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Comparison of Two Dialytic Modalities in Snakebite induced Acute Kidney Injury

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INTRODUCTION

Introduction

Snake bite

- common
- frequently devastating environmental and occupational disease
- Myanmar ---- snake bite = one of the priority health problems
- Acute kidney injury (AKI)- major contributor to morbidity & mortality associated with Russell's viper bite.

Introduction (cont.)

- **Hemodialysis** (HD) and **peritoneal dialysis** (PD) - mainstay
- inadequacy of PD
- intermittency of HD complicated by hemodynamic instability.

Continuous renal replacement therapy (CRRT)

- viable modality for Mx of hemodynamically unstable patients with AKI.
- limited by high cost and problems with anticoagulation.

Introduction (cont.)

Hybrid methods - sustained low efficiency dialysis (SLED)

- combining the advantages of both modalities – i.e., excellent hemodynamic stability and low costs
- use the conventional HD machines
- blood pump speeds and dialysate flow rates intermediate between HD and CRRT.
- Treatment duration and frequency > HD
- Hemodynamic tolerance & small solute clearance - good

Introduction (cont.)

- ***No consensus - optimal modality*** for AKI due to Russell's viper bite worldwide.
- Myanmar
 - Hemodialysis / Peritoneal dialysis = dialytic support

Introduction (cont.)

- randomized trial comparing acute peritoneal dialysis with sustained low efficiency dialysis in AKI patients due to Russell's viper bite.

HYPOTHESIS

HYPOTHESIS

- Sustained low-efficiency dialysis has **better outcomes** than peritoneal dialysis in acute kidney injury patients due to Russell's viper bite in terms of renal recovery and patient survival.

AIM & OBJECTIVES

Aim

- To compare the **therapeutic effectiveness** of sustained low-efficiency dialysis and peritoneal dialysis in oliguric acute kidney injury patients due to Russell's viper bite

Objectives

1. To compare the rate of **mortality and case failure** between SLED and PD groups
2. To compare the rate of **renal recovery** between the two groups
3. To compare the **time to complete renal recovery** of acute kidney injury in both groups
4. To describe the **complications** in both groups

MATERIALS AND METHODS

MATERIALS AND METHODS

Study design

- Randomized Controlled Study

Study area, period and population

- Study area - Department of Nephrology, Yangon Specialty Hospital
- Study period - From January, 2014 to December, 2015
- Study population - Acute kidney injury patients due to Russell's viper bite requiring renal replacement therapy
- 30 patients in each group

