Original Article

Patients' characteristics, diagnosis, and management of pancreatic masses in low resource settings

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Contributions: (I) Conception and design: Both authors; (II) Administrative support: LO Akoko; (III) Provision of study materials or patients: NE Kivuyo; (IV) Collection and assembly of data: NE Kivuyo; (V) Data analysis and interpretation: Both authors; (VI) Manuscript writing: Both authors; (VII) Final approval of manuscript: Both authors.

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Background: Pancreatic masses are challenging to diagnose and treat due to their indolent course. Despite the presence of both curative and palliative surgical services at Muhimbili National Hospital, there is a paucity of data on how these patients are investigated and managed. This study will enable clinicians to improve both their index of suspicion for pancreatic mass and their timely diagnosis to capture resectable disease for better outcomes. The study aimed to document the clinical characteristics, diagnosis, and management of patients with pancreatic masses at Muhimbili National Hospital.

Methods: A retrospective cross-sectional study of patients treated for pancreatic masses at Muhimbili National Hospital between 2018 and 2019. Using the hospital's electronic medical system and inpatient registry, we identified all patients with a diagnosis of pancreatic mass. Individual patients' case notes were retrieved from the medical records department. Patient clinical demographics, disease characteristics, types of investigations done, and treatment offered for management were collected. This information was entered into SPSS version 25 for analysis, whereby variables were summarized as means and frequencies. Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences. The study complied with the Helsinki declaration on studies involving human subjects.

Results: A total of 147 patients were identified as having pancreatic masses with a mean age of 60.1 ± 13.6 (range, 27–89) years, with an equal male-to-female ratio. A computed tomography (CT) scan of the abdomen was done in 72.1% of the patients, while a histological diagnosis was made in 32.7% of the patients. Most patients were labeled to have advanced disease at presentation as either unresectable (20.2%) or metastatic (57.3%). The potentially resectable masses were 13.7%, with a resection rate of 6%.

Conclusions: Patients with pancreatic masses present late with advanced disease. Most are under investigation and potentially assigned the wrong stage, leading to extremely low resection rates. Clinicians should standardize patients' workups to offer every patient the same opportunity for curative intervention and survival.

Keywords: Pancreatic mass; pancreatic cancer; benign pancreatic mass; resectable pancreatic mass; pancreatic cancer trends

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Introduction

Pancreatic cancer is a global health problem, being the 14th most common cancer and the 7th highest cause of cancer mortality in the world in 2018 (1). While pancreatic cancer is currently most common in high-income countries, its prevalence in low- and middle-income countries is expected to rise. Likewise, the highest mortality rate is estimated to be in Africa, followed by Latin America and the Caribbean, while the lowest incidence will be registered in Europe between 2018 and 2040 (2). Despite this threat, little is known about the disease burden and the presentation of such patients in Tanzania. This calls for a need to increase the identification of these patients, including adopting diagnostic approaches and developing treatment pathways for these patients. The diagnostic investigations for pancreatic masses include both imaging and histology (3). Once a mass is seen, a percutaneous or endoscopic biopsy should be done for all unresectable pancreatic masses, while patients with operable masses should get histology post resection of the mass (4). Additionally, a chest computed tomography (CT) scan or chest X-ray is also indicated to rule out metastasis. These investigations help to properly stage the patients, determine resectability, and discriminate benign from malignant diseases in an attempt to offer the right treatment (5). While the capacity to offer this approach to workup is available, we are unsure how individual patients were handled at our facility. This study seeks to explore potential areas for addressing improvements and identify challenges that will need to be addressed.

Surgery remains the mainstay for the potential cure of pancreatic masses (6). However, it is only feasible in resectable stages, which include American Joint Committee on Cancer (AJCC) stages I and II, and the subset of stage III that is defined as borderline resectable (5). The surgical options for curative surgery are pancreaticoduodenectomy, distal pancreatectomy, and total pancreatectomy depending on the anatomical location of the mass (7). Moreover, even in patients with unresectable disease, there is still a role for surgery to palliate jaundice and gastric outlet obstruction caused by the mass (4-8). To date, the proportion of patients undergoing curative resection in our resource-limited country is not known.

