

Original Article

Cancer Publications in One Year (2022): A Cross-Sectional Study

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Abstract

Introduction

Cancer is the uncontrollable and abnormal division of cells in a specific part of the body, which can spread to adjacent areas. The number of scientific publications on cancer has increased significantly over the past few decades. The objective of the current study is to evaluate scientific publications on cancer in 2022.

Methods

A cross-sectional study was conducted on published papers on cancer in 2022. The data were collected online from the Google Scholar search engine and recorded in Microsoft Excel 2010. The extracted data were calculated and thoroughly re-evaluated, and they were presented as frequencies and percentages.

Results

A total of 167,129 medical studies on cancer in various body organs were collected for the study, with 37,500 studies specifically focused on breast cancer. This represented the highest number of studies in 2022, while only 4 articles were specific to glottis cancer, marking the lowest number in that year.

Conclusion

The existence of a gap between the incidence rate of each cancer type and scientific literature may lead to a defect in our understanding of the nature of the diseases.

1. Introduction

Cancer can be defined as uncontrollable and abnormal cell division in a specific part of the body that can spread to other adjacent or distant parts [1]. Initiation of cellular proliferation, differentiation, and undergoing the process of apoptosis are strictly ordained by regulatory signals, while cancer cells are independent and gain autonomy over these signals [2]. This behavioral disruption of the cells originates from multiple

genetic mutations due to either hereditary or environmental factors [2,3]. The proposed environmental carcinogens are radiations (radioactivity, ultraviolet, electromagnetic field), certain viral families (Retroviridae, Papovaviridae, Herpesviridae), xenochemicals, air pollution, biocides, pesticides, and metals [4]. At the molecular level, normal cellular functions are carried out by proteins encoded by specific genes. Protein synthesis involves a series of steps, each requiring its own set of activated enzymes. Most of these steps

are susceptible to being affected, leading to modifications in the structure or quantity of proteins, which in turn can result in alterations in cellular function. Malignant transformation is induced by two or more mutant abnormalities in the same cell. The mutations can be inherited or sporadic. At the nucleotide level, types of mutation are substitution, addition, deletion, and activation of multiple oncogenes including the p53, c-fms, and Ras genes by point mutation leading to amino acid substitution in the composition of proteins [5]. Globally, in 2019, cancer was the fourth most common cause of death in patients at the age of 15 years old. There were 1.9 million cancer cases, resulting in 396,000 deaths [6]. As claimed by Globocan statistics, there were 19.3 million new cancer cases and about 10 million cancer deaths worldwide in 2020 [7]. According to Cancer Research UK, 375,000 new cancer cases arise in the UK each year, which is around 1,000 each day. In addition, there are around 167,000 cancer deaths in the UK every year, which constitute 460 cases every day [8]. Nevertheless, significant increases have been noticed in the incidence of colon cancer in people under 50 years in Denmark (by 3.1% per year), New Zealand (2.9% per year), Australia (2.9% per year), and the UK (1.8% per year) [9].

The present study aims to examine the number of published articles on cancer in 2022 and categorize them based on body organs and types of cancer.

2. Methods

2.1. Study design

This cross-sectional study was conducted on the studies whose main focus was on cancers in human beings. The study was conducted over a one-month duration, from February 1st, 2023, to March 1st, 2023.

2.2. Setting

The search engine 'Google Scholar' was exhaustively searched for all relevant publications in the English language, using the keywords; cancer OR cancers OR carcinoma OR carcinomas OR cancerous OR malignant OR malignancy OR malignancies OR malignance. For all of the cancers included in our research we used these keywords according to each type: (brain "intracranial"), (lung), (esophageal "esophagus"), (liver "hepatic"), (gastric "stomach"), (eyes "ocular"), (nasosinonasal), (ear), (oral), (tongue), (small intestine "small bowel"), (colorectal "large intestine", "large bowel"), (pancreas "pancreatic"), (bladder "vesical"), (prostate "prostatic"), (endometrial "uterus", "uterine"), (penile-"penis"), (testicular-"testis"), (thyroid), (adrenal), (skin "cutaneous"), (salivary gland), (pituitary), (parathyroid), (bone marrow), (bone "skeletal"), (nasopharynx, oropharynx, hypopharynx, supraglottic, glottis, subglottic), (lymphatic system), (cervical), (ovarian), (renal "kidney"), (breast), (vulvar "vaginal") and (anal "anus"). To supplement data collection, references in the retrieved studies were also checked for eligibility.