Patients

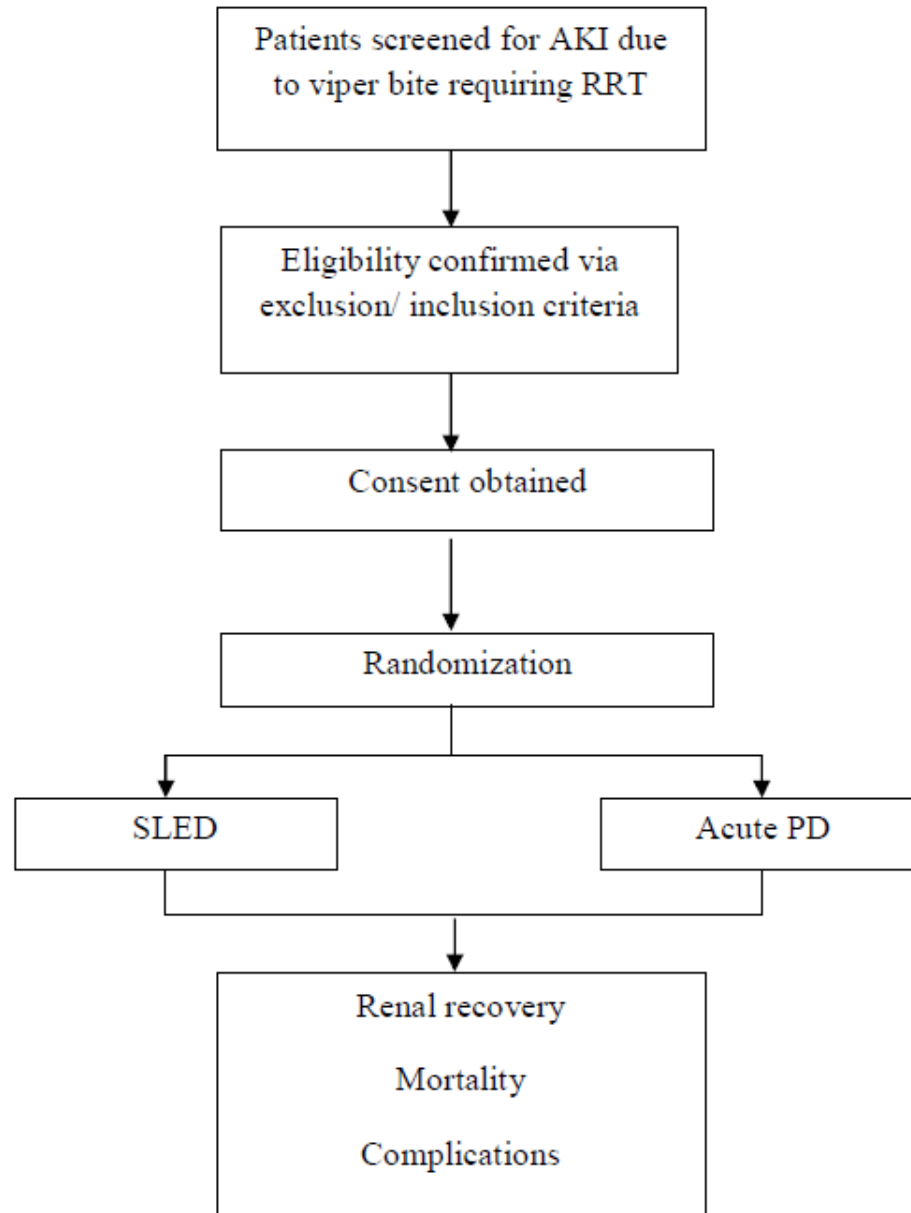
Inclusion Criteria

- Russell's viper bite patients with oliguric acute kidney injury requiring renal replacement therapy

Exclusion Criteria

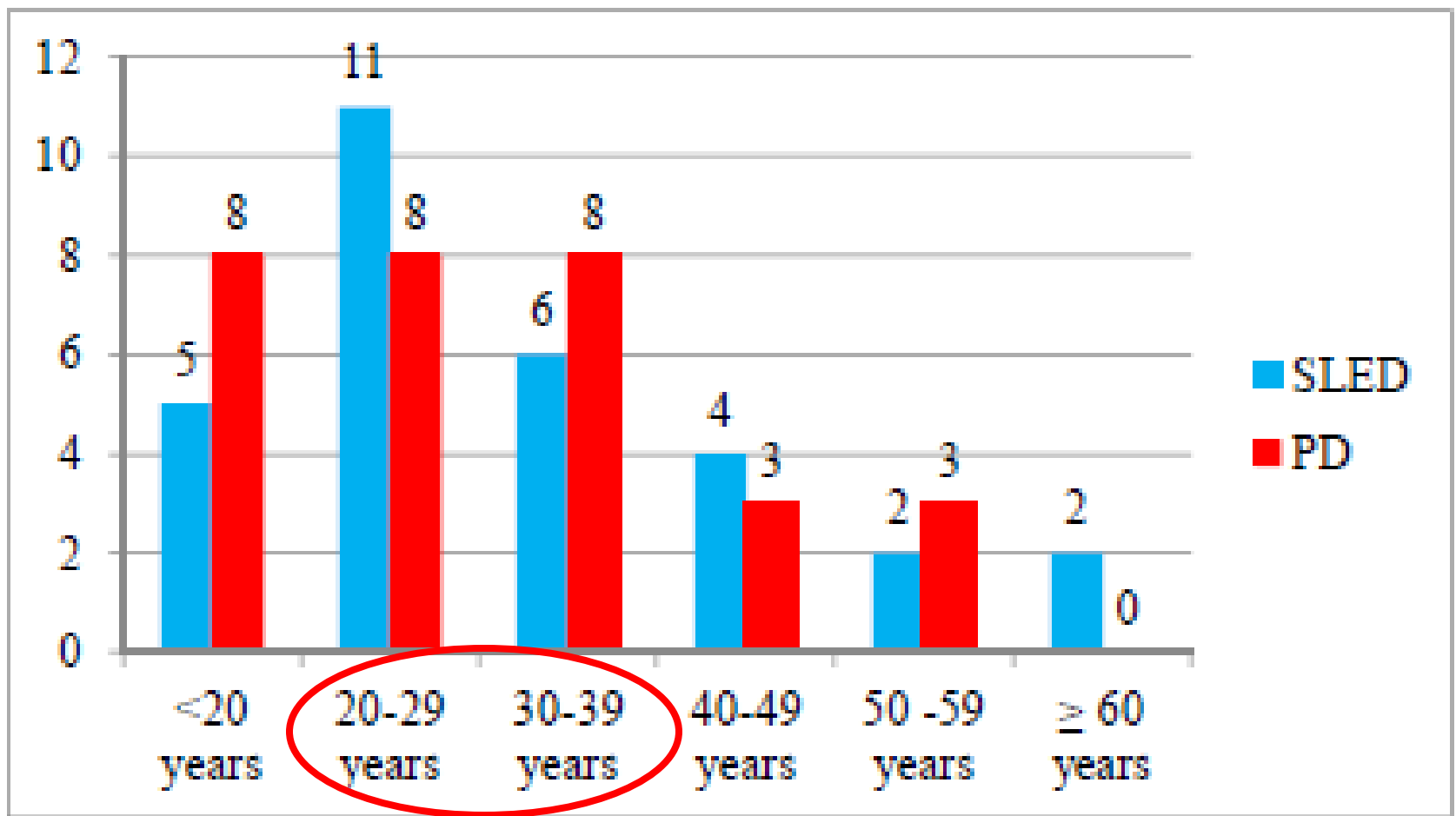
- pregnant patients
- patient with known documented renal disease
- patient with ultrasonographic evidence of polycystic kidney or hydronephrosis or small contracted kidney or cirrhosis of liver
- patient who was contraindicated to SLED or PD.

