0%	87.0%	100.0%	
	> 40 years	8	9	17	
		47.1%	52.9%	100.0%	
Total		11	29	40	
		27.5%	72.5%	100.0%	

[Citation Hayat, F.S., Ikhtiar, Z., Badshah, I., Hussain, M., Hadi, M., Khan, I., Ikhtiar, H., Khan, A. (2023). Incidence of acute kidney injury in patients of acute gastroenteritis admitted at Lady Reading Hospital, Peshawar. *Biol. Clin. Sci. Res. J.*, **2023***: 400*. doi: https://doi.org/10.54112/bcsrj.v2023i1.400]

Table 4: Comparison of mortality between both groups

		Age distribution		Total	P value
		< = 40 years	> 40 years		
Outcome	Expired, 2 Sessions	0	1	1	**0.25**
		0.0%	5.9%	2.5%	
	Expired, 5 Sessions, Prolong Stay	0	1	1	
		0.0%	5.9%	2.5%	
	Improved & 1 Session	0	1	1	
		0.0%	5.9%	2.5%	
	Improved & 2 Session	2	2	4	
		8.7%	11.8%	10.0%	
	Improved & Discharged	20	9	29	
		87.0%	52.9%	72.5%	
	Improved, 3 Session, Prolong Stay	1	2	3	
		4.3%	11.8%	7.5%	
Total		23	17	40	
		100.0%	100.0%	100.0%	

Table 5: Comparison of outcome and dialysis with respect to age

Age distribution			Dialysis		Total	P value
			Yes	No		
< = 40 years	Outcome	Improved & 2 Session	2	0	2	**0.0001**
			100.0%	0.0%	100.0%	
		Improved & Discharged	0	20	20	
			0.0%	100.0%	100.0%	
		Improved, 3 Session, Prolong Stay	1	0	1	
			100.0%	0.0%	100.0%	
	Total		3	20	23	
			13.0%	87.0%	100.0%	
> 40 years	Outcome	Expired, 2 Sessions	1	0	1	**0.004**
			100.0%	0.0%	100.0%	
		Expired, 5 Sessions, Prolong Stay	1	0	1	
			100.0%	0.0%	100.0%	
		Improved & 1 Session	2	0	2	
			100.0%	0.0%	100.0%	
		Improved & 2 Session	2	0	2	
			100.0%	0.0%	100.0%	
		Improved & Discharged	0	9	9	
			0.0%	100.0%	100.0%	
		Improved, 3 Session, Prolong Stay	2	0	2	
			100.0%	0.0%	100.0%	
	Total		8	9	17	
			47.1%	52.9%	100.0%	

Discussion

This study was conducted on patients who had developed AKI selected from individuals with acute gastroenteritis. A total of 142 individuals presenting to the Emergency department and the medical department of Lady Reading Hospital, MTI, Peshawar, with signs and symptoms of gastroenteritis were included in the study and fulfilled its inclusion criteria. Among this, 40 patients who had developed AKI were selected, with a mean age of 39.82±16.54 years. Gender-wise, 22 (55%) male and 18 (45%) female patients were in our study. We observed that 28.2% of patients had developed AKI secondary to acute gastroenteritis. This concurred with Jamal et al. (25%) and Mostafi et al. (23.8%). These patients were divided into two age groups with reference cut-off points of 40: 23 (57.5%) of whom were below 40, and 17 (42.5%) were above 40. 29 (72.5%) patients (20 or 69% below 40 years old and 9 or 31% above 40 years old) were treated conservatively with intensive IV fluid therapy, control of symptoms and close monitoring of hydration status, and daily RFTS and metabolic screen. This showed that many patients were discharged home with conservative therapy (Bhakthavatchalam et al., 2021; Mostafi et al., 2011). The majority of these patients were young, aged below 40 years. We observed 11 (27.5%) (8 or 72.7% above 40 years of age and 3 or 27.3% below 40) patients on dialysis who had developed AKI secondary to AGE. We observed that older patients above 40 years of age who developed AKI secondary to AGE had a significantly higher frequency of hemodialysis (47.1%) as compared to patients less than 40 years of age (13%) (P = 0.01). According to the comparison

[Citation Hayat, F.S., Ikhtiar, Z., Badshah, I., Hussain, M., Hadi, M., Khan, I., Ikhtiar, H., Khan, A. (2023). Incidence of acute kidney injury in patients of acute gastroenteritis admitted at Lady Reading Hospital, Peshawar. *Biol. Clin. Sci. Res. J.*, **2023***: 400*. doi: https://doi.org/10.54112/bcsrj.v2023i1.400]

of mortality with age groups, no mortality was seen in the age group of < = 40 years; however, there were 2 mortalities in the age group of > 40 years. One patient expired after 2 sessions, one after 5 sessions, and a prolonged stay. We did not observe any statistically significant association between mortality and age groups (P = 0.25). These results were consistent with previous studies showing that morbidity and mortality secondary to Age-related AKI were comparatively higher in older age groups, especially the elderly, Coca et al., Silveira Santos et al., Ishani et al. and Bogari et al. (Bogari et al., 2023; Coca, 2010; Ishani et al., 2009; Silveira Santos et al., 2018).

