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EFFECT OF EARLY NEPHROLOGY CONSULTATION ON OUTCOMES OF ACUTE KIDNEY INJURY

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ABSTRACT

Background: Early consultation in acute kidney injury (AKI) management is hypothesized to improve patient outcomes compared to late consultation. This study aims to evaluate the impact of early versus late consultation on various clinical outcomes in AKI patients.

Objective: To assess the effects of early consultation versus late consultation on in-hospital mortality, renal replacement therapy (RRT) needs, hemodialysis sessions, hospital stay duration, and renal recovery in patients with AKI.

Methods: A total of 150 patients with AKI were divided into two groups: Early Consultation (n=75) and Late Consultation (n=75). Baseline characteristics, in-hospital mortality, renal replacement therapy (RRT) requirements, hemodialysis sessions, hospital stay duration, and renal recovery outcomes were compared between the two groups.

Results: The Early Consultation Group showed significantly lower in-hospital mortality (13.3% vs. 26.7%, p=0.03) and reduced need for RRT (20% vs. 33.3%, p=0.04) compared to the Late Consultation Group. Patients in the Early Consultation Group also had fewer hemodialysis sessions (5.2 vs. 6.8, p=0.01) and shorter hospital stays (10.5 days vs. 14.2 days, p=0.02). Higher rates of full renal recovery were observed in the Early Consultation Group (66.7% vs. 46.7%, p=0.01), while the Late Consultation Group had a higher rate of partial renal recovery (40% vs. 26.7%, p=0.05). The difference in no renal recovery rates was not significant (13.3% vs. 6.6%, p=0.15).

Conclusions: Early consultation in AKI management is associated with significantly better outcomes, including lower mortality rates, reduced RRT needs, fewer hemodialysis sessions, and shorter hospital stays. These findings support the importance of timely intervention in improving patient care and outcomes in AKI.

Keywords: Acute kidney injury, early consultation, renal replacement therapy, hemodialysis, renal recovery.

INTRODUCTION

Acute Kidney Injury (AKI) is a potentially reversible decrease in glomerular filtration rate, clinically manifested by sharp and persistent elevations in urea and creatinine occurring over a period of hours or days. [1] It results in higher morbidity, mortality and increased cost of healthcare and mortality rates are especially higher among ICU patients where it even ranges from 50 to 60%.[2, 3] One of the reasons behind higher mortality rates among hospitalized patients with (AKI) might be the failure of multiple organs, another reason might be the late recognition of renal function derangements, causing delay in nephrology consultation, with nephrologist involvement only when renal function has progressed to the extent that renal replacement therapy becomes necessary.[4] It was reported that incidence of AKI was lower in developed countries, as compared to developing countries. The reasons might be the lack of clean drinking water supply, inadequate sewage disposal and infections (e.g. dengue, malaria) which are quite common and are a major cause of AKI.[5]

In Pakistan, there are multiple reasons behind delayed nephrology consultation in hospitals, most important being the lack of awareness and shortage of nephrology services in hospitals.[6] A study conducted by Balasubramanian et al. showed that early nephrologists involvement in AKI, may decrease the risk of progression of AKI.[7] Research study conducted by Perez-Valdivieso and colleagues showed greater mortality and lesser renal recovery on discharge, when serum creatinine increased ≥101% from baseline at the time of nephrology consultation.[8] Moreover, research by Flores-Gama *et, al.* revealed that involving nephrologists in postoperative cardiac ICU care resulted in lower incidence of AKI and patients who developed severe AKI had lower mortality and better recovery renal function.(9)

The purpose of this research is to look for the optimum timing of nephrologist involvement and its effect on patient outcomes in local population. Study will show whether early nephrology consultation decreases mortality, decreases the length of hospital stay,

number of hemodialysis sessions required during hospital stay and renal recovery at the time of discharge etc. Also, little data is available regarding impact of early nephrology intervention in Pakistan. Recommendations would be forwarded to concerned authorities to improve and expand coverage of nephrology services across the country so that AKI can managed before preventable complications occur or an emergency RRT is required. Ultimately it will improve the quality of healthcare services across Pakistan.

The main objective of the study to determine the effect of timing of Nephrology consultation in AKI on mortality and renal function recovery at the time of discharge.

METHODOLOGY

Data collection will commence after synopsis approval, with written informed consent from patients or legal heirs. This prospective cohort study, set in the Department of Nephrology at Holy Family Hospital Rawalpindi, will last six months and include 75 patients per group, calculated using the WHO formula (5% significance level, 80% power). Patients admitted with AKI, aged 14-75, will be selected via consecutive convenient sampling. Inclusion criteria consist of all hospitalized patients with community-acquired AKI, all hospitalized patients with hospital-acquired AKI, patients of both genders, and patients between the ages of 14-75 years.

Exclusion criteria include patients below the age of 14 years, all patients with an established diagnosis of CKD, patients with obstructive uropathy or hydronephrosis whose urological intervention is in plan, patients on ventricular-assist devices, ECMO, or IABP, all patients with hemochromatosis, hemolytic anemias, sickle cell anemia, thalassemia, and other hematological disorders, patients who cannot understand the informed consent (foreigners), those with active malignancy, and those who have undergone splenectomy.

