Survival Outcomes Among Pancreatic Cancer Patients at Kenyatta National Hospital

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Abstract

Purpose Mortality from pancreatic cancer has risen fast in the past two decades in East Africa, including Kenya. However, there was a paucity of conclusive data about the survival of pancreatic cancer patients in the study setting. Hence, this study aimed to assess the survival outcomes of pancreatic cancer patients at Kenyatta National Hospital.

Methods A hospital-based retrospective cohort analysis was used to evaluate the survival outcomes among pancreatic cancer patients treated in the study setting from 1 January 2015 to 31 December 2019. A total of 64 eligible pancreatic cancer patients were included in the study. In the pre-designed data abstraction tool, the data were collected by reviewing the medical records of the patients. The data were analyzed using the Statistical Package for the Social Sciences version 22 software. The mean survival time was estimated using Kaplan–Meier survival analysis. Cox regression analysis was employed to estimate the predictors of mortality among pancreatic cancer patients.

Results The mean age of the study participants was 60.38 ± 12.61 years. Most of the patients had adenocarcinoma (96.9%) and were diagnosed at an advanced stage of the disease. The overall mean and median survival estimate for pancreatic cancer was 48.7 ± 9.7 and 39.0 ± 23.9 months, respectively. The present study showed that the overall survival rate of pancreatic cancer patients was 79.7%.

Conclusion The mortality rate of pancreatic cancer in the present study was 20%. The overall mean survival estimate for pancreatic cancer was 48.7 ± 9.7 months, and the majority had disease progression in the last follow-up period.

Keywords Survival outcomes · Pancreatic cancer · Kenyatta National Hospital

Background

Pancreatic cancer is fast-paced on its mortality index in the world. Globally, the new incidences and deaths are rising parallelly due to the difficulty of early diagnosis [1]. According to Global Cancer Incidence, Mortality, and Prevalence (GLOBOCAN) 2018 report, the global mortality index of pancreatic cancer was 4.5%, putting it at position seven worldwide and number twelve for new incidences [2]. Even though pancreatic cancer mortality rates are lower than other cancers, such as breast, cervical, lung, or colorectal cancers, it is more dreadful, since the new incidences are almost as much as the number of deaths [3, 4].

Based on the cells’ origin, pancreatic cancers are categorized as exocrine and neuroendocrine tumors. Exocrine tumors start in cells that produce pancreatic juices, while endocrine tumors affect insulin and other hormone production. Most of the diagnosed cancers are exocrine in nature [5]. The event and the progression of carcinoma are caused by the activation of oncogenes, the inactivation of tumor suppressor genes, and the deregulation of the many signaling pathways, among which the EGFR, Akt, and NF-κB pathways appear to be most relevant [6].

For the longest time, pancreatic cancer has been majorly affecting advanced countries. But in the recent past, pancreatic cancer has been rising in developing countries, too [7]. As of 2017, the death rate for pancreatic cancer was 1% accounting for 667 deaths in total. Although relatively low, this was a marked increase as compared to 188 deaths in 1990. Previous reports showed that higher predicted mortality of pancreatic cancer compared to breast cancer [3]. The trend can be seen across East Africa, where the disease
claimed to kill 36,000 lives between 1990 and 2017 [8]. In Kenya, the national mortality is 2.2%, putting pancreatic cancer at number fourteen [9].

Of importance to note is that mortality and incidence of pancreatic cancer vary throughout the world. High incidence and mortality are more reported in high-income countries, and in recent findings, males are more affected than females [4]. Various risk factors are associated with pancreatic cancer, and they vary from region to region in mortality and incidence [7]. Pancreatic cancer-related risk factors can be categorized as modifiable and non-modifiable risk factors such as an increase in age, diabetes, chronic pancreatitis, black race, obesity, smoking, and dietary factors like non-vegetarians [10].

A previous systematic review reported that pancreatic cancer had a poor prognosis and shorter survival [11]. In addition, patients are expected to survive at least 5 years after diagnosis [12]. In an attempt to improve survival rates, early detection is of importance that includes a regular screening of people at risk [10]. However, most of the studies done on pancreatic cancer survival are in the American and Asian continents, with a dearth of information in the African continent and the study setting. Therefore, the present study was aimed to assess the overall survival of pancreatic cancer patients and its associated factors at the Oncology Department of Kenyatta National Hospital.

