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# Mortality of patients hospitalized in the Rheumatology Department of the Bogodogo University Hospital, Burkina Faso: frequency and associated factors

## *Mortalité des patients hospitalisés dans le Service de Rhumatologie de l'Hôpital Universitaire Bogodogo au Burkina Faso : fréquence et facteurs associés*

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**Summary**
*Context and objective*. Little is known regarding the predictors of mortality in rheumatic patients. The aim of the present study was to determine the frequency and factors associated with death in patients hospitalized in the Rheumatology Department of the Bogodogo University Hospital. *Methods*. This was a retrospective descriptive and analytical study from January 2023 to June 2023. Patients admitted to the hospital were followed. The variables of interest were death, duration of progression of symptoms before hospitalization and duration of hospitalization. Survival function was estimated using the Kaplan-Meier method. Cox regression analysis was used to model the factors associated with death. This analysis provided the adjusted hazard ratios. *Results*. One hundred and three patients were included in the study, and 13 patients died, representing a death frequency of 12.62%. The 120-day survival rate was 71.30%, based on the duration of symptoms before hospitalization. The median survival rate was 45.60% according to the duration of hospitalization. Factors associated with death according to the duration of symptoms before hospitalization were the presence of arterial hypertension (HR=8.43; IC95% [1.96-36.2]; p=0.004), the presence of infectious pathology (HR=6.93; IC95% [1.79-34.81]; p=0.010), and the presence of tumor pathology (HR=9.78; IC95%

**Résumé**
*Contexte et objectif.* Les prédicteurs de la mortalité chez les rhumatisants sont très peu connus. L'objectif de la présente étude était de déterminer la fréquence et les facteurs associés au décès des patients hospitalisés dans le service de rhumatologie du CHU Bogodogo. *Méthodes*. Il s'agissait d'une étude de suivi rétrospectif et analytique de janvier 2023 à juin 2023. Les variables d'intérêt étaient le décès, la durée de progression des symptômes avant l'hospitalisation et la durée de l'hospitalisation. La fonction de survie a été estimée à l'aide de la méthode de Kaplan-Meier. Une analyse de régression de Cox a été utilisée pour modéliser les facteurs associés au décès permettant d'obtenir les rapports de risque ajustés. *Résultats*. Cent trois patients ont été inclus dans l'étude et 13 patients sont décédés, soit une fréquence de décès de 12,62%. Le taux de survie à 120 jours était de 71,30%, basé sur la durée des symptômes avant l'hospitalisation. Le taux de survie médian était de 45,60% en fonction de la durée d'hospitalisation. Les facteurs associés au décès selon la durée des symptômes avant l'hospitalisation étaient l'hypertension artérielle (HR=8,43 ; IC95% [1,96-36,2] ; p=0,004), une pathologie infectieuse (HR=6,93 ; IC95% [1,79-34,81] ; p=0,010), et une pathologie tumorale (HR=9,78 ; IC95% [2,93-43,68] ; p=0,004). Les facteurs associés au décès en fonction de la durée d'hospitalisation étaient la présence d'un


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[2.93-43.68]; p=0.004). Factors associated with death according to length of hospitalization were the presence of diabetes mellitus (HR=7.24; IC95% [1.31-40.1]; p=0.023), a motor deficit (HR=7.11; IC95% [1.07-47.0]; p=0. 042), infectious pathology (HR=2.01; IC95% [1.11-15.69]; p=0.002), tumor pathology (HR=13.70; IC95% [3.9-77.44]; p<0.001), and microcrystalline pathology (HR=2.94; IC95% [1.44-18.74]; p=0.031).
*Conclusion.* The mortality rate in the Rheumatology Department is significant and varies according to the duration of symptoms and length of hospitalization, as well as the associated factors.
**Keywords**: frequency, mortality, survival, rheumatic diseases, sub-Saharan Africa

