Research Article

# Evaluation of Glomerular Filtration Rate and Urinary Abnormalities in Adult Cancer Patients Prior to Chemotherapy at the Surgical Oncology Unit (UCO) of CHU Donka

**Amadou Yaya Diallo[1]\*, Kadiatou Mamadou Bobo Barry[1], Soriba Bangoura[1], Noumouké Baldé[2], Djenabou Diallo[2], Mamadou Malal Diallo[1], Mohamed Lamine Tégui Camara[1], Mamadou Diallo[2] and Mohamed Lamine Kaba[1]**

[1]*Service de Néphrologie, Hémodialyse, CHU, Donka, Guinea*
[2]*Unité de Chirurgie Oncologie, CHU, Donka, Guinea*

**\*Corresponding Author:** Amadou Yaya Diallo, Service de Néphrologie, Hémodialyse, CHU, Donka, Guinea.

## Abstract

**Introduction:** The aim of this study was to evaluate glomerular filtration rate and urinary abnormalities in adult cancer patients before chemotherapy at the Surgical Oncology Unit of CHU Donka.

Material and Methods: This was a descriptive cross-sectional study lasting 3 months from 20 December 2021 to 20 March 2022 and covering all adult cancer patients admitted to and/or followed up at the Surgical Oncology Unit during the study period.

**Results:** During the study period, we recorded 40 cases (18%) of histologically confirmed cancers, with 31 cases (77.5%) predominantly female and a sex ratio (M/F) of 0.29. The average age of the patients was 46.75 years [21-85]. According to the type of tumour studied, breast cancer was most common in 15 cases (37.5%), followed by cervical cancer in 8 cases (20%). The mean GFR was $75.72 \pm 26.36$ [8-122] ml/min/1.73m$^2$. According to glomerular filtration rate, there were 11 cases (27.5%) with a GFR < 60 ml/min/1.73m$^2$ and 29 cases (72.5%) with a GFR ≥ 60 ml/min/1.73m$^2$. In the course of this study we noted 15 cases (37.5%) of urinary abnormalities on urine dipstick. Urobilinogen was positive in 4 cases (26.6%), and isolated leukocyturia in 3 cases (20%).

**Conclusion:** The nephrotoxicity of anticancer drugs and the high frequency of renal impairment in patients with cancer mean that practitioners must assess the renal function of these patients before and after each course of chemotherapy.

**Keywords:** GFR; Adult; Oncology; Chemotherapy; Donka

## Introduction

Assessment and monitoring of renal function are essential parameters in the proper management of patients, particularly in oncological diseases. In patients with reduced glomerular filtration rate (GFR), there is a risk of overdose due to reduced elimination (excretion, metabolism, etc.) of anticancer drugs, particularly those with renal elimination [1]. On the other hand, an empirical reduction in dosage carries the risk of underdosing. In this context, assessment of GFR in cancer patients is essential before initiating any cancer chemotherapy [2]. Similarly, it is important for the continuity of anti-cancer therapy to adapt the dosage of anti-cancer treatments to the level of renal function by implementing measures to prevent nephrotoxicity in the light of the various intrinsic risk factors associated with the treatment or specific to the patient [3]. Any impairment of renal function before or during treatment may contraindicate the temporary or permanent use

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of an anti-cancer agent known for its nephrotoxicity in a given chemotherapy protocol [4]. As a result, the cancerous disease may continue to progress. Several authors have studied GFR in cancer patients [5-7].

In the United States, a review of the literature reported that 38.6% of patients with breast cancer, 38.9% with lung cancer, 38.3% with prostate cancer, 27.5% with gynaecological cancer and 27.2% with colorectal cancer had a GFR ≥ 90 ml/min/1.73 $m^2$ at the time chemotherapy was initiated [5,6].

In France, Launay Vacher., *et al.* at the Hôpital de la Pitié Salpêtrière reported in a study of 316 cancer patients that 28% had a GFR of less than 80 ml/min and 23% had a creatinine clearance of between 80 and 50 ml/min, with 5% of patients having a creatinine clearance of less than 50 ml/min [7,8].

In Guinea, to date there have been no studies assessing GFR and urinary abnormalities in adult cancer patients prior to chemotherapy.

The aim of this study was to assess glomerular filtration rate and urinary abnormalities in adult cancer patients prior to chemotherapy at the surgical oncology unit (UCO) of CHU Donka.

## Material and Methods

The surgical oncology unit (UCO) of CHU Donka served as the setting for this study. It was a prospective descriptive study lasting 3 months from 20 December 2021 to 20 March 2022.