In an attempt to improve outcomes, a better understanding of the disease by both health practitioners and society at large is mandatory. This study gives an insight into the burden of pancreatic mass in Tanzania. It enumerates the clinical characteristics and presentations of patients with a pancreatic mass in Tanzania, shedding light on how these patients are investigated and managed and focusing on areas for improvement to improve the outcomes for these patients. This study demonstrates that now that there is a capacity to offer pancreatic resections, navigating patients to have maximum benefit from care is vital. We present the following article following the STROBE reporting checklist (available at https://apc.amegroups.com/article/view/10.21037/apc-22-3/rc).

Methods

Research context and design

We conducted a hospital-based retrospective cross-sectional study involving patients managed with pancreatic masses at Muhimbili National Hospital (MNH) from January 2018 to December 2019. Data collection was carried out in March 2020. The hospital is located in Dar es Salaam, the commercial capital of Tanzania, and is the most specialized hospital suitable for patients with pancreatic mass. It has one surgical oncologist with an orientation to the gastrointestinal system, four gastrointestinal surgeons, and eight general surgeons, all managing patients with obstructive jaundice (OJ) with or without a pancreatic mass. Also present at the facility is advanced anesthesia care, including a functioning Intensive care unit for post-operative recovery; a functioning endoscopy suite for diagnostic and intervention capabilities; a functioning radiology unit with modern CT scanning and magnetic resonance imaging (MRI), not to mention the basics like X-ray and ultrasonography capacity; and a new interventional radiology unit. The diagnostic laboratory runs tumor markers and offers standard histopathology services. With limited diagnostic and surgical services in the whole country, almost all pancreatic mass patients are handled by this hospital. Patients with pancreatic masses presenting with OJ frequently receive single-by-pass as cholecystojejunostomy (CJ) or double-by-pass as CJ plus gastrojejunostomy.

Study population and sample size

All information from patients with any documented intra-abdominal mass was reviewed for inclusion. From these, all patients with documentation of a pancreatic mass were selected. Patients were included if there was radiological documentation of a pancreatic mass by CT scan or

ultrasonography of the abdomen or following clinical exploration for any indication. Patients were of any age and sex and were admitted to the adult surgical units of the hospital.

Measurements

Patients' age was calculated from the year of birth as years, while sex was taken from the recorded gender and dichotomized as male or female. The area of residence was the administrative region within Tanzania of the original domicile of the patient before coming for medical care, as found in the records. Clinical stage was obtained by reviewing abdominal CT scan (hospital radiological information is stored in Clear Canvas where it was easy to retrieve CT scan and X-rays) and reported according to the World Health Organization (WHO) reporting for pancreatic masses as resectable, borderline resectable, unresectable, or metastatic. Histology was obtained from a patient's electronic management system report signed by a pathologist. The clinical symptoms and treatment offered were extracted from the case notes as documented by the treating physicians at the time of the original treatment, which are stored in papers in the hospital medical records department. Abdominal ultrasound reports and blood workups, including tumor markers, are available in the patients' electronic management system.

Data gathering

All patients' registration numbers and names were retrieved from MNH. Data collection took place in 4 stages. In the first stage, a search was conducted in the hospital's electronic medical records system to identify and prepare a list of all patients with intra-abdominal masses and OJ. From here, those with pancreatic masses were identified and their file numbers and names were extracted. In the second stage, we searched through the surgical wards' admission books for patients with a diagnosis of intra-abdominal masses and OJ and made a list with hospital registration numbers and names. The two lists were compared side by side in an excel spreadsheet to identify duplicates and a final list was made. The final list was sent to the medical records for identification of the individual case notes. Two extractors were trained using predefined spreadsheets, which were compared for similarity by the main investigator, NE Kivuyo. Discrepancies were resolved by NE Kivuyo reviewing the case notes and making the final abstraction.

From the hospital, the radiology management system, clear canvas, CT scan, and X-ray images of patients who had undergone investigations were reviewed and LO Akoko and one senior radiographer reported the images through consensus.

