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Research Article

**A QUASI-EXPERIMENTAL RESEARCH TO DETERMINE
COURSE AND EFFICACY OF PERITONEAL DIALYSIS (PD) IN
CHILDREN DIAGNOSED WITH RENAL FAILURE**¹Dr. Roshanay Fatima, ²Dr. Muhammad Umer Zaka, ³Dr. Umer Farooq¹Sir Ganga Ram Hospital Lahore²Jinnah Hospital Lahore³Ittefaq Hospital Trust Lahore**Abstract:**

Objective: The research aimed at determining efficacy & course of (peritoneal dialysis) in children having (renal failure).

Methods: This Quasi-Experimental research was carried out at Allied Hospital, Faisalabad in the time span from January 2016 to March 2017. Forty children having renal failure were assessed for a duration of PD, efficacy of PD & its relevant complications.

Results: The cases of chronic renal failure & acute renal failure were 45% & 55% respectively & 3.8 days was the average duration of PD. Almost 75% of all patients recovered with PD & 22.5% was the mortality rate. Main complications observed were catheter-related i.e. blockade & leakage & peritonitis.

Conclusion: In children, (peritoneal dialysis) is a life-saving method that enhances (acute metabolic) derangements of (renal failure). It has more benefits through having some complications.

Keywords: Renal failure, (Renal replacement therapy), Peritoneal Dialysis (PD).

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INTRODUCTION:

A preferred way of dialysis in children is (peritoneal dialysis) worldwide but the clinical outcome, standard of care & local experience differ significantly [1]. It is a feasible way of dialysis that continues to progress since its start in the late 70's [2]. The (conventional PD) fluids comprise (physiological solutions) of glucose, electrolytes, bicarbonate precursor commonly lactate as an (osmotic agent) [2]. (PD) is less costly as compare to (haemodialysis) [3]. The patients of (cardiovascular compromise) are commonly tolerated better. It gives (flexible schedules) & permits chances to travel, work & participate in patient's day-time activities. (PD) assists in preserving (arteriovenous access sites) & is needle-less. It reduces the danger of (blood-borne infections) as (hepatitis C) [4, 5]. It helps in preserving (residual-renal) function 6 to 8 better than (haemodialysis) & is linked with some complications [9] as a displaced catheter, peritonitis & (mechanical as blockage of PD catheter).

Perforation of gut & bleeding may occur too. The prevalence of (paediatric renal failure) is enhanced in the last 10 years & it's a common health problem [9]. Both chronic renal-failure & acute mostly require supportive care & also (renal replacement therapy). The (renal-replacement therapy) may be performed like hybrid therapies, intermittent haemodialysis, (continuous renal-replacement therapy) & peritoneal dialysis. The (PD) is useful in conditions like the removal of toxins, hyperthermia, hypothermia & (vascular access problems) & also in (paediatric age group) [10]. PD is mostly used modality in less than age six years [11].

The PD seems well for Asian people & in various Asian countries, dialysis plan is increasing annually by 10% or more [12, 13]. The manifestations of (renal compromise) are improved by (acute peritoneal dialysis) & it also gives (time-bridge) for upcoming time administration for (chronic renal failure). Our research was done for sharing our experience of (acute peritoneal dialysis) in children in which an analysis of clinical results & incidence of complications was done.

PATIENTS AND METHODS:

This Quasi-Experimental research was carried out at Allied Hospital, Faisalabad in the time span of January 2016 to March 2017. In the first six months, a collection of cases & in next six months, compiling of data & (statistical analysis) was done.

Both from acute or (chronic renal failure), forty patients were selected for research at (nephrology

department) in which PD was conducted & all cases identified based on laboratory investigations & clinical presentation by getting informed consent for (peritoneal dialysis). Patients age, sex, name, record number & social status was noted & history was recorded by examining the signs of (renal failure). Following things were noted: abdominal ultrasound, renal function tests, serum electrolytes, urine complete examination, activated partial thromboplastin time, prothrombin time, arterial blood gases & complete blood counts & also indications for (peritoneal dialysis) were recorded.