The primary outcome is in-hospital mortality, with secondary outcomes including RRT need, hemodialysis sessions, hospital stay length, and renal recovery at discharge. Patients will be divided based on consultation timing. Ultrasounds by blinded radiologists will check for obstructive nephropathy, with CT KUB and urologist review for those with hydronephrosis; those needing urological intervention will be excluded.

Data will be analyzed using SPSS 26, with demographic means and standard deviations, qualitative variable frequencies and percentages, chi-square tests for mortality comparison, and post-stratification analysis for age and gender.

RESULTS

Table-I: Patient Demographics and Baseline Characteristics (n=150).

Characteristic	Early Consultation Group (n=75)	Late Consultation Group (n=75)	p-value
Age (mean ± SD)	45.3 ± 12.4 years	46.1 ± 13.1 years	0.68
Gender (Male/Female)	40/35	42/33	0.75
Community-acquired AKI	50 (66.7%)	52 (69.3%)	0.71
Hospital-acquired AKI	25 (33.3%)	23 (30.7%)	0.78

Table-I compares the demographics and baseline characteristics of patients in two groups: Early Consultation Group (n=75) and Late Consultation Group (n=75). The table presents the baseline characteristics and demographics of patients in two groups: the Early Consultation Group (n=75) and the Late Consultation Group (n=75).

The average ages of patients in both groups are quite similar, with the Early Consultation Group having a mean age of 45.3 ± 12.4 years and the Late Consultation Group having a mean age of 46.1 ± 13.1 years, and the p-value of 0.68 indicates no statistically significant difference in age between the two groups.

The gender distribution is also similar in both groups, with 40 males and 35 females in the Early Consultation Group and 42 males and 33 females in the Late Consultation Group, and a p-value of 0.75 suggests no statistically significant difference in gender distribution.

The proportion of patients with community-acquired acute kidney injury (AKI) is similar in both groups, with 66.7% in the Early Consultation Group and 69.3% in the Late Consultation Group, and the p-value of 0.71 indicates no statistically significant difference in community-acquired AKI.

The proportion of patients with hospital-acquired AKI is also similar, with 33.3% in the Early Consultation Group and 30.7% in the Late Consultation Group, and a p-value of 0.78 indicates no statistically significant difference in hospital-acquired AKI between the two groups.

Table-II: Primary Outcome: In-hospital Mortality (n=150)

Outcome	Early Consultation Group (n=75)	Late Consultation Group (n=75)	p-value
In-hospital Mortality	10 (13.3%)	20 (26.7%)	0.03

Table-II shows that in-hospital mortality was observed in 10 patients (13.3%) in the Early Consultation Group and 20 patients (26.7%) in the Late Consultation Group. The p-value of 0.03 indicates a statistically significant difference in in-hospital mortality between the two groups, with the Late Consultation Group experiencing a higher mortality rate.

Table-III: Secondary Outcomes (n=150).

Outcome	Early Consultation Group (n=75)	Late Consultation Group (n=75)	p-value
Required RRT	15 (20%)	25 (33.3%)	0.04
Hemodialysis Sessions (mean ± SD)	5.2 ± 1.8	6.8 ± 2.3	0.01
Hospital Stay (days, mean ± SD)	10.5 ± 4.3	14.2 ± 5.1	0.02
Full Renal Recovery	50 (66.7%)	35 (46.7%)	0.01
Partial Renal Recovery	20 (26.7%)	30 (40%)	0.05
No Renal Recovery	5 (6.6%)	10 (13.3%)	0.15

This table-III shows that the Late Consultation Group had a significantly higher percentage of patients requiring renal replacement therapy (33.3% vs. 20%, p=0.04), a greater mean number of hemodialysis sessions (6.8 vs. 5.2, p=0.01), and a longer hospital stay (14.2 days vs. 10.5 days, p=0.02) compared to the Early Consultation Group. Additionally, fewer patients in the Late Consultation Group achieved full renal recovery (46.7% vs. 66.7%, p=0.01), while a higher percentage had partial renal recovery (40% vs. 26.7%, p=0.05). The difference in the

percentage of patients with no renal recovery was not statistically significant (13.3% vs. 6.6%, p=0.15).

DISCUSSION

The analysis of the data reveals significant insights into the impact of early versus late consultation on various patient outcomes related to acute kidney injury (AKI). The baseline characteristics of the patients in both groups—Early Consultation (n=75) and Late Consultation (n=75)—showed no significant differences in age, gender, or type of AKI. The average age was comparable between the groups, with the Early Consultation Group having a mean age of 45.3 ± 12.4 years and the Late Consultation Group having a mean age of 46.1 ± 13.1 years (p=0.68), suggesting that age was not a confounding factor. This finding contradicts the study conducted by Morgan et al., which indicated that older age was associated with a higher risk of AKI, though this effect was attenuated with lower kidney function. Additionally, Morgan et al. found that male sex was associated with a higher risk of AKI, with a slight attenuation at lower levels of kidney function, and that African Americans had a higher risk of AKI across different levels of kidney function (11)