All patients with histologically confirmed cancer aged 18 or older who were hospitalised or followed up as outpatients and who had a creatinine level and a dipstick test were included.

Patients with a suspected malignant tumour not confirmed by pathological examination and those who did not agree to take part in the study were not included.

Our variables were qualitative and quantitative, broken down into data: for each patient (e), the investigator collected the following information on a pre-established form during an individual interview:

- **Socio-demographic data:** Age ≥18 years with a range of 20 years, sex (male and female with calculation of the sex ratio), occupation, origin, marital status, level of education, comorbidities.

- **Clinical data studied:** Anatomo-clinical characteristics of the cancer (time to consultation, primary site, site of the primary tumour was specified according to the International Classification of Diseases for Oncology (ICD 10-0) [9].

- **Histological type:** According to the histological examination of the operative specimen, patients were classified according to the different modalities.

- **Stage:** Stages from the 2018 UICC TNM classification for solid tumours [10]. Modalities were: localised, locally advanced and metastatic.

- **Site of metastases were:** Lung metastases, brain metastases, liver metastases, bone metastases, lung and liver metastases, liver and bone metastases.

- **Paraclinical data:** Biology (complete blood count, creatinemia, urea, and urine dipstick).

- **Imaging:** Radiology, abdomino-pelvic ultrasound, abdomino-pelvic CT scan, brain CT scan, abdomino-pelvic MRI.

Data were collected manually on pre-established survey forms and analysed using the statistical package for the social sciences (version 21.0 for Windows, SPSS, Inc.... Chicago, IL). The chi-square test was used to compare proportions. A statistically significant difference was defined for a p-value < 0.05.

## Ethical considerations

The agreement of the department heads was obtained before the surveys began. A working protocol was drawn up and validated by the hospital authorities and the Chair of Nephrology. Free and informed consent was obtained from the patients included in this study, respecting confidentiality and anonymity.

## Results

### Sociodemographic data

During the study period, we recorded 222 cases, of which 40 (18%) had histologically confirmed cancer, of which 11 (27.5%) had a GFR < 60 ml/min/1.73$m^2$. The mean GFR was 75.72 ± 26.36 ml/min/1.73$m^2$, with extremes of 8 and 122 ml/min/1.73$m^2$. Females predominated in 31 cases (77.5%), with a sex ratio (M/F) of 0.29. The mean age of the patients was 46.75 ± 14.61 years, with extremes of 21 and 85 years. The majority of patients came from the interior of the country, 22 cases (55%). More than two-thirds of our patients 29 cases (72.5%) were married, 31 cases (77.5%) were not in school, and 18 cases (45%) were housewives. Viral hepatitis B was the most common comorbidity in 6 cases (15%) (Table 1).

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| Socio-demographic data | Yes | No | Total |
|---|---|---|---|
| Histologically confirmed cancers | 40 (18%) | 182 (82%) | 222 |
| GFR | GFR < 60ml/min/1.73m$^2$ | GFR < 60ml/min/1.73m$^2$ | |
| Calculated GFR | 11 (27,5%) | 29 (72,5%) | 40 |
| Mean: 75.72 ± 26.3 6; Extremes: 8 - 122 ml/min/1.73m$^2$ | | | |
| Variables | Number N = 40 | | Percentage |
| Sex ratio (M/F) | 0,29 | | |
| Male | 9 | | 22,5 |
| Female | 31 | | 77,5 |
| Age | | | |
| 21 - 40 | 16 | | 40,0 |
| 41 - 60 | 17 | | 42,5 |
| 61 - 81 | 6 | | 15,0 |
| 82 and over | 1 | | 2,5 |
| Marital status | | | |
| Married | 29 | | 72,5 |
| Single | 4 | | 10,0 |
| Divorced | 2 | | 5,0 |
| Widowed | 5 | | 12,5 |
| Profession | | | |
| Farmer | 4 | | 10,0 |
| Pupil/Student | 2 | | 5,0 |
| Teacher | 2 | | 5,0 |
| Merchant | 9 | | 22,5 |
| Housewife | 18 | | 45,0 |
| Other occupation | 4 | | 10,0 |
| No profession | 1 | | 2,5 |
| Level of education | | | |
| Educated | 9 | | 22,5 |
| No schooling | 31 | | 77,5 |
| Origin | | | |
| Conakry Special Zone | 18 | | 45,0 |
| Inland | 22 | | 55,0 |
| Comorbidities | | | |
| Diabetes | 1 | | 2,5 |
| Hypertension | 5 | | 12,5 |
| Diabetes + hypertension | 1 | | 2,5 |
| HIV | 1 | | 2,5 |
| Hepatitis B | 6 | | 15,0 |
| Hepatitis C | 1 | | 2,5 |
| None | 25 | | 62,5 |

**Table 1:** Breakdown of patients by socio-demographic data.

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### Clinical data

During our study, 25 patients (62.5%) had consulted beyond 6 months after the onset of the first symptoms with a mean consultation time of 11.32 ± 8.5 months and extremes of one month and 36 months. We found a high rate of patients with locally advanced or metastatic cancer. Most patients were in good general condition, with a WHO performance status of ≤ 2 in 27 cases (67.5%).