By using per-cutaneous (peritoneal-dialysis catheter), (acute peritoneal dialysis) was done & hypertonic or isotonic (peritoneal dialysis-solutions) were used. For one week, (arterial blood gases) & (renal-function tests) were followed-up. Following records were statistically described by finding percentages & proportions: Interest variables as number of days of dialysis, indications for dialysis, arterial blood gases, renal function tests, clinical signs recovery, dyspnoea, complications, body swelling, decreased urine output, altered conscious and vomiting and also (socio-demographic data) as socio-economy sex.

Evaluation of improvement was measured in (arterial blood gases), (renal function tests) & clinical signs. It was noted by indications for (complications associated with PD), dialysis & days of dialysis. Standard deviation & mean was noted for data as days of dialysis, renal function tests, blood pH level, age & weight. The data like clinical signs improvement, indications for dialysis, vomiting, altered conscious, reduced urine output, dyspnoea & body swelling were analysed statistically. Investigations of arterial blood gases or renal function tests & complications were analysed using (chi-square test). The t-test was used for data as days of dialysis, (renal function tests), (blood PH level), age & weight.

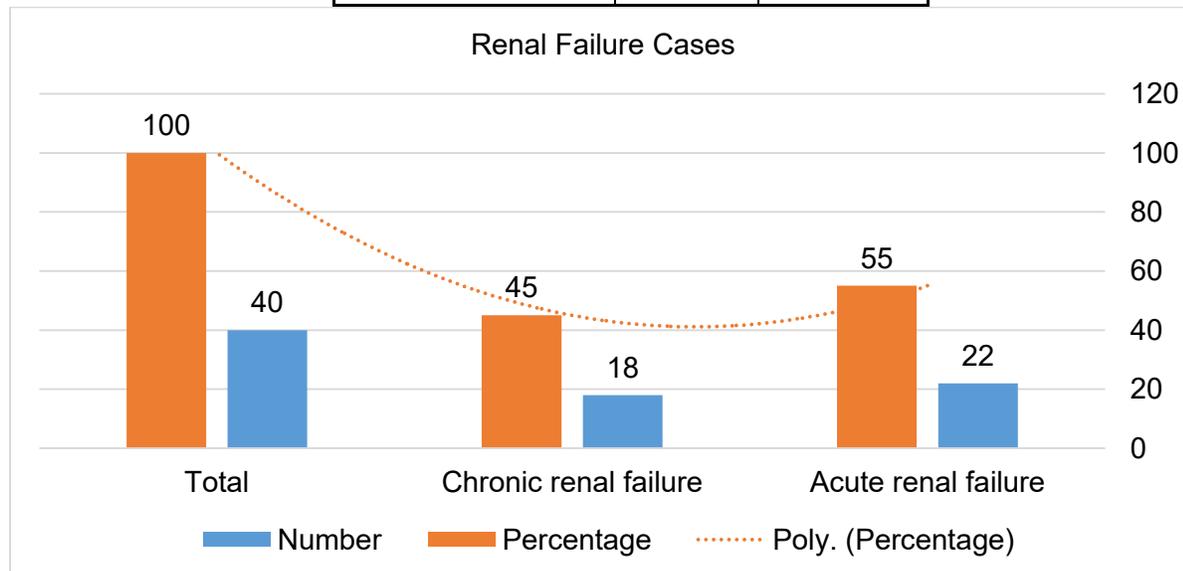
And the significant value of $p < 0.05$ was considered.

RESULTS:

In our study, 40 cases (26 at 65% male, & 14 at 35% female) of (renal failure) were selected in which median age was (54.00 months) & average age was (59.62 months) having a standard deviation of (46.74 months). The average age of females & males was 59.92 months & 59.46 months respectively. Median weight was 12.50 kg, mean weight 13.2 kg, (standard deviation) of 8.37 kg with confidence interval 95% of (10.54 – 15.89) in which most cases were of (ARF) as Table – I.

Table – I: Cases of renal failure

Renal Failure	Number	Percentage
Acute renal failure	22	55
Chronic renal failure	18	45
Total	40	100



Most cases were of (CRF) with (posterior urethral valves) having a common sign of fluid overload & pallor and ARF having (haemolytic uremic syndrome) with the sign of (acidotic breathing). ARF cases have dyspnoea as a common symptom (Table – V), CRF cases symptom was reduced (urine output).

