REVIEW ARTICLE

Gastrointestinal malignancies in Zambia: a scoping review

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ABSTRACT

Background: Gastrointestinal (GI) malignancies account for greater than one-third of cancer-related deaths worldwide. In Zambia, there is a lack of data on epidemiology, diagnosis, management, and outcomes. We sought to review existing literature to determine the extent of research and identify gaps in knowledge pertaining to GI malignancies in Zambia.

Methods: We systematically searched databases including Ovid MEDLINE, CINAHL, Web of Science Core Collection, Cochrane Library via Ovid, Embase, Africa Wide Information via Ebsco, African Index Medicus and African Journals Online, to identify studies on GI malignancies including colorectal (CRC), pancreatic (PC), gastric (GC), esophageal (EC) and liver cancers (LC) in Zambia.

Results: Of 323 studies screened, 27 were included in the final analysis. The included studies assessed an individual GI cancer or more than one GI cancer as follows: GC only (n=10, 37%), EC only (n=5, 18%), LC only (n=5, 18%), CRC only (n=2, 7%), PC only (n=1, 4%), PC, CRC, EC, GC, LC combined (n=1, 4%), CRC, EC, GC, LC combined (n=1, 4%), CRC, EC, GC combined (n=1, 4%) and EC, GC combined (n=1, 4%). Gastric cancer was the most studied (n =14 articles), followed by esophageal (n=9 articles), liver cancer (n=7 articles), colorectal (n=5 articles) and pancreatic cancer (n=2 articles).

Conclusion: There is paucity of published data. Existing studies have focused mainly on prevalence and risk factors. Longitudinal studies examining incidence, prognosis and survival are needed.

INTRODUCTION

Gastrointestinal malignancies such as colorectal, gastric, pancreatic, liver, and esophageal cancers account for 35% of all cancer-related deaths and 26% of all cancer incidence worldwide[1,2]. In 2018,

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there were 3.4 million attributable fatalities and an estimated 4.8 million new cases across the globe[1]. Despite improvement in therapeutics over the past decade, survival rates remain suboptimal[3]. The observed increase in global incidence of gastrointestinal cancers has been attributed to factors such as lifestyle trends (alcohol and tobacco use), genetics, environmental exposures, diet and obesity[4]. In a prospective study evaluating the relationship between red and processed meat intake and cancer risk, Cross et al found that individuals with the highest red meat consumption had a systematically higher risk of colorectal, esophageal and liver cancers[5]. The consumption of processed meat was also associated with higher risk of colorectal cancer. In developing countries, the high associated mortality has been ascribed to factors including delays in referral and diagnosis, advanced stage at time of diagnosis as well as inadequate access to diagnostic and treatment facilities[6].

In Zambia, a Southern African country with a total population of 19, 473, 1257, incidence and prevalence of GI cancers has been increasing, particularly among younger patients[8]. According to data from the Global Cancer Observatory, esophageal, liver and gastric cancers are among the top ten most prevalent cancers in Zambia with each having a cumulative 5-year prevalence of 3.09, 2.63 and 2.11 respectively per 100,000 population[9]. It is unclear if the increasing incidence and prevalence in recent years is attributable to an increase in occurrence of these cancers or simply a reflection of better detection. Data regarding this is sparse. There is generally a lack of understanding of the factors driving the observed trends in incidence and mortality of GI cancers in Zambia.

Research plays a significant role in understanding the carcinogenesis process, epidemiology, management and clinical outcomes. Results from published data can be applied towards policy development and public health measures. Public health measures to raise awareness amongst the general population and development of screening/surveillance guidelines rely on the availability of data on the burden of gastrointestinal cancers in Africa. The aim of our study is to assess the state of published data on gastrointestinal cancers in Zambia, Southern Africa and identify any potential gaps in research and recommend areas that need focus.

METHODS

Information Sources and Search Strategy

A comprehensive search for relevant published articles on gastrointestinal cancers in Zambia from inception to 31st March 2022 was conducted by a medical librarian (LP) using several databases including: Ovid MEDLINE, CINAHL, Web of Science Core Collection, Cochrane Library via Ovid, Embase, Africa Wide Information via Ebsco, African Index Medicus and African Journals Online. The search combined keywords and controlled vocabulary for two concepts: Zambia and gastrointestinal cancers. The full search strategies are available in Appendix 1. No language, study type, or date limits were incorporated into the database search strategies.

