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Original article

Trends and Patterns of Pancreatic Cancer Prevalence at Benghazi Medical Center: A Retrospective Analysis (2018–2024)

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Abstract
Pancreatic cancer is a highly lethal malignancy with a poor prognosis worldwide. Despite its clinical importance, there is limited regional data available regarding its demographic and histopathological patterns in Libya. This study aimed to analyze the demographic characteristics, clinical presentation, and histological subtypes of pancreatic cancer in patients admitted to Benghazi Medical Center between 2018 to 2024. A cross-sectional analysis was conducted on 114 cases of histologically confirmed pancreatic cancer. Data were collected from hospital archives after obtaining ethical approvals. The variables assessed included age, gender, geographic location, disease stage at diagnosis, and histopathological subtypes. Descriptive statistical analysis was conducted utilizing Microsoft Excel 2016. The incidence of pancreatic cancer peaked in the 55–64 age group, with a notable male predominance. Most cases originated from Benghazi, followed by Al-Baida and Al-Maraj. The majority of patients (66.67%) presented with advanced-stage (Stage 4) disease at the time of diagnosis. The most common subtype in terms of histology was adenocarcinoma (65%), which was followed by intraductal papillary mucinous neoplasm (23%). These findings highlight the predominance of late-stage diagnosis and underscore significant demographic and histological trends in pancreatic cancer within the studied population. Further research is warranted to explore factors contributing to gender disparities and regional variations in incidence.
Keywords. Pancreatic Cancer, Demographic Characteristics, Histological Subtypes, Late-Stage Diagnosis, Epidemiology, Benghazi Medical Center.

Introduction

Pancreatic cancer is among the most aggressive malignancies and remains a major contributor to cancer-related mortality worldwide. Characterized by an asymptomatic onset, rapid disease progression, and poor prognosis, the majority of cases are diagnosed at an advanced stage due to the absence of early clinical signs [1]. Despite progress in diagnostic techniques and therapeutic interventions, the five-year survival rate remains low, at approximately 13%, primarily due to late-stage detection and the limited availability of curative options [2]. Furthermore, the high metastatic potential of pancreatic cancer and its rising global mortality rates highlight the urgent need for improved strategies in early detection and treatment [3]. In 2022, 510,992 new cases of pancreatic cancer were recorded, according to the World Health Organization (WHO) [4]. The aggressive nature of the illness and delayed diagnosis are major factors in the appallingly low five-year survival rate, which is often less than 10% [5].

Pancreatic cancer is associated with both modifiable and non-modifiable risk factors. Several studies have shown a positive correlation between a history of pancreatitis and pancreatic cancer (PC), though the nature and strength of this association are still unclear [6,7]. An international epidemiological study found that people with chronic pancreatitis, regardless of the underlying cause, are more likely to develop PC [6].

Another known risk factor for pancreatic cancer that dramatically increases the likelihood of developing the illness is smoking. Cigarette smoking dramatically raises the risk of pancreatic cancer, according to this extensive pooled research of more than 6,500 cases. The risk increased with the amount and duration of smoking, with current smokers having a risk that was more than double that of never smoking. But after nearly 20 years, this risk returned to normal as smoking cessation steadily decreased [8].

The risk of pancreatic cancer is increased by cigarette smoking by 75% for current smokers and 20% for past smokers, and this increased risk lasts for at least ten years after quitting. The usage of pipes and cigars increases this risk as well. About 20% of instances of pancreatic cancer are caused by smoking in populations where smoking is very prevalent [9]. In addition to raising risk, smoking and alcohol consumption are associated with an earlier age at diagnosis; those who smoke now receive their diagnosis 6–8 years earlier than those who never smoke, and the earliest onset is caused by the combination of smoking and drinking. Although it has a slight impact on age, past smoking increases long-term risk. These results highlight how important quitting smoking is for lowering the incidence and early burden of pancreatic cancer [10].