Metabolic acidosis was common & present in 87% of cases as a sign of (PD). The second common indication was (uremic encephalopathy) in 35% of cases. The presence of acidosis was 77.8% in ARF & 95.5% in CRF with volume overload as 17.6% of CRF & 40.9% of ARF and hyperkalaemia as 5.6% of CRF & 45.5% of ARF. (Uremic encephalopathy) was 27.8% of CRF & 40.9% of ARF.

Table – II: Complications of PD (frequency, percentage and cross tabulation)

PD Complications		Number	Percentage	Pathology	
				ARF	CRF
Valid	Peritonitis	6	15	2	4
	Bleeding	3	7.5	2	1
	Perforation	1	2.5	0	1
	wound infection	2	5	0	2
	catheter blockage	5	12.5	2	3
	catheter leakage	6	15	4	2
	Total	23	57.5	10	13
Missing System		17	42.5		
Total		40	100		

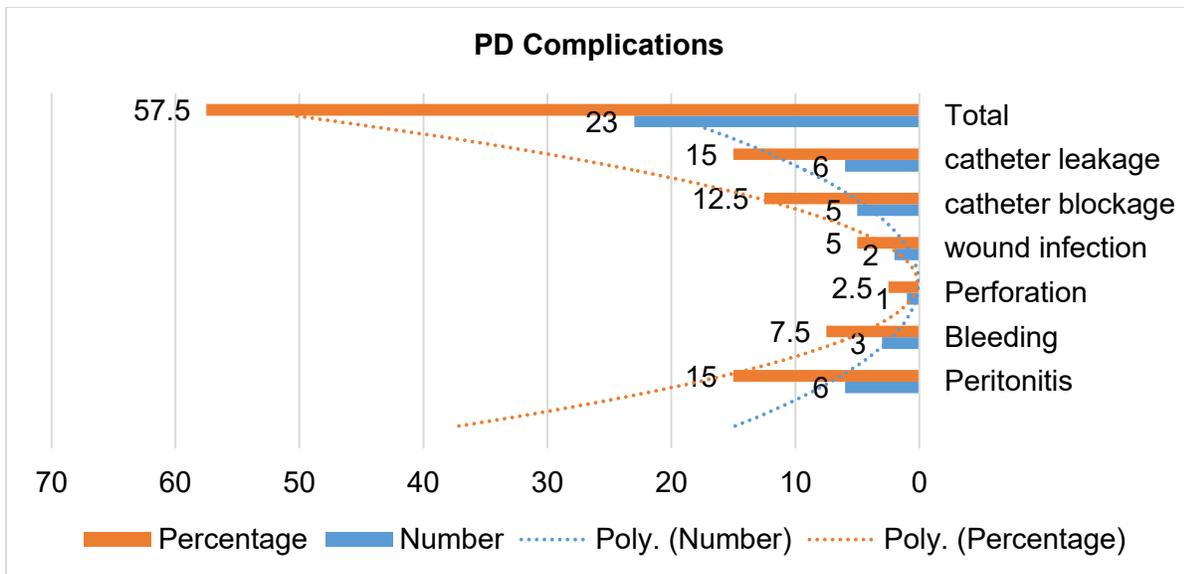
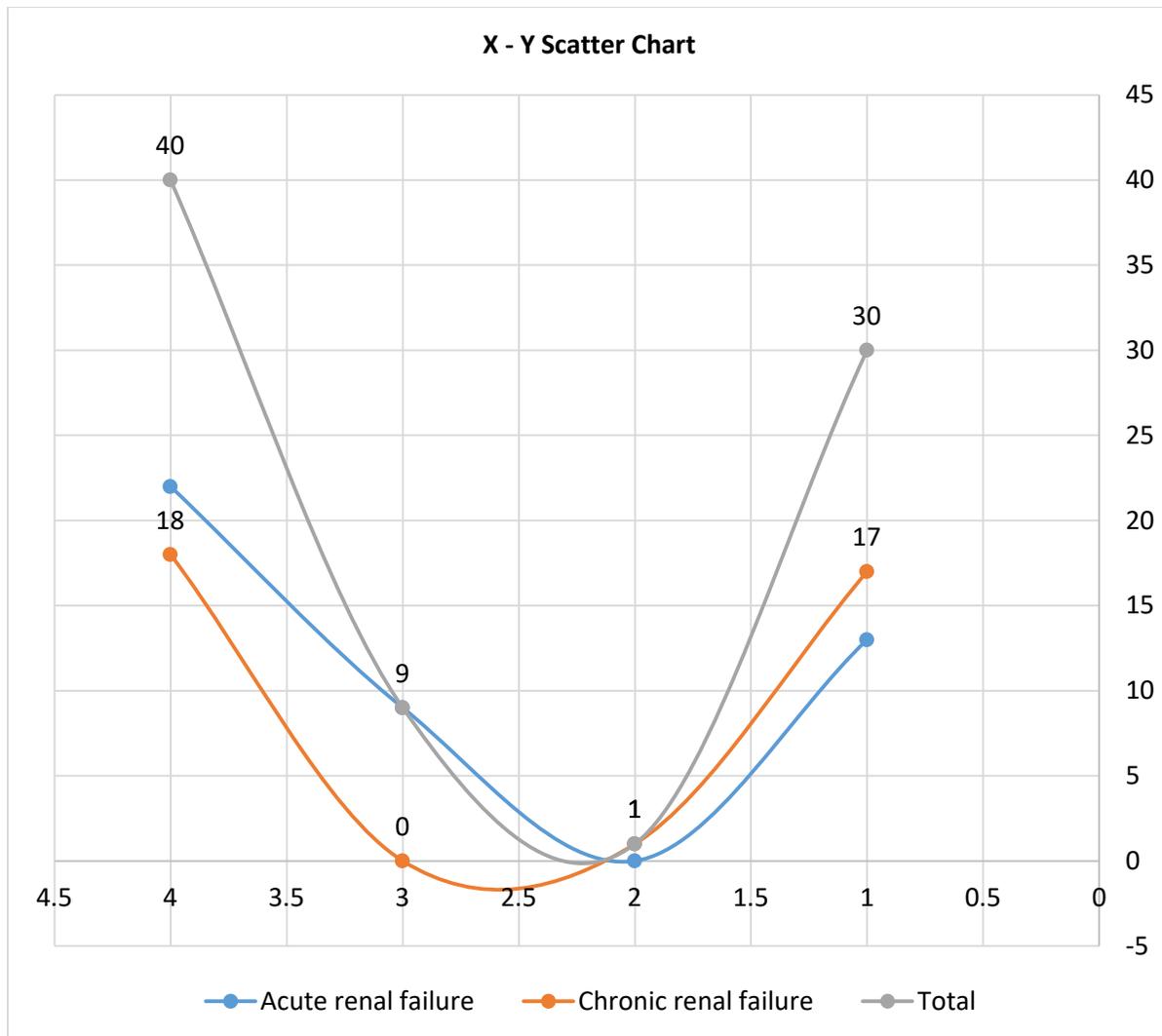


