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COVID-19

AND MANAGEMENT OF PATIENTS IN HEMODIALYSIS THERAPY AT THE IESS AMBATO HOSPITAL

COVID-19 Y TRATAMIENTO DE PACIENTES EN TERAPIA DE HEMODIÁLISIS EN EL HOSPITAL IESS AMBATO

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ABSTRACT

The recent SARS-CoV-2 pandemic has significantly impacted the general population. In COVID-19 infection, a high mortality rate has been observed in patients with comorbid disease, especially in chronic kidney injury. This is a pathology of rapid and progressive evolution since it is accompanied by metabolic acidosis, requiring immediate hemodialysis therapy. This procedure removes toxic waste due to a lack of kidney function. The objective of this work is to determine the impact of COVID-19 on the management of patients on hemodialysis therapy at the IESS Ambato Hospital. It was identified that the most frequent manifestations of this pathology are proteinuria and the nephrotic range. In addition, it presents comorbidities such as arterial hypertension, anemia, and diabetes mellitus, which are risk factors, along with advanced age and immunosuppression. The most frequent symptoms identified were: diarrhea and abdominal pain, caused by hypotension. For the hemodialysis procedure, the supine position is essential as it decreases the ultrafiltration rate. Patients who receive this maintenance therapy are more susceptible since their immune system is compromised by complications secondary to the infection or the procedure.

Keywords: SARS-CoV-2, COVID - 19, chronic kidney injury, hemodialysis therapy.

RESUMEN

La reciente pandemia de SARS-CoV-2 ha afectado significativamente a la población en general. En la infección por COVID-19, se ha observado una alta tasa de mortalidad en pacientes con enfermedad comórbida, especialmente en la insuficiencia renal crónica. Se trata de una patología de rápida y progresiva evolución ya que se acompaña de acidosis metabólica, requiriendo tratamiento de hemodiálisis inmediata. Este procedimiento elimina los desechos tóxicos debido a la falta de función renal. El objetivo de este trabajo es determinar el impacto del COVID-19 en el manejo de pacientes en terapia de hemodiálisis en el Hospital IESS Ambato. Se identificó que las manifestaciones más frecuentes de esta patología son la proteinuria y el rango nefrótico. Además, presenta comorbilidades como hipertensión arterial, anemia y diabetes mellitus, que son factores de riesgo, junto con la edad avanzada y la inmunosupresión. Los síntomas más frecuentes identificados fueron: diarrea y dolor abdominal, causado por hipotensión. Para el procedimiento de hemodiálisis, la posición supina es esencial ya que disminuye la tasa de ultrafiltración. Los pacientes que reciben esta terapia de mantenimiento son más susceptibles ya que su sistema inmunológico se ve comprometido por complicaciones secundarias a la infección o al procedimiento.

Palabras clave: SARS-CoV-2m COVID - 19, lesión renal crónica, terapia de hemodiálisis.

INTRODUCTION

On December 31, 2019, the authorities of the People's Republic of China reported several cases of pneumonia with unknown etiology in Wuhan. Within a week they confirmed that it was a new coronavirus called SARS-CoV-2, which causes clinical manifestations going from the common cold to severe pneumonia with respiratory distress syndrome, septic shock, and multi-organ failure, (Averos & Suárez, 2020). As the virus spreads, it has been observed that most people have mild symptoms, and others become seriously ill and require hospital care. Although some recover from the infection, others have died (Cohen, 2020), (Liu et al., 2020).

Chronic diseases have received greater attention from health professionals for presenting a high rate of morbidity and mortality, thus becoming a major concern for the field of public health. Among the various chronic diseases that affect the population, Chronic Renal Failure (CRF) is considered a pathology with no expectation of cure, with rapid and progressive evolution. (Paules et al., 2020), (Arias et al., 2021).

Severe kidney injury associated with metabolic acidosis in severe COVID-19 infection is caused by the inflammatory process related to cytokine overproduction, rhabdomyolysis, sepsis, and direct virus damage to renal tubule cells. This complication is observed in only 5.1% and 23% of cases, it worsens the prognosis of the disease and requires early intervention with continuous therapy in combination with immunoadsorption (Mar Cornelio et al., 2021).

Several patients have been infected with COVID-19 and because of this, they receive hemodialysis due to kidney damage, while others have been infected receiving this therapy. In the first case, the most frequent symptoms are diarrhea, abdominal pain, and gastrointestinal symptoms. Hemodialysis consists in that the patient's blood is passed through a filter called a dialyzer, to eliminate the substances that accumulate due to the lack of kidney function. (Cheng et al., 2020), (Diao et al., 2021), each needle is attached to a soft tube connected to the dialysis machine, which pumps the blood through the filter and returns it to the body (Wortham, 2020), (Lu et al., 2020).

