Comparing Kidney Care during the Pandemic in Hospitalized Non-COVID-19 Patients

O Cuidado Aplicado à Patologia Renal durante a Pandemia em Pacientes Não-COVID-19 Hospitalizados

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RESUMO

INTRODUÇÃO: A doença de coronavírus 19 (COVID-19) causou um aumento direto na mortalidade, mas nem tudo é totalmente atribuível ao COVID-19, o que significa que houve uma taxa mais elevada de mortalidade em doentes não COVID-19 devido à pandemia.

O objetivo deste estudo foi comparar dois grupos de doentes: grupo 1, incluiu todos os doentes internados na enfermaria de Medicina Interna durante o mês de abril do ano de 2019 e o grupo 2, composto pelos doentes internados na mesma enfermaria em abril de 2020 (enfermaria não COVID) e identificar o que se associou, de forma significativa, a alteração da função renal.

MÉTODOS: Estudo observacional retrospetivo realizado através da análise de dados digitais de todos os doentes não COVID-19 internados numa enfermaria de Medicina Interna em abril de 2019 (grupo 1) e abril de 2020 (grupo 2).

RESULTADOS: Foram incluídos 162 doentes; dos quais 63,6% eram do grupo 1 e 36,4% do grupo 2. Embora houvesse diferença significativa (p<0,001) entre a creatinina basal e a apresentada à admissão para internamento em ambos grupos, a diferença foi marcadamente maior no segundo grupo quando comparado ao primeiro grupo. O agravamento da função renal, medida pela fórmula CKD-EPI, associou-se a maior mortalidade que foi mais elevada no grupo de 2020.

CONCLUSÃO: A pandemia COVID-19 impôs um sentimento de medo na população, que levou ao atraso no recurso aos serviços de saúde, levando a uma maior gravidade das condições médicas. No rescaldo pós-pandemia, é essencial uma coordenação eficaz entre a Medicina Geral e Familiar e as diferentes especialidades médicas para melhorar, conjuntamente, o acompanhamento dos nossos doentes, de forma a eliminar o medo imposto pela COVID-19.

PALAVRAS-CHAVE: COVID-19; Doença Renal; Mortalidade; Pandemia; Prestação de Cuidados de Saúde

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ABSTRACT

INTRODUCTION: Coronavirus disease 19 (COVID-19) has caused a direct increase in mortality but not all of it is entirely attributable to COVID-19, meaning there was a higher rate of mortality in non-COVID-19 patients due to the pandemic.

The aim of this study was to compare two groups of patients: group 1, which included all of the patients admitted to the Internal Medicine ward during the month of April in the year 2019 and group 2, composed of all of the patients admitted to the same ward in April 2020 (a non-COVID ward) and to identify factors which were closely related with worse renal function in two group of patients.

METHODS: Retrospective observational study carried out through the analysis of digital data of all non-COVID-19 patients admitted at an Internal Medicine ward in April 2019 (group 1) and April 2020 (group 2).

RESULTS: A total of 162 patients were included. Group 1 represented 63.6% of the patients and group 2 represented 36.4%. Although there was a significant difference ($p<0.001$) between baseline creatinine and that presented at admission for hospitalization in both groups, the difference was markedly greater in the second group when compared to the first group. The worsening of renal function, measured by the CKD-EPI formula, was associated with higher mortality, which was higher in the 2020 group.

CONCLUSION: There was a sense of fear imposed by the pandemic, which delayed resorting to medical care. This increased the severity of medical conditions. In the post-pandemic aftermath, it is essential that General and Family Medicine coordinate effectively with different medical specialties to jointly improve the follow-up of our patients.

KEYWORDS: COVID-19; Delivery of Health Care; Hospitalization; Mortality; Pandemics

INTRODUCTION

A new strain of the well-known coronavirus was identified in 2019 and changed the world as we know it. Coronavirus disease 2019 (COVID-19) due to severe acute respiratory syndrome coronavirus 2 (SARS--CoV-2) infection has affected millions worldwide. Several clinical studies and meta-analysis have demonstrated that the elderly and patients with comorbidities, such as diabetes mellitus, hypertension, cardiovascular disease, chronic lung disease, cancer and chronic kidney disease (CKD) who become infected are prone to develop a more severe disease, thus having poorer outcomes.[1]

This virus caused a direct increase in mortality but, according to literature, not all of it is entirely attributable to COVID-19, meaning there is a collateral higher rate of mortality in non-COVID-19 patients due to a shift of care towards the pandemic. Worsening kidney function associated with the reduced medical visits could be an important factor for the indirect COVID associated mortality.[2]

General and Family Medicine is commonly the first contact of many patients with the health system and has a big responsibility of promoting health, preventing disease and providing cure, care or palliation. However, in this time of pandemic by COVID-19, patient´s follow-up, with regard to all other "non-COVID-19 problems", despite all the efforts, it is no longer ideal.[1,2]

The aim of this study was to compare two populations of patients admitted in two equivalent/comparable periods of time in the same Internal Medicine ward (one in the non-pandemic period and the other in the pandemic period) in order to identify possible factors related to the difference in both populations, focusing on kidney function, and assess their impact on mortality.