Algorithm of the study



RESULTS

Figure (1) Age distribution of study groups



$p = 0.305$

Figure (2) Gender distribution of study groups

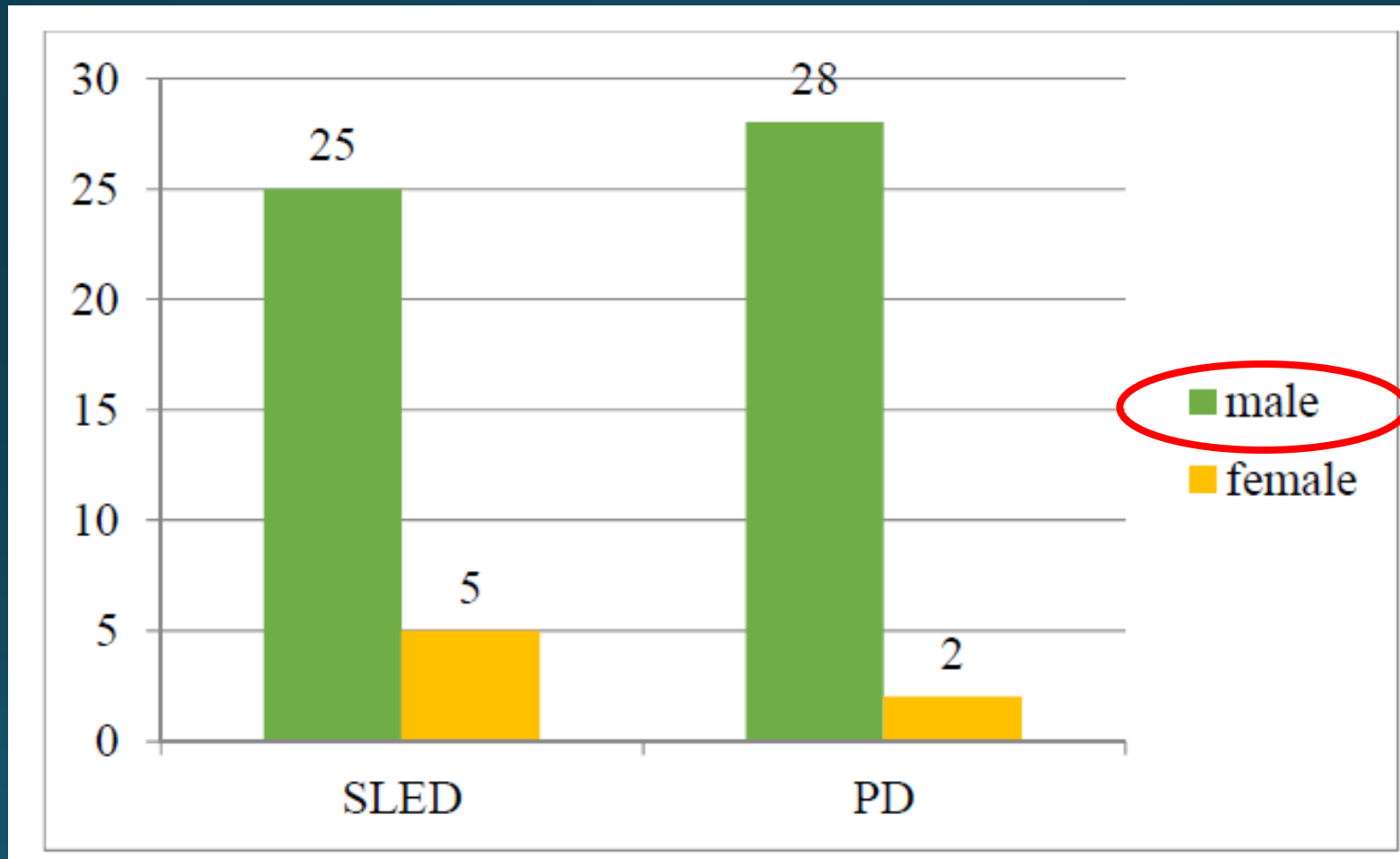


Figure (3) Occupation distribution of study groups

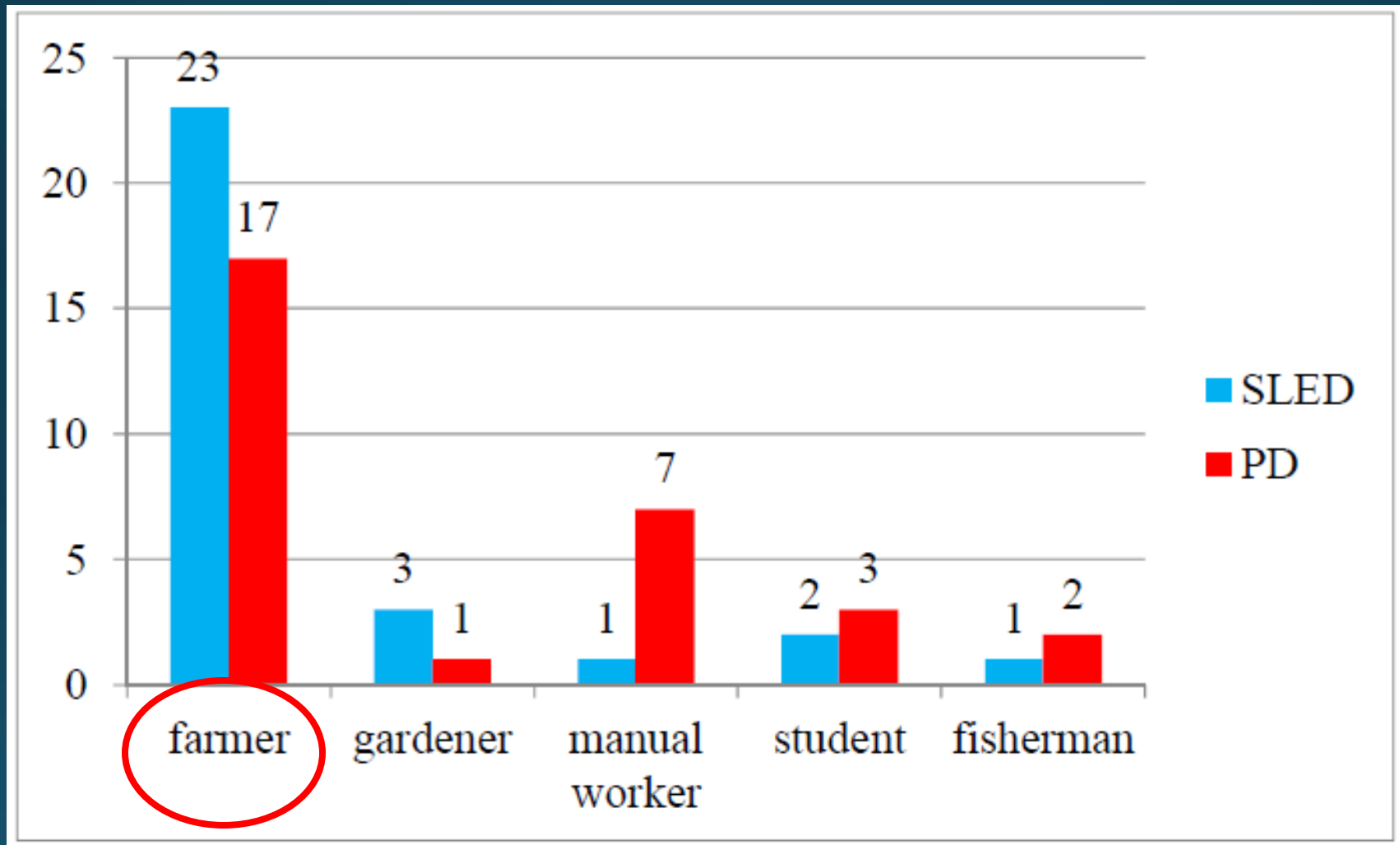


Figure (4) Residence distribution of study groups

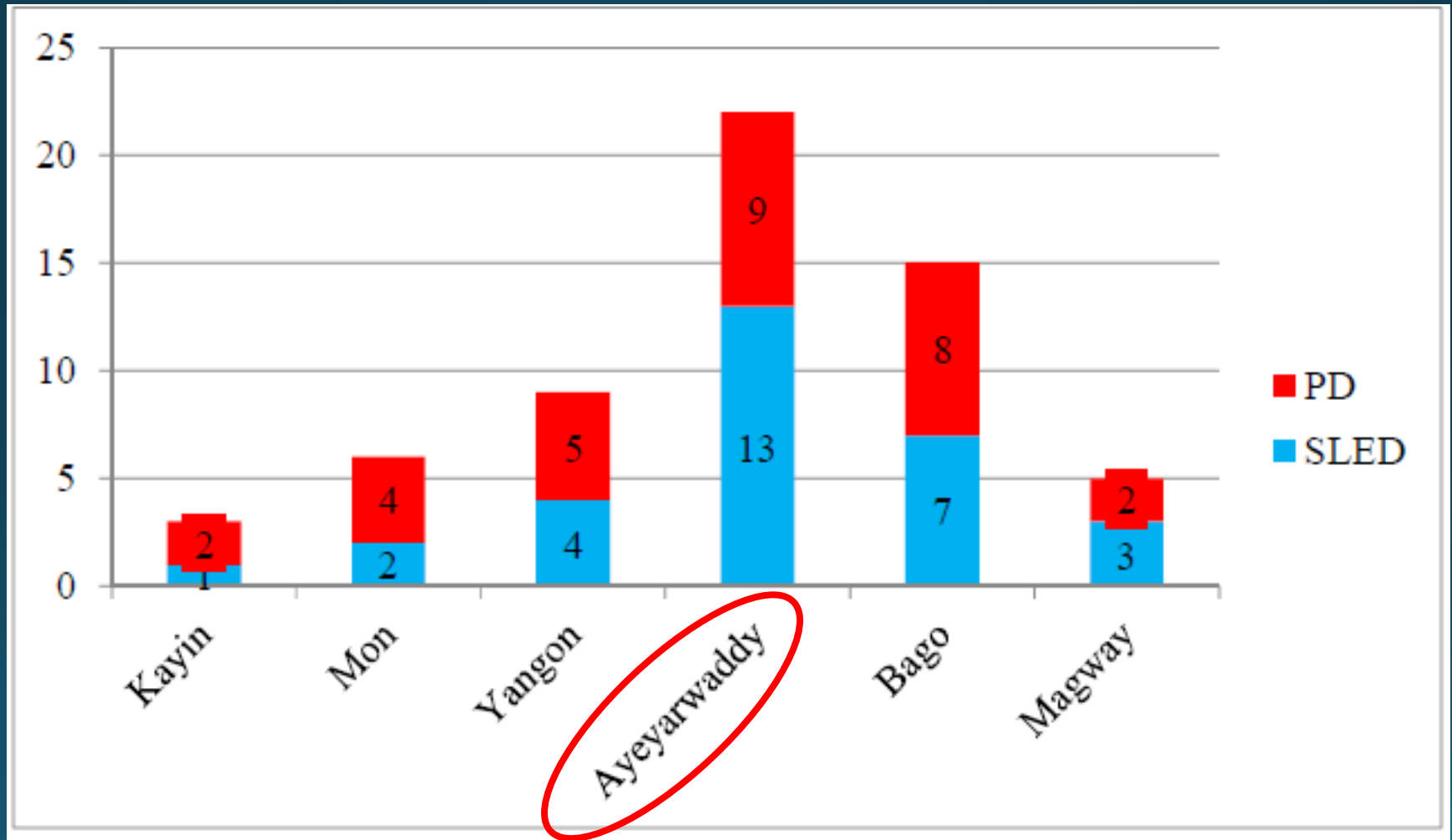


Table (1) Comparison of Mortality between SLED and PD groups

	SLED		PD		Total	
	N	%	N	%	N	%
Alive	29	96.67%	23	76.67%	52	86.67%
Expired	0	0.00%	3	10%	3	5%
Signed and Gone	1	3.33%	4	13.33%	5	8.33%
Total	30	100.00%	30	100%	60	100%

Table (2) Comparison of Case Failure between SLED and PD groups

	SLED		PD		Total	
	N	%	N	%	N	%
Alive	29	96.67%	23	76.67%	52	86.67%
Case failure (Expired+Signed and gone)	1	3.33%	7	23.33%	8	13.33%
Total	30	100%	30	100%	60	100%
$\chi^2 = 5.192$		$p=0.023$				

Table (3) Renal recovery in SLED and PD groups

	SLED		PD	
	N	%	N	%
Complete renal recovery	19	63.33%	22	73.33%
Partial renal recovery	10	33.33%	2	6.67%
Non recovery of renal function	1	3.33%	6	20.00%