Among the advantages of this therapy, we may mention that it helps control blood pressure, improves the levels of impurities in the blood, promotes the balance of the chemical components of the blood, improves anemia and bone and muscle diseases associated with CRF, and helps neurological disorders and digestive problems (Pullano et al., 2020). Disadvantages include hypotension, cramps, nausea and vomiting, headache, small bleeding from the site where the needle or vascular catheter is placed, allergic reactions, imbalance of blood chemicals, arrhythmias or irregular heartbeat, infection of the arteriovenous fistula or vascular venous catheters that can cause bacterial endocarditis and in some cases even death (François & Bargman, 2014), (Mar Cornelio et al., 2020).

Among the risk factors for getting infected with COVID-19, ethnic group and mortality are identified: most deaths from COVID-19 occur in people over 65 years of age, especially in Hispanic people (35%) or not Caucasian (30%), compared to only 13% white, non-Hispanic people. We have also the blood type: studies have shown that people with type O blood have a slightly lower risk of infection. There is a greater risk in those with comorbidities such as cancer, CRF, COPD, immunosuppressed, obesity, serious heart conditions, sickle cell disease, DM 1 and 2, asthma, cerebrovascular disease, cystic fibrosis, arterial hypertension (HT), neurological medical conditions, pregnancy, liver disease, and thalassemia. (Leyva-Vázquez et al., 2020), (Teruel et al., 2018).

Protection for COVID-19 in the hemodialysis unit is stricter since health personnel who provide patient care must use: surgical masks, anti-fluid cloth gowns, gloves, eye protection. For infected or suspected patients, who generate aerosols, the following should be used: standard N95 or FFP2 respirator or equivalent, anti-fluid cloth gown, gloves, eye protection, non-sterile long-sleeved anti-fluid gown. Health workers and patients with respiratory symptoms should keep a distance of at least 1 meter and wear a surgical mask (Arenas et al., 2020), (Albalate et al., 2020), (Di Lucas et al., 2019).

To reduce the spread of COVID-19 in patients receiving hemodialysis, informational posters on hand hygiene, respiratory hygiene should be placed on visible spots, as well as to inform patients that they should notify health personnel if they have symptoms/signs, if possible, before going to the hemodialysis session. The strategies in both suspected and confirmed cases are to avoid their stay in the waiting room by adjusting the schedule. In HD centers that have physically isolated rooms with an independent entrance circuit, such rooms will be preferably used. In rooms that don't meet such requirements; patients will be dialyzed in a part of the general room adjusted for this purpose, with a distance of 2m. Therapy is carried out in rooms in conditions of isolation for contact and drops. Access and manipulations should be limited, (Yomayusa González et al., 2020), (Lindsay, 2002).

For the management of COVID-19 patients, they should be placed in the prone position, as it increases the amount of oxygen and blood flow in the lungs. In patients with kidney damage and COVID-19, when receiving hemodialysis, the

correct position is supine, as it helps to control hypotension and maintain the ultrafiltration rate (UF).

Regarding nutrition, the patient's capacity for feeding must be verified, taking into account that 30-35 kcal/kg of weight/day should be provided, 1.25 to 1.5 grams of protein per kilo per day or depending on the state of kidney function. Hydration is also essential and hydration should be given for each kg of weight, in addition to vitamin supplements if indicated, as well as nutritional supplements.

The objective of this research is to determine the impact of COVID-19 on the management of patients in hemodialysis therapy at the Hospital IESS Ambato, for which, risk factors were analyzed, procedures were identified in the management of patients, and strategies were established to mitigate the contagion.

Since it is a current problem and has an important relationship with kidney patients, it is relevant to address this issue, since the study subjects constitute a risk group, because they have comorbidities, immunosuppression, and advanced age.

DEVELOPMENT

The universe investigated is 52 members of the health personnel. Since it is a small population, no sampling techniques were used and the research instruments were applied to the entire universe.

Table 1. Members of the health staff.

Population	Frequency	Percentage
Nursing assistant	2	3.8%
ICU nurse	14	26.9%
ICU nurse	3	5.8%
Licensed Nurse	20	38.5%
Intensive Care Physician	5	9.7%
Resident doctor	8	15.3%
Total	**52**	**100%**

A qualitative-quantitative approach was applied:

Qualitative: Through information obtained by different research techniques, we analyzed: the impact of COVID-19 in the management of patients under hemodialysis treatment, biosafety measures, the correct procedure of this treatment, positions, nutritional assessment, and strategies for the care of these patients.