METHODS

POPULATION SELECTION AND STUDY DESIGN

Retrospective observational study carried out through the analysis of digital data of all non-COVID-19 patients admitted at an Internal Medicine ward in April 2019 (group 1) and April 2020 (group 2). In the year 2020, all patients enrolled in this study had a negative test for SARS-CoV-2 infection diagnosed by real time PCR SARS-CoV-2 test. The same ward was used in both years, which had a total of 30 beds. In the year 2019 it was an exclusively male ward, but in the year 2020 it became a mixed ward. Admission criteria remained the same in both years.

DATA COLLECTION

Data regarding patients' baseline characteristics, symptoms, laboratory findings, length of hospital stay, treatment regimens, clinical outcomes, and comorbidities were collected by consulting electronic medical records.

Chronic Kidney Disease Epidemiology Collaboration equation (CKD-EPI) was used to calculate the glomerular filtration rate based on the patient's baseline serum creatinine value. Admission and discharge serum creatinine values were collected. An increase in serum creatinine value equal to or greater than 0.3 mg/dL or higher than 1.5 times the baseline value was defined as target for considering acute kidney injury. In patients who already had chronic kidney disease, their staging was performed and the increase in one or more stages was considered worsening of the underlying disease. Baseline serum creatinine was defined as the lowest, most recent, or the median value over the preadmission period. Initial creatinine corresponds to the value presented by patients upon admission for hospitalization.

ETHICAL CONCERNS

Our research was conducted in full accordance with the World Medical Association Declaration of Helsinki. Informed consent was waived as part of the public health outbreak investigation.

STATISTICAL ANALYSIS

Statistical analyses were performed using SPSS statistics version 23.0 (SPSS Inc., Chicago, IL). Comparisons of means and frequencies were calculated using t-tests for numeric variables and chi-square for nominal variables. All reported p values are two-tailed, with a p value lower than 0.05 indicating statistical significance.

RESULTS

In total, 162 patients were included. Group 1 included patients hospitalized in April 2019 which represented 63.6% (n=103) of the sample and mostly were men (98.1%). Group 2 included 59 patients (36.4%) hospitalized in April 2020, 66.1% were women. The mean age of patients in each group was similar (81 years in 2019 *vs* 83.7 years in 2020). Prior to hospitalization, patients were mostly residing in their own residence in both groups (59.2% in 2019 *vs* 67.8% in 2020), followed by nursing homes (28.2% in 2019 *vs* 22.0% in 2020) and then continuous care units (10.7% in 2019 *vs* 10.2% in 2020). The number of complications (infectious diseases, stroke, and others) that occurred during hospitalization was higher in 2020 (37.9% in 2019 *vs* 55.9% in 2020). General data of the population is described in Table 1.

Hospital stay was higher in the 2020 group (12.3 *vs* 8.9 days), but the difference was not statistically significant (p=0.023).

Diseases of the respiratory tract were the most common cause of hospitalization in both groups (44.7% in 2019 *vs* 42.4% in 2020), followed by diseases of the digestive system in 2019 (n=16, 15.5%) and heart failure (n=8,13.6%) in 2020.

There was no difference in mortality between the groups (both with 13.6%), although we find differences in mortality among patients with worse kidney function.

Regarding kidney function, there was a significant difference (p=0.001) between creatinine at baseline and admission for hospitalization in both groups, but the difference was larger in the second group due to a higher serum creatinine upon admission. In 2020 a total of 54.2% patients had a worse function upon hospitalization and 33.9% in 2019. Kidney function upon discharge was worse than their baseline in 14 patients in 2020 (23.7%) and in 10 patients in 2019 (9.7%). Among patients with worse kidney function, mortality was higher, the mortality was higher in 2020 (n=9, 15.2%) than in 2019 (n=12, 11.6%). No significant correlation was found between the creatinine presented at admission and mortality, although the average value was higher in patients who died. Evolution of kidney function in both years is described in Table 2.

DISCUSSION

According to recent studies, kidney impairment in hospitalized patients with COVID-19 infection is associated with increased in-hospital mortality and worse clinical evolution.[1] There have been recent reports patients infected with COVID-19 who have developed an acute kidney injury - sudden loss of kidney function. Many of these adults did not have underlying medical conditions. With proper treatment, including dialysis in severe cases, acute kidney injury can be reversible.[3]

However, the effect of COVID-19 pandemic in kidney function does not stop there and it is very important to think about non-COVID-19 patients.[1,4] The COVID-19 pandemic involved profound and rapid changes in the functioning of health care services. The interruption of clinical programmed activity during the lockdown period and the significant delay in visits to emergency departments, due to fear of COVID-19, led to the postponement of appropriate treatment for potentially serious conditions. These factors contributed to the decompensation of different pathologies, probably influencing their severity upon admission and increasing their mortality during the pandemic.[5,6]

Curiously, there was no difference in total mortality between both groups in this study (although we find differences in mortality among patients with worse kidney function). However, that is not what recent

TABLE 1. General data of the population.