The search included the use of a combination of relevant keywords. The keywords were used individually or in combination to search for cancer-related publications in English and index terms with appropriate Boolean operators (AND/OR). Medical Subject Headings (MeSH) terms or subject heading in all fields was included, and syntax was modified appropriately for each database if necessary to identify all relevant studies.

Study Selection and Eligibility Criteria

The database search, which initially focused on the titles of the articles and adhering to the inclusion and exclusion criteria was conducted by LP. Potentially relevant articles were exported to Covidence, and duplicates were removed. Two independent reviewers then conducted abstracts and full article screening. Disputes arising between the two reviewers were resolved by a third reviewer. Studies were included if they reported quantitative data on

the epidemiological burden (morbidity, incidence, prevalence, and mortality) risk factors, diagnosis, economic burden, and management of the esophageal, gastric, colorectal, pancreatic, liver, and biliary tract cancers in Zambia (including multinational studies that included Zambia). Eligible study designs included case-control, cross-sectional, cohort, randomized controlled trials (RCTs), and case series with a minimum of 10 patients.

We excluded studies not reported in English, non-human studies, abstract-only studies, review articles, comments, editorials, opinions, case reports, and studies whose abstract or full text were unavailable 2 months after an inter-library request was made.

Data Extraction

A data collection form designed by the team was used to extract relevant information from included studies. The following information was extracted from each study: title, surname of the first author, year of publication, country, aim, study design, study setting, sample size, age and gender of the targeted group, type of GI cancer studied, incidence, age standardized incidence rate (ASIR), case fatality rate (CFR), prevalence, risk factors, diagnosis (including screening methods), management, and outcomes (survival, mortality) and any other quantitative findings.

RESULTS

A total of 323 studies were initially identified through database searching, of which 171 duplicates were removed and the remaining 152 studies were reviewed by title and abstract. Eighty-eight studies were irrelevant, and 64 studies were further evaluated for full-text eligibility. Of these, 37 studies were ineligible and 27 studies were eligible for data synthesis. The 27 studies used for data synthesis included studies that assess an individual GI cancer or more than one GI cancer as follows: GC only (n=10, 37%), EC only (n=5, 18%), LC only (n=5, 18%),CRC only (n=2, 7%), PC only (n=1, 4%), PC, CRC, EC, GC, LC (n=1, 4%), CRC, EC, GC, LC (n=1, 4%), CRC, EC, GC (n=1, 4%) and EC, GC (n=1, 4%). The earliest GI cancer related publication from Zambia was study on the radiological appearances of esophageal carcinoma in Zambians, published by Khurana et al in 1967. According to decades most full-text articles on GI cancers in Zambia were published between 2010 - 2019 (Figure 1). Analysis by cancer type showed that the most studied GI cancers were gastric cancer (n=14 articles), esophageal cancer (n=9 articles), liver cancer (n=7 articles), colorectal cancer (n=5) and pancreatic cancer (n=2 articles). The most common study designs were Retrospective (n=12), cross-sectional (n =8), case-control (n=6), cohort (n=1), non-randomized experimental (n=1). (Figure 2)