Table (4) Comparison of renal recovery and non-recovery of renal function between SLED and PD groups

	SLED		PD	
	N	%	N	%
Renal recovery (complete + partial)	29	96.67%	24	80%
Non- recovery	1	3.33%	6	20%
$\chi^2 = 4.043$ $p=0.044$				

Table (5) Comparison of complete and non-complete renal recovery between SLED and PD groups

	SLED		PD	
	N	%	N	%
Complete renal recovery	19	63.33%	22	73.33%
Non-complete renal recovery (partial + non-recovery)	11	36.67%	8	26.67%
$\chi^2 = 0.693$ <p>$p=0.405$</p>				

Table (6) Time to complete renal recovery in SLED and PD groups

	N	Mean (days)	SD	Minimum(days)	Median(days)	Maximum(days)	<i>p</i>
SLED	19	17.79	5.19	10	18	26	0.165
PD	21	19.81	3.97	10	20.5	26	

Table (7) Complications observed in SLED

Complications	Number	%
Hypoalbuminemia	2	6.67%
Catheter infection	1	3.33%
Artery puncture	-	-
Hypotension	1	3.33%
Hemothorax/ Pneumothorax	-	-
Arrhythmia	-	-
Air Embolism	-	-
Total	4	13.33%

Table (8) Complications observed in PD

Complications	Number	%
Peritonitis	7	23.33%
Hyperglycemia	3	10.00%
Hypoalbuminemia	14	46.67%
PD tube blockage	1	3.33%
Exit site leakage	1	3.33%
Total	26	86.67%

DISCUSSION

DISCUSSION

- Russell's viper bite = common health problem in Myanmar
- ~ 70% of AKI due to Russell's viper bite – RRT
- Developed countries -- CRRT or HD = mainstays
- Developing countries -- HD or PD = dialytic support
- SLED = hybrid HD
- Hospital based interventional trial
- 60 patients

DISCUSSION (cont.)

- Young active age group
- Majority - farmers (occupational hazard in rural tropics)
- Male preponderance (breadwinners of the family)

DISCUSSION (cont.)

- Overall mortality rate = 5%
- Case failure rate (expired + signed & gone) = 13.33%

Mohapatra et al. (2011)	Snake bite in one survey from India	hospital mortality = 23%
Trang and others (1992)	64 patients with malaria ARF treated with PD	mortality rate = 19%.
Naqvi et al. (2003)	Pakistan ARF patients due to malaria who underwent hemodialysis	mortality rate = 25.8%
Anochie and Eke (2006)	Pediatric acute peritoneal dialysis in southern Nigeria	mortality rate = 22.2%
Cheng et al. (2014)	Sustained low-efficiency dialysis treatment in 15 patients of severe snakebite	mortality rate = 20%

DISCUSSION (cont.)