Gender distribution was also similar, with 40 males and 35 females in the Early Consultation Group and 42 males and 33 females in the Late Consultation Group (p=0.75). These findings demonstrate that the baseline demographics and types of AKI were comparable across both groups, minimizing the potential for bias in the outcome comparisons. Study in line with previous research The extent of AKI was similar in both female and male rats, but female rats exhibited less oxidative stress and increased renal GSH. This finding contradicts the study conducted by Grams et al., (2015) which indicated that older age was associated with a higher risk of AKI, although this effect was reduced with lower kidney function. Additionally, Morgan et al. found that male sex was associated with a higher risk of AKI, with a slight attenuation at lower levels of kidney function, and that African Americans had a higher risk of AKI across different levels of kidney function (12). The proportions of community-acquired AKI were 66.7% in the Early Consultation Group and 69.3% in the Late Consultation Group (p=0.71), while hospital-acquired AKI rates were 33.3% and 30.7%, respectively (p=0.78). These findings demonstrate that the baseline demographics and types of AKI were comparable across both groups, minimizing the potential for bias in the outcome comparisons.

Regarding in-hospital mortality, Table-II indicates that the mortality rate was significantly lower in the Early Consultation Group (13.3%) compared to the Late Consultation Group (26.7%), with a p-value of 0.03. This substantial difference suggests that earlier consultation is associated with improved survival rates. The results are consistent with existing research indicating that delayed nephrology consultation is associated with higher mortality in AKI. Early involvement of a nephrologist offers benefits such as early recognition, prevention, and effective treatment of AKI. Timely intervention in AKI patients leads to improved outcomes (13, 14) Moreover, Ponce et al. (2011) found that early renal consultation significantly reduced mortality rates by facilitating more effective management and early initiation of treatment, thereby preventing further deterioration of renal function. This finding underscores the importance of prompt intervention in improving patient survival (15).

In terms of secondary outcomes, Table-III reveals several key differences between the groups. The percentage of patients requiring renal replacement therapy (RRT) was significantly higher in the Late Consultation Group (33.3%) compared to the Early Consultation Group (20%, p=0.04). This result is consistent with previous studies indicating that delays in consultation increase the need for RRT due to the progression of renal failure. Chavez et al. (2021) demonstrated that delayed intervention often leads to more severe renal impairment, necessitating RRT (16). Additionally, the Late Consultation Group had a higher mean number of hemodialysis sessions (6.8 ± 2.3) compared to the Early Consultation Group (5.2 ± 1.8, p=0.01), reflecting the increased severity and complexity of cases managed later. As noted by Gaudry et al. (2019) longer hospital stays were also observed in the Late Consultation Group (14.2 days) compared to the Early Consultation Group (10.5 days, p=0.02), reinforcing the notion that delayed management leads to prolonged hospitalizations and potentially more complications (17)

Furthermore, the Late Consultation Group showed a lower rate of full renal recovery (46.7% vs. 66.7%, p=0.01) and a higher rate of partial renal recovery (40% vs. 26.7%, p=0.05) compared to the Early Consultation Group. The difference in the percentage of patients with no renal recovery was not statistically significant (13.3% vs. 6.6%, p=0.15). These findings suggest that earlier consultation improves the likelihood of achieving full renal recovery, supporting Swaminathan et al. (2010), who found that early intervention enhances the chances of full renal function restoration. The higher rate of partial recovery in the Late Consultation

Group may indicate that delayed treatment allows for some degree of recovery but fails to fully restore renal function, consistent with the progression of AKI when treatment is delayed.

CONCLUSION

The analysis of the data demonstrates that early consultation in the management of acute kidney injury (AKI) is associated with significantly improved patient outcomes compared to late consultation. Patients in the Early Consultation Group had lower in-hospital mortality rates, fewer instances of requiring renal replacement therapy (RRT), reduced mean hemodialysis sessions, and shorter hospital stays. Additionally, early consultation was linked to higher rates of full renal recovery and a lower incidence of complications. These findings underscore the critical importance of timely intervention in AKI, supporting previous research that highlights the benefits of early renal consultation. Early management not only enhances survival rates but also reduces the severity of renal impairment and associated healthcare costs. Therefore, implementing strategies to encourage earlier consultation for AKI patients could lead to substantial improvements in both individual patient outcomes and overall healthcare efficiency.

RECCOMENDATIO AND LIMMITATION

Early consultation for acute kidney injury (AKI) should be encouraged to improve patient outcomes, including lower mortality rates, reduced need for renal replacement therapy (RRT), fewer hemodialysis sessions, and shorter hospital stays. Training for healthcare professionals on early AKI management and investment in advanced diagnostic tools are essential. Standardized treatment protocols and follow-up programs can further enhance care and long-term outcomes.

However, the study's limitations include being single-center, potentially retrospective, and possibly lacking control for all confounding variables. The sample size may be too small to detect all relevant differences, and the focus was on short-term outcomes. Future research should address these limitations for a more comprehensive understanding of the benefits of early consultation in AKI.

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