Methods

Study Design

A retrospective cohort study design was employed among pancreatic cancer patients treated at Kenyatta National Hospital (KNH) from 1 January 2015 to 31 December 2019.

Study Setting and Period

The study was conducted in the Oncology Department of Kenyatta National Hospital. In Kenya’s capital city Nairobi, KNH is situated in the immediate west of Upper Hill. The hospital is situated approximately 3.5 km west of the main business district of the city. KNH is the country’s largest teaching and referral hospital. KNH has 50 wards, 22 outpatient clinics, 24 theaters which 16 are specialized, and the Department of Accident and Emergency. Two hundred nine beds for the private wing out of a total bed size of 1800.

Target Population

Patients treated for pancreatic cancer at the Oncology Department of KNH from 1 January 2015 to 31 December 2019.

Inclusion Criteria

- All adult patients 18 years and older with a confirmed diagnosis of pancreatic cancer treated in the hospital from 1 January 2015 to 31 December 2019.
- Patients with complete medical records of diagnosis, stage of cancer, and treatment regimen. Documented information about the time interval from the date of primary diagnosis to the date of cancer-related death or last follow-up should be presented.

Exclusion Criteria

- Medical records of patients with incomplete information about the diagnosis, stage of cancer, and treatment regimen were excluded from the study.

Sample Size Determination and Sampling Techniques

Consecutive sampling techniques were employed since all eligible pancreatic cancer patients from 1 January 2015 to 31 December 2019 were studied because of having a small population for this cancer. Hence, a total of 64 pancreatic cancer patients were involved in the study.

Research Instruments

Data abstraction form was the data collection tool used. The data collection tool consisted of sociodemographic information, clinical characteristics of the patients, treatment regimens, and survival outcomes.

Pretesting

A pretest was conducted in 5% of the sample population. After that, all the necessary modifications were incorporated into the data collection tool before implementing them in the main study.

Data Collection Techniques

The patients’ records were obtained from the Health Information Department at Kenyatta National Hospital. A structured data abstraction form was used to review the relevant patient charts. Important information such as the sociodemographic and clinical characteristics of the patient, the type of treatment given, and the outcome that resulted from the therapy was included. Time of death and how long the patient survived were taken into consideration.
Outcomes were measured in terms of metastasis, mortality, remission, and degree of progression.

**Data Analysis**

The data collected were analyzed using Statistical Package for the Social Sciences (SPSS), version 22.0. The mean survival time, median survival time, and survival outcomes were analyzed using the Kaplan–Meier survival analysis. Survival time was determined by calculating the last date of contact minus the first date of a confirmed diagnosis of pancreatic cancer. The time to event analysis was employed to estimate the survival outcome of pancreatic cancer using the Kaplan–Meier survival analysis. Cox regression analysis was employed to estimate the predictors of mortality among pancreatic cancer patients.

**Results**

**Sociodemographic Characteristics of Pancreatic Cancer Patients**

Of the 64 pancreatic cancer patients involved in the study, 51 were censored, and 13 died. Thirty-four (53.1%) study participants were females, and 30 (46.9%) were males. Overall, 45.3% of the participants were below 60 years old, while 54.7% were above 60 years of age. The mean age of the study participants was 60.38 ± 12.61 years (Table 1).

**Clinical Characteristics of Pancreatic Patients**

Most of the patient population presented with adenocarcinoma (62, 96.9%) of those patients, 21% died. A large percentage of the patients were diagnosed at advanced stages of cancer, with a higher percentage of those diagnosed in stage IV succumbing. It was noted that half of the study cases had other comorbid conditions, while the other half did not have comorbid conditions (Table 2).

Forty-eight percent of the patient population was on palliative care; 31% of the patients were on chemotherapy (Table 3).

**Survival Outcomes of Pancreatic Cancer Patients**

The present study shows that the overall survival rate of pancreatic cancer patients is 79.7%, with a minimal decrease over the 5 years, as illustrated in Fig. 1.