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Additionally, an earlier onset of pancreatic cancer has been associated with obesity and overweight status, especially in early adulthood. Research indicates that the median age of diagnosis for overweight people is 61 years old, while the median age for obese people is even lower, at 59 years old, as opposed to 64 years old for the general population [11]. Both general and abdominal obesity considerably increase the risk of pancreatic cancer, according to a meta-analysis of 23 prospective studies that included 9,504 instances of the disease. Risk rose by 10% for every 5-unit rise in BMI (RR=1.10) and by 11% for every 10-cm increase in waist circumference (RR=1.11). Notably, there was no safe threshold, since even nonsmokers of average weight displayed heightened risk. The study shows that measurements of obesity and pancreatic cancer have a dose-response connection that is consistent across populations [12].

Similarly, weight gain, obesity, and an elevated waist-to-hip ratio all increase risk, according to a pooled analysis of 14 studies [13]. It is thought that pro-inflammatory unsaturated fatty acids generated during lipolysis may encourage the growth of tumors in visceral adipose tissue, which mediates this connection [14]. These results highlight how crucial it is to maintain a healthy body weight to lower the risk of pancreatic cancer.

Diabetes and pancreatic cancer have a complicated, reciprocal interaction. While the absolute risk is minimal, those with new-onset diabetes, especially those over 50, had a 2.2-fold greater chance of developing pancreatic cancer immediately after receiving a diabetes diagnosis, suggesting that it may be an early clinical sign of the disease [15]. Before progressively decreasing over time, the risk increases during the first year and can rise to eightfold [16]. Notably, diabetes frequently develops many years before pancreatic cancer; in fact, 40% of patients with pancreatic cancer receive a diabetes diagnosis within three years of their cancer diagnosis [17,18], suggesting that new-onset diabetes may serve as an early detection flag.

The risk of pancreatic cancer is doubled by long-term diabetes on its own [19], and it is further increased by gestational diabetes [20]. Diabetes pharmacological treatment also affects cancer risk; metformin is connected to a lower risk, whereas insulin or insulin secretagogues are linked to a higher risk [21]. However, further future research is required to elucidate these correlations. It may be expected that the number of instances of pancreatic cancer would rise in tandem with the incidence of diabetes worldwide.

Due to conflicting results and complicating variables such as smoking, socioeconomic inequality, pancreatitis, and diabetes, the link between alcohol use and pancreatic cancer (PC) is still debatable [22,23]. Heavy alcohol use, especially consuming three or more drinks daily or favoring liquor over beer or wine, may increase the incidence of PC, according to some research, while others find no significant correlation [24,25]. A pooled analysis revealed no clear risk at low-to-moderate consumption levels but reported a 60% increased risk among individuals consuming nine or more drinks per day [26]. Instead of being a direct carcinogen, alcohol may have an indirect effect by encouraging diabetes and pancreatitis, two known risk factors for PC [27]. Racial and gender disparities have also been noted, with African Americans showing a higher vulnerability to alcohol-related pancreatic injury even when their drinking habits are similar [28].

With people over 50 having a roughly 20-fold higher risk than those under 50, age continues to be the most important risk factor for pancreatic cancer. The typical age upon diagnosis is 71 years, and less than 10% of cases include people under the age of 55 [29]. Additionally, across all age groups, epidemiological statistics consistently demonstrate that males have greater incidence rates than women [30].

Another important risk factor is family history; having a first-degree relative with pancreatic cancer raises a person's risk by 2.5 to 5.3 times, and the risk is increased if more than one family member has the disease. Lifestyle variables and common genetic variants contribute to this increased risk [31]. Susceptibility is greatly increased by inherited mutations in genes such as BRCA1, BRCA2, and PALB2 [32].

Even while approximately 5–10% of individuals with pancreatic cancer have a favorable family history, new genetic studies are still finding more susceptibility genes and indicators. These include sites linked to the ABO blood group and germline mutations in BRCA1, BRCA2, and PALB2, which all help to expand our knowledge of the inherited causes of pancreatic cancer [33].

The risk of pancreatic cancer is also greatly impacted by racial differences. Pancreatitis and pancreatic cancer are two to three times more common in Black people than in White people, with studies showing a 50% to 90% higher incidence rate among Black Americans [34].