Data analysis

Data were checked for completeness, de-identified to keep anonymity, coded, and entered into Statistical Package for Social Scientists (SPSS) software version 25 for analysis. Continuous variables were summarized as means with standard deviation, while categorical variables were summarized as means. Missing data were excluded from the item during analysis.

Ethics clearance

The study conformed to the provisions of the Declaration of Helsinki (as revised in 2013). Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences (MUHAS) Institutional Review Board (No. MUHAS-REC-09-2020-368) and individual consent for this retrospective analysis were waived. No direct patient identifiers were used during data analysis following the de-identification process.

Results

Study participants' profiles

In this study, 147 case notes of patients with pancreatic masses were reviewed and their characteristics are depicted in *Table 1*. The mean age of patients was 60.1±13.6 (range, 27–89) years, with a male to female ratio of 1.16:1. The majority of patients (55.1%) were educated at the primary level, and most of the patients were either peasant (29.9%) or retired (26.5%). The average duration of symptoms before diagnosis was 4 months, with the most common symptom being abdominal pain, which was reported by 72.1% of the patients, followed by jaundice, weight loss, and gastric outlet obstruction, respectively.

Risk factors

In *Figure 1* below, we present the findings of risk factors collected from patients as documented in their case notes. Cigarette smoking was assessed in all the patients, of which

Table 1 Characteristics of study participants

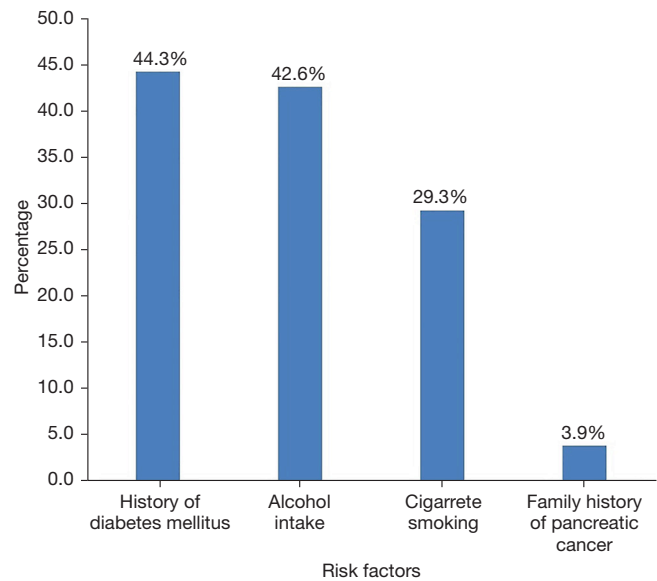| Variables	Frequency (%) or mean ± SD [range] (n=147)
Age (years)	60.1±13.6 [27–89]
<40	16 (10.9)
40–59	41 (27.9)
60–69	51 (34.7)
70–79	32 (21.8)
>79	7 (4.8)
Sex	
Male	79 (53.7)
Female	68 (46.3)
Level of education	
No formal education	17 (11.6)
Primary level	81 (55.1)
Secondary level	38 (25.9)
Tertiary level	11 (7.5)
Occupation	
Peasant	44 (29.9)
Employed	36 (24.5)
Unemployed	28 (19.0)
Retired	39 (26.5)
Presenting symptoms	
Abdominal pain	106 (72.1)
Jaundice	100 (68.0)
Weight loss	82 (55.8)
Gastric outlet obstruction	55 (37.4)
Duration of symptoms (months)	4.72±5.9 [1–36]

SD, standard deviation.

Figure 1 The distribution of risk factors assessed for patients with pancreatic masses at MNH between 2018 and 2019. MNH, Muhimbili National Hospital.
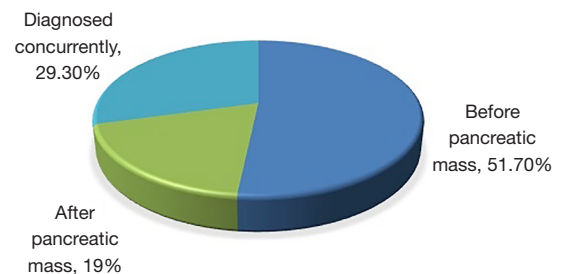

Figure 2 Approximate timing of a diagnosis of Diabetes Mellitus to the detection of the pancreatic mass.