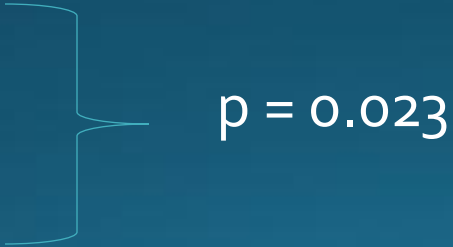
- Overall mortality rate - **lower** compared to other studies
- This might be due to
 - ***Snake bite AKI***
 - ***relatively young age***
 - ***no comorbidity of study population.***

DISCUSSION (cont.)

Mortality rate

- SLED = 0%
- PD = 10%

Case failure (expired + signed & gone)

- SLED = 3.33%
 - PD = 23.33%
- 
- $p = 0.023$

Mortality of Two Dialytic Modalities

Win-Win-Hlaing (2010)	outcome of PD & HD in ARF d/t Russell's viper bite	no significant difference 20.7% in PD 17.4% in HD
Ponce et al. (2013) Brazil	double-center RCT AKI comparing high volume PD vs extended daily dialysis	63.9% in high volume PD 63.4% in extended daily dialysis
George et al. (2011)	continuous veno-venous hemodiafiltration vs continuous PD in critically ill	84% in continuous veno- venous hemodiafiltration group 72% in PD group

DISCUSSION (cont.)

Ponce et al. study

- used flexible PD catheter
- exchanges with Dianeal PD solution using HOMECHOICE cycler for 24 hours dialysis 7 days per week.

This study

- rigid PD catheter and local PD solution
- Rigid PD catheter - relatively more prone - trauma , infection

Mortality of Two Dialytic Modalities

Gabriel et al. (2008)

continuous PD and daily HD - both effective in treating AKI patients

58% in PD group
53% in daily HD group

Phu et al. (2002)

infection associated ARF in Vietnam
PD vs Hemofiltration

47% in PD group
15% in hemofiltration group
 $p=0.005$

DISCUSSION (cont.)

- The case failure difference of our study is **comparable to the mortality rate of Vietnamese study** because both studies used
 - rigid catheter
 - open drainage system
 - manual exchanges

DISCUSSION (cont.)

Renal recovery vs non-recovery = statistically significant difference ($p=0.044$) [technique of PD , small no. of study]

Complete vs non-complete renal recovery = statistically insignificant difference ($p=0.405$).

**Ponce et al.
(2013)**

HVPD = 29.6% (18/61)
Extended HD = 26.9% (22/82)

$p = 0.11$

**Gabriel et al.
(2008)**

HVPD = 83%
Daily HD = 77%

NS

DISCUSSION (cont.)

Difference in **time to complete renal recovery** = statistically insignificant ($p = 0.165$)

Ponce et al. (2013) Brazil	Extended HD = 11 (5.7-20 days) High vol PD = 9 (5.7-19 days)	$p = 0.58$
Win Win Hlaing (2010)	PD = 18.95 ± 7.32 days HD = 27.35 ± 10.44 days	$p=0.004$
Gabriel et al. (2008)	High volume PD = 7.2 ± 2.6 days Daily HD = 10.6 ± 4.7 days	high volume PD - significantly shorter time to the recovery of renal function

DISCUSSION (cont.)

Intermittent HD vs PD

- Reasons for rapid biochemical recovery in PD group than HD group
 - better hemodynamic stability
 - smooth removal of fluid
 - no rapid fluid shift
- SLED and PD - hemodynamic tolerability.
- SLED vs PD = time to complete renal recovery - not different

DISCUSSION (cont.)

- Complications - manageable.
- **Hypoalbuminemia** - albuminuria and protein loss in peritoneal dialysis.
- One patient in SLED group - **hypotension** during dialysis.
(severe DIC with small ICH, Hypopituitarism)
- Other serious complications - not seen in this study population.
This might be due to the small number of patients.

CONCLUSION

CONCLUSION

- Acute kidney injury due to Russell's viper bite = common
- Substantial morbidity and mortality
- Peritoneal dialysis and intermittent hemodialysis = usual modalities of renal replacement therapy
- Sustained low efficiency dialysis vs Peritoneal dialysis

CONCLUSION (cont.)

- Significant difference in *case failure and renal recovery*
- SLED group - better outcome
- *Mortality and time to complete renal recovery* - not statistically different
- Some minor but mostly treatable *complications* noted in both groups

CONCLUSION (cont.)

SLED

- survival advantage
- significantly better clinical outcome

SLED - one of the dialytic modality of choice if available
resource

PD - important modality --- resource-poor setting of
developing countries

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Thank You