2.3. Inclusion criteria

discussed cancers or types of cancer that have been published in 2022.

2.4. Exclusion criteria

The exclusion criteria included articles with only abstracts available, non-English articles, pre-print articles (non-peer-reviewed), and published articles in predatory journals. Predatory journals were defined and determined based on Kscien's list [10].

2.5. Data analysis

Data were collected by unprinted forms from Google Scholar, then entered and summarized by Microsoft Excel 2010, and the extracted data were organized and thoroughly re-evaluated. The IBM SPSS Statistics software was used for descriptive analysis. The data were displayed as frequencies and percentages.

3. Results

The study included 167,129 medical studies in the search engine "Google Scholar". A total of 37,500 studies (22.4%) were specific to breast cancer, which was the most focused cancer. The minimum number of studies in cancer research was on glottis cancer, which had only four studies. In total, the studies focused on cancer in 34 different organs and the throat's components. Regarding the type of cancer, hepatocellular carcinoma was the most commonly studied cancer in 9090 studies (76.8%) among liver cancers in 2022, and 5.44% among all cancers in 2022. The least common ones, on which only one study was performed, are basal cell carcinoma of the anal canal, vulval melanoma, transitional cell carcinoma of the prostate, sinonasal lymphoma, oral cavity lymphoma, renal sarcoma, and verrucous carcinoma of the vulva. It was found that the majority of brain cancer studies were on medulloblastoma (22%), and the minority of them were on oligodendroglioma (2.4%). The most commonly mentioned lung cancer studies were on non-small cell carcinoma (38.4%), and the least ones were on squamous cell carcinoma (3.2%). The most prevalent studies on oesophageal cancer were on squamous cell carcinoma (49%), and the least prevalent were on adenocarcinoma (11%). Adenocarcinoma (10%) was the most common cancer focused on in the studies on gastric cancer, and neuroendocrine tumors were the least commonly mentioned (0.4%). Regarding ocular cancer, the studies were commonly on retinoblastoma (38.7%), and the fewest of them were on medulloepithelioma (1.7%) (Table 1).

4. Discussion

The term "cancer" is confined to a wide spectrum of diseases that are caused by unregulated cellular division and biological cell death (apoptosis). Cancers are specified by the cell types, tissues, or organs from which they arise [11]. More than 200 various types of cancer have been classified [12,13]. confirmed primary modalities for the treatment of cancer include surgery,

Table 1. Distribution of published papers in 2022 regarding the site of cancer origin and types of cancer

Cancer regarding the origin site	Number of studies	Cancer Types	N. (%)
Brain tumor	2,305	Medulloblastoma	506 (22%)
		Astrocytoma	225 (9.8%)
		Ependymoma	179 (7.8%)
		Oligodendroglioma	56 (2.4%)
		Others	1339 (58%)
Lung cancer	17,769	Non-small cell carcinoma	6821(38.4%)
		Adenocarcinoma	2856 (16.1%)
		Small cell carcinoma	945 (5.3%)
		Squamous cell carcinoma	562 (3.2%)
		Others	6585 (37%)
Esophageal cancer	2,930	Squamous cell carcinoma	1426 (49%)
		Adenocarcinoma	327 (11%)
		Others	1177 (40%)
Liver cancer	11,840	Hepatocellular carcinoma	9090 (76.8%)
		Others	2750(23.2%)
		Adenocarcinoma	629 (10%)
		GIST	293 (4.6%)
Gastric cancer	6,304	Lymphoma	82 (1.3%)
		Diffuse gastric tumor	50 (0.8%)
		Neuroendocrine tumor	23 (0.4%)
		Others	5227 (82.9%)
Ocular cancer	119	Retinoblastoma	46 (38.7%)
		Uveal melanoma	17 (14.3%)
		Squamous cell carcinoma of the conjunctiva	3 (2.5%)
		Medulloepithelioma	2 (1.7%)
		Others	51 (42.8%)
Nasal, Sinonasal cancer	320	Olfactory neuroblastoma	34 (10.6%)
		Squamous cell carcinoma	30 (9.4%)
		Melanoma	7 (2.2%)
		Lymphoma	1 (0.3%)
Ear cancer	22	Others	248 (77.5%)
		Basal cell carcinoma	3 (14%)
Oral cancer	4,118	Others	19 (86%)
		Squamous cell carcinoma	1030 (25%)
		Verrucous carcinoma	6 (0.15%)
		Lymphoma	1 (0.02%)
Tongue cancer	275	Others	3081 (74.82%)
		Squamous cell carcinoma	117 (42.5%)
		Others	158 (57.5%)
Small intestine cancer	1,351	Lymphoma	114 (8.4%)
		Adenocarcinoma	98 (7.3%)
		Sarcoma	31 (2.3%)
		Carcinoid	11 (0.8%)
		Others	1097 (81.2%)

