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Research Article

Dr. Tony Dhillon, a British-Born Medical Oncologist of Indian Origin, the Pioneer of Recent Innovation of Bowel Cancer Vaccine: A Medicometric Portrait

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ABSTRACT

Dr. Perminder Tony Singh Dhillon, popularly known as Dr. Tony Dhillon, is a celebrated medical oncologist and pioneer of recently (first) developed bowel cancer vaccine, under whose headship groundbreaking global trial of the vaccine is going on. This medicometric study covers his 29 publications during 2003-2023 with 269 co-authors. He has one single authored and 28 multi-authored paper. His highest number of publication is 6 in 2005. Using his biographical data and bibliographic-information, this study draws a short life history and journey of the Britain-born medical scientist of Indian origin (Punjab) in cancer research and identifies his year wise growth of research publications, authorship patterns, author productivity, research team and co-authors, leading collaborative authors, scattering of publications in several communication channels. His most notable journal is *Journal of Clinical Oncology*, a high impact UK journal for his paper publication. In all, degree of collaboration is 0.96. It counts Citation Growth Rate according to citation received in different *Abstracting and Indexing Journals* (GS, PM and RG) including citation analysis, Citation received patter, Relative Un-cited Index (RUI) and Relative Citation Impact (RCI), etc. The RUI values for the study period ranged from 0.01 to 0.03 in three databases. The highest RCI value is 2.74 in RG in 2006. Among highest frequency keywords, *Colorectal* (Colon+rectum) *cancer*, that is, bowel cancer, the prime theme of this study along with other nine has been appeared 3 times each. It also examines whether the data set follows Lotka's Law and Bradford's Law or not.

Keywords: Perminder Tony Singh Dhillon, Biobibliometric, Medicometric, Citation Growth Rate, Citation Relative Impact, Relative un-cited index, Tony Dhillon, Punjab, Bowel cancer, Colorectal Cancer, Bowel cancer vaccine, Surrey University (UK).

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INTRODUCTION

If pages of newspaper, TV news channels and different social medias are turned, statistics of cancer cases and deaths due to it around the world will be seen every day. It is a big cause for anxiety of nations. Cancer and chance of survive form it, are the biggest challenge for the medical scientists, practioners, educands, especially oncologists and living long of the nations. Cancer is no exception in our lives. Its long-term treatment and much expenditure become people beggar on the way. Cancer or oncology is a much-debated topic/discipline and burning burden in medical research till now. Each individual's discovery in oncology research once unitedly will win the fight against cancer. It's just a matter of time.

Oncology is a branch of medicine and health sciences. It varies in names such as cancers, malignant neoplasms, malignant growth or tumor, neoplastic diseases, carcinoma, etc. (Dewey, 2003; Collins Dictionary, 2024). Oncology deals with the diagnosis, medical and surgical treatment of cancer. It is the study of cancer for prevention and cure cancer patients. Oncology, literary, has derived from the Greek term "ὄγκος (*ónkos*)", meaning "tumor", "volume" or "mass" (OUP, 2014) from which later 'cancer' may form. Cancer is 'a serious disease in which cells in a human's body increase rapidly in an uncontrolled way with abnormal growths' (Collins Dictionary, 2024) and 'spread to other parts of the body' (NCI, 2021). In a word, cancer is a disease of an uncontrolled cell division in human's body. Broadly, this branch of medicine includes 'Medical oncology' that focuses on the use of chemotherapy, immunotherapy, hormone therapy and other drugs to treat cancer; 'Radiation oncology'-the use of radiation therapy to treat cancer; and 'Surgical oncology'-the use of surgery and other procedures to treat cancer (Physiopedia, 2024). Cancer is a terror in lives of human beings over the world. Cancer is the

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most dangerous disease in the today's world than other diseases. Day by day, there is a tremendous up trend in spreading cancer throughout India as well as world. Rate of death due to cancer is high. It has no confirm-single treatment till now in the world. Till recent past, its treatment mostly was based on likely '*prevention is better than cure.*' So, people have a great panic because of having their misconception. Mostly think that cancer means death. However, due to today's rapid advancement in medical science including quick disease detection and treatment technology, some of the cancers such as breast, lung, blood and prostate cancers are possible to cure fully at right time (Ghosh, 2024) at the primary stage. All these may be called 'curable cancers' or in other words, some 'cancer finds answer' nowadays. There is no doubt that a patient who is diagnosed today with a cancer has a better treatment than a patient diagnosed 20 or 50 years ago. It is still far to kill cancer permanently. The challenges are still numerous. Hence, '*oncologic biomedical research*' should be given a worldwide priority (Piña-Sánchez and *et al*, 2021). In regard to, a recent good news should be noted that bowel cancer vaccine has been developed by Dr. Tony Dhillon. Colorectal or bowel can be cured using it without any surgery (Dutta, 2024a). It has been currently published in different mass and social Medias.