ABO blood group and the risk of pancreatic cancer have also been linked in recent research. While blood type B has erratic connections, those with blood groups A and AB are substantially more at risk than people with blood group O [35]. According to a large cohort investigation, non-O blood types were more common in instances of pancreatic cancer, with the A1 subtype having a notably higher risk. Although some research indicates that people with blood type O tend to have greater survival rates, these results are typically not statistically significant. For example, reported median survival durations for blood categories A and B were 9.0 months, AB were 9.1 months, and O was 11.1 months [36]. Although further research is required to confirm its prognostic importance, another study suggests that blood type A may be linked to worse outcomes [37].

Because of its poor prognosis, lack of available treatments, and increasing prevalence, pancreatic cancer continues to pose a significant worldwide health burden [38]. A multifaceted public health approach is needed to address this issue, one that incorporates developments in imaging technology for early diagnosis

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and biomarker discovery [39]. Programs for quitting smoking have the potential to greatly reduce the burden of illness [40], and lifestyle changes that encourage better eating, weight control, and exercise may help reduce risk in general [41].

Less than 10% of individuals with pancreatic ductal adenocarcinoma (PDAC) survive five years following diagnosis, despite advancements in cancer treatment. This difficulty stems from two main problems: [42] there are currently no effective methods for early illness detection in those who are at risk, and [43] the conventional therapies are ineffective against this aggressive form of cancer. But there is hope. According to recent research, using sophisticated imaging techniques to closely monitor high-risk patients can help detect cancers early enough for surgical removal [44, 45]. At the same time, examining the genetic composition of tumors is revealing possible weak points that, in some individuals, might be the focus of novel therapies [46]. However, it takes more than simply research to translate these findings into practical applications; collaboration is needed. This entails establishing focused screening initiatives, identifying more accurate biomarkers, and accelerating research in customized medicine. This review summarizes the most recent research in these important fields, demonstrating how a combination of early identification and more intelligent therapies may ultimately improve the prognosis for this debilitating illness.

Planning health policies effectively in areas like Benghazi, Libya, requires an awareness of local illness trends. A data-driven strategy that concentrates on particular area data rather than national averages enables the effective distribution of healthcare resources and more effectively attends to the community's particular health requirements. The purpose of this research is to examine the histological subtypes, clinical manifestations, and demographic characteristics of pancreatic cancer in the local community. It will identify the most common histological subtypes, assess stage at diagnosis with an emphasis on late-stage presentations, and analyze patient distributions by age, gender, and place of origin.

Methods and Materials

Study Design and Setting

This study examined 114 instances of pancreatic cancer that were admitted to Benghazi Medical Center between 2018 and 2024 using a cross-sectional approach.

Data Collection and Ethical Approval

The required permissions were acquired from the appropriate hospital authorities before data collection. Staff from the oncology department worked with students to gather the data. Between May 20th and July 21st, 2024, patient records were obtained from hospital archives with further permission from the University of Benghazi's Head of the Cytotechnology Department. Ethical approval was secured from the appropriate institutional review board. All information was managed with strict confidentiality, and patient identities were anonymized to safeguard privacy and ensure data security.

Data Variables and Categories

Among the information gathered were the demographic details such as Gender, age, and address, and the clinical information of the patients, including: Diagnosis, file numbers, and histopathology findings.

Statistical Analysis

Microsoft Excel 2016 was used for data analysis, producing pie charts and graphs to effectively convey the main conclusions.

Results

The study examined 114 pancreatic cancer patients, 61% of whom were male, in Benghazi, Libya. Geographically, Benghazi city accounted for the majority of cases (n = 62), with smaller cities contributing fewer instances. Only the first six months of 2024 data reflect diagnoses, which peaked in 2019.

The prevalence of pancreatic cancer in Benghazi city is depicted in this bar chart for various age groups (Figure 1). According to the statistics, the incidence rises with age, reaching a high in the 55–64 age range before somewhat declining in the later age ranges. The age categories with the lowest frequency are the youngest (25–34) and oldest (>85). These results highlight age as a major risk factor for pancreatic cancer and are consistent with recognized epidemiological trends.

