META-ANALYSIS

Community acquired acute kidney injury in South Asia: Causes and outcome. A Meta-Analysis

Rubina Naqvi, Anbreen Huma

Abstract

Objective: To collect all studies on acute kidney injury, even with their limitations, done in South Asia to draw a picture about the types of acute kidney injury prevalent in the region.

Method: The meta-analysis was conducted in June 2022 and comprised search on PubMed, Medline, Cochrane Library and Google Scholar databases for studies on acute kidney injury done in South Asia regardless of time limit, and published in the English language. Combinations of key words used were 'community acquired acute kidney injury' or 'acute renal failure' with using individual names of 'different countries' in South Asia. Data was extracted and analysed.

Results: Of the 31(67.4%) studies subjected to detailed analysis, 17(54.83%) had been done in India, 10(32.25%) in Pakistan, 2(6.45%) in Nepal, and 1(3.22%) each in Bangladesh and Sri Lanka. Overall, there were 16,584 patients with acute kidney injury. There were 16(51.61%) studies focussing on community-acquired acute kidney injury, while 15(48.38%) also included hospital-acquired acute kidney injury. Also, 17(54.83%) studies were prospective and 14(45.16%) were retrospective. Pattern of defining and classifying acute kidney injury varied in the studies. Need for renal replacement was not mentioned universally. Complete recovery reported varied 40-80% and mortality 2.2-52% in the studies analysed.

Conclusions: The number of acute kidney injury patients was considerable. Despite variations in definitions, study designs and outcomes, the meta-analysis provides useful information about the pattern of presentation and major causes of community-acquired acute kidney injury in South Asia.

Keywords: Acute kidney injury, Community-acquired, South Asia, Meta-analysis. (JPMA 73: 333; 2023)

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Introduction

The South Asia region consists of eight countries; Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. These countries generally face issues like rising commodity prices, limited supplies and financial-sector vulnerabilities.[1] In terms of global ranking on the basis of gross domestic product (GDP), India ranks 6th, Bangladesh 42nd, Pakistan 46th, Sri Lanka 69th, Nepal 100th, Afghanistan 114th, Maldives 157th and Bhutan 168th.[2] Access to healthcare in this region is scarce and in majority cases it is not supported by the state, resulting in the emergence of private-sector healthcare which the common man does not always afford. Major issues, like maternal and child health, infectious diseases and exposure to animal, plant and chemical toxins, remain commonplace. Acute kidney injury (AKI), which was previously called acute renal failure (ARF), has shown wide variation in prevalence; both in community and hospital settings. One main reason contributing to this heterogeneity is the absence of a standard definition for condition, and professionals used to diagnose ARF on the basis of sudden rise in creatinine from >1.5, to >2, to >3mg/dl, or >500µmol/l,[3] or on the basis of a sudden drop in glomerular filtration rate (GFR) of >50%.[4-19]

In 2002, the acute dialysis quality initiative workgroup proposed a multi-level AKI classification system called the Risk, Injury, Failure, Loss, and End-stage kidney (RIFLE) criteria. In 2005, the Acute Kidney Injury Network (AKIN) classification was introduced, and in 2012 came the Kidney Disease: Improving Global Outcomes (KDIGO) guidelines.[20] AKI can occur as a result of volume loss in the form of gastroenteritis, blood loss around child birth, or as result of trauma, infections common in this region, like malaria, dengue, leptospirosis, or animal toxins, like snake envenomation or scorpion sting or exposure to other poisons, incidental environmental exposure or intentional intake.[8,21] Depending on healthcare facilities available, such cases are either missed completely or reported very infrequently in literature. The current meta-analysis was planned to collect all studies on AKI, even with their limitations, done in South Asia to draw a picture about AKI types prevalent in the region.

Materials and Methods

The meta-analysis was conducted in June 2022 and comprised search on PubMed, Medline, Cochrane Library and Google Scholar databases for studies on acute kidney

Department of Nephrology, Sindh Institute of Urology and Transplantation (SIUT), Karachi, Pakistan.

Correspondence: Rubina Naqvi. e-mail: rubinanaqvi@gmail.com

ORCID ID. 0000-0003-0666-7212

injury done in South Asia regardless of time limit, and published in the English language. Combinations of key words used were 'community-acquired acute kidney injury' (CA-AKI) or 'acute renal failure' with using individual names of 'different countries' in South Asia.

Studies which addressed an isolated cause or group, like AKI after snake bite, or after wasp sting or scrub typhus, without mentioning total number of AKI cases during the study period were excluded.