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diabète sucré (HR=7,24 ; IC95% [1,31-40,1] ; p=0,023), la présence d'un déficit moteur (HR=7,11 ; IC95% [1,07-47,0] ; p=0. 042), une pathologie infectieuse (HR=2,01 ; IC95% [1,11-15,69] ; p=0,002), une pathologie tumorale (HR=13,70 ; IC95% [3,9-77,44] ; p<0,001), et une pathologie microcristalline (HR=2,94 ; IC95% [1,44-18,74] ; p=0,031).
*Conclusion.* Nos résultats montrent que la mortalité dans le service de rhumatologie est importante et varie en fonction de la durée des symptômes et de la durée d'hospitalisation, ainsi que des facteurs associés.
**Mots-clés** : fréquence, mortalité, survie, maladies rhumatismales, Afrique subsaharienne

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## Introduction

Rheumatic diseases are common and represent real public health problems. They are a major burden on health services worldwide (1-2). Indeed, they are the most common cause of severe pain and long-term physical disability, affecting hundreds of millions of people worldwide. Despite their significant global impact, they do not receive the attention they deserve and are underfunded (1-3). In Burkina Faso (West Africa), rheumatology is a new specialty, and the rheumatology department at Bogodogo University Hospital regularly sees patients admitted to the hospital with this type of pathology (4). The management of these patients is complex due to the chronic nature of the disease, diagnostic and therapeutic problems, and complications associated with the disease and its treatment. All of these factors can lead to an unfavorable course of the disease, threatening the patient's vital prognosis (5-7).

Death in rheumatology is an important topic, but one that is often neglected in the medical literature because it is considered "non-fatal" by the medical community and the general public (8). Indeed, the frequency and the factors associated with the death of these patients remain little studied in rheumatology departments in general. Three cases of death related to autoimmune diseases were reported in a cohort of 90 patients in Congo-Brazzaville (9). In Burkina Faso, a series of four deaths related to chronic inflammatory rheumatism was reported during the first year of rheumatology practice in Bobo-Dioulasso (10). It is important to understand the causes and contributing factors of deaths related to these diseases in order to improve patient management and reduce mortality. The aim of this study was to determine the frequency of death in patients hospitalized for rheumatologic pathology at the rheumatology department of the Bogodogo University Hospital and to identify factors that might be associated with an increased risk of death.

## Methods

*Type and period of study*

This was a retrospective descriptive and analytical study of the frequency and factors associated with death in patients admitted to the rheumatology department for rheumatologic pathology from January 2023 to June 2023 (6 months) at the Bogodogo University Hospital**.** It is the only rheumatology inpatient department in the country.

*Study population*

The study population consisted of patients admitted to the rheumatology department for rheumatologic pathology during the study period. As part of the sharing of beds, the rheumatology department receives other patients. During the study period, 23 patients were admitted to the department on behalf of other specialties.

*Inclusion criteria*

Patients admitted to the rheumatology department for rheumatic or musculoskeletal diseases were included in the study. The pathology was diagnosed by a senior physician [K.F, Z/T.JSW,


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O.DD]. The files included had a completeness of ≥75%.

*Non-inclusion criteria*

All patients hospitalized in the rheumatology department for non-rheumatological pathology were not included in the study. Records of patients for whom a diagnosis was not accepted and incomplete records were not included.

*Study variables*

The variables of interest were death (autopsies were not performed on deceased patients), duration of symptom progression prior to hospitalization, corresponding to the first manifestation of the disease until the patient's admission to the rheumatology department, and duration of hospitalization. Other variables included patient socio-demographics, comorbidities, general condition on admission according to the World Health Organization stage (stage O = normal activity, stage 1 = minimal reduction in activity, stage 2 = unable to work, bed rest less than 50% of waking time, stage 3 = bed rest more than 50% of waking time and stage 4 = bedridden), anemia, motor deficit and type of diagnosis: infectious pathology (osteoarticular infections), degenerative pathology (osteoarthritis, intervertebral disc disease), tumour pathology (primary or secondary malignant bone tumors and benign bone tumors), microcrystalline pathology (gout or calcium pyrophosphate rheumatism); chronic inflammatory rheumatism (rheumatoid arthritis, systemic lupus erythematosus, primary Gougerot-Sjögren syndrome, dermatomyositis, scleroderma).