Table 1. Continued...

Colorectal cancer	11,100	Adenocarcinoma	618 (5.6%)
		Lymphoma	102 (0.9%)
		Neuroendocrine tumor	29 (0.3%)
		Familial colorectal cancer	24 (0.2%)
		Others	10327 (93%)
Pancreatic cancer	1,794	Adenocarcinoma	1174 (65.4%)
		Pancreatic neuroendocrine tumor	449 (25%)
		Colloid carcinoma	84 (4.7%)
		Acinar cell carcinoma	49 (2.7%)
		Adenosquamous carcinoma	15 (0.8%)
		Pancreatoblastoma	3 (0.2%)
Bladder cancer	3,450	Others	20 (1.1%)
		Transitional cell carcinoma	379 (11%)
		Squamous cell carcinoma	26 (0.8%)
		Adenocarcinoma	6 (0.2%)
		Others	3039 (88%)
Prostate cancer	10,039	Neuroendocrine tumor	117 (1.2%)
		Adenocarcinoma	35 (0.3%)
		Squamous cell carcinoma	7 (0.07%)
		Sarcoma	4 (0.04%)
		Transitional cell carcinoma	1 (0.01%)
Endometrial cancer	2,765	Others	9875 (98.4%)
		Uterine sarcoma	112 (4.1%)
		Endometroid adenocarcinoma	62 (2.2%)
		Uterine cell carcinoma	22 (0.8%)
		Squamous cell carcinoma	17 (0.6%)
		Uterine papillary carcinoma	4 (0.1%)
Penile carcinoma	313	Others	2548 (92.2%)
		Squamous cell carcinoma	66 (21%)
		Sarcoma	6 (2%)
		Melanoma	2 (0.6%)
Testicular cancer	352	Others	239 (76.4%)
		Seminoma	132 (37.5%)
		Stromal tumor	15 (4.3%)
		Non-seminoma	5 (1.4%)
		Others	200 (56.8%)
Thyroid cancer	4,150	Papillary	1280 (30.84%)
		Medullary	281 (6.8%)
		Anaplastic	195 (4.7%)
		Follicular	154 (3.7%)
		PTMC	6 (0.14%)
		Hurthle cell carcinoma	4 (0.1%)
		Malignant lymphoma	4 (0.1%)
		Others	2226 (53.63%)

Table 1. Continued...

