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Cross-sectional Study

Prevalence of acute kidney injury amongst Covid-19 admitted patients in Ribat Teaching Hospital isolation centre: A retrospective cross-sectional study

Hussein Elsadig *, Abdalla Ismail, Khalda Khalid, Faisal Elsayed, Khalid Ahmed

Ribat Isolation Center, Ribat Teaching Hospital, The National Ribat University, Khartoum, Sudan

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ABSTRACT

Background: Covid-19 sequeale have been a cause of serious health concerns since the start of the Covid-19 pandemic. Studies regarding this are still lacking especially in relation to the prevalence of Covid-19 induced AKI. Therefore, we have aimed to determine the prevalence of AKI amongst Covid-19 hospitalised patients in Ribat isolation centre.

Methodology: A cross-sectional retrospective study was conducted in the period from March 2020 to July 2021 in Ribat teaching hospital primary isolation centre which includes admitted Covid-19 induced AKI patients. A total of 333 confirmed Covid-19 patients were tested out of which we analyzed 183 files that fit the criteria of our research. The data was collected from the patients' record files using a checklist.

Results: A total of 77 out of 183 patients (42%) of admitted patients were diagnosed with AKI, out of which 35 patients had stage 3 AKI (46%), followed by 28 (36%) and 14 (18%) regarding stage 1 and stage 2 respectively. Furthermore, 57 out of the total 77 (74%) aged 60 years and above.

Conclusion: This study substantiates the theory that Covid-19 induces AKI regardless of its severity and the presence of co-morbidities. Additionally, older age (60 years and above) was the most important risk factor associated with it. Furthermore, most cases of Covid-19 induced AKI were stage 3

1. Introduction

It's a well-established fact that one of the commonest causes of AKI is infection and sepsis [1]. This also applies to the context of Covid-19, in which the hyper-inflammatory and the hyper-coagulable state may affect the kidneys and lead to renal insufficiency.

Covid-19 has been known to cause multi-organ dysfunction as part of its extended complications. AKI has been displayed as part of these complications. Furthermore, the incidence of Covid-19 induced AKI was noticed to be directly proportionate to the severity of Covid-19 infection [2].

Covid-19 induced AKI prevalence has variably reached 36.6% in cohort study. This variation might be due to traditional, ethnic, and AKI risk factors' differences amongst cohort patients [3].

According to a previous study, it has been found that 17% of hospitalised Covid-19 patients had developed AKI. Most cases were found to be mild (50% stage 1 AKI) [4]. In a separate meta-analysis and systemic review of 54 studies, Covid-19 resulted in AKI in approximately 1 out of every 3 Covid-19 admissions [5]. Additionally, regarding the severity of AKI by KDIGO staging, the pooled prevalence of AKI stages was 44%, 19% and 34% respectively [5].

We aimed to conduct this study in order to determine the ambiguous figures of such cases to highlight the importance of early diagnosis and management, considering that most cases presented with stage 1 AKI which is considerably manageable, in contrast to the financial and fatal burden imposed by advanced stages of AKI.

2. Methodology and material

We conducted a descriptive cross-sectional study in Ribat Teaching Hospital isolation centre. This study was a total coverage collecting all the records of Covid-19 admitted patients during the period from March 2020 until July 2021. Inclusion criteria included any patient admitted with Covid-19 and diagnosed with AKI during the admission (77 patient). Exclusion criteria included all Covid-19 patients who were not diagnosed with AKI.

* Corresponding author.
E-mail address: husseinemad73@gmail.com (H. Elsadig).

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The study variables included socio-demographic variables such as the Age of the patient, vitals sign such as oxygen saturation, respiratory rate. Along with the chronic illnesses and the stages of AKI. Statistical analysis was performed using (IBM) SPSS statistic 15.0. The descriptive analysis was carried out by computing frequencies and percentages for categorical variables. Ethical approval was obtained from Ribat teaching hospital's research ethical committee.

This study is compliant with STORCSS criteria [6].

This study was registered in research registry with the unique identifying number: researchregistry7954 (https://www.researchregistry.com/register-now#home/registrationdetails/62925d6dc9f1cc001e81fe4e/).