The profession was defined according to the different sectors: the primary sector corresponding to the exploitation of natural resources (agriculture, livestock, fishing, mining); the secondary sector corresponding to the transformation of raw materials into finished products (bricklayers, electricians, workers, engineers); the tertiary sector grouping together market services (commerce, banking, transport, tourism) and non-market services (education, health, administration); and finally, the quaternary sector grouping together non-traditional services from the tertiary sector (software development, telecommunications, media, consultancy, legal activities).

Gout was diagnosed according to the 2015 ACR/EULAR (American College of Rheumatology/European Alliance of Associations for Rheumatology) classification criteria and calcium pyrophosphate rheumatism according to the 2023 ACR/EULAR classification criteria.

Rheumatoid arthritis has been diagnosed according to the ACR/EULAR 2010 classification criteria. Systemic lupus erythematosus was diagnosed according to the ACR/EULAR 2019 classification criteria, primary Gougerot-Sjögren's syndrome according to the ACR/EULAR 2016 classification criteria, dermatomyositis according to the Troyanov 2005 criteria and scleroderma according to the ACR/EULAR 2013 classification criteria.

*Data source and statistical analysis*

Data source

The clinical records of patients hospitalized during the study period served as the database. The data was collected using a pre-established form and covered the various variables in the study.

Statistical analysis

Data were analyzed using R software version 4.2.3. Frequencies were used for categorical variables. Continuous variables were summarized using measures of central tendency (mean and median) and dispersion (range, standard deviation). The estimation of the survival function was described by the Kaplan-Meier method. Two survival curves were constructed, the first for the duration of symptom progression to hospitalization and death. The second was for the duration of hospitalization and death. Cox regression analysis was used to model the factors associated with death, adjusting for confounders. Two series of modeling runs were performed: the first concerned the duration of symptom progression before hospitalization and death. The second focused on the duration of hospitalization and death. All variables were retained for the initial model of each series. An automated top-down stepwise selection procedure was used to build the final model. The likelihood ratio test was used to compare nested models. Model fit was assessed using the Schoenfeld test. The variables associated with death were included in the final model. This gave us the adjusted hazards ratio with a significance level of less than 5% and a confidence interval of 95%.

*Ethical considerations*

The protocol was approved by the institutional ethics committee. Administrative authorization for data collection was also obtained from the management of the university hospital. Confidentiality and anonymity were respected


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during data collection and processing, in accordance with the Helsinki recommendations.

**Results**

The study included 103 patients **(**51 males, 49,50%). During the study, 13 patients died, i.e. 12.62% (8 males). The mean age of the patients was 49.21±17.71 years, with extremes of 13 and 84 years. Females accounted for 52 (50.50%) of the patients, with a sex ratio of 0.98. The mean pain score out of 10 on the visual analog scale (VAS) was 7.83±2.10, with extremes of 0 and 10 on admission. The mean duration of symptom evolution before hospitalization was 46.60±42.13 days, with extremes of 1 day and 365 days. The median time to hospitalization was 21 days (7-60). The mean duration of hospitalization was 8.08±5.54 days, with extremes of 1 day and 30 days. The median length of hospital stay was 6 days. Arterial hypertension was found in 31 (30.10%) cases. Infectious pathology was found in 41 (39.80%) cases. Table 1 shows the distribution of patients included in the study according to socio-demographic and clinical characteristics.


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Table.1. Distribution of study patients by socio-demographic and clinical characteristics