Table – III: Complications (acute vs. chronic renal failure)

Type		Number	Percentage	
Acute renal failure	Valid	Peritonitis	2	9.1
		Bleeding	2	9.1
		Catheter blockage	2	9.1
		Catheter leakage	4	18.2
		Total	10	45.5
Missing System		12	54.5	
Total		22	100	
Chronic renal failure	Valid	Peritonitis	4	22.2
		Bleeding	1	5.6
		Perforation	1	5.6
		Wound infection	2	11.1
		Catheter blockage	3	16.7
		Catheter leakage	2	11.1
		Total	13	72.2
Missing system		5	27.8	
Total		18	100	

Table – IV: Acute and Chronic Renal Failure Outcomes

Outcomes	Acute renal failure	Chronic renal failure	Total
Adequate response	13	17	30
Inadequate PD response	0	1	1
Death	9	0	9
Total	22	18	40



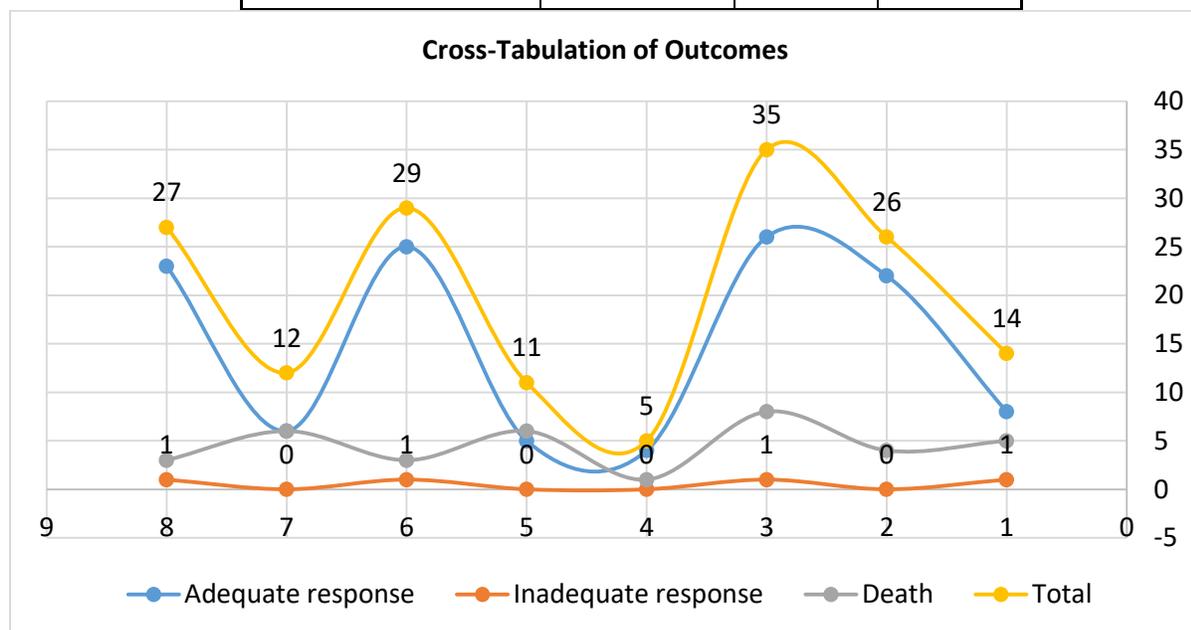
Median of PD was 4.0 days, mean duration 3.85 & (standard deviation) as 0.94 days with (confidence interval) in 95% of (3.54 – 4.15). In CRF, average duration of PD was 4.0 days, mode, 4.0 & standard deviation was 0.76 days while in ARF, average duration 3.72 days, median 4.0 & standard deviation 1.07 days & their difference was not clear as $p = 0.566$ with average hospital stay as 11.40 days, median 11.50 & (standard deviation) 3.54 days & 95% (confidence interval) was (10.26 – 12.53).

In 40 cases, the complication rate of catheter leakage & peritonitis was 26.09 each as in Table – II. In CRF,

the common complication was peritonitis at 30.8% while in ARF, it was (catheter leakage) as 40.0% in Table – III & their difference was not as significant as $p=0.611$. With PD, all (renal functions) improved & CRF cases have better result while ARF has a poor result with a significant difference among response as $p= 0.006$ in Table – IV. Results with hyperkalaemia & volume overload were significantly lower as p -values of 0.011 & 0.026 respectively. Results with (uremic encephalopathy) & (metabolic acidosis) were better as in both $p>0.05$ in Table – V.

Table – V: Cross tabulation of outcomes

Outcome	Uremic Encephalopathy		Total
	Yes	No	
Adequate response	8	22	30
Inadequate response	1	0	1
Death	5	4	9
Total	14	26	40
Outcome	Acidosis		Total
	Yes	No	
Adequate response	26	4	30
Inadequate response	1	0	1
Death	8	1	9
Total	35	5	40
Outcome	Hyperkalemia		Total
	Yes	No	
Adequate response	5	25	30
Inadequate response	0	1	1
Death	6	3	9
Total	11	29	40
Outcome	Overload		Total
	Yes	No	
Adequate response	6	23	29
Inadequate response	0	1	1
Death	6	3	9
Total	12	27	39



DISCUSSION:

In both CRF or ARF, management is always difficult requiring the important measure to take in time as (renal failure) has been seriously affecting child health. For both CRF & ARF of many interventions, PD has its place. Males outnumbered female in our 40 cases research that is confirmed by past researches of our region [14, 15]. Average in our research was 4.96 years while it was 9.48 years in research by (Ali et al14) but it included also (adult patients). The average age of ARF patients was 4.5 years in research by (Jamal et al) [15].