Figure 1: Published studies on gastrointestinal cancers in Zambia by decades

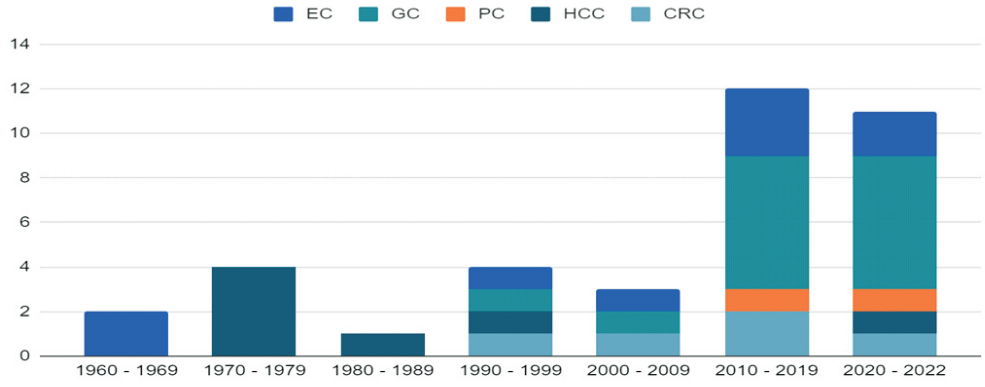
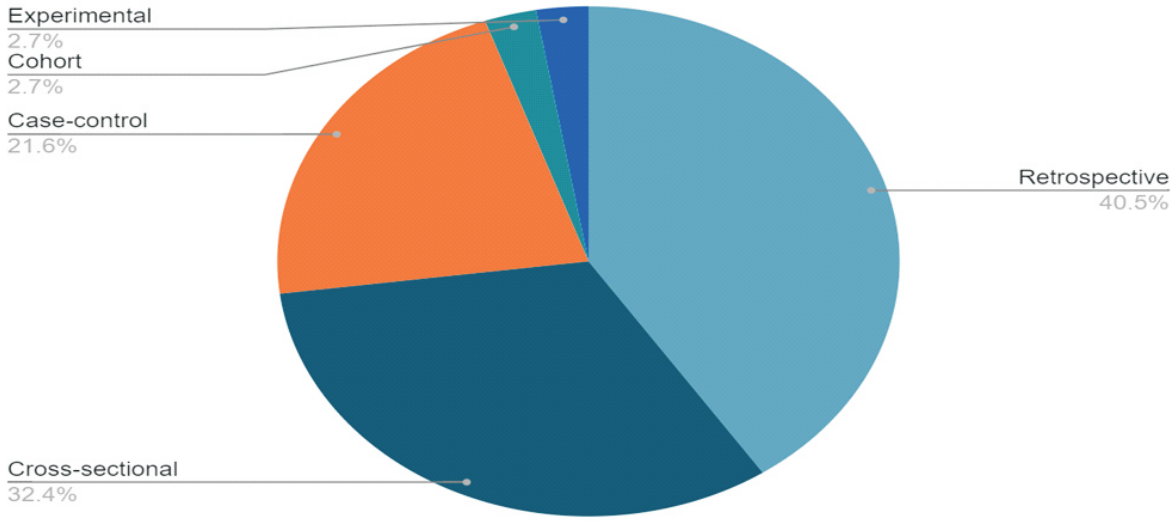


Figure 2: Study designs of included studies



Colorectal cancer

There was a total of 5 published studies on CRC; 4 retrospective studies and 1 cross-sectional study. (Table 1) CRC was more common in males than females in both studies that compared gender distribution of CRC[10,11]. Age-standardized incidence rate of CRC was reported across three studies; 0.8 per 100,000 in 1995, 33.78 per 100,000 in 2008 and 7.19 per 100,000 in 2021[12-14]. Only two studies report age distribution of CRC cases[10, 14.] A study by Asombang et al reported the mean age of CRC in Zambia at 48.6 years while another study by Kelly et al. reported that 57% of CRC was found in adults <45 years old. Only one study comprehensively evaluated the clinical profile of CRC patients in Zambia[10]. In this study, most patients presented at stage 4 of disease. Majority of patients were diagnosed through surgery, with a smaller proportion being diagnosed using endoscopy or imaging. Management options included surgery, chemotherapy, and radiotherapy. In a study published by Kayamba et al in 2018, 18% of females and 16% of males presenting for colonoscopy were diagnosed with CRC[11]. No studies conducted in Zambia have assessed risk factors of colorectal cancer and the clinical outcomes of CRC such as survival and mortality.

Table 1: Characteristics of full-text articles on colorectal cancers in Zambia.