Quantitative: Since through a questionnaire addressed to specialists in the subject (nursing staff) it was possible to contrast the study problems, in terms of strategies for good mechanical ventilation, identification of the most frequent signs and symptoms associated with contagion, risk factors, comorbidities, and prognosis. Statistical tables and graphs were made.

Bibliographic - documentary review: through a descriptive study of books, magazines, and documents in general. It was investigated in databases such as PubMed, Redalyc, Scielo; and in nephrology and public health journals in Mexico, which served as a reference for the analysis. The review was contrasted with the information provided by health personnel (nurses) trained in the subject. Additionally, a field investigation was carried out, through the application of surveys and interviews, for the collection of primary information.

The survey technique was used with its respective instrument, the questionnaire, which was approved by the director of the Intensive Care Unit. It consisted of 12 closed, dichotomous, and polytomous questions about the research variables. A semi-structured interview was also applied.

Results and Discussion

COVID-19 has had a great impact on the management of patients receiving hemodialysis, due to risk factors characteristic of Serious Kidney Injury, presented in Table 2. It also causes autoimmune diseases, immunosuppression, advanced age, and comorbidities such as HT and anemia, the most frequent being those listed in Table 3.

Table 2. Risk factors for COVID-19 in patients on hemodialysis therapy.

Usual findings	Percentage
Proteinuria	63%
Nephrotic range	34%
Hematuria	20%
Increase of nitrogenous products	27%
Creatinine	19%

Table 3. Comorbidities associated with Chronic Kidney Injury for COVID-19.

Comorbidities	Percentage
Arterial hypertension	71.57%
Anemia	61.05%
Mellitus diabetes	40%,
Cerebrovascular disease (CVD)	32.63%

Malnutrition due to inadequate nutrient intake, protein loss through dialysate, inflammation, metabolic acidosis, or hormonal changes	24.21%
Hypoalbuminemia	22.10%

The Intensive Care Unit (ICU) of the IESS Ambato Hospital has 12 beds with their respective mechanical ventilators and a single machine for hemodialysis treatment. The Nephrology Unit has 9 machines and the COVID-19 Unit has a single machine. Figure 1 shows a patient receiving hemodialysis with COVID-19 in the ICU.

Figure 1. A patient infected with COVID-19 receiving hemodialysis in the ICU.

Source: Hospital IESS Ambato, (2020).

Out of the 40 patients admitted at the IESS Ambato Hospital, 22 patients, representing 55%, are regular ones and receive hemodialysis; 8 patients, representing 20%, receive hemodialysis and have been infected with COVID-19; and 10 patients, representing 25%, have entered only with COVID-19 and, due to this infection, they have developed kidney damage, so they receive hemodialysis. Figure 2 shows a patient with a central venous catheter receiving hemodialysis.

Figure 2. Patient with a central venous catheter receiving hemodialysis.

Source: Hospital IESS Ambato, (2020).

Two critically ill patients are found in the ICU. Table 4 shows a comparison between the Dialysis Service, Covid-19, and the ICU.

Table 4. Comparative table between the Dialysis Service, Covid-19, and the ICU.

Dialysis unit			COVID-19 Unit		ICU	
Machines	9 hemodialysis machines		1 hemodialysis machine		1 hemodialysis machine	12 mechanical fans
Patients	22	55%	8	20%	2 critically ill patients	
			10	25%		

Health personnel has personal protective equipment (PPE, including masks) for the care of patients suspected or positive of COVID-19, with 76.9% (40 members of the health personnel), which prevents intra-hospital contagion and provides security to health personnel and patients, while 23.1% indicate that no. Table 5 shows the most frequent symptoms of COVID-19 in patients receiving hemodialysis therapy.

Table 5. Most common symptoms of COVID 19 in patients receiving hemodialysis therapy.

Alternative	Frequency	Percentage
Fever, headache, cough	18	34.6%
Difficulty breathing	5	9.6%
Loss of smell and taste	2	3.8%
Diarrhea and abdominal pain	27	51.9%
Total	**52**	**100%**

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020).

Among the most frequent symptoms of COVID-19 in patients receiving hemodialysis therapy are diarrhea and abdominal pain with 51.9%, followed by fever, headache, and cough with 34.6%, troubles for breathing with 9.6% %, and loss of smell and taste with a value of 3.8%.