The studies shortlisted on the basis of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 expanded checklist[22] were categorised into different sub-groups.

Data was extracted on Excel sheets and analysed.

Results

Of the 31 studies subjected to detailed analysis, 17(54.83%) had been done in India, 10(32.25%) in Pakistan, 2(6.45%) in Nepal, and 1(3.22%) each in Bangladesh and Sri Lanka (Figure). Overall, there were 16,584 patients with AKI.

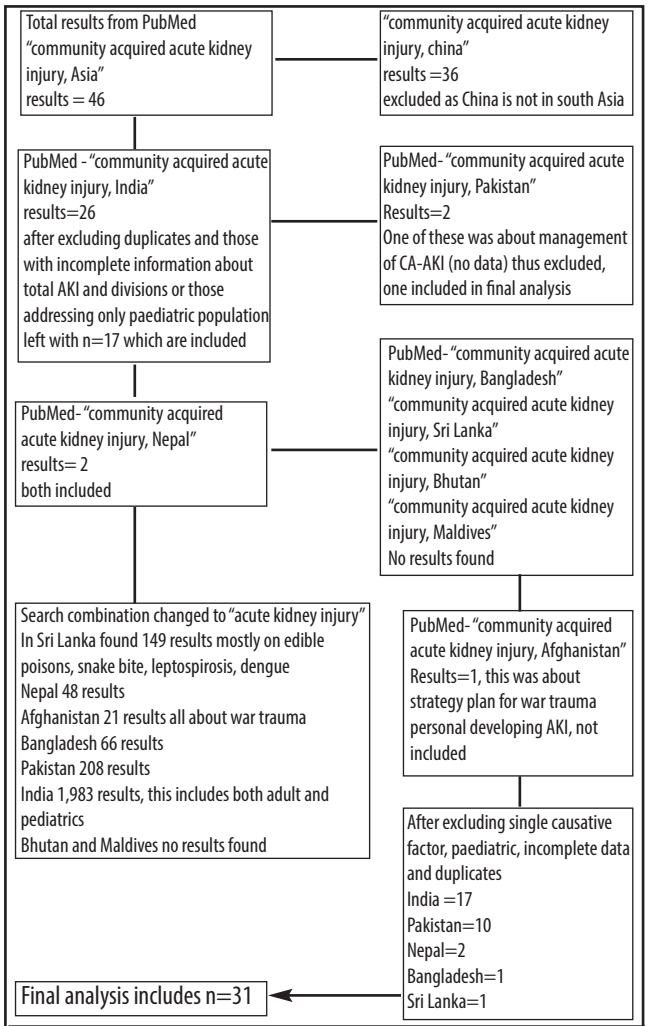

Figure: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow-chart.

There were 16(51.61%) studies focussing on CA-AKI, while 15(48.38%) also included hospital-acquired (HA-AKI). Also, 17(54.83%) studies were prospective and 14(45.16%) were retrospective. Further, 2(6.45%) studies comprised paediatric population along with adults, while 29(93.54%) comprised only adult populations. Study duration varied from 0.5 to 26 years; 1(3.22%) study was published in 1993; 20(64.51%) between 2003 and 2019; and 10(32.25%) between 2020 and June 2022. Pattern of defining and classifying AKI varied in the studies, RIFLE criteria was used to define AKI in 2(6.45%) studies, KDIGO in 9(29.03%), AKIN in 2(6.45%), AKI requiring dialysis (AKI-D) in 1(3.22%), and 16(51.61%) studies categorised AKI on the basis of recent derangement in renal functions with suggestive history and normal-sized kidneys on ultrasonography (Table).

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Patients were classified under medical, obstetrical and surgical cases in 20(64.51%) studies, while 9(29.03%) used cause-based classification, and 2(6.45%) studies used pre-renal, renal and post-renal methodology. Medical causes were most commonly reported contribution to AKI ranging from 77-91 %. This highest percentage was in a study which intentionally excluded obstetrical cases, and divided total AKI cases in medical and surgical categories. Obstetrical causes ranged from 0.5-35%, while surgical causes from 1.5-20%. The studies which used cause based classification of AKI, reported sepsis as most common (up to 45%), one exception was study from Nepal which reported acute gastro-enteritis contributing 77% to AKI.

In 11(35.48%) studies, there was no mention of renal replacement therapy (RRT) requirement. Haemodialysis was most commonly used RRT, provided to 9-85% of patients. While intermittent peritoneal dialysis used in 1-53% patients.