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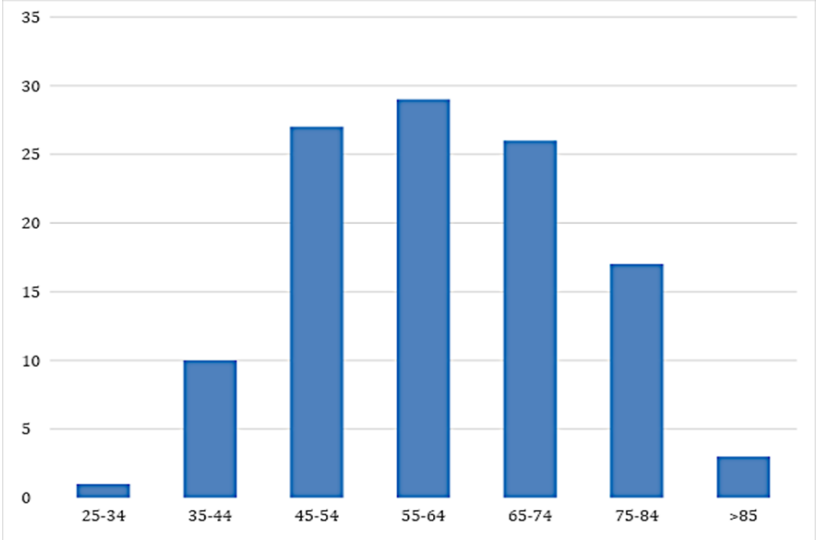


Figure 1: Distribution of Pancreatic Cancer Prevalence Across Age Groups in Benghazi

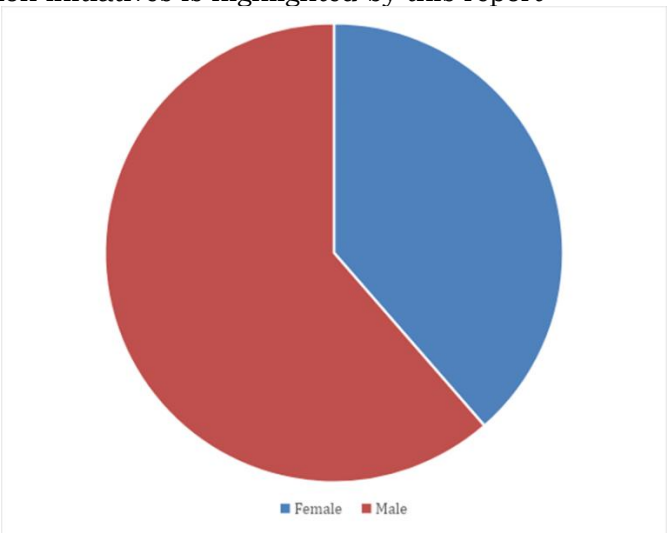
The frequency of pancreatic cancer in Benghazi varies significantly between males and females, as the pie chart shows (Figure 2). Males in this demographic have a greater incidence of the condition, as indicated by the bigger chunk devoted to them.

Additional research into possible relevant variables, including biological variances, lifestyle variations, and environmental exposures, is warranted in light of this result. It's also critical to investigate if screening or diagnostic procedures may be contributing to this discrepancy. Contextual information, such as the general frequency of pancreatic cancer in Benghazi and how it compares to other areas or populations, would be helpful in order to completely understand the relevance of this discovery.

This study highlights the importance of gender-specific characteristics in pancreatic cancer research and prevention efforts in the Benghazi region. The frequency of pancreatic cancer in Benghazi is significantly different for men and women, with a notably higher percentage of cases in men, according to the pie chart. This raises the possibility of underlying causes for the elevated risk in men, including biological variations, lifestyle choices, and environmental exposures.

To ascertain if inequalities in diagnostic procedures or healthcare access contribute to this trend, more research is required. Furthermore, putting these results in a larger context—contrasting Benghazi's total pancreatic cancer prevalence with that of other areas—might yield insightful information.