Seventy-seven percent of the patient population showed disease progression on their last follow-up. Partial remission, complete remission, and non-response were 9%, 5%, and 9%, respectively.

| Variable          | Category          | Frequency | Percent |
|-------------------|-------------------|-----------|---------|
| Age categories    | < 60 years        | 29        | 45.3    |
|                   | ≥ 60 years        | 35        | 54.7    |
| Gender            | Male              | 30        | 46.9    |
|                   | Female            | 34        | 53.1    |
| Marital status    | Single            | 3         | 4.65    |
|                   | Married           | 49        | 76.6    |
|                   | Divorced          | 4         | 6.3     |
|                   | Widowed           | 8         | 12.5    |
| Educational level | Primary           | 9         | 14.1    |
|                   | Secondary         | 21        | 32.8    |
|                   | Tertiary          | 27        | 42.2    |
|                   | Illiterate        | 7         | 10.9    |
| Occupational status| Housewife      | 9         | 14.1    |
|                   | Govt employee     | 7         | 10.9    |
|                   | Retired           | 3         | 4.7     |
|                   | Unemployed        | 15        | 23.4    |
|                   | Farmer            | 14        | 21.9    |
|                   | Daily laborer     | 5         | 7.8     |
|                   | Private employee  | 10        | 15.6    |
| History of substance use | Alcohol     | 13        | 20.3    |
|                   | Smoking cigarette | 10        | 15.6    |

The overall mean and median survival estimate for pancreatic cancer was 48.7 ± 9.7 months and 39.0 ± 23.9 months, respectively. The study found that patients under 60 years old had a median survival duration of 67.6 months, whereas those over 60 had a median survival time of 29.2 months. There was a small difference in mean survival time between patients with and without comorbidities. Patients with comorbidities had a mean survival time of 38.2 months and those without having a mean survival time of 40 months. Survival was affected by distance metastases, with those without metastasis living an average of 70 months and those with metastasis living an average of 15.4 months. Mean survival was also affected by treatment regimen, with treatment refusal/missing having the shortest survival time. However, none of the indicated variables had statistical significance on mean survival estimates (Table 4).

**Predictors of Mortality Among Pancreatic Cancer Patients**

The relationship between baseline variables and hazard of mortality was analyzed using Cox proportional hazard regression model. The variables included were age, stage of cancer, distant metastasis, and presence of comorbidity. Therefore, there was no statistically significant association between the said variables in this study (Table 5).
Discussion

This retrospective cohort study aimed to assess the survival outcomes and associated factors among pancreatic cancer patients at Kenyatta National Hospital. A large percent of the patient population (56%) were diagnosed in the advanced stages of the disease in the study setting. Similarly, previous report revealed that most pancreatic cancer patients had metastasis in various organs at the initial diagnosis [13]. In addition, pancreatic cancer has ambiguous signs and symptoms, inadequate screening, and a poor referral system which played a major role in the study setting for late diagnosis.

This study reported almost similar incidents of pancreatic cancer in both males and females, with females (53.1%) being slightly more than males (46.9%). Spatial cohort analysis in Spain reported a higher incidence in males, but a minimal difference was noted between the genders [14]. The mean age of pancreatic cancer incidence was 60 years, with those above 60 years having higher mortality. The study is in line with a previous study in China which showed that the mean age diagnosis was 70 years, and advanced age was a poor prognostic factor in pancreatic cancer [13].

Adenocarcinoma (96.9%) located on the head (76.6%) of the pancreases was the most common presentation of pancreatic cancer in this study. A study done by Onal et al. reported that 92.8% patient population with adenocarcinoma [15]. Half of the patients had comorbidities, with diabetes mellitus being the most prevalent (26.6%). There has been a long-standing relationship between pancreatic cancer and diabetes mellitus, where it can be both a risk factor and presentation of pancreatic cancer [10].