Study	Study design (period)	Total Sample Size	M: F (of total participants)	Mean age (SD)	Histology (stage at presentation)	Risk factors	Diagnosis	Management	outcomes	Comments
Asombang et al, 2018 (Zambia)	Retrospective study	234	1.6:1	48.6	Stage 4 (122, 54%) stage 3 (79, 35%), Stage 2 (19, 8%), Stage 1 (1, 0.44%)	-	Surgery>endoscopy> imaging	Surgery, chemotherapy, radiotherapy, mixed	-	-
Kayamba et al, 2018 (Zambia)	Cross sectional	573	1.5:1	-	-	-	-	-	-	Prevalence of CRC tumors among those undergoing colonoscopies Females 38 (18%) Males 50 (16%)
Patil et al 1995** (Zambia)	Retrospective	7836	-	-	-	-	-	-	-	Incidence of CRC 0.8 per 10000 population
Kalubula et al, 2021** (Zambia)	Retrospective	21512	-	-	-	-	-	-	-	- ASIR 7.19 per 10000 population - CFR 12.6%
Kelly 2008** (Zambia)	Retrospective	2187	-	-	-	-	-	-	-	- Estimated ASIR 33.78 per 100 000 per year - 57% of CRC was in adults <45 years old

**Multiple GI cancers CFR - Case fatality rate ASIR - Age standardized incidence rate CRC - Colorectal cancer

Esophageal cancer

A total of nine full-text articles published data on esophageal cancer in Zambia (Table 2). Of these, 4 were retrospective studies, 3 Cross-sectional studies, and 2 case-control studies. Age-standardized incidence rate of EC has been on the rise in Zambia; 0.8 per 100,000 in 1995, 5.44 per 100 000 in 2008, 5.5 - 8.38 per 100 000 in 2021[12-15]. The mean age of EC observed in three studies, lies between 54 - 57 years[15-17]. All four studies that evaluated gender distribution of EC showed a higher prevalence in males than females[15-18]. Squamous cell carcinoma was the most common histopathological subtype of EC in Zambia, followed by adenocarcinoma[15,17]. In majority of patients, diagnosis was made by upper endoscopy and histopathology[15]. Staging revealed that most patients presented at stage 4 of the disease[15]. Across all three studies describing tumor location, most esophageal tumors were found in the middle third of the esophagus[15,17,18]. The lower third was the second most common site in two studies and the least common site in one study. The upper third was the second most common site in one study and the least common site in two studies. Treatment options for EC patients in Zambia included chemotherapy, radiotherapy and palliative care[15.] The case fatality rate of EC in Zambia was 19.4%[13]. Four studies assessed the risk factors of EC in Zambia[16,17,19,20]. Risk factors include, smoking, alcohol consumption, cooking with charcoal or firewood, high Isoprostane excretion, HIV infection in patients less than 60 years, and male gender. A study by Kayamba et al in 2015, reported that EC was diagnosed in 3.3% of all patients undergoing upper endoscopy, and that there is a 32 % increase in diagnosis of esophageal cancer per decade in Zambia[20]. There were no studies on the mortality and survival rates for EC in Zambia.

Table 2: Characteristics of studies on Esophageal cancer in Zambia.

Study	Study design (period)	Total Sample Size	M: F (of total participants)	Mean age (SD)	Histology	stage at presentation	Risk factors	Diagnosis	Management	outcomes	Comments
Asombang et al, 2021 (Zambia)	Retrospective	278	2:1	55	SCC >> adenocarcinoma > undifferentiated carcinoma > Carcinoma in-situ	Stage 4 >> stage 2 > stage 3> stage 1> stage 0	-	Upper Endoscopy	Chemotherapy Radiotherapy Palliation	-	- ASIR 5.5 per 100 000 - Most common presenting symptoms- dysphagia - Tumor location: Middle third>lower third>upper third
Asombang et al, 2016 (Zambia)	Case-control	72	1.7:1	54.67 (16.4)	Only SCC studied	-	-High Isoprostane excretion - Smoking	-	-	-	
Kayamba et al, 2015 (Zambia)	Case-control	100	2.6:1	56.2	SCC >> adenocarcinoma	-	Cigarette smoking, Cooking with charcoal or firewood, HIV infection in patient less than 60 years	-	-	-	- Tumor location: Middle third>upper third>lower third
Khurana et al, 1967 (Zambia)	Cross-sectional	50	16:1	-	-	-	-	-	-	-	- Tumor location: Middle third>lower third>>upper third
McGlushun et al, 1969 (Multiple countries)	Cross-sectional	-	-	-	-	-	Alcohol consumption	-	-	-	
Kayamba et al, 2015 (Zambia)**	Cross-sectional	549	-	-	-	-	Male gender	-	-	-	- EC diagnosed in 3.3% of all patients undergoing endoscopy - 32 % increase in diagnosis of oesophageal cancer per decade
Patil et al 1995** (Zambia)	Retrospective	7836	-	-	-	-	-	-	-		Incidence of EC 0.8 per 10000 population
Kalubula et al, 2021** (Zambia)	Retrospective	21512	-	-	-	-	-	-	-	-	- ASIR 8.38 per 10000 population - CFR 19.4%
Kelly 2008** (Zambia)	Retrospective	2187	-	-	-	-	-	-	-	-	- Estimated ASIR 5.44 per 100 000 per year

