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Short Communication **Open Access**

Leptospira sp and chronic kidney disease: A preliminary study of the serological status of a population of dialysis patients in Abidjan, Côte d'Ivoire

*[1,2,3]Koffi, K. S., [1]Bahi, G. A., [1]Saraka, N. D., [1]Tiémoko, G. G., [1]Kouassi, K. S., [1,2]Méité, S., and [1]Dosso, M.

[1]Institut Pasteur de Côte d'Ivoire, 01 BP 490, Abidjan 01, Côte d'Ivoire
[2]Unité de Formation et de Recherche Sciences Médicales, Université Félix Houphouët-Boigny
[3]Service de Bactériologie-Virologie, CHU de Treichville
*Correspondence to: Koffi.ks@ufhb.edu.ci

Abstract:

Background: Pathogenic strains of *Leptospira* are responsible for leptospirosis, a neglected zoonotic disease, whose pathophysiology involves acute kidney injury. These kidney lesions may progress to chronic forms, suggesting that leptospirosis could be a potential contributor to chronic kidney disease (CKD). This study aimed to determine the serological status related to leptospirosis in dialysis patients in Côte d'Ivoire.
Methodology: This cross-sectional study was conducted from November 15 to December 15, 2024, at the Institut Pasteur de Côte d'Ivoire. It involved serum samples collected from dialysis patients in Abidjan. The presence of anti-*Leptospira* IgM and IgG antibodies was assessed using ELISA techniques, and data were analyzed using the Epi Info software.
Results: A total of 30 patients, predominantly males (sex ratio of 2), were included, with a mean age of 43.7 years. None of the patients tested positive for anti-*Leptospira* IgM or IgG antibodies.
Conclusion: The findings from this preliminary study suggest that leptospirosis likely plays a limited role in the burden of CKD cases in Côte d'Ivoire. However, given the relatively small sample size, these conclusions should be interpreted with caution. Further studies involving a larger population would be necessary to better assess potential links between leptospirosis and chronic kidney disease.

Keywords: *Leptospira*; Chronic kidney disease; Hemodialysis; Serology; Côte d'Ivoire

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Leptospira sp et maladie rénale chronique: étude préliminaire du statut sérologique d'une population de patients dialysés à Abidjan, Côte d'Ivoire

*[1,2,3]Koffi, K. S., [1]Bahi, G. A., [1]Saraka, N. D., [1]Tiémoko, G. G., [1]Kouassi, K. S., [1,2]Méité, S., et [1]Dosso, M.

[1]Institut Pasteur de Côte d'Ivoire, 01 BP 490, Abidjan 01, Côte d'Ivoire
[2]Unité de Formation et de Recherche Sciences Médicales, Université Félix Houphouët-Boigny
[3]Service de Bactériologie-Virologie, CHU de Treichville
*Correspondance à: Koffi.ks@ufhb.edu.ci

Résumé:

Contexte: Des souches pathogènes de *Leptospira* sont responsables de la leptospirose, une maladie négligée. Maladie zoonotique, dont la physiopathologie implique une atteinte rénale aiguë. Ces lésions rénales peuvent évoluer vers des formes chroniques, suggérant que la leptospirose pourrait être un facteur contributif potentiel de l'insuffisance rénale chronique (IRC). Cette étude visait à déterminer le statut sérologique lié à la leptospirose chez les patients dialysés en Côte d'Ivoire.
Méthodologie: Cette étude transversale a été menée du 15 novembre au 15 décembre 2024 à l'Institut Pasteur de Côte d'Ivoire. Elle a porté sur des échantillons de sérum prélevés chez des patients dialysés à Abidjan. La présence d'anticorps IgM et IgG anti-*Leptospira* a été évaluée par des techniques ELISA, et les données ont été analysées à l'aide du logiciel Epi Info.
Résultats: Un total de 30 patients, majoritairement des hommes (sex-ratio de 2), ont été inclus, avec un âge

moyen de 43,7 ans. Aucun des patients n'a été testé positif aux anticorps IgM ou IgG anti-*Leptospira*.
Conclusion: Les résultats de cette étude préliminaire suggèrent que la leptospirose joue probablement un rôle limité dans la prévalence des cas d'IRC en Côte d'Ivoire. Cependant, compte tenu de la taille relativement réduite de l'échantillon, ces conclusions doivent être interprétées avec prudence. D'autres études portant sur une population plus large seraient nécessaires pour mieux évaluer les liens potentiels entre la leptospirose et l'insuffisance rénale chronique.