Surgery is the first line in managing pancreatic cancer, but due to disease progression at the time of diagnosis, only a small percent of the patient population benefits

| Table 2 | Clinical characteristics of pancreatic cancer patients |
|---------|------------------------------------------------------|
| Variable | Category                          | Frequency | Percent |
| Histological type | Adenocarcinoma                | 62        | 96.9    |
|           | Pancreatic neuroendocrine tumors | 1         | 1.6     |
|           | Spindle cell carcinoma of the pancreas | 1        | 1.6     |
| Location of cancer | Head                           | 49        | 76.6    |
|           | Tail                            | 9         | 14.1    |
|           | Body                            | 6         | 9.4     |
| Stage of cancer | Stage I                        | 3         | 4.7     |
|           | Stage II                       | 5         | 7.8     |
|           | Stage III                      | 33        | 51.5    |
|           | Stage IV                       | 23        | 36      |
| Comorbidity | Present                       | 32        | 50      |
|           | Absent                         | 32        | 50      |
| Type of comorbidity | Retroviral disease           | 3         | 4.7     |
|           | Diabetes mellitus             | 17        | 26.6    |
|           | Chronic obstructive pulmonary disease | 1      | 1.6     |
|           | Deep venous thrombosis        | 5         | 7.8     |
|           | Hypertension                   | 14        | 21.9    |
| Number of comorbidities | Zero                         | 32        | 50      |
|           | One                            | 24        | 37.5    |
|           | Two                            | 8         | 12.5    |

| Table 3 | Treatment regimens of pancreatic cancer patients |
|---------|--------------------------------------------------|
| Variable | Frequency | Percent |
| Treatment regimen | Chemotherapy         | 20        | 31.3    |
|           | Surgery    | 5         | 7.8     |
|           | Combination therapy | 6        | 9.4     |
|           | Palliative care | 31       | 48.4    |
|           | Treatment refusal/missing regimen | 2      | 3.1     |
| Type of chemotherapy regimen | Doxorubicin-ifosfamide-mesna | 1  | 1.6  |
|           | Leucovorin + Fluorouracil + Irinotecan + Oxaliplatin | 6  | 9.4  |
|           | Gemcitabine and oxaliplatin | 7        | 10.9    |
|           | Capecitabine-oxaliplatin | 1         | 1.6     |
|           | Gemcitabine-Cisplatin | 3         | 4.7     |
|           | Leucovorin + Fluorouracil + Irinotecan | 3  | 4.7  |
|           | Cisplatin-Temozolomide | 1         | 1.6     |
|           | Gemcitabine-capecitabine | 1        | 1.6     |
|           | Gemcitabine | 1         | 1.6     |
| Number of drugs given | <5          | 20        | 31.3    |
|           | 5–9        | 1         | 1.6     |
from it [16]. This was evident in this study since only 7.8% of the patients underwent surgery. The present study showed that patients treated with combination therapy had a slightly better mean survival time than the other treatment regimens in our setting. This is in line with findings from Canada, where surgery alone was not an option [17].

The 1-year, 3-year, and 5-year survival were reported as 81.3%, 81.4%, and 79.7%, respectively. This is not in line with the reported statistics from SEER data that report a 5-year survival of 10.8% [18]. Another study in China reported a 1-year survival rate of 17.8%, a 3-year survival rate of 5.7%, and a 5-year survival rate of 4.1% [19] which