**Multiple GI cancers CFR - Case fatality rate ASIR - Age standardized incidence rate EC - Esophageal cancer SCC - Squamous cell carcinoma

Gastric Cancer

A total of 14 full-text articles published data on gastric cancer in Zambia (Table 3). This included 6 Cross-sectional studies, 4 case-control studies, 3 retrospective studies, and 1 cohort study. Age-standardized incidence rate of GC was reported in three studies: 0.8 per 100000 populations in 1995, 22.06 per 100 000 in 2008, and 5.61 per 100 000 populations in 2021[12-14]. The mean age of GC reported in two studies by Asombang et alwas 61 years. Six studies reported similar findings on the histopathological subtypes of gastric cancer, using the Lauren classification. Intestinal adenocarcinoma made up the greatest proportion of gastric cancers, with a smaller proportion being diffused or mixed type GC[21-26]. Upper GI endoscopy was the most common mode of diagnosis seen in five studies[6,23,26-28]. In a study by Kayamba et al in 2018, blood in gastric juice was found to have a high sensitivity but low specificity for gastric cancer detection[27].A single study looked at the management and outcomes of GC in Zambia[21]. In this study by Asombang et al, most GC patients were treated surgically and the median survival for GC was 142 days. They also observed that the intestinal type histology was associated with improved survival. Six studies described risk factors of GC in Zambia[22-25,27,28]. Risk factors of GC in Zambia include: smoking, alcohol consumption, low consumption of fruits and vegetables, gastric atrophy, age > 60 years, low socioeconomic status (poverty, unemployment, rural residence), low body mass index (BMI), Low pepsinogen 1:2 ratio, high urinary isoprostane excretion, low gastrin-17, and microsatellite instability. Two studies observed no significant association between H. pylori infection and gastric cancer[22,23]. In a study by Kayamba et al in 2019, median time to endoscopic gastric cancer diagnosis was 12 weeks from onset of symptoms. No study on GI cancers in Zambia mentioned the stage of disease at diagnosis.

Table 3: Characteristics of studies on Gastric cancer in Zambia

Study	Study design (period)	Total Sample Size	M: F (of cases)	Mean age of cases (SD)	Histology	stage at present ation	Risk factors	Diagnosis	Management	outcome	Comments
Asombang et al, 2014 (Zambia)	Cohort	50	1.7:1	61.7 (15.5)	Intestinal adenocarcinoma>>diffused>mixed	-	-	-	surgery>chemotherapy=radiotherapy	Median survival 142 days	A history of alcohol intake and intestinal type histology were associated with improved survival
Asombang et al, 2013 (Zambia)	Case-control	150	1.7:1	61	Intestinal adenocarcinoma>>diffused>mixed	-	Smoking, gastric atrophy, high urinary isoprostane excretion, low fruit intake, Low pepsinogen 1:2 ratio	-	-	-	H. pylori was not associated with cancer
Kayamba et al 2013 (Zambia)	Case-control	146	1.5:1	-	Intestinal adenocarcinoma>>diffused>mixed	-	Smoking, Regular alcohol intake, Gastric atrophy, low pepsinogen 1:2 ratios, low gastrin-17	Upper endoscopy	-	-	H. pylori was not associated with cancer
Kayamba et al 2020 (Zambia)	cross-sectional	369	1:1.2	-	Intestinal adenocarcinoma>diffused>mixed	-	Age >60, Rural residence, low BMI, Tertiary level of education, No employment, Microsatellite instability	-	-	-	No evidence of EBV-related GC