Our results showed a significant association between the outcome and dialysis sessions. In patients aged less than or equal to 40 years, we observed that two patients who had dialysis showed significant improvement in 2 sessions while one patient showed significant improvement in 3 sessions with prolonged hospital stay (P = 0.0001) while patients having age greater than 40 years 2 patients had expired after dialysis while 2 patients showed significant improvement after 1 session, two patients showed significant improvement after 2 sessions and 2 patients showed significant improvement after 3 sessions with prolonged hospital stay (P = 0.004). These results were consistent with Shiffl et al. and Lee et al. (Lee et al., 2023; Schiffl et al., 2002).

Conclusion

During a 5-month observational study (March to July 2023), 28.2% of 142 acute gastroenteritis patients developed acute kidney injury. Of those, 27.5% required hemodialysis. Prompt hydration and monitoring without hasty dialysis decisions allowed 72.5% to recover fully. Patients over 40 had higher rates of morbidity and mortality.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the concerned hospital.

Consent for publication
Given

Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

References

Bányai, K., Estes, M. K., Martella, V., and Parashar, U. D. (2018). Viral gastroenteritis. *The Lancet* **392**, 175-186.

Bhakthavatchalam, S., Srinivasan, D., and Prithviraj, R. (2021). The requirement of hemodialysis in patients with acute gastroenteritis–induced acute kidney injury. *Journal of Family Medicine and Primary Care* **10**, 2423.

Bogari, M. H., Munshi, A., Almuntashiri, S., Bogari, A., Abdullah, A. S., Albadri, M., Hashim, A., and AlZahrani, M. S. (2023). Acute gastroenteritis-related acute kidney injury in a tertiary care center. *Annals of Saudi Medicine* **43**, 82-89.

Bradshaw, C., Zheng, Y., Silver, S. A., Chertow, G. M., Long, J., and Anand, S. (2018). Acute kidney injury due to diarrheal illness requiring hospitalization: data from the National Inpatient Sample. *Journal of General Internal Medicine* **33**, 1520-1527.

Coca, S. G. (2010). Acute kidney injury in elderly persons. *American Journal of Kidney Diseases* **56**, 122-131.

Ishani, A., Xue, J. L., Himmelfarb, J., Eggers, P. W., Kimmel, P. L., Molitoris, B. A., and Collins, A. J. (2009). Acute kidney injury increases risk of ESRD among elderly. *Journal of the American Society of Nephrology: JASN* **20**, 223.

Jamal, N., Banaras, F., Ashfaq, M., Tahir, T., Jadoon, I., and Raza, A. (2022). Incidence of Acute Kidney Injury (AKI) Secondary to Acute Gastroenteritis in Patients Presenting to Ayub Teaching Hospital, Abbottabad. *Pakistan Journal of Medical & Health Sciences* **16**, 537-537.

Lee, C.-C., Kuo, G., Chan, M.-J., Fan, P.-C., Chen, J.-J., Yen, C.-L., Tsai, T.-Y., Chen, Y.-C., Tian, Y.-C., and Chang, C.-H. (2023). Characteristics of and outcomes after dialysis-treated acute kidney injury, 2009-2018: a Taiwanese Multicenter study. *American Journal of Kidney Diseases* **81**, 665-674. e1.

Mostafi, M., Nessa, M. A., Fakir, M. A. H., Bhuiyan, M. A. Q., and Rahman, A. M. (2011). Presentation and outcome of acute kidney injury in a tertiary military hospital of Bangladesh. *Bangladesh Journal of Medicine* **22**, 35-40.

Schiffl, H., Lang, S. M., and Fischer, R. (2002). Daily hemodialysis and the outcome of acute renal failure. *New England Journal of Medicine* **346**, 305-310.

Silveira Santos, C. G. d., Romani, R. F., Benvenutti, R., Ribas Zahdi, J. O., Riella, M. C., and Mazza do Nascimento, M. (2018). Acute kidney injury in elderly population: a prospective observational study. *Nephron* **138**, 104-112.

Yokota, L. G., Sampaio, B. M., Rocha, E. P., Balbi, A. L., Sousa Prado, I. R., and Ponce, D. (2018). Acute kidney injury in elderly patients: narrative review on incidence, risk factors, and mortality. *International journal of nephrology and renovascular disease*, 217-224.