The number of patients who recovered from AKI was not mentioned in 17(54.83%) studies. Those who developed irreversible renal failure, or chronic kidney disease (CKD) were not mentioned in 18(58.06%) studies. Acute phase mortality was reported in 24(77.42%) studies with ranges from 2.2-52%. Multi organ failure, use of vasopressin, presence of sepsis, low serum albumin and need for RRT were reported as predicting factors for mortality.

Table: Characteristics of the studies analysed.

Author	City	Country	Publication year	Study design	Study duration (years)	Study population	Definition of AKI	Classification of AKI	Recovered %	Died %
Anandh U[23]	Bangalore	India	2003	Prospective	2	642	NA	Cause based	NA	26.5
Ansari MR[4]	Hyderabad	Pakistan	2008	Prospective	1	116	Deranged renal functions	Only obstetrical	47.41	20.68
Arshad A[24]	Karachi	Pakistan	2020	Retrospective	1	134	KDIGO	Cause based	NA	NA
Bagai S[25]	Dehli	India	2019	Prospective	NA	65	RIFLE	Cause based	41.50	50.70
Chaudhri N[26]	Islamabad	Pakistan	2019	Prospective	1	294	RIFLE	Medical/surgical	NA	39.10
Chhetri PK[5]	Katmandu	Nepal	2008	Retrospective	1	45	Deranged renal functions	Cause based	77.77	2.22
Farid MA[6]	Faisalabad	Pakistan	2019	Descriptive	2	150	Deranged renal functions	Pre-renal/ renal/post-renal	NA	NA
Goswami S[27]	Indore	India	2020	Prospective	2	286	KDIGO	Medical/ obstetrical/ surgical	59	20
Gupta KL[28]	Chandigarh	India	2019	Prospective	1	150	AKIN	Cause based	NA	12
Gupta S[7]	Ludhiana	India	2021	Prospective	1.25	380	Deranged renal functions	Cause based	47	21
Irum H[29]	Karachi	Pakistan	2020	Prospective	0.5	230	KDIGO	Medical/ obstetrical/ surgical	66.96	4.35
Jaryal A[30]	Shimla	India	2022	Retrospective	2	128	AKI-D	Medical/ obstetrical/ surgical	53.10	36.70
Jayakumar M[8]	Chennai	India	2006	Retrospective	10	1112	Deranged renal functions	Medical/ obstetrical/ surgical	NA	19.6
Kaaviya R[31]	Puducherry	India	2019	Prospective	2.75	186	KDIGO	Only medical	NA	15.10
Kaul A[9]	Lucknow	India	2012	Retrospective	5	240	Deranged renal functions	Medical/ obstetrical/ surgical	44	26.25
Khakurel S[10]	Katmandu	Nepal	2005	Retrospective	1	45	Deranged renal functions	Medical/ obstetrical/ surgical	64.44	22.22
Khan FG[32]	Karachi	Pakistan	2022	Prospective	0.5	400	KDIGO	Medical/ surgical	NA	NA
Kumar S[11]	Shimla	India	2012	Prospective	1	102	Deranged renal functions	Medical/ obstetrical/ surgical	70.80	29.20
Naqvi R[21]	Karachi	Pakistan	2021	Retrospective	25	5,623	KDIGO	Medical/ obstetrical/ surgical	53.35	23.84
Prakash J[12]	Varanasi	India	2013	Retrospective	26	2,405	Deranged renal functions	Medical/ obstetrical/ surgical	NA	NA
Priyamvada PS[33]	Puducherry	India	2018	Prospective	2.5	232	KDIGO	Cause based	NA	53.44
Rabbani A[13]	Karachi	Pakistan	2008	Retrospective	10	898	Deranged renal functions	Medical/ obstetrical/ surgical	NA	NA
Rashid HU[14]	Dhaka	Bangladesh	1993	Retrospective	5	129	Deranged renal functions	Medical/ obstetrical/ surgical	NA	25
Sethi J[15]	Chandigarh	India	2022	Prospective	4	573	Deranged renal functions	Medical/ obstetrical/ surgical	NA	18.30
Shaikh QA[16]	Larkana	Pakistan	2008	Retrospective	7	294	Deranged renal functions	Pre-renal/ renal/post-renal	NA	NA
Singh Y[17]	Haldwani	India	2016	Prospective	1	102	Deranged renal functions	Cause based	NA	41.80
Umesh L[34]	Bangalore	India	2016	Prospective	4	624	AKIN	Medical/ obstetrical/ surgical	80	NA
Vairakkani R[35]	Chennai	India	2022	Retrospective	2	358	KDIGO	Medical/ obstetrical/surgical	40	39.70
Vikrant S[36]	Shimla	India	2018	Prospective	1.25	309	KDIGO	Medical/ obstetrical/surgical	NA	8.70
Wijewickrama E[18]	Colombo	Sri Lanka	2014	Prospective	0.5	65	Deranged renal functions	Cause based	NA	52.30
Zarkoon AK[19]	Quetta	Pakistan	2020	Retrospective	2	267	Deranged renal functions	Medical/ obstetrical/ surgical	67.70	4.20