		Melanoma	995 (42%)
		Basal cell carcinoma	598 (25%)
Skin cancer	2,389	Squamous cell carcinoma	487 (20%)
		Porocarcinoma	25 (1%)
		Others	284 (12%)
		Pheochromocytoma	446 (37%)
Adrenal cancer	1,203	Neuroblastoma	361 (30%)
		Others	396 (33%)
		Parotid tumor	193 (43%)
		Submandibular cancer	33 (7.4%)
Salivary gland carcinoma	448	Mucoepidermoid carcinoma	27 (6%)
		Minor salivary gland tumor	11 (2.5%)
		Sublingual gland tumor	4 (0.9%)
		Others	180 (40.2%)
Pituitary cancer	67	None	0.04%
Parathyroid cancer	136	None	0.08%
		Multiple myeloma	3600 (58.5%)
		AML	1425 (23.1%)
		CLL	459 (7.5%)
Bone marrow cancer	6,153	CML	263 (4.3%)
		ALL	74 (1.2%)
		Others	332 (5.4%)
		Osteosarcoma	1590 (42.8%)
		Ewing sarcoma	363 (9.8%)
		Chondrosarcoma	258 (7%)
Bone cancer	3,711	Fibrosarcoma	97 (2.6%)
		Leiomyosarcoma	7 (0.2%)
		Clear cell chondrosarcoma	4 (0.1%)
		Others	1392 (37.5%)
Nasopharyngeal cancer	1,335	None	0.8%
Oropharyngeal cancer	714	None	0.4%
Hypopharyngeal cancer	202	None	0.12%
Supraglottic cancer	88	None	0.05%
Glottic cancer	4	None	0.002%
Subglottic cancer	24	None	0.01%
		Hodgkin lymphoma	3660 (41.7%)
Lymphoma	8,780	Non-Hodgkin lymphoma	766 (8.7%)
		Others	4354 (49.6%)

Table 1. Continued...

		Epithelial cell tumor	730 (12.1%)
Ovarian cancer	6,048	Germ cell tumor	26 (0.4%)
		Stromal tumor	12 (0.2%)
		Others	5280 (87.3%)
Cervical cancer	5,429	Squamous cell carcinoma	198 (3.6%)
		Adenocarcinoma	32 (0.6%)
		Small cell carcinoma	21 (0.4%)
		Others	5178 (95.4%)
Renal cancer	4,257	Renal cell carcinoma	3229 (75.85%)
		Wilms tumor	246 (5.8%)
		Lymphoma	3 (0.07%)
		Transitional cell	2 (0.05%)
		Sarcoma	1 (0.02%)
		Others	776 (18.2%)
		Ductal carcinoma	257 (0.7%)
Breast cancer	37,500	Inflammatory breast cancer	198 (0.5%)
		Metaplastic	83 (0.2%)
		Intensive lobular carcinoma	76 (0.2%)
		Papillary	36 (0.1%)
		Mucinous	32 (0.1%)
		Micropapillary carcinoma	17 (0.05%)
		Apocrine carcinoma	13 (0.04%)
		Medullary carcinoma	7 (0.02%)
		Tubular carcinoma	3 (0.01%)
		Others	36778 (98%)
		Squamous cell	46 (42%)
Vulvar cancer	110	Verrucous carcinoma	1 (1%)
		Melanoma	1 (1%)
		Others	62 (56%)
Bladder cancer	6,863	Urothelial carcinoma	1440 (21%)
		Transitional cell carcinoma	389 (5.65%)
		Squamous cell carcinoma	48 (0.68%)
		Small cell bladder carcinoma	19 (0.28%)
		Adenocarcinoma	22 (0.32%)
		Plasmacytoid	8 (0.1%)
		Micropapillary	7 (0.1%)
		Sarcomatoid	5 (0.07%)
Others	4925 (71.8%)		
Anal canal cancer	329	Squamous cell carcinoma	84 (25.5%)
		Adenocarcinoma	3 (1%)
		Basal cell carcinoma	1 (0.3%)
Appendiceal cancer	23	Others	241 (73.2%)
		None	0.013%
Total	167,129		

GIST: Gastrointestinal Stromal Tumor, PTMC: Papillary Thyroid Microcarcinoma, AML: Acute Myeloid Leukemia, ALL: Acute Lymphocytic Leukemia, CML: Chronic Myeloid Leukemia, CLL: Chronic Lymphocytic Leukemia.