| Variables | Number | Percentage |
|---|---|---|
| Gender | | |
| Female | 52 | 50.50 |
| Male | 51 | 49.50 |
| Age range (years) | | |
| <60 | 74 | 71.80 |
| ≥60 | 29 | 28.20 |
| Marital status | | |
| Married | 78 | 75.70 |
| Not married | 25 | 24.30 |
| Residence | | |
| Urban | 66 | 64.10 |
| Rural | 37 | 35.90 |
| Profession | | |
| Primary sector | 80 | 77.70 |
| Secondary sector | 18 | 17.50 |
| Tertiary sector | 4 | 3.90 |
| Quaternary sector | 1 | 0.9 |
| Comorbidity | | |
| Arterial Hypertension | 31 | 30.10 |
| Diabetes mellitus | 11 | 10.70 |
| **Acquired Immunodeficiency** | 8 | 7.80 |
| **Virus** | 9 | 8.70 |
| Kidney failure | 4 | 3.90 |
| Tuberculosis | | |
| VAS Interval | | |
| ≤5 | 11 | 10.70 |
| >5 | 92 | 89.30 |
| WHO Stadium | | |
| Stadium 1 et 2 | 33 | 32 |
| Stadium 3 et 4 | 70 | 68 |
| Anemia | | |
| No | 93 | 90.30 |
| Yes | 10 | 9.70 |
| Motor deficit | | |
| No | 82 | 79.60 |
| Yes | 21 | 20.40 |
| Diagnostic | | |
| Infectious pathology | 41 | 39.80 |
| Degenerative pathology | 25 | 24.30 |
| Tumor pathology | 15 | 14.60 |
| Microcrystalline pathology | 12 | 11.60 |
| **CIR** | 10 | 9.70 |
| Death | | |
| No | 90 | 87.**38** |
| Yes | 13 | 12.6**2** |
| Causes of death | | |
| Cardiorespiratory arrest | 7 | 53.85 |
| Multiple organ failure | 6 | 46.15 |


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**CIR**: chronic inflammatory rheumatism WHO: World Health Organization

VAS: Visual analog scale

Patient survival at 120 days was 71.30% according to the Kaplan-Meir method, depending on the duration of symptom progression prior to hospitalization. Figure 1 shows the Kaplan-Meir survival curve for patients included in the study as a function of duration of symptom progression prior to hospitalization.


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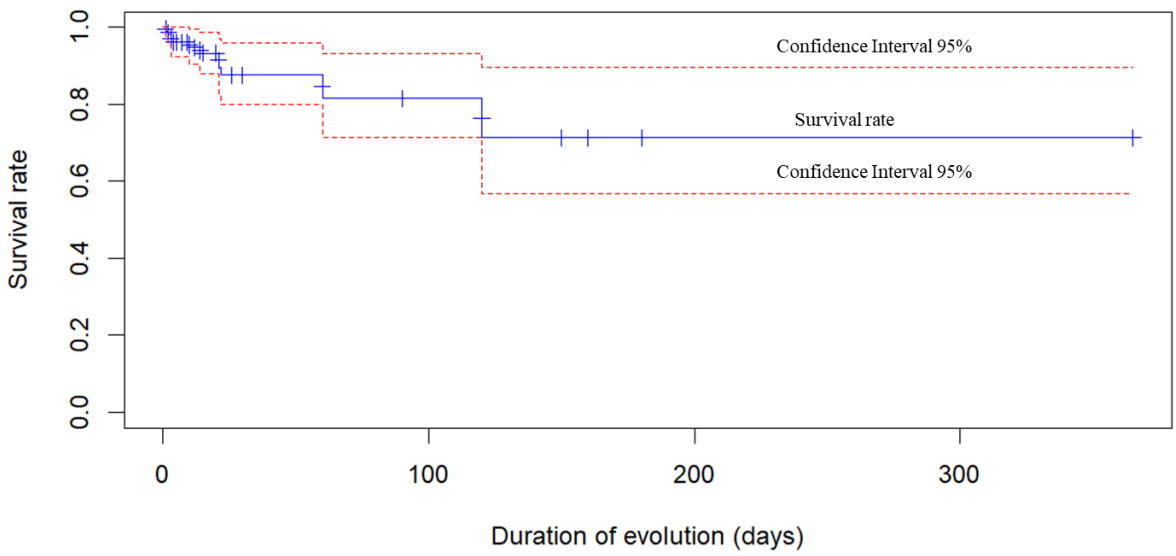


**Figure 1.** Kaplan-Meier survival curve for patients enrolled in the study according to the duration of symptom onset prior to hospitalization

The median survival of patients at 26 days was 45.60% according to the Kaplan-Meir method, depending on the duration of hospitalization. Figure 2 shows the Kaplan-Meir survival curve for patients included in the study as a function of length of hospitalization.