Table 4 Mean survival estimate among pancreatic cancer patients

| Variable                        | Mean survival time (months) ± standard error (95% CI) | Log-rank test (p-value) |
|---------------------------------|--------------------------------------------------------|-------------------------|
| Age (in years)                  |                                                        |                         |
| < 60 years                      | 67.664 ± 7.489 (52.985–82.342)                         | 0.163                   |
| ≥ 60 years                      | 29.185 ± 4.265 (20.825–37.545)                         |                         |
| Comorbidity                     |                                                        |                         |
| Present                         | 38.200 ± 11.096 (16.452–59.948)                        | 0.366                   |
| Absent                          | 39.933 ± 3.747 (32.589–47.277)                         |                         |
| History of substance use        |                                                        |                         |
| Alcohol                         | 8.853 ± 2.618 (3.721–13.985)                           | 0.216                   |
| Smoking cigarette               | 9.233 ± 2.095 (5.128–13.339)                           |                         |
| None                            | 15.42 ± 4.002 (7.576–23.264)                           |                         |
| Distant metastasis              |                                                        |                         |
| No                              | 70.022 ± 5.819 (58.617–81.428)                         | 0.234                   |
| Yes                             | 24.867 ± 4.325 (16.389–33.345)                         |                         |
| Treatment regimen               |                                                        |                         |
| Chemotherapy                    | 14.706 ± 4.766 (5.365–24.047)                          | 0.494                   |
| Palliative care                 | 11.302 ± 2.534 (6.336–16.268)                          |                         |
| Combination therapy             | 16.167 ± 6.585 (3.26–29.073)                           |                         |
| Treatment refusal/missing regimen | 5 ± 1 (3.04–6.96)                                     |                         |
has a considerable variance with the current study. The reason for this disparity will probably be linked to the smaller eligible sample size in our setting during the study period. The type of treatment regimen also affects 1-year survival with patients who underwent resection to have better survival than those who had chemoradiation [20]. The overall mean survival time was 48.7 ± 9.7 months among pancreatic cancer patients, in contrast to another study that reported 12.9 ± 1.8 months [15]. The data in this study varies due to a very small patient population, incomplete filling of patient files, and missing files, hence missing data. From this study, cigarette smoking greatly reduces the mean survival time of pancreatic cancer patients. A previous systematic review and meta-analysis reported that individuals who smoked prediagnosis had an increased mortality rate [21].

### Table 5 Predictors of mortality among pancreatic cancer patients

| Variable                  | Bivariate analysis | Multivariate analysis |
|---------------------------|--------------------|-----------------------|
|                           | CHR (95% CI)       | p-value               | AHR (95% CI)  | p-value |
| **Age**                   |                    |                       |               |         |
| < 60 years                | 1                  |                       | 0.8 (0.731–7.125) | 0.155  |
| ≥ 60 years                | 0.8 (0.167–1.586)  | 0.173                 | 0.8 (0.731–7.125) | 0.155  |
| **Stage of cancer**       |                    |                       |               |         |
| Early (I & II)            | 1                  | 1                     |               |         |
| Advanced (III & IV)       | 3.2 (0.000–52.108) | 0.378                 | 13.2 (0.000–52.108) | 0.981  |
| **Distant metastasis**    |                    |                       |               |         |
| No                        | 1                  | 1                     |               |         |
| Yes                       | 0.7 (0.167–1.586)  | 0.248                 | 0.12 (0.221–3.554) | 0.866  |
| **Comorbidity**           |                    |                       |               |         |
| Present                   | 1                  | 1                     |               |         |
| Absent                    | 0.3 (0.723–2.356)  | 0.377                 | 0.122 (0.550–2.325) | 0.739  |

Statistically significant p-value < 0.05, CHR crude hazard ratio, AHR adjusted hazard ratio.

### Conclusion

The mortality rate of pancreatic cancer in the study setting was 20%. The overall mean survival estimate for pancreatic cancer was 48.7 ± 9.7 months. Most of the patients had disease progression in the last follow-up period. The Cox regression analysis showed no statistically significant predictors of mortality among pancreatic cancer patients.

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### Author Contribution

FM and AD were involved from the conception to the final manuscript preparation. All the authors reviewed the manuscript.

### Availability of Data and Material

The datasets used and/or analyzed during the current study will be obtained from the corresponding author of this project.

### Code Availability

Not applicable.

### Declarations

#### Ethics Approval

The actual data collection was conducted after approval from the University of Nairobi/Kenyatta National Hospital Ethics and Research Committee (Approval number: UP7/01/2021). All patient information was treated with the utmost confidentiality. The patients’ names were not recorded, and each patient was identified only based on study numbers and their initials. Patient files were not removed from the premises, and the data collected was used for the intended purpose only.

#### Consent to Participate

Since the study was a retrospective study, we have obtained participants’ informed consent waivers from the Ethics committee.

#### Consent for Publication

We have obtained approval to publish from the Ethics committee.

#### Conflict of Interest

The authors declare no competing interests.