The necessity of taking gender into account in pancreatic cancer research, screening methods, and community-specific prevention initiatives is highlighted by this report



This bar graph displays the origins of patients in several Libyan cities (Figure 3). The fact that Benghazi has the most patients suggests that it is a significant healthcare hub. While many other cities have a far lower patient population, other cities, including Al-Baida and Al-Maraj, also have a sizable patient population. Planning for healthcare and allocating resources in Libya may be impacted by this unequal patient distribution throughout towns.

Figure 2: Gender Distribution of Pancreatic Cancer Cases in Benghazi

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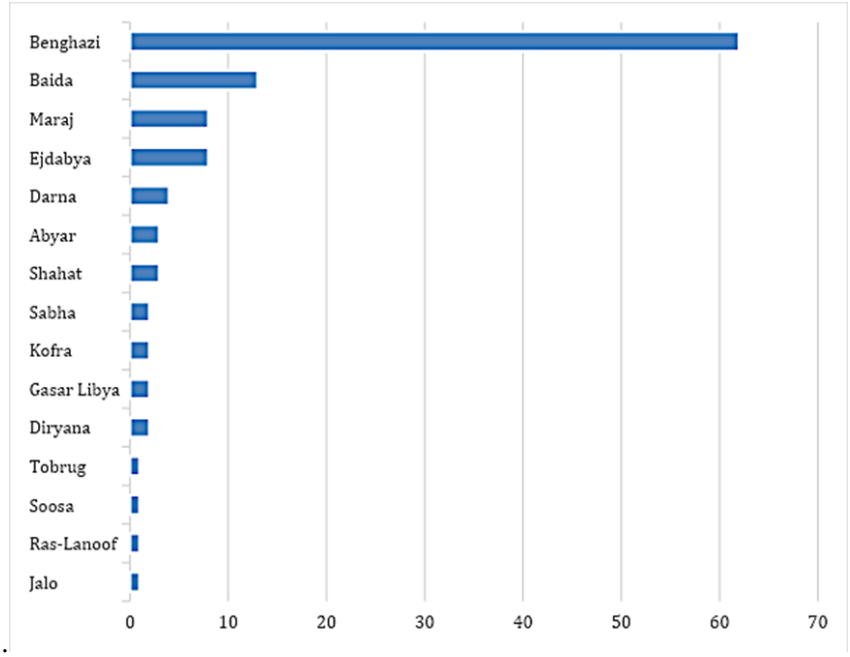
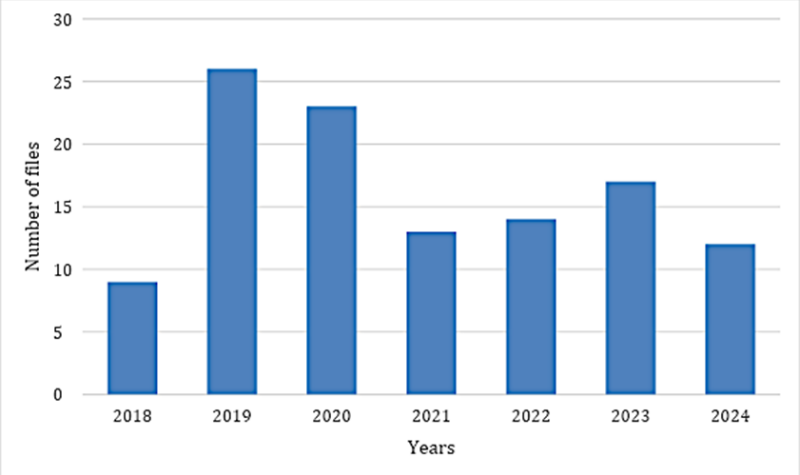


The number of patients at Benghazi Medical Hospital who were diagnosed with a particular disease between 2018 and 2024 is shown in this bar chart (Figure 4). The greatest number of diagnoses occurred in 2019, and the number declined in 2020. Interestingly, 2023 saw a notable rise in diagnoses. Overall, throughout the course of the seven years, the data shows variations in the number of diagnosed cases. Variances in data gathering techniques, adjustments to screening and awareness campaigns, or fundamental changes in the condition's epidemiology within the Benghazi community might all be responsible for these variances. To completely comprehend the tendencies that have been noticed, more research is required, including looking at statistics on screening rates and awareness initiatives.