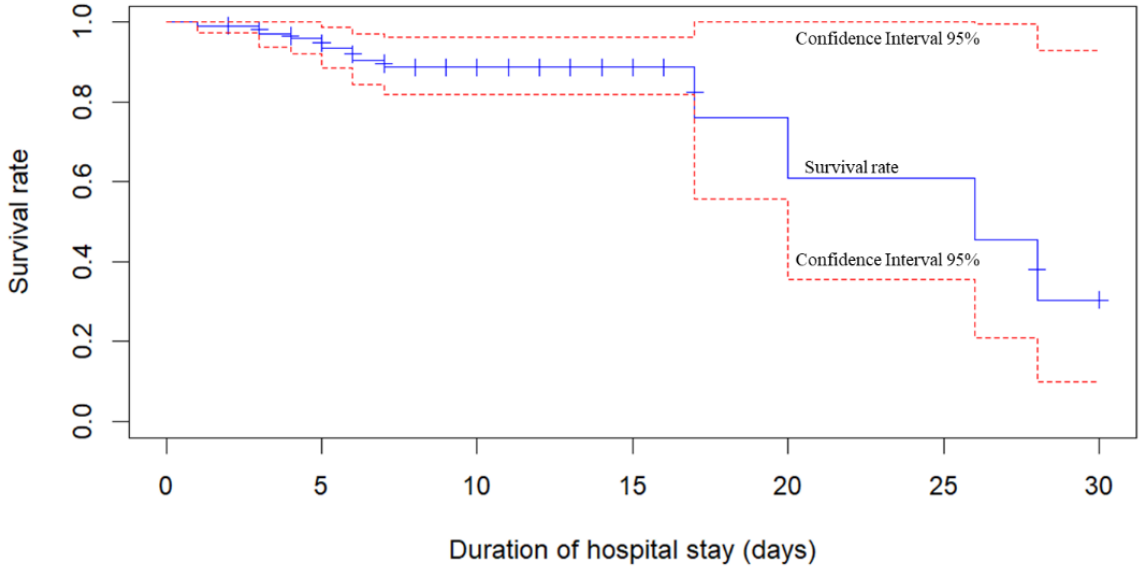


**Figure 2.** Kaplan-Meier survival curve for the patients included in the study as a function of the length of stay in the hospital

In Cox analysis, the factors associated with death according to the duration of symptoms before hospitalization after modeling were the presence of arterial hypertension (HR = 8.43; CI95% [1.96-36.2]; p = 0.004), the presence of an infectious pathology (HR = 6.93; CI95% [1.79-34.81]; p = 0.010) and the presence of a tumor pathology (HR = 9.78; CI95% [2.93-43.68]; p = 0.004). Table 2 shows the factors associated with death according to the duration of symptom evolution before hospitalization and after modeling during the study period.


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Table 2. Factors associated with death according to the duration of symptom evolution before hospitalization during the period

| | **Duration of evolution-Death Initial model** | | | **Duration of evolution-Death Final model** | | |
|---|---|---|---|---|---|---|
| **Variables** | **HR** | **CI (95%)** | **P Value** | **Adjusted HR** | **CI (95%)** | **P Value** |
| Gender | | | | | | |
| Female | **1** | — | — | | | |
| Male | 0.86 | [0.18-4.07] | 0.8 | | | |
| Age range (years) | | | | | | |
| <60 | **1** | — | — | | | |
| ≥60 | 0.84 | [0.19-3.77] | 0.8 | | | |
| Arterial Hypertension | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 6.42 | [1.19-34.7] | 0.031 | 8.43 | [1.96-36.2] | 0.004 |
| Diabetes mellitus | | | | | | |
| No | **1** | — | — | | | |
| Yes | 1.47 | [0.25-8.54] | 0.7 | | | |
| WHO Stadium | | | | | | |
| Stadium 1 et 2 | **1** | — | — | | | |
| Stadium 3 et 4 | 2.10 | [0.38-11.5] | 0.4 | | | |
| Anemia | | | | | | |
| No | **1** | — | — | | | |
| Yes | 2.01 | [0.34-11.9] | 0.4 | | | |
| Motor deficit | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 3.52 | [0.89-13.9] | 0.073 | 3.01 | [0.86-10.5] | 0.084 |
| Infectious pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 9.96 | [2.42-48.22] | 0.004 | 6.93 | [1.79-34.81] | 0.004 |
| Degenerative pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 4.13 | [0.49-34.6] | 0.2 | 1.43 | [0.24-9.5] | 0.63 |
| Tumor pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 13.6 | [3.55-68.77] | 0.009 | 9.78 | [2.93-43.68] | 0.010 |
| Microcrystalline pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |


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| | | | | | | |
|---|---|---|---|---|---|---|
| Yes | 9.12 | [0.44-46.24] | 0.14 | 9.9 | [0.91-52.60] | 0.65 |
| **CIR** | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 6.62 | [0.22-78.83] | 0.79 | 7.58 | [0.70-43.45] | 0.35 |

HR = Hazard Ratio, CI = Confidence Interval
**CIR**: chronic inflammatory rheumatism
WHO: World Health Organization

Factors associated with death in Cox analysis according to duration of hospitalization after modeling were the presence of diabetes mellitus (HR=7.24; IC95% [1.31-40.1]; p=0.023), the presence of a motor deficit (HR=7.11; IC95% [1.07-47.0]; p=0. 042), the presence of an infectious pathology (HR=2.01; IC95% [1.11-15.69]; p=0.002), the presence of a tumoral pathology (HR=13.70; IC95% [3.9-77.44]; p<0.001) and the presence of a microcrystalline pathology (HR=2.94; IC95% [1.44-18.74]; p=0.031). Table 3 shows the factors associated with death according to the length of hospitalization before and after modeling during the period.

Table 3. Factors associated with death according to length of hospital stay during the study period

| | **Duration of hospital stay-Death Initial model** | | | **Duration of hospital stay-Death Final model** | | |
|---|---|---|---|---|---|---|
| **Variables** | **HR** | **CI (95%)** | **P Value** | **Adjusted HR** | **CI (95%)** | **P Value** |
| Gender | | | | | | |
| Female | **1** | — | — | | | |
| Male | 0.70 | [0.12-4.10] | 0.7 | | | |
| Age range (years) | | | | | | |
| <60 | **1** | — | — | | | |
| ≥60 | 1.26 | [0.24-6.66] | 0.8 | | | |
| Arterial Hypertension | | | | | | |
| No | **1** | — | — | | | |
| Yes | 1.63 | [0.27-9.81] | 0.6 | | | |
| Diabetes mellitus | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 6.40 | [0.88-46.4] | 0.066 | 7.24 | [1.31-40.1] | 0.023 |
| WHO Stadium | | | | | | |
| Stadium 1 et 2 | **1** | — | — | | | |
| Stadium 3 et 4 | 1.59 | [0.26-9.77] | 0.6 | | | |
| Anemia | | | | | | |
| No | **1** | — | — | | | |


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| | | | | | | |
|---|---|---|---|---|---|---|
| Yes | 0.40 | [0.05-3.16] | 0.4 | | | |
| Motor deficit | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 6.50 | [0.97-43.5] | 0.054 | 7.11 | [1.07-47.0] | 0.042 |
| Infectious pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 3.01 | [1.96-19.10] | 0.001 | 2.01 | [1.11-15.69] | 0.002 |
| Degenerative pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 1.41 | [1.07-14.02] | 0.048 | 1.03 | [0.10-9.73] | 0.091 |
| Tumor pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 11.09 | [20.7-59.356] | <0.001 | 13.7 | [3.9-77.44] | <0.001 |
| Microcrystalline pathology | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 2.25 | [1.60-16.901] | 0.034 | 2.94 | [1.44-18.74] | 0.031 |
| **CIR** | | | | | | |
| No | **1** | — | — | **1** | — | — |
| Yes | 9.13 | [1.47-56.55] | 0.045 | 6.7 | [0.75-19.53] | 0.072 |

HR = Hazard Ratio, CI = Confidence Interval
**CIR**: chronic inflammatory rheumatism
WHO: World Health Organization


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**Discussion**

The frequency of death among patients hospitalized for rheumatic disease during the study period was 12.62%. The 120-day survival rate of patients was 71.30% according to the duration of symptom evolution before hospitalization, and the median survival rate of patients at 26 days was 45.60% according to the duration of hospitalization. Factors associated with death were arterial hypertension, diabetes mellitus, motor deficit, infectious pathology, tumor pathology, and microcrystalline pathology.