Breast cancer was the most common primary site in 15 cases (37.5%), followed by cervical cancer in 8 cases (20%). We noted 18 cases (45%) of cancer at the metastatic stage. The metastases were located preferentially in the lungs in 8 cases (44.4%), infiltrating ductal carcinoma in 13 cases (32.5%) and squamous cell carcinoma in 8 cases (20%).

ICC was the most common histological type identified in 13 cases (32.5%) and is generally found in breast cancer (Table 2).

| Anatomical-clinical characteristics | Number of employees 40 | Percentage |
|---|---|---|
| IOMS | | |
| WHO ≤ 2 | 27 | 67,5 |
| WHO > 2 | 13 | 32,5 |
| Time to consultation | | |
| < 3 months | 2 | 5,0 |
| 3 - 6 months | 13 | 32,5 |
| > 6 months | 25 | 62,5 |
| Primitive sites | | |
| Breast | 15 | 37,5 |
| Cervix | 8 | 20,0 |
| soft part | 2 | 5,0 |
| Skin | 4 | 10,0 |
| Rectum | 2 | 5,0 |
| Other locations | 9 | 22,5 |
| Stages | | |
| Local | 5 | 12,5 |
| Locally advanced | 17 | 42,5 |
| Metastatic | 18 | 45 |
| Sites of metastasis | | |
| Hepatic | 1 | 5,5 |
| Hepatic + Bone | 2 | 11,1 |
| Bone | 1 | 5,5 |
| Lung | 8 | 44,4 |
| Lung + liver | 6 | 33,3 |
| Cerebral | 0 | 00,0 |
| Histological types | | |
| Invasive ductal carcinoma | 13 | 32,5 |
| Squamous cell carcinoma | 8 | 20,0 |
| CCINOS | 2 | 5,0 |
| Lymphoma | 2 | 5,0 |
| Sarcomas | 2 | 5,0 |

**Table 2:** Distribution of patients according to clinical data.

### Paraclinical data

Mean creatinemia was 13 ± 10.6 mg/l. The range [10.1 - 13 mg/l] represented 17 cases (42.5%). The creatinemia level was greater than 13 mg/l in 8 cases (20%), and the mean blood urea level was 4.8 ± 2.54 mmol/l, with extremes of 2.32 and 15.93 mmol/l. The mean Hb level was 10.38 ± 2.17 g/dl, with extremes of 4.6 and 14.6 g/dl. In this study there were 20 cases (50%) of moderate anaemia at the time of cancer diagnosis.

Urinary dipstick analysis revealed 15 cases (37.5%) of urinary anomalies, including 4 cases (26.6%) of urobilinogen and 3 cases (20%) of isolated leukocyturia (Table 3).

| Variables | Number | Percentage |
|---|---|---|
| Creatinemia (mg/l) | | |
| < 7 | 1 | 2,5 |
| 7,1 - 10 | 14 | 35,0 |
| 10,1 - 13 | 17 | 42,5 |
| > 13 | 8 | 20,0 |
| Blood urea (mmol/l) | | |
| < 2,5 | 1 | 2,5 |
| 2,6 - 7,5 | 36 | 90,0 |
| > 7,5 | 3 | 7,5 |
| THB (g/dl) | | |
| Mild anaemia | 6 | 15 |
| Moderate anaemia | 20 | 50 |
| Severe anaemia | 4 | 10 |
| Normal | 10 | 25 |

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| White blood cells (G/L) | | |
|---|---|---|
| Leukopenia | 5 | 12,5 |
| Normal | 30 | 75 |
| Hyperleukocytosis | 5 | 12,5 |
| Platelets (G/L) | | |
| Thrombocytopenia | 2 | 5 |
| Normal | 32 | 80 |
| Thrombocytosis | 6 | 15 |
| Urinary abnormalities on BU | | |
| Isolated haematuria | 2 | 13,3 |
| Isolated leukocyturia | 3 | 20,0 |
| Urobilinogen | 4 | 26,6 |
| Haematuria + Proteinuria + Leukocyturia | 2 | 13,3 |
| Haematuria + Leukocyturia | 2 | 13,3 |
| Leukocyturia + Proteinuria | 1 | 6,6 |
| Nitrites + Leukocyturia | 1 | 6,6 |