Mots-clés: Leptospirose; Insuffisance rénale chronique; Hémodialyse; Sérologie; Côte d'Ivoire

Introduction:

Pathogenic strains of *Leptospira* are responsible for leptospirosis, a neglected zoonosis that poses a significant public health challenge. Each year, nearly about one million cases are reported globally, with approximately 60,000 deaths (1). Leptospirosis is more prevalent in tropical and subtropical areas where climatic conditions favor the bacterial life cycle (2). In West Africa, the prevalence of leptospirosis varies significantly across countries, reaching up to 33% in some studied populations (3,4). In Côte d'Ivoire, the prevalence is high, estimated at 9.4% by Koffi et al., (5).

While leptospirosis is generally mild, severe forms occur in about 10% of cases, often characterized by multiorgan failure (2,6). Pathophysiological evidence shows that the kidneys are one of the primary target organs, and the bacterial infection could lead to acute kidney injuries (7). These acute injuries, particularly acute interstitial nephritis and acute tubular necrosis, may progress to chronic kidney disease, according to the severity of initial damages (7,8). Consequently, leptospirosis could be a potential contributor to the burden of chronic kidney disease (CKD).

In this context, an essential question arises; what proportion of CKD cases in Côte d'Ivoire could be attributed to leptospirosis? Answering this question could provide critical insights into CKD management, thereby justifying this study, which aims to determine the serological status related to leptospirosis in patients with chronic renal failure.

Materials and method:

Study setting, design, participants and sample collection:

We conducted a cross-sectional study from November 15 to December 15, 2024, at the Institut Pasteur de Côte d'Ivoire. The study involved serum samples collected from dialysis patients at the Cocody site, Abidjan, Côte d'Ivoire, of the Centre National de Prévention et de traitement de l'Insuffisance Rénale (CNPTIR). All consenting patients aged 18 years or older were included. Pregnant women were excluded from the study. Serum samples were collected between July 1 and August 31, 2021, and stored at -20°C at the Institut Pasteur de Côte d'Ivoire until analysis.

Ethical approval:

The study was approved by the Comité national d'Ethique des Sciences de la Vie et de la Santé under the reference number 023-20/MSHP/CNESVS-km.

Serological detection of *Leptospira* in samples:

In the laboratory, anti-*Leptospira* IgM and IgG antibodies were detected using an ELISA technique, with *Leptospira fainei* as the antigen, as previously described by Bourhy et al., (9). The antigen was immobilized on 96-well flat-bottom plates. For IgM detection, we used a goat anti-human IgM conjugated with horseradish peroxidase (Invitrogen®).

For IgG detection, a goat anti-human IgG conjugated with horseradish peroxidase was used (Chemicon®). The presence of anti-*Leptospira* antibodies was revealed by adding the TMB substrate (3,3',5,5'-Tetramethyl benzidine). Negative and positive controls were included to validate the tests.

Data analysis:

Data were analyzed using the CDC's EPI INFO software 7.2. Quantitative variables were expressed as minimum and maximum values, means, and standard deviations. Qualitative variables were presented as absolute numbers and proportions.

Results:

A total of 30 patients were included in this preliminary study. The age of participants ranged from 23 to 76 years, with a mean age of 43.7±17.3 years. There was a predominance of male patients, accounting for 66.7% of the study participants, resulting in a sex ratio of 2. Laboratory analysis revealed no patients with detectable anti-*Leptospira* IgM or IgG antibodies.