3. Results

In total, 183 patients were included in the study. The study illustrated that there is a significant relation between Covid-19 and AKI in the admitted patients in Ribat Teaching Hospital isolation centre. We found that 42% of the admitted patients had AKI (Fig. 1) in comparison to roughly 36.6% in the aforementioned study [3]. This gap in prevalence could be attributed to the fact that dehydration and subsequent hypovolemia are more common in Sudan due to its hot climate and insufficient oral intake, in addition to sepsis caused by primary Covid-19 infection or a secondary infection.

The vast majority of the admitted patients had a clear medical background with 30%. However, the most significant chronic illnesses in relation to Covid-19 were: simultaneous hypertension and diabetes (24%), hypertension (16%) and diabetes (16%). In contrast to common belief, which indicates that the severity ofCovid-19 infections are almost constantly associated with co-morbidities., we found that this doesn't apply in this study in contrast to a previous study [7], where hypertension was the most significant co-morbidity with (21.1%) followed by diabetes (9.7%), cardiovascular disease (8.4%) and respiratory disease (1.5%). Additionally, the presence of both hypertension and diabetes concurrently increases the risk of Covid-19 more than that of their risk separately. Lastly, we found that, diabetes and hypertension are equal in terms of Covid-19 risk.

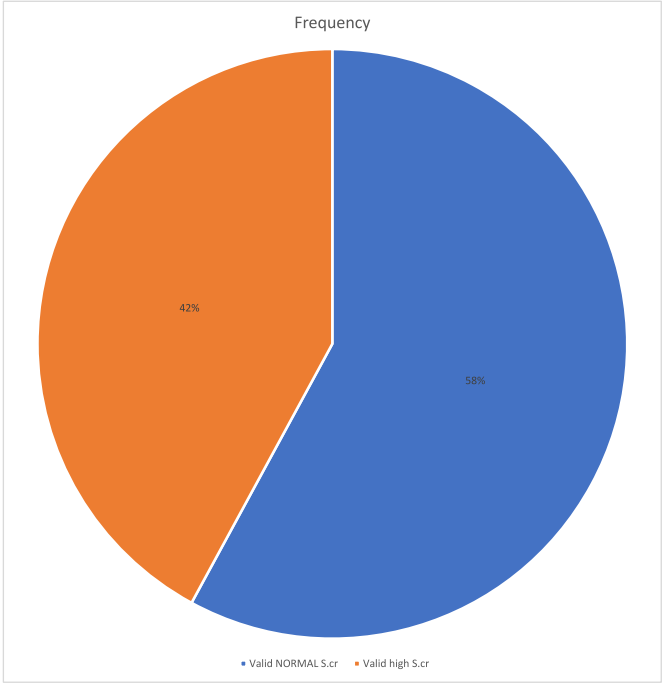

Fig. 1. Shows the prevalence of AKI in Covid-19 admitted patients in Ribat teaching hospital isolation centre.

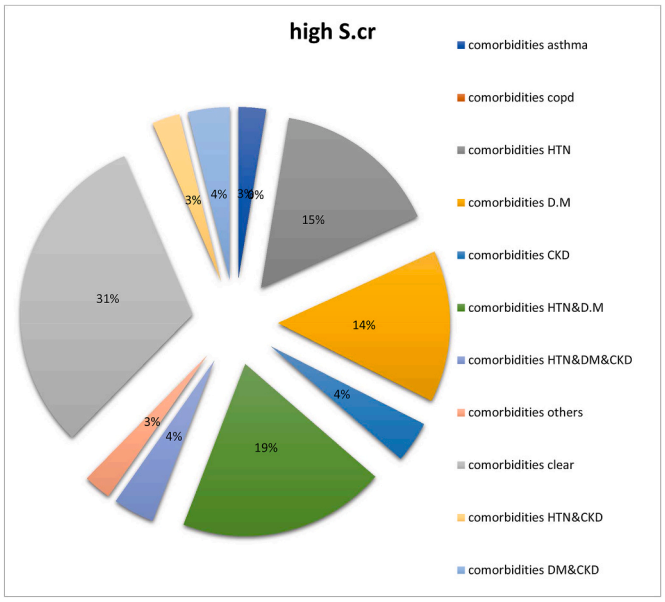

Fig. 2. Shows the relation of co-morbidities in patients with Covid19-induced AKI.