It must be emphasized that the symptoms of diarrhea and abdominal pain, although they are not part of the most common symptoms of the infection, should be taken into account, since they have manifested frequently in these patients, possibly because in the previous dialysis session, hypotensive episodes may appear, which generates abdominal pain and could be indicative of mesenteric ischemia.

Table 6 shows the knowledge expressed by the respondents about the care protocol for the management of patients receiving hemodialysis and being infected with COVID-19 in the ICU.

Table 6. Knowledge of the care protocol for the management of patients receiving heemodialysis and being infected with COVID-19 in the ICU.

Alternative	Frequency	Percentage
Yes	3	5.8%
No	49	94.2%
Total	**52**	**100%**

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020)

Regarding the knowledge of the care protocol for the management of patients who receive hemodialysis and are infected with COVID-19 in the ICU, 5.8%. (3) They do know it, while the majority, that is, 94.2% (49) do not know it, which makes healthcare personnel more susceptible to contagion.

The protocol for the management of these patients states that: the therapy will be carried out with a distance of 2m. Protection is stricter since health personnel who provide direct care to confirmed COVID-19 patients must use: surgical mask, anti-fluid cloth gown, gloves, eye protection (glasses).

Table 7 shows the results obtained in the survey regarding the realization of an early diagnosis of the risk factors that influence hemodialysis treatment.

Table 7. Carrying out an early diagnosis of the risk factors that influence hemodialysis treatment.

Alternative	Frequency	Percentage
Yes	18	34.6%
No	3. 4	65.4%
Total	**52**	**100%**

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020).

A large part of ICU professionals (34) corresponding to 65.4%, do not make an early diagnosis of the risk factors that influence hemodialysis treatment, while 34.6% (18) do.

There are risk factors such as advanced age and immunosuppression. Early identification of individuals at risk is necessary, preferably before being transferred to the corresponding renal unit, as a fundamental measure to prevent transmission and reduce the high morbidity and mortality of these patients.

Table 8 shows the results obtained in the survey regarding the susceptibility of contagion by COVID-19 in patients receiving hemodialysis.

Table 8. Susceptibility of contagion by COVID-19 in patients receiving hemodialysis.

Alternative	Frequency	Percentage
Yes	40	76.9%
No	12	23.1%
Total	**52**	**100%**

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020).

Patients receiving hemodialysis are more prone to Covid-19 infection, with a value of 76.9% (40) as opposed to 23.1% (12) who state that No.

The kidney is an important target organ of COVID-19, since the function of the angiotensin-converting enzyme 2, acts as a receptor for the entry of the virus into the cell, in the podocytes, and the renal proximal tubules, which contributes to the progress of kidney injury. It is also due to the comorbidities and complications of chronic kidney disease that lead to this treatment, such as fluid overload, hypertension, and autoimmune diseases. In addition, advanced

age (in patients aged 50 to 80 years) is an important risk factor, which is why specialized care is essential.

Table 9 shows the results obtained in the survey regarding the most feasible strategy for good mechanical ventilation in patients with COVID-19 in the ICU.

Table 9. Most feasible strategy for good mechanical ventilation in patients with COVID-19 in the ICU.

Alternative	Frequency	Percentage
Supine position	0	0%
Prone position	52	100%
Lateral decubitus	0	0%
Total	**52**	**100%**

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020).

100% (52) affirm that the most feasible strategy for good mechanical ventilation in patients with COVID-19 in the ICU is the prone position since this position increases the amount of oxygen and blood flow in the patients' lungs.

Table 10 shows the results obtained in the survey regarding the most appropriate strategy in patients on hemodialysis therapy and COVID-19 in the ICU.

Table 10. Most appropriate strategy in patients on hemodialysis therapy and COVID-19 in the ICU.

Alternative	Frequency	Percentage
Supine position	52	100%
Prone position	0	0%
Lateral decubitus	0	0%
Total	**52**	**100%**

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020).

100% (52) state that the most feasible strategy for good mechanical ventilation in patients who receive hemodialysis and are infected with COVID-19 in the ICU is the supine position since it is the most effective in controlling the hypotension during the procedure and decreases or cancels the ultrafiltration rate.

If the patient requires hemodialysis therapy immediately and there is no time to wait for a fistula or graft to work, it is advisable to place a catheter (tube), in the upper part of the leg, in a vein in the neck, or chest.

Table 11 shows the results obtained in the survey regarding the correct assessment of nutritional status and risk in patients receiving hemodialysis and being infected with COVID 19 in the ICU.

Table 11. Correct assessment of the nutritional status and risk in patients receiving hemodialysis and presenting with COVID 19 in the ICU.