Table 3: Characteristics of studies on Gastric cancer in Zambia continued

Study	Study design (period)	Total Sample Size	M: F (of cases)	Mean age of cases (SD)	Histology	stage at present ation	Risk factors	Diagnosis	Management	outcome	Comments
Kayamba et al, 2019 (Zambia)	cross-sectional	388	-	-	-	-	-	Upper endoscopy	-	-	median time to endoscopic gastric cancer diagnosis was 12 weeks
Kayamba et al, 2018 (Zambia)	cross-sectional	276	-	-	-	-	Age, Residence outside capital city, No employment, No secondary education	Upper endoscopy	-	-	Blood in gastric juice has a high sensitivity but low specificity for gastric cancer detection
Kayamba et al, 2020 (Zambia)	case-control	316	1:1.2	-	Intestinal adenocarcinoma>>diffused>mixed	-	rural residence, poverty, daily consumption of processed meat, low consumption of green vegetables, biomass smoke exposure	-	-	-	Gastric cancer was not associated with biochemical measures of current exposure to aflatoxins or ochratoxins.
Shokouhi et al, 2021 (multiple countries)	cross-sectional	-	-	-	-	-	-	-	-	-	This study reported trends. For females, Zambia showed he moderate-to-high falling pattern. For males, Zambia had a moderate falling trend
Zyambo et al 2022 (Zambia)	case-control	159	-	-	-	-	Age, low BMI	Upper Endoscopy	-	-	no association between plasma Selenium levels and gastric cancer
Kasochi et al, 2020 (Zambia)	Cross-sectional	43	-	-	Intestinal adenocarcinoma>>diffused>Mixed	-	-	Endoscopy >>surgery	-	-	Intestinal type tumors had a higher occurrence of HER2 overexpression than diffuse or mixed sub - types

Table 3: Characteristics of studies on Gastric cancer in Zambia continued

Study	Study design (period)	Total Sample Size	M: F (of cases)	Mean age of cases (SD)	Histology	stage at present ation	Risk factors	Diagnosis	Management	outcome	Comments
Kayamba et al, 2015 (Zambia)**	Cross-sectional	-	-	-	-	-	-	-	-	-	-In patients under 60 years of age there was increasing detection rates per decade -In patients of 60 years of age or more the frequency of diagnosis of gastric cancer appears to have decli ned by 15 % per decade
Patil et al 1995** (Zambia)	Retrospect ive	7836	-	-	-	-	-	-	-	-	Incidence of GC 0.8 per 10000 population
Kalubula et al, 2021** (Zambia)	Retrospect ive	21512	-	-	-	-	-	-	-	-	-ASIR 5.61 per 10000 population -CFR 19.7%
Kelly 2008** (Zambia)	Retrospect ive	2187	-	–	-	-	-	-	-	-	--Estimated ASIR 22.06 per 100 000 per year

[a]Lauren classification **Multiple GI cancers CFR - Case fatality rate ASIR - Age standardised incidence rate GC - Gastric cancer EBV - Epstein-Barr Virus BMI - Body Mass Index

Liver Cancer

There was a total of 7 studies published on liver cancer in Zambia; two cross-sectional studies, 2 retrospective studies, 2 case-control studies, and 1 non-randomized experimental study. (Table 4) Age-standardized incidence rate of LC was reported in two studies; 1.8 per 100, 000 population in 1995 and 5.86 per 100 000 population in 2021[12,13]. Two studies reported the gender distribution of liver cancer in Zambians[29,30]. Males were at least six times more affected by liver cancer than females. The most common histopathological subtype of LC was the trabecular type[29,30]. Diagnosis of LC was made by biopsy and alpha fetoprotein levels[30-32]. Most cases of LC were diagnosed at stage 3 and treated with chemotherapy[30]. Hepatitis B infection was the main risk factor of LC in 2 studies[32,33]. No studies conducted in Zambia have assessed the clinical outcomes of LC in Zambia.