Definitions of Cancer

Cancer as a disease has been described in the history of medicine. The origin of the word '*cancer*' is credited to the Greek physician Hippocrates (460-370 BC), the "Father of Medicine." He used the term "karkinoma" for denoting non-ulcer forming and ulcer forming tumors. In Greek, the word "karkinoma" ('carcinos' or 'carcinoma') refers to a crab ("karkinoma" means "crab" in Greek)- 'a sea animal with a shell and ten legs' (Collins India, 2013). There is a central body to a tumor and the tumor extension appeared as the legs of the "crab" (National Cancer Institute, n.d.; Herndon, 2023) i.e., the finger-like spreading projections of cancer in the tumor that looks like the shape of a crab. Hence, image of crab is generally used as the logo of cancer. The Roman physician, Celsus (25 BC - 50 AD), later translated the Greek term into 'cancer'. Galen (130-200 AD), another Greek physician, used the word "oncos" (means swelling) to describe tumors. Although, the crab analogy of Hippocrates and Celsus is still used to describe malignant tumors. Galen's term is now used as a part of the name for cancer specialists-oncologists (American Cancer society, 2024, 2024a; Mandal, 2023; Herndon, 2023; Free dictinary.com, n.d). According to WHO, "Cancer is a large group of diseases that can start in almost any organ or tissue of the body when abnormal cells grow uncontrollably, go beyond their usual boundaries to invade adjoining parts of the body and/or spread to other organs. The latter process is called metastasizing and is a major cause of death from cancer." (Mint, 2023). Most types of cancer cells form a lump, or mass called a tumor. Not all tumors are cancer. A tumor that is not cancer is called benign, that means not harmful in effect. A cancerous tumor is called malignant. A cancerous tumor can invade and destroy healthy tissue (American Cancer society, 2024).

History of cancer

Cancer was discovered nearly thousands of years back. Most likely it was began from before the evolution of humans. It was first documented in Egypt about 5,000 years ago. Few earliest evidences, cancer were found among fossilized bone tumors, human mummies in ancient Egypt and ancient manuscripts (Herndon, 2023). Nearly 2,700 years ago, a 40-50-year-old Scythian king was recorded the first scientifically documented person as cancer patient who lived in the desert area of Southern Siberia (Faguet, 2014). Cancer case reports from India began in the 17th century (Smith and Mallath, 2019). Its historical back ground is long span of time. Shortly, some historical facts may be mentioned. In 1628, '*Autopsies*', developed by Harvey for examining the circulation of blood throughout the heart and body. Giovanni Morgagni of Padua in 1761 used autopsies to find the cause of diseases. Karl Thiersch, a German surgeon, was the first person who proved that cancer spread through malignant cells in 1860. In 1879, the term *'biopsy'* was coined and introduced into medical terminology by Ernest Besnier. It had restricted application until the mid-20th century. At present, the method is widely adopted and its use is general and for total human organism. Its use is not only in cancer treatment but in all clinical specialties (Zerbino, 1994). Biopsy is a clinically strong technique to confirm cancer from a tumor. Between 1860 and 1910, several documents of cancer were published by Indian Medical Service Doctors around India. Cancer treatment was done by surgery to remove cancerous tumors and affected organs throughout most of the 1800s. The X-rays was discovered by a physicist, Wilhelm Konrad Roentgen in 1895 and it used to diagnose cancer cases and confirmed the way for radiation therapy (Herndon, 2023). From a study on autopsy, pathology and clinical data between 1917 and 1932 from various medical college and hospitals across India, it has been found that cancer was a common cause of death in middle-aged and elderly Indians (Smith and Mallath, 2019).

19th century

The 19th century saw the birth of scientific oncology with use of the *modern microscope* in studying diseased tissues. Rudolf Virchow, a pathologist, often called the *founder of cellular pathology*, provided the scientific basis for the modern pathologic study of cancers under the microscope. He also developed study of tissues taken outside the body after surgery (Mandal, 2023; American Cancer Society, 2014, 2024a). The German chemist, Paul Ehrlich coined the term *"chemotherapy."* He started working with drugs to treat infectious diseases in the early of this century. Chemotherapy is the use of chemicals to treat cancer disease (Herndon, 2023).