### References

1. McGuigan A, Kelly P, Turkington RC, Jones C, Coleman HG, McCain RS. Pancreatic cancer: a review of clinical diagnosis, epidemiology, treatment and outcomes. World J Gastroenterol. 2018;24(43):4846–61.
2. Observatory TGC. World 2018. Cancer Today. 2020;876:1–2.
3. Ferlay J, Partensky C, Bray F. More deaths from pancreatic cancer than breast cancer in the EU by 2017. Acta Oncol (Madr). 2016;55(9–10):1158–60.
4. Kamisawa T, Wood LD, Itoi T, Takaori K. Pancreatic cancer. Lancet. 2016;388(10039):73–85.
5. Pancreatic Cancer UK. Types of pancreatic cancer fact sheet. 2014;2014:1–9.
6. Malhotra L, Ahn DH, Bloomston M. The pathogenesis, diagnosis, and management of pancreatic cancer. J Gastrointest Dig Syst. 2015;05(02):1–11.
7. Pourshams A, Sepanlou SG, Ikuta KS, Bisignano C, Safiri S, Roshandel G, et al. The global, regional, and national burden of pancreatic cancer and its attributable risk factors in 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet Gastroenterol Hepatol. 2019;4(12):934–47.

8. Kinuthia K. Pancreatic tumour fastest-growing cause of Kenya’s cancer deaths - Business Daily [Internet]. 2019 [cited 2020 Sep 15]. Available from: https://www.businessdailyafrica.com/datahub/Pancreatic-tumour-fastest-growing-cause-of-Kenya/3815418-5235456-4776cs/index.html.

9. World Health Organisation IA for R on C. Kenya Source: Glibocan 2018. 2020.

10. Midha S, Chawla S, Garg PK. Modifiable and non-modifiable risk factors for pancreatic cancer: a review. Cancer Lett. 2016;381(1):269–77.

11. Carrato A, Falcone A, Ducreux M, Valle JW, Parnaby A, Djazouli K, et al. A systematic review of the burden of pancreatic cancer in Europe: real-world impact on survival, quality of life and costs. J Gastrointest Cancer. 2015;46(3):201–11.

12. Rawla P, Sunkara T, Gaduputi V. Epidemiology of pancreatic cancer: global trends, etiology and risk factors. World J Oncol. 2019;10(1):10–27.

13. Zhang L, Sanagapalli S, Stoita A. Challenges in diagnosis of pancreatic cancer. World J Gastroenterol. 2018;24(19):2047–60.

14. Etxeberria J, Goicoa T, López-Abente G, Riebler A, Ugarte MD. Spatial gender-age-period-cohort analysis of pancreatic cancer mortality in Spain (1990–2013). PLoS One. 2017;12(2).

15. Önal Ö, Yılmaz SD, Erğöl HS, Erğöl İ, Koçer M. Survival analysis and factors affecting survival in patients with pancreatic cancer. Med Sci Discov. 2020;7(2):412–8.

16. Zeng S, Pöttler M, Lan B, Grützmann R, Pilarsky C, Yang H. Chemoresistance in pancreatic cancer. Int J Mol Sci. 2019;20(18):1–19.

17. Kanji ZS, Gallinger S. Diagnosis and management of pancreatic cancer. CMAJ. 2013;185(14):1219–26.

18. Surveillance Epidemiology and End Results Program. Cancer Stat Facts: pancreatic cancer. Natl Cancer Inst. 2015.

19. Luo J, Xiao L, Wu C, Zheng Y, Zhao N. The incidence and survival rate of population-based pancreatic cancer patients: Shanghai Cancer Registry 2004–2009. PLoS One. 2013;8(10):e76052.

20. Kleeff J, Michalski C, Friers H, Büchler MW. Pancreatic cancer: from bench to 5-year survival. Pancreas. 2006;33(2):111–8.

21. Ben R, Liu J, Sun YW, Wang LF, Zou DW, Yuan YZ. Cigarette smoking and mortality in patients with pancreatic cancer: a systematic review and meta-analysis. Pancreas. 2019;48(8):985–95.

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