Table 4: Characteristics of studies on Liver cancer in Zambia

Study	Study design (period)	Total participants	M: F (cases)	Mean age of cases(SD)	Histology	stage at presentation	Risk factors	Diagnosis	Management	outcomes	Comments
Bahl et 1975 (Zambia)	cross-sectional	82						biopsy			Hepatoma was the second most common cause of hepatomegaly
Naik et al 1976 (Zambia)	cross-sectional	166	6.2:1		trabecular >anaplastic>			biopsy			HCC was 8.2% of all malignant tumors encountered
Tabor et al 1977 (Multiple countries)	Case-control	93					HBsAg (Hepatitis B surface antigen)				
Vogel et al, 1977 (multiple countries)	Non-randomized experimental	19	8.5:1		trabecular >adenoid> solid	Majority Stage 3			Chemotherapy		
Zumla et al 1982 (Zambia)	**case-control**						**HBV (Hepatitis B virus)**	**AFP (Alpha-fetoprotein)**			
Patil et al 1995** (Zambia)	Retrospective	7836									Incidence of HCC (Hepatocellular Carcinoma) 1.8 per 10000 population
Kalubula et al, 2021** (Zambia)	Retrospective	21512									- ASIR (Age standardised incidence rate) 5.86 per 10000 population - CFR (Case fatality rate)19.8%

**Multiple GI cancers CFR - Case fatality rate ASIR - Age standardised incidence rate GC - Gastric cancer HBV - Hepatitis B virus AFP - Alpha feto-protein HCC - Hepatocellular carcinoma HBsAg - Hepatitis B surface antigen HIV - Human Immunodeficiency virus

Pancreatic cancer

There were two published studies on PC, both retrospective studies (Table 5). In a study by Asombang et al, Pancreatic cancer was more common in males than females[34]. The mean age (SD) of patients with PC at the time of diagnosis was 55.7 (12.7). All patients were diagnosed at stage 4, and pancreatic adenocarcinoma was the most common histopathological subtype. Most tumors were found in the head of the pancreas, followed by the body, tail and peri-ampullary. Majority of patients were diagnosed via surgery and received palliative care. In a second study by Kalubula et al, the ASIR of PC was 1.45 per 100 000 populations and the case fatality rate (CFR) was 36.3%[13]. No studies conducted in Zambia have assessed risk factors of pancreatic cancer and clinical outcomes such as survival and mortality.

Table 5: Characteristics of studies on Pancreatic cancer in Zambia

Study	Study design (period)	Total Sample Size	M: F (cases)	Mean age of cases(SD)	Histology	stage at presentation	Risk factors	Diagnosis	Management	outcome	Comments
Asombang et al, 2017 (Zambia & USA)	**Retrospective**	**27**	**1.7:1**	**55.7 (12.7)**	**Adenocarcinoma>neuroendocrine tumor**	**Stage 4 (100%)**	**-**	**Surgery**	**Palliative>>chemotherapy>none**	**-**	**Location: Head>>body>tail>periampullary**
Kalubula et al, 2021** (Zambia)	Retrospective	21512	-	-	-	-	-	-	-	-	- ASIR (Age standardised incidence rate) 1.45 per 10000 population - CFR (Case fatality rate) 36.3%

**Multiple GI cancers CFR - Case fatality rate ASIR - Age standardised incidence rate

DISCUSSION

GI cancers impose a significant medical and financial burden globally. Publications on gastrointestinal cancers in Zambia are scarce. Efforts directed at increasing cancer research are hampered by several obstacles throughout the continent, such as a lack of infrastructure, trained personnel, and research funding[35]. Africa has very few active researchers and a deficit of skilled healthcare workers due to immigration to more developed countries[36].

This study highlights the extent of gastrointestinal research in Zambia has focused on prevalence, risk factors, symptoms, potential screening methods, treatment modalities, and outcomes. Dietary patterns are significantly associated with all GI cancers in Zambia. Therefore, dietary and lifestyle modifications could potentially reduce risk of GI malignancies[37]. A study by Liu et al, evaluated the trends in the incidence of primary liver cancer caused by different etiologies and found a negative trend in nations with high socio-demographic indices, indicating that targeted strategies needed to be established[38].Chronic Hepatitis B virus (HBV) infection is the main cause of liver cancer in Sub-Saharan Africa. Several additional exposures to aflatoxin B1, co-infection with human immunodeficiency virus (HIV) and alcohol use are common and may exacerbate the risk in HBV-infected individuals[39]. Hepatitis C virus (HCV), non-alcoholic steatohepatitis/non-alcoholic fatty liver disease (NASH/NAFLD) are other leading causes[40].