43 (29.3%) were smokers, all of them being male patients. A total of 141 of the patients were assessed, and 60 (42.6%) of them were taking alcohol, of which men contributed 83.3%. A family history of pancreatic masses was available for 77 of the patients, and only three (3.9%) were reported to have had a family member with a pancreatic mass diagnosis: two of them were male. Of 131 patients with diabetic information recorded, 58 (44.3%) had a diagnosis of diabetes mellitus (DM), with 55% being male patients.

Figure 2 depicts the relationship between the diagnosis of diabetes and the appearance or detection of a pancreatic mass. It was noted that all patients had developed DM in their adult life. In 51.7% of the patients, DM was diagnosed before the pancreatic mass, while in 19% it was diagnosed after the detection of the pancreatic mass, and in 29.3%, the two diseases were diagnosed concurrently.

Diagnosis

Figure 3 below shows diagnostic procedures that were done on patients to make a diagnosis and stage the patients. Eight investigations were done in varied proportions for these patients, with abdominal CT being the most commonly done, as was in 72.1% of the patients, followed by chest
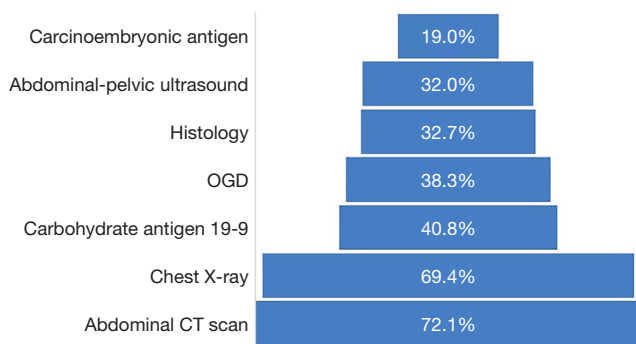
Figure 3 Investigations done on patients with pancreatic masses at MNH in 2018–2019. OGD, oesophago-gastro-duodenoscopy; CT, computed tomography; MNH, Muhimbili National Hospital.

X-ray in 69.4% and the rest as shown. Of significance to note was that only 32.7% had a histological diagnosis and 40.8% had carbohydrate antigen 19-9 (CA19-9).

Histology findings, mass location, and WHO staging

Table 2 below shows that among the 48/147 patients with histological diagnosis, adenocarcinoma was the most common histology (68.8%), followed by inflammation (27.1%), and the rest had a papillary cyst. Most pancreatic masses were located at the head of the pancreas (81.1%) and the least was masses involving the whole pancreas (4.5%). In the WHO staging, it was revealed that only 13.7% of the masses were resectable, whereas the majority (57.3%) presented as metastatic disease. Twenty-three (15.6%) patients were not staged due to the absence of sufficient investigations. Almost a quarter of patients died during their admission before they could receive either palliative or curative treatment.

Discussion

This is the first study in Tanzania that we know of to describe pancreatic masses. A total of 147 patients were managed at MNH during the 2 years under review. Only 9 patients (6.1%) had a curative resection, which is lower than global estimates (8). In this study, only a third of patients had histology done, so discrimination of benign from malignant masses was not feasible. Hence, some parameters may be under or overexpressed due to the differences in presentation and management of these two entities. The findings of this study can be used to make inferences on the situation of pancreatic masses in the country since it was

Table 2 Shows patients' histology results, location of the mass on the pancreas and the WHO stage assigned and the various treatments offered for each patient managed for pancreatic mass at MNH between 2018/2019