Discussion:

The present study aimed to detect anti-*Leptospira* antibodies in dialysis patients with chronic kidney disease (CKD) to explore a potential link between leptospirosis and CKD. Leptospirosis is known to cause acute kidney injuries, which, when severe, can evolve into chronic kidney disease, ultimately requiring dialysis. The study participants were predominantly males, with a relatively young mean age of 43.7 years. These findings are comparable to those of several studies cond-

ucted in Côte d'Ivoire on CKD. Studies by Mondé et al., (10) and Ouattara et al., (11) reported similar mean ages of 39 and 44 years, respectively. Male predominance was also observed in these two studies, although with slightly lower sex ratios of 1.1 and 1.3, respectively.

In the present study, none of the tested samples showed detectable levels of anti-*Leptospira* IgM or IgG antibodies. Based on these findings, leptospirosis does not appear to be a significant contributor to CKD in Côte d'Ivoire. However, these results prompt reflections on both the potential effects of dialysis on antibody levels and the healthcare access of patients undergoing dialysis. Regarding the potential impact of dialysis on antibody levels, it is worth noting that hemodialysis may influence antibody kinetics, either by altering their elimination or by affecting their production. Hemodialysis, which removes metabolic waste and excess electrolytes from the blood, could theoretically lower antibody titers to undetectable levels by clearing them from circulation. This could lead to false-negative results. However, antibodies are large molecules that are not filtered by the membranes used in hemodialysis. Therefore, hemodialysis is unlikely to have affected the presence of anti-*Leptospira* antibodies in the patients included in this study through this mechanism.

Conversely, hemodialysis is known to impair antibody production. Hemodialysis patients often exhibit altered immune responses, making them less responsive to infections and vaccines (12). However, for this hypothesis to be considered, CKD would need to be pre-existing, suggesting that a factor other than leptospirosis initially triggered the renal failure. In severe forms of leptospirosis, multi-organ failure often includes renal involvement (7). Many studies have reported acute kidney injuries associated with severe leptospirosis (13-15). It is therefore essential to investigate whether these acute injuries could progress to chronic kidney disease following a severe episode of leptospirosis.

The study population, composed of dialysis patients, highlights the issue of health care access in Côte d'Ivoire. Despite efforts to improve access to dialysis, it remains limited due to the shortage of dialysis units in public healthcare facilities, the high cost of dialysis in private centers, and the lack of social coverage for most patients (16,17). Consequently, resource-limited populations, who are at higher risk of leptospirosis due to poor hygiene conditions and rodents' proliferation, the primary reservoirs of leptospires worldwide (2), may not have access to dialysis. This situation could underrepresent this segment of the population among dialysis patients, potentially masking a link between CKD and leptospirosis.

Furthermore, the risk of leptospirosis is higher in the western region of the country (5,18), where only one dialysis center exists according to the Ivorian Society of Nephrology (S.I.NEPH, http://www.sinephweb.org/page_indicateur_1.php). This limited access to dialysis services could also contribute to the underrepresentation of a potential link between the two diseases, even though the study population was selected from Abidjan, the economic capital of Côte d'Ivoire. However, the small sample size of this preliminary study warrants caution when interpreting these findings. A larger study, encompassing more regions of the country, would be necessary to better assess the potential association between leptospirosis and CKD in Côte d'Ivoire.

Conclusion:

In conclusion, this study did not detect anti-*Leptospira* IgM or IgG antibodies in the dialysis patients included. These findings suggest that leptospirosis plays a limited role in the burden of CKD in Côte d'Ivoire. However, given the relatively small sample size, these conclusions should be interpreted with caution. A larger study, covering a broader population, would be necessary to more accurately assess the potential link between leptospirosis and chronic kidney disease.

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Contributions of authors:

KKS, BGA and SND designed the study; KKS drafted the protocol and the manuscript; BGA and SND collected the samples; TGG and KKS carried out the laboratory analyses; MS and DM validated the protocol and revised the document. All the authors read and approved the manuscript submitted for publication.

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Conflicts of interest:

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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