Figure 3: Geographical Distribution of Patients Per City



The distribution of pancreatic cancer (PC) in the various anatomical sites of the pancreas is depicted in this pie chart (Figure 5). The head of the pancreas is where most occurrences (73%) occur, followed by the body (17%) and tail (7%). Metastatic pancreatic cancer, which indicates that the initial tumor has migrated to other areas of the body, accounts for a tiny percentage (3%) of cases.

Figure 4: Distribution of the Patients by Year of Diagnosis

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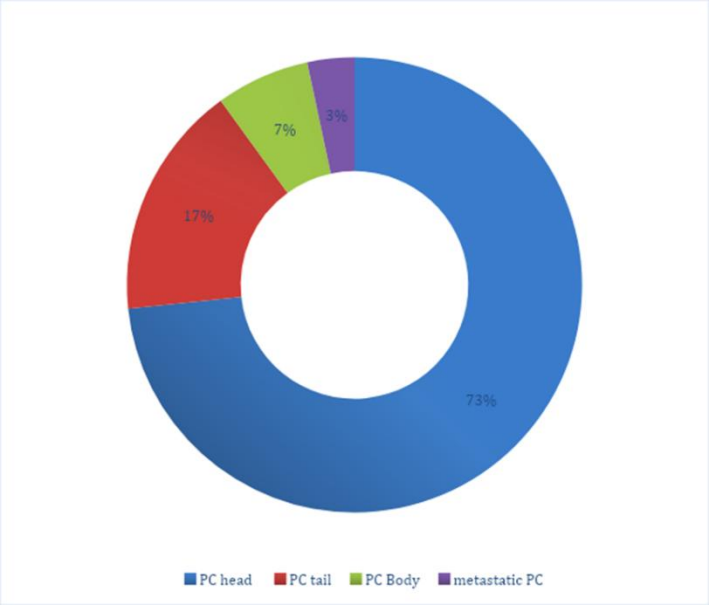

Figure 5: Regional Distribution of Pancreatic Cancer Within the Head, Body, and Tail of the Pancreas

The distribution of 114 cases of pancreatic cancer by clinical stage is shown in (Table 1). Sixty-six percent of patients were detected at stage 4, which indicates severe illness. Diagnoses at earlier stages were less common: 2.63% at stage 1, 7.89% at stage 2, and 11.40% at stage 3. The clinical stage was unknown in 11.41% of patients.

Table 1: Distribution of Patients According to the Stage of the Pancreatic Cancer at Diagnosis

Clinical Stage	Number of cases	Percentage
Stage 1	3	2.63 %
Stage 2	9	7.89 %
Stage 3	13	11.4 %
Stage 4	76	66.67 %
Unknown	13	11.41 %

The distribution of pancreatic cancer cases at various stages of the disease at the time of diagnosis is shown in this bar chart (Figure 6). About 80% of the patients were identified at stage 4, which denotes severe illness. Stage 3 (about 15%), stage 2 (approximately 10%), and stage 1 (approximately 5%) were the early phases during which a lesser percentage of cases were detected. A considerable percentage of individuals who come with late-stage illness are highlighted by this distribution.