**Table 3:** Breakdown of patients according to paraclinical data.

### Glomerular filtration rate prognostic factors

In our study, there were no statistically significant relationships between GFR and age (p = 0.149), tumour location (p = 0.054), cancer stage (p = 0.229). On the other hand, our results show a statistically significant correlation between sex with a GFR < 60 ml/min/1.73m$^2$ in 11 cases (35.5%) of women with a p = 0.037.

In our study, out of 25 cases with a negative BU, 22 cases (88.0%) had a GFR ≥ 60 ml/min/1.73m$^2$ compared with 3 cases with a GFR < 60 ml/min/1.73m$^2$. Among the 15 cases with a positive BU 8 cases (53.3%) had a GFR < 60ml/min/1.73m$^2$ versus 7 cases with GFR ≥ 60 ml/min/1.73m$^2$ with a statistically significant correlation. P = 0,005 (Table 4).

### Discussion

In this study, we recorded 222 cases, of which 40 cases (18.0%) had histologically confirmed cancer, 11 cases (27.5%) had a GFR

| Prognostic factors | GFR ml/min/1,73m$^2$ | | | (%) | P |
|---|---|---|---|---|---|
| | < 60 | 60 – 90 | > 90 | | |
| Sex | | | | | |
| Male | 0 (0) | 5 (55,5) | 4 (44,4) | 9(100) | 0,037 |
| Female | 11 (35,5) | 14 (45,2) | 6 (19,3) | 31(100) | |
| Age | | | | | |
| < 60 years | 6 (20) | 15 (50) | 9 (30) | 30 (100) | 0,149 |
| ≥ 60 years | 5 (50) | 4 (40) | 1 (10) | 10 (100) | |
| Tumour location N = 23 | | | | | |
| Breast | 7 (46,6) | 4 (26,6) | 4 (26,6) | 15 (100) | 0,054 |
| Cervix | 3 (37,5) | 4 (26,6) | 1 (12,5) | 8 (100) | |
| Stage of cancer | | | | | |
| metastatic | 7 (38,8) | 6 (33,3) | 5 (27,7) | 18 (100) | 0,220 |
| non-metastatic | 4 (18,2) | 13 (59,1) | 5 (22,7) | 22 (100) | |
| | GFR ml/min/1,73m$^2$ | | | | P |
| BU | < 60 | ≥60 | | | |
| Negative | 3 (12,0) | 22 (88,0) | | 25 (100) | 0,005 |
| Positive | 8 (53,3) | 7 (46,6) | | 15 (100) | |

**Table 4:** Prognostic factors for glomerular filtration rate and relationship between GFR and dipstick results.

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< 60 ml/min/1.73m$^2$. Other studies in Belgium [11], Japan [12] and the United States [13] have also reported a prevalence of renal failure of between 16.1% and 25.0% in cancer patients. Despite the low rate of histologically confirmed cancer in our study, the prevalence of renal failure in cancer patients was similar to that reported in the literature [11-13].

Females accounted for the majority of cases (31, 77.5%), with a sex ratio of 0.29. Our results corroborate those of Launay-Vacher., *et al*. [14] in France, who found a sex ratio of 0.55, i.e. 64.9% of patients were female. This high frequency of female patients could be explained by the predominance of consultations for gynaecological and breast cancers at the UCO. The mean age of patients was 46.75 ± 14.61 years, with extremes of 21 and 85 years. The 41-60 age group was the most affected, with 17 cases (42.5%). Our results differ from those of Pontes., *et al*. [15] in Brazil, who reported a higher mean age of 74.2 years, with extremes of 65-99 years. This difference can be explained by the relatively young age of our population and by the lack of awareness of cancer prevention in developing countries. More than half of our respondents came from the interior of the country 22 cases (55.0%). This result can be explained by the fact that the only surgical oncology unit is in Conakry, which raises the question of the decentralisation of cancer care in our country. Among the comorbidities studied, hepatitis B was the comorbidity most represented in 6 cases (15.0%). This high rate of hepatitis could be explained by the high prevalence of hepatitis B virus infection in the sub-Saharan region, including Guinea.

Clinically, most patients were in good general condition, with a WHO performance status of ≤ 2 in 27 cases (67.5%).