20th century

The 20th century was the prime time in cancer research. *Carcinogens, chemotherapy, radiation therapy*, etc. were all used to diagnose cancer in these years. Several developments (Herndon, 2023) in cancer research of the century were very remarkable, such as: 1962: James Watson and Frances Crick introduced an outstanding work on the *chemical structure of DNA*, for which a Nobel Prize was awarded to him. 1981: Takeshi Hirayama, Japanese professor, published the first *research linking lung cancer*. 1982: Baruch S. Blumberg played a role in developing vaccine against *hepatitis B, a cause of liver cancer*. 1989: The first gene therapy cancer treatments began to evolve. 1994: The *BRCA1 gene*, the first known gene, was discovered. It can suggest a person to developing breast or ovarian cancer**.** 1999: Jan Walboomers and Michele Manos found evidence implicating *Human Papilloma Virus (HPV)* to 99.7% percent of cervical cancers.

21st century

The 21st century witnessed the following period with cancer: 2006: The first *vaccine against the HPV virus* was approved in the United States. 2009: Introduced *immunotherapy* that improves cure rates for children with neuroblastoma. 2011: Found *Low-dose Computed Tomography (CT) scans* for reducing lung cancer deaths by finding early-stage cancer in high-risk people. 2016: A gene therapy called *CAR-T for B-cell* hematologic cancers was introduced. 2021: The *OncoKB, a genetic variant database*, was recognized by the Food and Drug Administration (FDA), USA. It is a tool for predicting drug responses in cancer patients. Using this tool, oncologists could find the best individual treatments for specific types of cancer. Recently, 2024: *Bowel cancer vaccine* was developed by Dr. Tony Dhilllon, at present under trail in Australia (Dutta, 2024a)**.** 2024: Dr. Rajendra Bhorve, Senior Cancer Surgeon, Mumbai Tata Memorial Cancer Hospital, India, produced *a cancer preventive "Tablet" (Pro-oxidant with copper tablet)* (Anandabazar Ptrika, Kolkata, 2024).

Modern Treatment

Oncologists are using different technologies for better treatment and correct diagnosis of cancers such as Precision oncology; AI-based risk profiling to screen for common cancers, Ai based X-ray; Liquid and synthetic biopsies, better than biopsies

Table 1: Statistics for Top 5 cancer sites for males worldwide, 2022.

Rank	Types of Cancer	Number of Males	
		Total	%-age
1	Lung	1 572 045	15.2
2	Prostate	1 467 854	14.2
3	Colorectal (bowel)	1 069 446	10.4
4	Stomach	627 458	6.1
5	Liver	600 676	5.8
	Others	4 974 131	48.2
Total		10 311 610	100

Data source: (WHO Global Cancer Observetory, 2024).

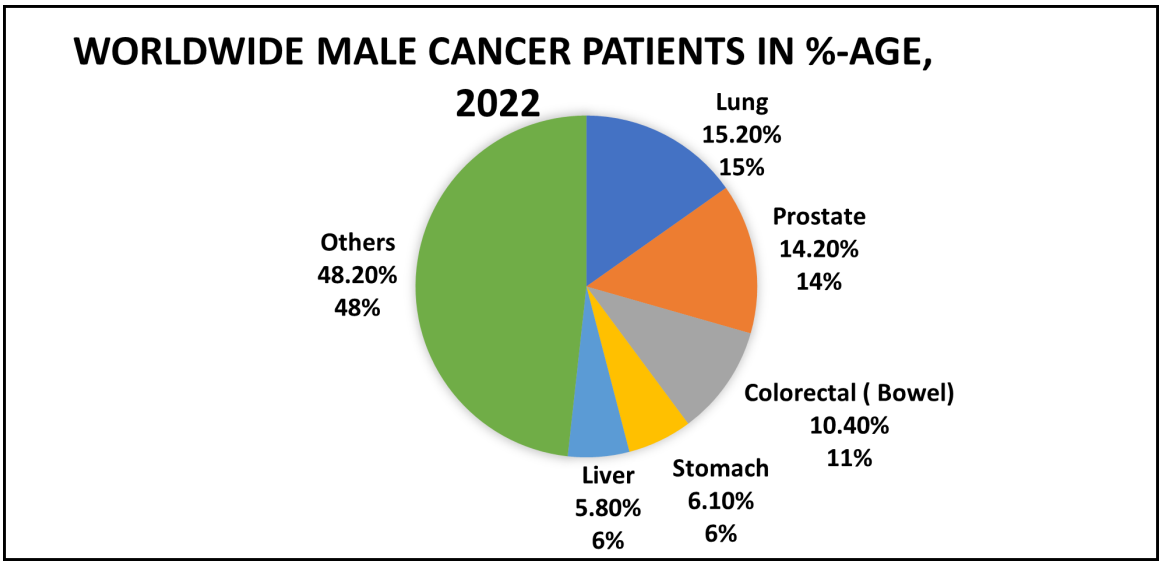

Figure 1: Leading cancers in male worldwide, 2022.

in laboratory; CAR-T-cell therapy/ Immunotherapy (World Economic Forum, 2022).