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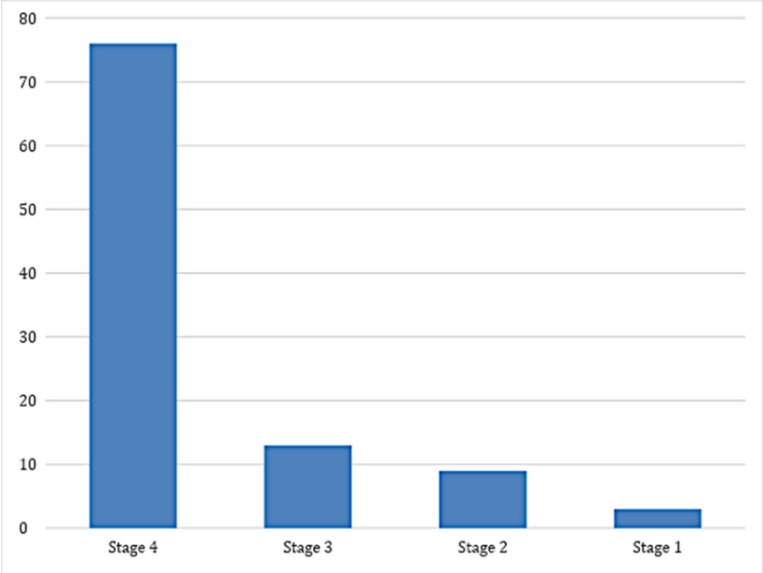

Figure 6: Distribution of Patients According to the Stage of the Pancreatic Cancer at Diagnosis

The distribution of pancreatic cancer cases according to histological diagnosis is shown in this pie chart (Figure7). With 65% of cases, adenocarcinoma is the most common form. Pseudo-papillary neoplasms (2%), metastatic (10%), and intraductal papillary mucinous neoplasms (23%) are further forms.

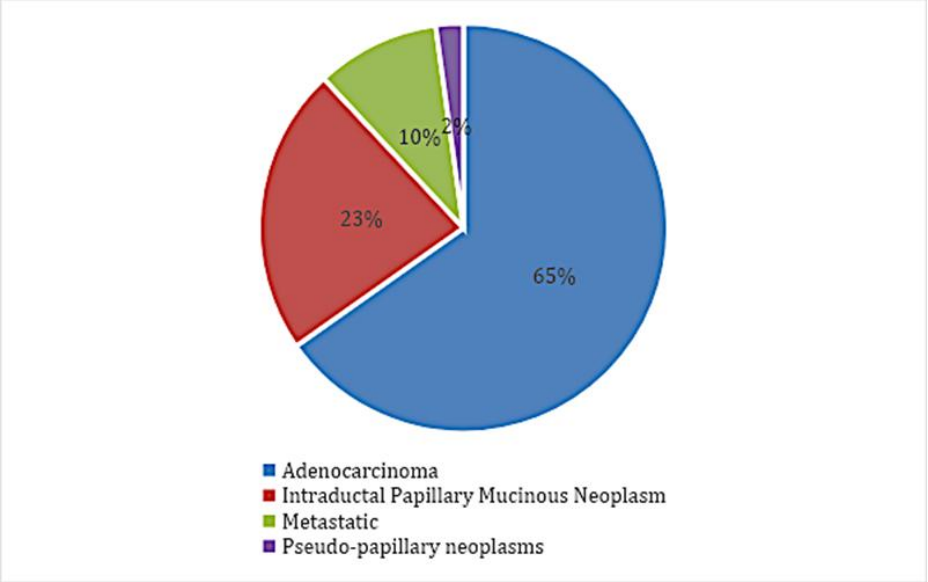

Figure 7: Distribution of Patients According to Histopathology Diagnosed

Discussion

Important new information about the epidemiology and clinicopathological characteristics of pancreatic cancer in Benghazi, Libya, is provided by this study. The incidence of pancreatic cancer rose significantly with age, culminating in those between the ages of 55 and 64, in line with global trends. Age above 50 is regularly identified as a key risk factor for pancreatic cancer in the literature, which is consistent with this data [31,47]. Both underdiagnosis in older populations and survivorship bias may be responsible for the reported reduction in incidence in the oldest age groups.

Benghazi's male-to-female pancreatic cancer frequency is consistent with global patterns in which men are more likely than women to develop the disease [32,47]. This discrepancy might be caused by a number of things, such as potential biological variations and increased exposure to known risk factors, including smoking and occupational hazards. The significance of gender-specific preventive and early detection techniques in the local context is highlighted by these findings.