Our research has 55 % patients from ARF & others were of CRF in Table – I. In the same research [16] on PD, ARF cases were 74% & 26% from CRF which may be because of increasing knowledge of PD in (ARF) & selecting (haemodialysis) for CRF patients currently at our centre.

Renal failure in our study presented patients like pallor, acidotic breathing, (altered conscious state) & vomiting. While another study [14] showed, oliguria, vomiting, fluid overload & fever. With CRF, the study on children showed hypertension, (metabolic acidosis) & growth failure [17].

This study found (haemolytic uremic syndrome) as a common reason for ARF which is also observed in various researches [15, 16]. The second common reason was (septicaemia of ARF) followed by (acute glomerulonephritis) while (pre-renal reasons) less contributed to this research. Another study [18] in Thailand, (sepsis) was found the main reason for ARF followed by (hypovolemia). In a study [19] on new-borns of ARF showed surgery as main (pre-disposing factor).

A common reason for CRF in our research found was (posterior-urethral valves) that is confirmed by past researches in this hospital [16, 17]. The second common reason for CRF was (nephrolithiasis) in this study & also shown by (Hafez et al) [17]. Hypertension & diabetes mellitus is shown as the main reasons for CRF in a study on the general population [20].

In this research, the average time of PD was 3.85 days while it was 4.12 days in other local research [14]. Our study showed complications in 57.5% of cases in that peritonitis & (catheter-related) were the main as Table – II & III. The general complication of PD found is (peritonitis) in local [9, 14, 16] & also other regions of the world [21, 22].

Common complications were (catheter-related) including leakages & blockage in our study & it was

a second most occurring complication in research by (Jamal et al) which is also confirmed by a past research [16]. The (mechanical complications) [23] reported incidence was ranging from 12% to 73%. A relatively lesser rate of (peritonitis) is found in this research than other two local [9, 16] researches may be because of (maintenance of asepsis) & (technique related).

The (catheter-related) issues may not be given value in these studies [9, 16]. Gut perforation & bleeding were little greater in this research than a study by (Jamal et al) may because of the small sample or personal expertise of this research. Some un-common complications as sudden death, (encapsulating peritoneal sclerosis), (non-occlusive mesenteric ischemia), hydrothorax, chyloperitoneum & abdominal hernias were never observed in this study as their chances enhances in long-term PD in aged patients & some other (predisposing factors).

It was (metabolic acidosis) observed in our study required PD while (Saeed et al) observed the same ratio of (fluid overload) & (metabolic acidosis) as an indication of (PD). The PD efficacy is confirmed in a lot of studies [9, 14, 16] but kind of renal failure & (underlying pathology) also matters much. The overall proper response was 75% in our research & confirmed by the study [16].

Mortality in our research was 22.5% in Table – IV, it was 12% in a past research in our centre while 24% in another study [16]. Jamal et al9 showed mortality as 17%. Mortality is greater in our research because of including maximum patients of ARF which universally show lesser results. Another local study observed greater mortality in ARF was because of both HUS & septicaemia [9]. Other studies [24, 25] compared results of HD & PD & observed PD with enhanced mortality while we never compared them because just PD was employed as first-line (dialysis modality).

Other studies showed a greater ratio of (peritonitis) with growing days of PD [9, 14]. It was found also in this research as (peritonitis rates) were greater in CRF patients because they need more PD days. In (Jamal et al.), 50% patients were having persistent (renal impairment) immediate after doing PD that is opposite to our outcomes.

CONCLUSION:

In children, (peritoneal dialysis) is a life-saving method that enhances (acute metabolic) derangements of (renal failure). It has more benefits through having some complications.

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