This study showed that AKI has a strong relation with Covid-19 despite the existence of co-morbidities as 31% of the admitted patients who had a clear medical background developed AKI. Furthermore, the coexistence of hypertension and diabetes is the second highest figure with 19% followed by the isolated hypertension and D.M with 15%, 14% respectively (Fig. 2).

Regarding the severity of Covid-19 infection in association with AKI, we categorised this according to the type of mask, due to the key indicator of Covid-19 severity, dyspnea and hypoxemia being corrected with the administered oxygen therapy.

There was no relation between the severity of Covid-19 and AKI as

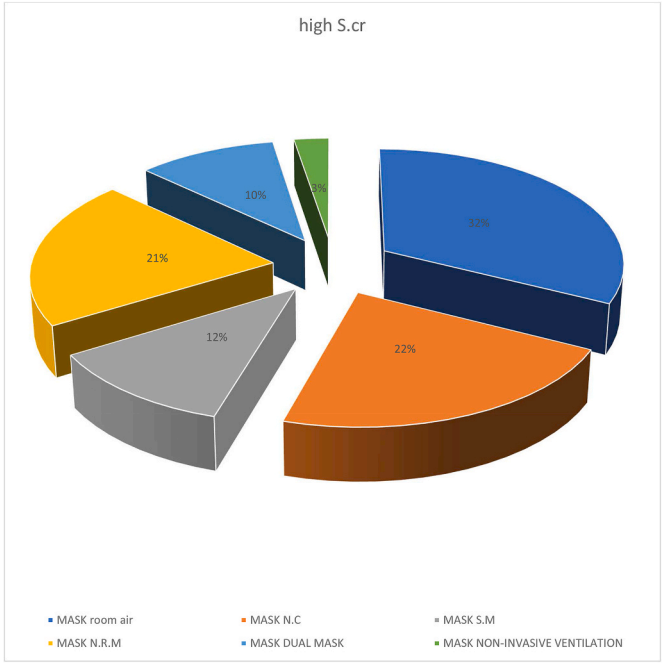

Fig. 3. Shows the severity of Covid-19 stratified according to the type of mask in Covid-19 induced AKI patients.

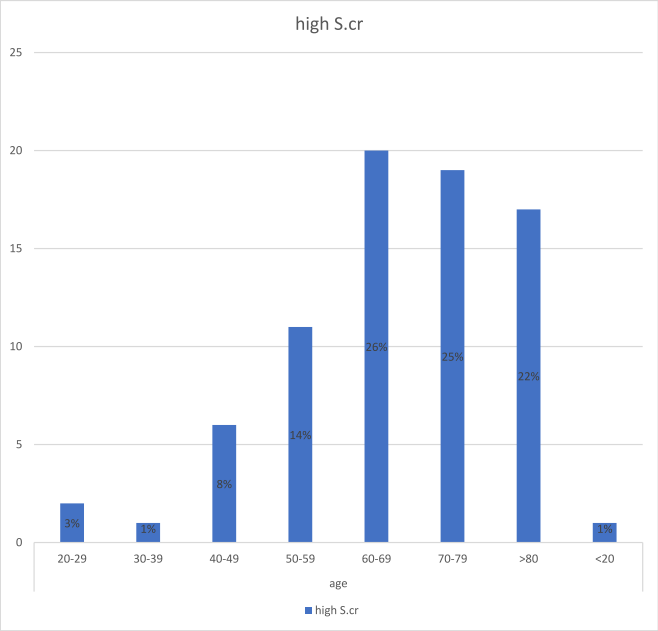

Fig. 4. Shows association of age in Covid-19 induced AKI patients.