According to data on geographic distribution, Benghazi accounted for the majority of patients, while Al-Baida and Al-Maraj also made significant contributions. This trend highlights the differences in healthcare access throughout Libya and most likely reflects the concentration of specialist healthcare services in Benghazi. To guarantee fairer access to care, it highlights the necessity of regionally bolstering diagnostic and therapeutic capacities. The geographical disparity assertion is supported by a 2024 Latin America

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cohort research that highlights that metropolitan locations, like as Benghazi, have larger concentrations of cancer cases because of more sophisticated diagnostic facilities, even if the study is not specifically about Libya [48].

Due to its fast development and late discovery, pancreatic cancer continues to rank among the deadliest cancers worldwide. With five-year survival rates continuously below 13%, survival results are still poor despite improvements in diagnosis and treatment [1,2]. The lack of early signs and the disease's great propensity for metastasis are major factors in this dismal prognosis [3,5]. WHO figures, which showed more than half a million new cases in 2022 alone, demonstrate that the worldwide incidence is still rising [4].

The burden of pancreatic cancer is caused by several identified and new risk factors. In both demographics and etiologies, chronic pancreatitis has been repeatedly associated with an increased risk of cancer [6,7]. Another significant modifiable factor is tobacco use, which doubles the risk of pancreatic cancer and causes its onset early. Smoking and alcohol use together have a compounding impact [8–10]. With data pointing to a dose-response connection, obesity, particularly the buildup of abdominal fat, independently raises risk and results in a younger age at diagnosis [11–14].

Diabetes introduces an additional level of complication by serving as a possible early warning indicator as well as a risk factor. Long-term and gestational diabetes also enhance susceptibility to pancreatic cancer, and new-onset diabetes, especially in people over 50, is linked to a much higher short-term risk [15–20]. Furthermore, several diabetic drugs may alter the risk of cancer, emphasizing the necessity of cautious patient care [21].

Alcohol's function is still up for dispute. Heavy drinking, particularly of liquor, has been associated with a 60% higher risk, but light-to-moderate drinking reveals mixed relationships [24–26]. Alcohol may have an indirect carcinogenic effect by fostering intermediate diseases such as diabetes and pancreatitis [27]. This picture is further complicated by racial discrepancies; African Americans are more susceptible to pancreatic injury from alcohol, possibly as a result of genetic or metabolic variations [28].

Important roles are also played by risk variables that cannot be changed, such as age, sex, and family history. The prevalence of pancreatic cancer is higher in men and rises quickly after age 50 [29,30]. Due in part to hereditary abnormalities in genes including BRCA1, BRCA2, and PALB2, those who have a first-degree relative with pancreatic cancer are at a much higher risk [31–33].

There are also notable racial differences in incidence and results. With incidence rates up to 90% greater than those in White communities, Black people are disproportionately at risk for both pancreatitis and pancreatic cancer [34]. Blood type has also become a genetic risk factor; non-O blood types, especially A and AB, are linked to a greater incidence of cancer and a potentially poorer prognosis [35–37].

Urgent action is required to address the ongoing mortality burden of pancreatic cancer. Modifiable risk variables may be decreased by public health initiatives such as weight control, smoking cessation, and early diabetes screening [40,41]. Although early detection, imaging, and genetic profiling advances are promising, they need to be combined with risk-based screening and biomarker identification to be incorporated into clinical practice [42–46] [49,50].

Conclusion

One of the deadliest and most aggressive cancers in the world, pancreatic cancer is becoming more common, especially in developed areas. Although there is a disproportionately high incidence of late-stage diagnosis, the illness in Benghazi follows global trends. Significant risk factors for the development of illness still include family history, obesity, diabetes, and smoking. Based on this study, there are many areas of improvement to better pancreatic cancer outcomes in Benghazi. This begins with recognizing gaps in public knowledge about early indicators of pancreatic cancer and incorporating initiatives and programs that will provide accessible education. Additionally, increasing screenings of high-risk populations, not only in Benghazi but other locations in Libya. One of the most tangible improvements is to address the modifiable lifestyle risk factors, including smoking and diet. Finally, outcomes can be improved by monitoring trends by creating a national pancreatic cancer registry, along with redirecting our resources into genetic research and imaging technologies.

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Conflicts of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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