Discussion

The actual CA-AKI burden in South Asia was difficult to estimate accurately. Some countries in the region do not have state-organised renal care centres with relevant diagnostic and management tools available under one roof. Nephrologists providing renal care in private setups are bound to limit investigations and treatment according to the social status of the patient. Therefore, complete data for both government and private centres is difficult to obtain. There are also nephrologists who manage renal patients in accordance with international guidelines, but are not interested in converting and publishing their data in research form. This leaves very few studies published from the region.

The present meta-analysis, despite having done away with time restriction, found 31 studies published over a span of 29 years on the subject of interest. Many of these studies just recorded the number of AKI cases, their causes and/or outcomes, without separating CA-AKI from HA-AKI.[8,11,13,24,26,30,32,33,35,36] Some provided total number of hospital admissions during the studied period and prevalence of AKI,[18,25] while others only recorded AKI. Some studies, after giving the total number of AKIs, further evaluated only one or two causes, like only obstetrical causes[4] only medical causes[31] or medical and surgical causes.[26,32]

Since the present meta-analysis included research done without any time bar, some of the studies were published when RIFLE or other diagnostic criteria had not been established. In contrast, the more recent publications used RIFLE, AKIN, KDIGO or AKI-D criteria, applied either retrospectively or prospectively.

Similarly, there was also variation in categorising AKI in different classes. Some classified it as medical, obstetrical and surgical causes,[6,8-15,19,21,27,29,30,34-36] while others made it cause-based without universally identifying the source of sepsis origin.[5,7,17,18,23,24,28,33] Two studies used the pre-renal, renal and post-renal methodology.[6,16]

Aetiological pattern of AKI also differed in South Asia compared to other parts of the world. For instance, obstetrical AKI is almost non-existent in the developed world, but the studies analysed in the current meta-analysis reported 3.1% to 36% prevalence.[4,30]

A study in China, comprising data from 44 medical facilities of 4,136 patients with CA-AKI, showed distribution of causes as 48% pre-renal, 27% renal, 12% post-renal and 13% indicating exposure to nephrotoxins.[37] The current meta-analysis showed volume depletion, infections and animal toxins being more frequent causes in South Asia.

Some of the studies analysed, after giving details of different causes and symptoms at presentation, did not further discuss requirement of RRT[6,7,12,13,15,23,24,25,29] or outcome of patients.[6,12,13,16,23,24,32] Some used intermittent haemodialysis (IHD) and intermittent peritoneal dialysis (IPD) both in their populations,[11,21] while the more recent studies also used sustained low-efficiency daily dialysis (SLED-D) along with IHD.[30,33]

Also, in most studies, a number of patients disappeared beyond 90 days of follow-up after first discharge from hospital. Thus, data on patients developing CKD cannot be commented upon. Outcome as complete recovery from AKI was also missing in many studies.[6,8,12-18,23,24,26,28,31-33,36] Five of the studies did not comment on mortality rate among their subjects.[6,16,24,32,34]

The current meta-analysis included even studies with limitations. This was done to encourage health professionals to share their experiences more frequently and with fewer shortcomings.

Despite the limitations, by compiling data, the current meta-analysis gives a clear idea about the pattern of AKI causes in the South Asian community, problems faced by nephrologists in managing these patients, and to some extent the outcome of CA-AKI. The current meta-analysis is an effort towards highlighting the burden of CA-AKI in the region, and can guide the relevant authorities to plan healthcare facilities in a strategic manner to prevent AKI.

Conclusion

AKI is a common and critical problem faced by nephrologists, which still causes considerable number of deaths. CA-AKI can occur as a result of many preventable conditions. South Asian countries with low or low-middle income status and compromised available health facilities, fail to report data on some important health issues, including CA-AKI.

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