Alternative	Frequency	Percentage
Yes	49	94.2%
No	3	5.8%
Total	52	100%

Source: UCI - Dialysis Health Personnel Survey, Hospital IESS Ambato, (2020).

94.2% (49) DO make a correct assessment of the nutritional status and risk in patients receiving hemodialysis and infected with COVID 19 in the ICU, while 5.8% (3) do not. Most of the health personnel who carry out the assessment, do so through: a healthy, balanced diet, low in salt and fat. In addition, they control their blood pressure, sugar level, and weight.

Kidney diseases can be confirmed through biochemical and clinical examinations. Comorbidities (hypertension, anemia, diabetes mellitus, cardiovascular disease, etc.) associated with higher mortality during COVID-19 are common in patients with chronic kidney disease (CKD) and patients with kidney transplants or undergoing therapy of kidney replacement. However, some small series and case reports suggest that the clinical presentation of these renal patients could be mild, considering the hypothesis that it is a consequence of their pro-inflammatory state. Chronic kidney disease has an impaired immune response and therefore there is a lesser capacity to develop a cytokine storm. However, it is known that these patients are at increased risk of upper respiratory tract infection and pneumonia.

The few studies carried out so far focus on observations of small groups and series, with a disparity of opinions. A first investigation conducted in a single hemodialysis center at Wuhan University Renmin Hospital, reports 37 cases of COVID-19 among 230 hemodialysis patients. In most of these patients, the symptoms of COVID-19 were mild, without the need for admission to intensive care units. This research showed that these patients had less lymphopenia and lower serum levels of inflammatory cytokines than patients without dialysis affected by COVID-19 infection. This study concluded that COVID-19 hemodialysis patients are prone to experiencing mild illness that does not develop into complete pneumonia,

However, this finding does not agree with that found in the Italian and Spanish series, where around 28% of hemodialysis patients who required hospital admission due to COVID-19 died. Furthermore, contrary to what is reported from Chinese research, fever and respiratory symptoms

were common in these studies. In these cases, the comorbidity and risk factors of these patients are speculated. This population may have a very high prevalence and mortality rate for COVID-19, as they combine advanced age, malnutrition, cardiovascular disease, diabetes, lung disease, and a less efficient immune system with the need for dialysis treatment in overcrowded settings where many patients, nurses, doctors and support staff are present at the same time

What can be deduced from the different series is that, although the symptoms of COVID-19 in dialysis patients probably appear to be less aggressive due to their impaired immune system, mortality in these patients may be higher than in the general population. It is obvious that, in such complex and fragile patients, a serious infection that targets organs such as the lung and heart (already compromised during years of dialysis) carries a very high risk of death, even if the infection itself is not the final cause.

Another parameter to take into account is that COVID-19 infection leads to systemic inflammation and elevation of D-dimer, which coagulates dialysis circuits, possibly more often under conditions of low blood flow. The study suggests that COVID-19 disease has a significantly more severe course and worse prognosis in hemodialysis patients. In this sense, it will be important to make plans to guarantee the safety of these patients with COVID-19 and establish guidelines to better dialyze them.

CONCLUSIONS

Patients with Chronic Kidney Injury, who receive hemodialysis therapy, are a vulnerable group for contagion by COVID-19 because they must go to hospitals to perform this procedure, but the level of absenteeism has increased for the fear of getting infected. In addition, this fast and progressive disease is more frequent in the elderly and represents a risk factor due to immunosuppression and associated comorbidities such as high blood pressure, anemia, and diabetes mellitus being the most frequent.

For the management of patients receiving hemodialysis, it was identified that the supine position should be taken into account, which improves mechanical ventilation and decreases the ultrafiltration rate (UF), in addition, it is necessary to ensure free access to the procedure. As for nutrition, it should be based on a diet low in salt and fat. It is important to monitor blood pressure and weight.

The most appropriate strategies in suspected and confirmed cases of COVID-19 in patients receiving hemodialysis are to treat them in rooms under contact and drop isolation conditions. Dialyze in a part of the general chronic room adjusted for this purpose, with a distance of 2m, by the same personnel, and limit entries and manipulations. Environmental hygiene is reinforced with disinfection of the room before and after the dialysis session. In addition, since only one hemodialysis machine is available in the ICU, attention decreases, and since it is a great source of infection, it is necessary to use adequate personal protective equipment.

Increasing prevention efforts, instituting universal screening, isolating COVID-19 patients, and directing them to designated hemodialysis centers are effective in preventing the spread of infection.

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