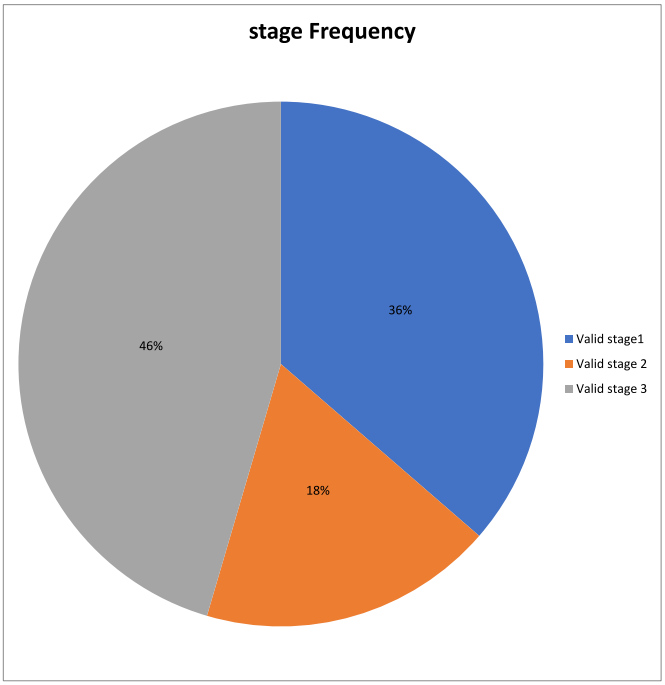

Fig. 5. Shows the severity of AKI stratified by stage.

32% were on room air, 22% were on nasal cannula and 21% were on non-rebreather mask (Fig. 3) when AKI developed which was opposite to a previous meta-analysis, (2) which reported that AKI was associated with poor composite outcomes, including mortality and severe COVID-19.

The highest age group with Covid-19 induced AKI was ≥60 years group with 57 (74%) patients (Fig. 4). This finding correlates well with a previous study [8], which concludes that age is an independent risk factor for AKI in Covid-19 patients.

Most AKI patients were stage 3 with 46% in comparison to the one of the previous studies in which stage 1 was the highest category with 44%, followed by stage 3 with 34% then stage 2 with 19% [5] (Fig. 5). This difference in AKI severity may be due to Sudan's hot climate which further precipitates hypoperfusion of the kidneys, along with Covid-19's hypothesized role in causing micro-coagulation in the kidneys' vasculature, together with the hyper-inflammatory state.

4. Discussion

The consequences of multi-organ dysfunction associated with Covid-19 is still not well documented and under-researched, this burden is amplified in developing countries. Furthermore, this is increased in regards to prevalence of Covid-19 induced AKI.

This study demonstrated that Covid-19 infection increases the risk of AKI regardless of Covid-19 severity and the co-existence of co-morbidities.

Age groups ≥60 years were found to have the highest risk of acquiring Covid-19 induced AKI.

Regarding the categorisation of AKI stages our study found that the greater number of patients were stage 3.

5. Conclusion

Covid-19 has been known to cause multi-organ dysfunction as part of its extended complications. AKI has been displayed as part of these complications as 42% of admitted patients had AKI. However more detailed studies nationally need to be done in regards to covid-19 infection and AKI. In prospect, evidence-based guidelines and protocols should be established in order to prevent AKI and to protect Covid-19 induced AKI patients by diminishing the occurrence of stage 3 and RRT. Furthermore, health education towards the community regarding the consequences of diabetes and hypertension would be beneficial.

Provenance and peer review

Not commissioned, externally peer reviewed.

Ethical approval

The ethical approval was obtained from Ribat teaching hospital ethical committee.

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None.

Author contributions

Hussein Elsadig: Involved in study design, data acquisition, drafting the
Article, revising it critically and finally approved the manuscript.
Abdalla Ismail: Involved in study design, data acquisition, drafting the
Article, revising it critically and finally approved the manuscript.
Khalda ahmed:Involved in study design, data acquisition, drafting the
Article, revising it critically and finally approved the manuscript.
Faisal Elsayed: data acquisition, drafting the Article.
Khalid Khalid: data acquisition, drafting the article.

Trail registry number

1. Name of the registry: research registry.
2. Unique Identifying number or registration ID: researchregistry7954.
3. Hyperlink to your specific registration https://www.researchregistry.com/register-now#home/registrationdetails/62925d6dc9f1cc001e81fe4e/

Guarantor

Hussein Elsadig.

Consent

All data were collected from patients records cconfidentiality of the patients' information on records was maintained.

Declaration of competing interest

All author report no conflict of interest of any kind.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.104404.

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