The study's selection criteria concentrated on all articles that

radiotherapy, and chemotherapy, either as monotherapy or in combination [14,15]. Regarding cancers of the central nervous system (CNS), glioblastoma was not only the most common type but also the most aggressive one, which also has an inadequate response to chemoradiation. In a study based on data from 1999 to 2016, CNS cancers were responsible for considerable morbidity and mortality. The incidence has increased by 17.3%, of which 330,000 cases were reported only in 2016, and East Asia took the largest share, with about 108,000 cases for both sexes. In 2022, worldwide, 2,305 studies were conducted about brain tumors. However, a considerable geographical and regional difference in CNS cancer was noted; it might indicate variations in diagnosis, documentation, ethnicity, or environmental exposures. As reported by the National Brain Tumor Society, only in the United States, an estimated 700,000 people have a primary brain tumor [16,17]. Regarding lung cancer, nearly 17,769 studies have been conducted since 2022. Among the deadliest cancers, lung cancer is at the top of cancer-related deaths globally because of late diagnosis, limited treatment, and interventions [18]. Though squamous cell carcinoma (SqCC) falls into the most common lung cancer category, no efficient, targetable agents have been discovered. Histologically, lung carcinoma is classified into two major groups: small-cell lung carcinoma (SCLC), which accounts for 15% of all lung cancers, and non-SCLC, which accounts for around 85% of all cases. Only in 2022, approximately 6,821 studies have discussed NSCLCs, which are generally subclassified into adenocarcinoma, SqCC, and large cell carcinoma [18]. Recently, the widely used methods for NSCLC treatment include surgery, radiotherapy, chemotherapy, targeted therapy, immunotherapy, and comprehensive therapy. Despite all of these modalities, no effective improvement in the survival rate has been recorded. Lung cancer is the most frequent cancer among males, followed by prostate and colorectal cancers. It is the third most common cause of death in males after liver and stomach cancers. Thyroid cancer is the most recurring cancer among endocrine organs. There has been a comprehensive rise in the prevalence of thyroid malignancy over the past few decades. According to the National Cancer Institute, the estimated number of new thyroid cancer cases in 2022 was 43,800, which was about 2.3% of all new cancer cases. Moreover, the estimated number of deaths in 2022 due to thyroid cancer was 2,230. However, it was only 0.4% of all cancer deaths [19,20]. This study is in line with American Cancer Society data, which reported 43,720 new cases of thyroid cancer (12,540 in males and 31,180 in females) in addition to 2,120 deaths from thyroid carcinoma (970 in males and 1,150 in females) [18]. Among the subtypes, papillary thyroid carcinoma (PTC) is primarily accountable for this rise; among 4150 studies in 2022, 1280 (30.84%) were about PTC. In a study conducted in Pakistan, about 374 thyroid lesions were reassessed, and 56 cases were cancerous. PTC constituted about 43 (76.78%) cases [19]. Thyroid carcinoma is nearly three times more common in women than men, and it is more widespread in white people than in black people [19]. Regarding liver cancer, in a study published in the *Journal of Hepatology*, scientists from the International Agency for Research on Cancer (IARC) and partner institutions calculated

the global load of liver malignancy in 2020 and guessed that the number of new cases and deaths per year would increase by more than 55% before 2040 [21]. This conclusion goes with the data from the World Cancer Research Fund (WCRF). Mongolia had the highest rates of liver cancer and the highest number of deaths due to the disease in 2020, followed by Egypt. About 11,840 studies were conducted on liver cancer worldwide in 2022. Parathyroid carcinoma (PC) is not only a rare endocrine carcinoma but also an aggressive one. Moreover, it's not a common cause of primary hyperparathyroidism; this might be the reason for not having an abundance of studies; there are only 136 studies worldwide about parathyroid cancer, with a frequency of 0.08% of all cancers. It is usually seen among old-aged Caucasians, with a slight male predominance [22]. Parathyroid malignancy is most often diagnosed in patients over 30 years of age [23]. Regarding esophageal cancer, despite being a rare type of cancer, it is aggressive and develops slowly. It makes up nearly 1% of cancer cases in the United States, and 80% are adenocarcinomas. The frequency of new cases per year is around 4 per 100,000 people, and it is more prominent in men compared to women [24]. The number of studies on esophageal malignancy was about 2,930 in 2022. Bone cancer is not a widespread type of cancer compared to other types of malignancies. Among the subtypes, osteosarcoma contributes 36% of all types of bone cancer. It affects mainly the leg bones of children and young adults [25]. Also, this kind is more frequent among girls younger than 15 and boys over 15. In Hawaii, American Chinese males have the highest incidence rate of bone cancer (6.4 per 100,000) [25]. In the most recent study, the countries with the highest incidence of bone cancer were Australia, New Zealand, Ireland, and the United States [26]. Regarding breast cancer, the pathophysiological background is multifaceted and still poorly comprehended, but certain risk factors have been revealed. Female sex and advancing age are considered the most common risk factors [27,28,29]. In 2022, 290,560 new cases were recorded in the United States of America among both sexes [30]. Despite considerable progress in diagnosing and treating breast cancer, a number of key clinical and scientific issues remain to be resolved regarding prevention, diagnosis, prognosis, recurrence, and treatments [31]. The current study reported that 37,500 (22.4%) studies in 2022 were published under the title "breast cancer." This might have originated from the urge to reveal poorly understood aspects of the disease and evaluate the most effective intervention in order to meet its growing burden. Ductal cell carcinoma in situ (DCIS) is an unlimited division of neoplastic luminal cells that are restricted to the duct-lobular system of the breast tissue. The DCIS advances toward invasive breast cancer when the abnormal cells reach the ductal basement membrane and intrude into the surrounding parenchyma [32]. The incidence rate among women under 50 years of age has been continuing to rise since 1983 [33].