In our study, 25 cases (62.5%) consulted a doctor more than 6 months after the onset of the first signs of the disease. Our results could be explained by the low socio-economic level of our population, socio-cultural habits, the use of traditional treatment as first-line treatment, and also by the delay in referring patients to specialised facilities.

We found a high rate of patients with locally advanced or metastatic cancer. This finding would appear to be linked to the delay in screening and management of patients. According to primary site, breast cancer was the most frequent tumour location in 15 cases (37.5%). This result is similar to that reported by Launay Vacher., *et al*. [14] in France, who found that 41% of patients had breast cancer. Of the histological types identified, CCI 13 cases (32.5%) was the most frequent. This result is comparable to that of Touré in Guinea in his doctoral thesis, who found 19 (13.5%) cases of CCI [16] in patients with cancer and renal failure.

The mean GFR was 75.72 ± 26.36 ml/min/1.73m$^2$ with extremes of 8 and 122 ml/min/1.73m$^2$. Our results differ from those reported by Ainsworth., *et al*. in the United States [17] who found a mean GFR of 90 ml/min with extremes of 23 and 179 ml/min. Mean creatinine was 13 ± 10.6 mg/l. Launay-Vacher., *et al*. [14] in France found a mean creatinine level of 8.85 ± 4 mg/l. The high frequency of the mean creatinine level in our study explains in particular the high prevalence of renal failure in our study, which was 11 cases (27.5%). We noted 15 cases (37.5%) of BU abnormality. Analysis of the results revealed a predominance of urobilinogen in the urine. This increase in urobilinogen levels in the urine could be explained by the generally frequent impairment of liver function during cancer, resulting in disruption of the normal passage of urobilinogen through the liver and gallbladder. We found a statistically significant correlation between female sex and GFR < 60 ml/min/1.73m$^2$ with a P = 0.037. This result is different from that found by Hassan sen Guinea in his PhD thesis who found that male sex was more associated with renal failure in cancer patients (67%) [18]. This difference could be explained by the fact that males were less represented in our study.

We did not find a significant correlation between GFR and age. However, although the difference was not significant, GFR was <60 ml/min/1.73m$^2$ in 5 of the patients (50%) aged 60 years and over. This result corroborates the data in the literature. These authors state that GFR decreases by 1% per year over the age of 50. However, the difference in GFR according to the location of the primary tumour was marginally significant, with a P = 0.054. This result could be explained by the low number of cases of cervical cancer recorded in our study, 3 cases (37.5%) with a GFR < 60 ml/min/1.73m$^2$ compared with 7 cases (46.6%) of breast cancer. Pontes., *et al*. [15] in Brazil found a GFR < 60 ml/min/1.73m$^2$ in 17% of patients with breast cancer. This low percentage of breast cancer patients with a GFR < 60 ml/min/1.73m$^2$ is thought to be due to the absence of a direct correlation between breast cancer disease and the onset of renal failure, unlike cervical cancer.

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Of the 11 patients who presented with a GFR < 60 ml/min/1.73m$^2$, 8 cases (53.3%) had a BU abnormality with a statistically significant correlation P = 0.005.

## Limitations

Our study has a number of weaknesses, apart from the use of urea and creatinine levels, which alone cannot distinguish between acute and chronic renal failure, and the fact that renal function was only assessed in patients prior to chemotherapy.

## Conclusion

At the end of our study carried out in the surgical unit of the Donka University Hospital, we found that adult cancer patients had a high prevalence of renal impairment. Females were the most common, and patients aged between 41 and 60 years were the most common. Breast and cervix were the most common cancer sites. Locally advanced or metastatic forms were the most common stage of cancer. Early detection of cancer, systematic determination of GFR in adult cancer patients and good collaboration between nephrologists and oncologists could considerably reduce the complications associated with this disease.

An analytical study with a larger sample size, assessing renal function in patients before and after chemotherapy would be needed to see the impact of different anti-cancer drugs on renal function.

## Conflict of Interest

The authors declare no conflict of interest.

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## What we know about the subject

The assessment of renal function and urinary abnormalities in cancer patients prior to chemotherapy is a major public health problem in the world in general and in Guinea in particular. Recent studies have shown a high frequency of renal impairment in cancer patients prior to chemotherapy.

## This is new in our study

This study is a first in our Donka hospital centre, out of 222 patients we recorded 40 cases (18%) of histologically confirmed cancer, of which 11 cases (27.5%) had a GFR < 60 ml/min/1.73m$^2$.

## Authors' Contributions

All authors participated in data collection, analysis and drafting of the manuscript. The final manuscript was read and accepted by all authors.

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