Examining the epidemiology, risk factors, classification, genomic traits, and treatment approaches in a study found the development and occurrence of gastric cancer to be a multifactorial disease that was influenced by both environmental and genetic factors[41]. The mean age of patients with GC at the time of diagnosis, which increased steadily with age, was 61 years[21,22]. Lyons K et al, evaluated theclinical and environmental factors that affected the prevalence of gastric cancer and covered the

various intervention strategies that could be used to not only raise awareness of the disease but also increase screening in an effort to lower the risk[42]. The main risk factor was Helicobacter pylori infection. Geographical location, age, sex, smoking, socioeconomic status, dietary habits, and genetics were additional risk factors. The risk of gastric cancer can be decreased through primary and secondary prevention methods like dietary changes and screenings. Interventions with some promise as a preventive measure include the elimination of H. pylori through chemo prevention studies[42].

Globally, colorectal cancer is the third most common cancer in women and the fourth most common cancer in men. There is limited data regarding colorectal cancer in Zambia and sub-Saharan Africa due to recognized challenges of the database that result in incomplete or lower reported data[10].

When the endoscopic service originally started, in 1977, healthcare in Zambia was completely subsidized by the government and provided free at the point of care. Cost-sharing user fees were implemented at government hospitals after 1991, when the majority of the state's assets were being privatized and the economy could no longer afford universal, free healthcare[20].

Currently children, the elderly and immunocompromised (HIV seropositive, TB) receive free medical care and all diagnostic services attractive fees. Endoscopy presently costs 150 Zambian Kwacha (approximately USD 22), which a significant barrier to investigation is given that 60.5% of Zambia's population lives in poverty and can hardly afford it[20.]

Over the past forty years, there has undoubtedly been a change in public perception of the endoscopic service, which may contribute to the increased prevalence of esophageal cancer diagnosed. Awareness of the endoscopy services across the nation has certainly changed and this may explain the raising diagnostic rate[20]. Increased cancer research is essential for addressing the existing and anticipated rise in the cancer burden as well as serving as the basis for the creation and effective use of evidence-based approaches to disease prevention and control. However, efforts to increase the production of cancer research are hampered across the continent by issues such as a lack of infrastructure, qualified employees, research funding, and the constantly rising demand for limited resources [4 3].Training and financing for cancer research have not always been given primary attention.

However, there is promise for improving cancer research in Africa as a number of domestic and foreign partners are working in this direction. One illustration is the African Organization for Research and Training in Cancer. African Organization for Research and Training in Cancer was founded to increase cancer research in Africa, advance oncology training programs, assist African oncology research, and address the difficulties of developing effective cancer prevention campaigns to raise Awareness[44]. In addition, a number of international funding organizations have made appeals for promoting cancer research in Africa, particularly among early career researchers[45]. Training and financing for cancer research have not historically been top priority for many African nations. However, there are instances of nations that have just started implementing national research funding programs[46].

The issue of competent employees relocating to more developed areas is still a problem in Africa, where there is a lack of clinical researchers[36]. Therefore, there is need to curb the African brain drain, several funding mechanisms are set up to encourage skilled African researchers to accept positions in institutions in their home countries and contribute to improving local capacity[47]. Another tactic that has been successful in increasing the retention of African graduates is funding research training at African institutions[48].Journals specializing in oncology in global health have emerged, including the ASCO's JCO Global

Oncology, to promote cancer manuscripts from low resource countries[49].

Limitations encountered in this study were that some studies could not be retrieved due to a lack of full-text, and we only included studies that were in English which makes it possible that some non-English Studies were omitted. We analyzed gastrointestinal cancers publications in Zambia, our review does draw attention to the relatively low output of cancer-related research showing the need to employ deliberate efforts aiming at encouraging and facilitating cancer publications in Zambia.

CONCLUSION

In conclusion, this review highlighted the gaps in GI cancer research in Zambia. Future research should examine the barriers to research in Zambia. The authors suspect the limited funding of non-HIV-related research to be one of these barriers.

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Competing interests

All authors declare no conflict of interests.

Authors' contributions

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All the authors have read and agreed to the final manuscript.

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