Primary cancers of the small bowel are infrequent, representing less than 1% of all adult malignancies. The most commonly found type is adenocarcinoma; however, carcinoid tumors exhibit the most frequent histological type; other types are

sarcomas and lymphomas [34]. Small intestine cancers were subjected to 1,351 studies in 2022, compared to a previous study conducted by Rebecca et al., which revealed that cancer was diagnosed in 11,790 cases only in the United States of America during 2022 [30]. A further study conducted by Chow et al. demonstrated that the mean annual incidence of adenocarcinoma is 3.7 per million individuals, followed by carcinoid and lymphoma, which are 3.6 and 1.1 per million people, respectively [35]. This is disproportionate to the number of publications in 2022, including 114, 98, and 31 papers for lymphoma, adenocarcinoma, and sarcoma, respectively. Colorectal cancer has remained uncommon for several decades; however, it has grown to be a common cancer and recently represents approximately 10% of mortality from cancer in the Western world [36]. The incidence rate has also increased in developing countries [37]. Based on a study conducted by Abu Hassan et al., the incidence rate varies among different ethnicities. Variation can emerge from different geographical backgrounds, variable risk factors, and genetic compositions. Surgery is the cornerstone therapeutic approach to localized colorectal cancer, and adjuvant chemotherapy is typically suggested for lymph node metastases. A combination of surgery, chemotherapy, and radiotherapy are the essential components of the treatment of rectal cancer [37]. Its huge burden aligns with being exposed to a large number of scientific works in 2022, which was nearly 11,100 papers. Risk factors for prostate cancer are multiple and diverse, including genetic predisposition, inflammatory and infectious factors, androgen-dependent factors, age, ethnicity, and dietary factors [38]. According to previous statistics by Siegel et al., the incidence rate of prostate cancer has steadily increased to 268,490 cases in 2022. The current study highlighted that prostate cancer has been entitled 10,039 times among all publications in 2022. The ongoing studies might aim to identify the factors that reduce the risk of prostate cancer and develop preventative strategies [38]. Ovarian cancer is responsible for 4% of all cancers in females and is the main cause of mortality from gynecologic malignancies. Because ovarian cancer is asymptomatic at an early stage, about 75% of patients have advanced disease at the time of diagnosis [39]. A study by Malvezzi et al. showed that the ovarian cancer mortality rate declined by 10% between 2002 and 2012, and the mortality rate was 5.2 cases out of 100,000 cancer cases in Europe. The decline was approximately 16% in the USA, with a mortality rate of 4.9 per 100,000 in 2012 [40].

5. Conclusion

The existence of a gap between the incidence rate of each cancer type and the scientific literature may lead to a defect in our understanding of the nature of the disease, identification of risk factors, the effectiveness of screening programs in early detection of the disease, prevention of recurrence and the most curative therapeutic approach.

Declarations

Conflicts of interest: The author(s) have no conflicts of interest to disclose.

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Patient consent (participation and publication): Not applicable.

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