Variables	Frequency (%)
Histology (n=48)	
Adenocarcinoma	33 (68.8)
Inflammation	13 (27.1)
Papillary cyst	2 (4.2)
Location of the mass (n=111)	
Head	90 (81.1)
Body	9 (8.1)
Tail	7 (6.3)
Whole pancreas	5 (4.5)
WHO staging (n=124)	
Resectable	17 (13.7)
Borderline resectable	11 (8.9)
Locally advanced unresectable	25 (20.2)
Metastatic	71 (57.3)
Treatment	
Curative surgery	9 (6.1)
Pancreaticoduodenectomy	5 (55.6)
Distal Pancreatectomy	4 (44.4)
Palliative surgery	83 (56.5)
CJ	30 (36.1)
GJ	23 (27.7)
CJ and GJ	29 (34.9)
Only biopsy taken	1 (1.2)
Palliative chemotherapy	23 (15.6)
Died before treatment	32 (21.8)

WHO, World Health Organization; MNH, Muhimbili National Hospital; CJ, cholecystojejunostomy; GJ, gastrojejunostomy.

done in the National Hospital, which receives patients from all regions of the country.

With several authors reporting that less than 10% of patients are diagnosed under the age of 55, with the majority being diagnosed in their seventh and eighth decades of life (9), it is possible that we have a transition into younger population with different risk factors. But histological diagnosis was only available for one third of the

study subjects hence in the majority there is a possibility of observing a different picture. We need to ensure that we understand the complete epidemiology of patients with pancreatic malignancy in our setting by ensuring all patients get a histological diagnosis. Likewise, there was a slight gender predilection, showing a male predominance. The male-to-female ratio was 1.16:1, in line with international and regional studies (10). The reason for this might be greater exposure to some risk factors such as smoking and alcohol, which are expected to be more common among males.

Delay in developing symptoms is a common observation among patients with pancreatic masses, with symptoms developing late in the course of the illness. It is expected that patients will show up for medical consultation right after developing symptoms. In our study, patients took over 4 months from initial presentation to the time of diagnosis. This is a long time compared to that seen in western countries, where patients are usually diagnosed within the first month of symptom presentation (11). Another study in Nigeria showed that most patients presented within the first 2 months (4). The reasons for the delay might be multifactorial, with the low socio-economic status being one of them. Most of our patients had low education levels and were unemployed, which are surrogate markers of low socio-economic status. Another potential cause of delay that will need to be investigated in these patients might be the use of local herbs and the availability of healthcare services, including awareness of the condition among healthcare providers.

Studies have shown cigarette smoking and alcohol intake to be risk factors for pancreatic masses (12-14). The same is depicted in our study, where a third of patients were cigarette smokers and almost half consumed alcohol. A similar picture is depicted in other African countries like Algeria (15). Regarding the family history of pancreatic cancer, only 3.9% of patients were picked in this study, a number very low compared to findings from another study (16). Similarly, a study done in Nigeria showed none of the patients had a family history of pancreatic cancer (4). This difference could be attributed to poor documentation and small sample sizes, which were limitations, mentioned in the later study and may also apply to our study.

It has been shown that DM is a common presentation among patients with pancreatic masses (17). Our study showed that about half of patients had DM, with more than half having the diagnosis before the pancreatic mass. The relationship between pancreatic cancer and DM has been considered to be like that of an egg and chicken. But with diabetic clinics available in many health facilities across the country, the possibility of screening these patients should be explored to improve the early diagnosis of pancreatic masses.

Even though abdominal ultrasound is an important initial investigation in patients with clinical features suggestive of a pancreatic mass (7), it was only performed in one-third of our patients. We, therefore, urge clinicians to adapt this practice to all suspicious patients as some might be missed if this important step is skipped. We also discovered that nearly one out of every three patients lacked an abdominal CT scan, which is critical in the diagnosis and staging of pancreatic tumors (7). Even though CT scan services are readily available in our center, it is not known why only a fraction of patients had this investigation. During the review of abdominal CT scans, it was observed that all of them were abdominal scans lacking the pancreatic protocol. Failure to follow pancreatic protocol could partially explain the low resection rates seen in this study due to inappropriate staging.