The frequency of death (12.62%) reported in our series was higher than that reported in the literature in sub-Saharan Africa (9,10). In Brazil, the frequency of death related to systemic lupus erythematosus was 4.1%, while in other developing countries it varied from 4.3% to 10% (11-15). In France, the mortality rate due to osteoarticular infections was 25% (16). This difference could be explained by the fact that these studies focused on specific rheumatological pathologies, unlike our series, which looked at several rheumatic diseases.

In our series, patient survival rate varied according to the duration of symptom evolution prior to hospitalization, the number of days of hospitalization, and probably the diagnosis. Indeed, in systemic lupus erythematosus, survival rates of 83.1% to 100% and 72.6% to 97% were observed at 5 and 10 years, respectively (14,17-18). Certain inflammatory rheumatic diseases, such as systemic lupus erythematosus (SLE), systemic sclerosis, polymyositis, and vasculitis, are associated with higher rates of premature mortality than in the general population (8, 19). Mortality rates are lower for rheumatoid arthritis (RA) and gout, but still higher than in the general population. Osteoarthritis is also associated with premature mortality (8, 19-22). In France, the death rate from osteoarticular infections is 4 times higher than the rate observed in the general French population at the same age and much higher than the death rate observed 5 years after myocardial infarction, breast cancer, or colorectal cancer (16). Hypertension and diabetes mellitus were associated with death in our series. This result is similar to that reported in the literature (8,23). In fact, hypertension and diabetes mellitus increase the risk of death in the general population and especially in rheumatologic diseases. In addition, patients with rheumatic diseases have a high prevalence of hypertension (53%) and diabetes (47%) (24-25).

In our series, infectious, tumoral, and microcrystalline pathologies were associated with death. These factors have been found in the literature (19, 26-27). In China, the main causes of death were infectious pathology, cardiovascular complications, and tumoral pathology (26). In Norway, the main causes of death were cardiovascular disease, neoplasia, chronic respiratory disease, and infection (27). In Lithuania, cardiovascular disease and tumor pathology, particularly neoplasia, were the main causes of death in patients with rheumatic diseases, together accounting for 70% of all causes of death (28). It should also be noted that, in addition to the mortality factors mentioned above, other factors such as genetics, environment, cultural beliefs, smoking, alcohol, level of education, socio-economic status, physician and specialist referral system, and treatment compliance are also involved (26).

Any interpretation of our data must take into account the number of cases included in the study and the variables considered in the search for associated factors that may constitute selection bias. In addition, our data are intra-hospital and cannot be extrapolated to the general population.

Ouedraogo Issa: Contributed to the validation and writing of the original draft.

son Bakoubassé Aïssata: Contributed to the validation and writing of the original draft.

Kabore Fulgence: Contributed to the supervision, validation and writing of the original draft.

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**Conclusion**

This is the first study to report the frequency and factors associated with death in a rheumatology department in sub-Saharan Africa. It will be an important reference for future survival analyses and epidemiologic surveys in the region. It will also help to better describe mortality statistics for rheumatic diseases in general and chronic inflammatory rheumatism in particular.

**Consent for publication**

Not applicable

**Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

**Competing interests**

The authors declare that they have no competing interests.

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**Authors' contributions**

Ayouba Tinni Ismael: Contributed to the conceptualization, data curation, methodology, formal analysis, supervision, validation and writing of the original draft.

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**Association entre la surdité neurosensorielle et les conditions météorologiques : une série analytique des cas dans deux hôpitaux à Kinshasa**
***Association between sensorineural hearing loss and weather conditions: an analytic case series in two hospitals at Kinshasa***


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