	2019		2020		
General Data	**Number of patients**	**%**	**Number of patients**	**%**	***p*-value**
Total of patients	103	63.6	59	36.4	<0.001
Age ≥65 years	77	74.8	49	83.1	0.070
Age <65 years	26	25.2	10	16.9	0.060
Age (years - medium)	81		83.7		0.077
- Minimum age (years)	39		44		
- Maximum age (years)	102		96		
Men	100	97.1	20	33.9	<0.001
Women	3	2.9	39	66.1	<0.001
Type of Admission					
- Scheduled admission	1	0.9	0	0	<0.001
- No scheduled admission	102	99.1	59	100	0.990
Length of stay (days - medium)	8.9		12.3		0.061
- Minimal number of days	1		2		
- Maximum number of days	65		59		
Provenance					
- Home	61	59.2	40	67.8	0.055
- Nursing home	29	28.2	13	22.0	0.059
- Continuous care units	11	10.7	6	10.2	0.890
- Hospital (wards)	2	1.9	0	0	<0.001
Complications	39	37.9	33	55.9	0.002
- Infectious	20	51.3	25	75.6	
- Cardiovascular	10	25.6	5	15.2	
- Others	9	23.1	3	9.2	
Deceased	14	13.6	8	13.6	0.990

studies have shown.[5] Recent publications on mortality in Portugal during the pandemic, showed an increase in the number of deaths in the last two years, in a dimension not explained by the deaths due to COVID-19.[6]

The worsening kidney function at admission for hospitalization in 2020 and the higher mortality present in the group of patients with renal impairment must be related to the pandemic and the effect that it had on the population and health services. In general, patients belonging to group 2 had better baseline kidney function compared to group 1. Despite this, it was in group 2 that there was the greatest deterioration in kidney function, with a higher number of patients having a worse estimated glomerular filtration rate upon discharge. As an example, in group 2, at discharge, patients with end-stage renal disease doubled compared to their baseline disease.

In group 2 there was also a higher rate of infectious and cardiovascular complications. This may be related to a greater severity of the clinical status of these patients, in relation to a greater delay in accessing health care.

This pandemic poses an unprecedented challenge to health systems globally, with a need to increase resource capacity across all health services, thus implying a significant healthcare burden.

There are limitations to this study that should be acknowledged. In fact, it is a single-center retrospective study with a small size sample, and some patients' laboratory and clinical data were incomplete. A multi-center retrospective study should be conducted to include a larger sample size across multiple centers to better assess the effects of COVID-19 pandemic in kidney function in non-COVID-19 patients.

TABLE 2. Evolution of kidney function in patients admitted in April 2019 and 2020.

	2019	2020		2019	2020	
GFR categories (mL/min/1.73 m²)	**Admission**		***P*-value**	**Discharge**		***p*-value**
G1 Normal or High (GFR ≥90 mL/min/1.73 m²)	29.1%	33.9%	0.065	19.4%	16.9%	0.071
G2 Mildly decreased (GFR 60-89 mL/min/1.73 m²)	14.6%	22.1%	0.002	19.4%	22.1%	0.066
G3a Mildly to moderately decreased (GFR 45-59 mL/min/1.73 m²)	38.9%	20.3%	0.002	40.8%	25.4%	0.002
G3b Moderately to severely decreased (GFR 30-44 mL/min/1.73 m²)	9.7%	16.9%	<0.001	4.9%	25.4%	<0.001
G4 Severely decreased (GFR 15-29 mL/min/1.73 m²)	6.8%	5.1%	0.053	13.6%	6.8%	0.003
G5 Kidney failure (GFR <15 mL/min/1.73 m²)	0.9%	1.7%	0.004	1.9%	3.4%	<0.001

CONCLUSION

COVID-19 changed routines and challenged health professionals. Patients were afraid thus resorting later to health services with more severe forms of their disease, sometimes at the point of no return. The results of this study are still a mirror of the present days. With the return to the "new normality" we need to reinvent, to strive even harder to compensate what may have been left behind in these difficult times. It is necessary to improve accessibility, improve the follow-up of chronic patients and take special care in promoting healthy lifestyle and disease prevention. It is also essential that General and Family Medicine coordinate effectively with the different medical-surgical specialties to jointly improve the follow-up of our patients. Maybe this is a good opportunity for us to play an even active role in promoting health literacy among our patients, clarifying, for example, what are urgent problems and need to be taken care of, of those who are not. We will have to increase our ability to overcome challenges to once again be close to our patients while dealing with the reality of COVID-19 that is here to stay.

DECLARAÇÃO DE CONTRIBUIÇÃO/ CONTRIBUTORSHIP STATEMENT

RS: Escrita do manuscrito

FM, RC, CR, CR, LS e RA: Revisão do artigo

Todos os autores aprovaram a versão final

RS: Manuscript writing

FM, RC, CR, CR, LS and RA: Article review

All authors approved the final version

RESPONSABILIDADES ÉTICAS

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