Although a chest CT scan is the most preferred imaging to assess for lung and/or pleural metastasis, a chest X-ray is also an alternative (7), but it was done only in two-thirds of our patients. Despite the usefulness of the marker CA19-9 in the diagnosis and follow-up of patients with pancreatic masses (18), less than half of our patients had it done, emphasizing the magnitude of under investigation in this setting. Under-investigation implies that it assigns the wrong stage to the patient and hence the wrong management. Regarding tumor location, our study shows that 8 in 10 of the pancreatic masses were in the head. This is also shown in other studies where masses in the head were more common, followed by the body and tail, respectively (7,15).

The National Comprehensive Cancer Network (NCCN) guidelines recommend that for patients with potentially resectable pancreatic masses, surgery should be done without prior histology. However, for patients with metastatic or locally advanced unresectable disease, a biopsy is required before initiation of chemotherapy treatment (19). However, since pancreas biopsy in non-operated patients can only be obtained by CT- or ultrasound-guided percutaneous fine needle aspiration cytology or by endoscopic ultrasound (20), this explains why a very small proportion of our patients had histology results. We expect the number to increase soon due to a recently established section of interventional radiology in our center that will enable us to perform more percutaneous pancreatic

biopsies. With several authors advocating for the use of endoscopic ultrasound-fine needle aspiration biopsy (EUS-FNAB) over percutaneous approaches due to the lower safety and risk of seeding associated with the latter (20), the importance of establishing EUS services in our center cannot be overstated.

This study also identified missed opportunities for establishing histological diagnoses among patients with pancreatic masses. All patients who underwent resection had reported histology. However, among the 83 patients who had palliative surgical procedures, only 39 patients, equivalent to just less than half, had biopsies taken and reported. Overall, the most predominant histology was that of adenocarcinoma, and this is consistent with other literature (15). The fact that almost one-third of the reported histology was inflammation emphasizes the need for histological diagnosis to differentiate benign from malignant disease and hence offer appropriate treatment. Abandonment of care without proper histological diagnosis is worrisome in our setting and denies patients with non-malignant diseases the appropriate treatment while exposing them to unwarranted chemotherapy for palliation.

The mainstay of treatment in unresectable diseases is palliative chemotherapy and palliation of jaundice and/or gastric outlet obstruction. In the absence of self-expanding metal stents in our center, biliary bypass is the alternative option for palliating jaundice. Hence, most of our patients underwent palliative surgery, the leading being CJ, followed by combined CJ and gastrojejunostomy, and then gastrojejunostomy alone. Further studies are needed to evaluate the outcomes of these procedures.

The role of neoadjuvant chemoradiation, particularly in borderline resectable pancreatic cancers, is not negligible as some studies show that it improves treatment outcomes and increases survival rates. In this study, however, no patients with borderline resectable pancreatic mass received neoadjuvant chemoradiotherapy; instead, they were all treated with palliative surgery or palliative chemotherapy. This denies them a chance of cure in selected patients who could benefit from surgical resection following the mentioned therapy.

Conclusions

Pancreatic masses are not a very rare occurrence in our practice. As was expected, patients with pancreatic masses were found to have a late presentation with advanced disease. DM was not uncommon among these patients,

either preceding it or diagnosed concurrently with it. There is a lack of a uniform workup of these patients, hence the potential to assign the wrong stage and wrong treatment assignment. This resulted in low resection rates with unclear selection criteria given that some patients with the resectable disease were not offered the choice. Similarly, a few patients had histology results with benign ones not uncommon. There is an urgent need to standardize care for these patients, including investigations and treatment pathways.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://apc.amegroups.com/article/view/10.21037/apc-22-3/rc

Data Sharing Statement: Available at https://apc.amegroups.com/article/view/10.21037/apc-22-3/dss

Peer Review File: Available at https://apc.amegroups.com/article/view/10.21037/apc-22-3/prf

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://apc.amegroups.com/article/view/10.21037/apc-22-3/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study conformed to the provisions of the Declaration of Helsinki (as revised in 2013). Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences (MUHAS) Institutional Review Board (No. MUHAS-REC-09-2020-368) and individual consent for this retrospective analysis were waived. No direct patient

identifiers were used during data analysis following the de-identification process.

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