Recently, in October, 2023, Central Drug Standard Control Organization (CDSCO) of India gave approval for use of CAR-T therapy. This therapy opens a new ways to prevent blood cancer in India (Eai Samay, Kolkata, 2024). Cornel Dr. V K Gupta, Gastroentology specialist of Delhi was the first blood cancer patient in India on whom this CAR-T theory was applied. In addition, Dr. Tony Dhillon, Britain-born medical oncologist of Indian origin provides treatment using his currently discovered Bowel Cancer Vaccine (2024). Though, it is under trail (Dutta, 2024a). A cancer preventive "Tablet" (Pro-oxidant with copper tablet) was just produced by Dr. Rajendra Bhorve. Its cost is only INC Rs.100/- that can be reduced 50% side effects like radiation or chemotherapy (Anandabazar Ptrika, Kolkata, 2024). There are so many cancer treatment centers running in India and abroad. These centres provide cancer treatment using Ayurveda, or Homeopathic or Allopathic medicine along with modern technology and mental supports. Dr. Arnob Gupta, Director of *Saroj Gupta Cancer Centre and Research Institute, Thakur Pukur, Kolkata* (Ghosh, 2024) said with confidence that value of time for cancer is very important. Cancer patients can be 90-100% cured if its treatment is started at the Stage-I, whereas 60-70% possibility at Stage-II and 40-45% at Stage-III. Even if it is detected at Stage – IV, the cancer is not completely cured, but the patient may be well for a long period. At present, a cancer patient can survive nearly five years due to modern techniques of Chemotherapy, Targeted therapy, Immune Therapy.

Types of cancer

There are different kinds of cancer according to the parts/sites/ organs of the human body where cancer is developed. Cancers, in case of males, mouth and throat cancer is first in rank; lung cancer in second and colon cancer occupies in third position; and similarly, breast cancer, cervical cancer and oral cancer are the more reported cases in females around India (Dutta, 2024). In addition, there are several other types of cancer such as Carcinoma, Sarcoma, Leukemia, Lymphoma and multiple myeloma, Brain Tumors, Chondroblastoma, Colorectal Cancer or bowel cancer, Gastric Cancer, Giant Cell Tumor, Glioblastoma Multiforme, Malignant Melanoma, Neuroblastoma, Central nervous system cancers, Osteoblastoma, Osteochondroma, Osteoid Osteoma, Osteosarcoma, Pancreatic Cancer, Paraneoplastic Syndrome, Renal Cancer, Skeletal Metastases, Testicular Cancer, Thyroid Cancer, Prostate cancer, etc., (NCI, 2021;Ghosh, 2024; Physiopedia, 2024).

Causes of Cancers

Cancer is caused by a variety of risk factors such as aging, life-style, tobacco, lack of balanced diet and air pollution etc., (Kumar and Anupoma, 2022). It has a deep relationship with food habits and life styles. Genes and family history also plays a big role in causing cancer. Chewing tobaccos, smoking cigarettes or biri/bidi are the main causes of mouth, throat and lung cancer. On the other sides, habit of eating excessive mutton, special attention to processed meat, food having fat, avoiding or low fruits and vegetables intake increase the risk of developing colon cancer (Dutta, 2024). Apart, there are many environmental factors are responsible for the developing cancer such as radiation (e.g., internet, mobile, mobile towers, etc.,) pollution, diet, and obesity, long time infections and stress, etc.,

CANCER STATISTICS

Cancer cases around the world vary significantly depending on some factors such as genetics, lifestyle choices, environmental exposures and the availability and quality of healthcare services. Data for cancer statistics were collected from the sites of International reporting agencies like World Health Organization (WHO), International Agency for Research on Cancer (IARC), Global Cancer Observatory (WHO Global Cancer Observatory, 2020, 2024) and some other published articles (Kumar, 2024; Patil and *et al.*, 2017; Mathew and *et a.l*, 2020; Shekhar, 2022; Siegel and *et al.*, 2023; Statista, 2023; Wisevoter, 2024).

Top five cancer sites worldwide

Tables 1, 2 and 3 illustrate worldwide statistics of top five cancer sites for males and females and/or both. For males, the highest number of lung cancer patients is 1,572,045 (15.2%) worldwide, ranked in 1st, followed by prostate (14.2%), colorectal cancer (10.4%) with 2nd and 3rd position in the rank list (Table 1). So, lung cancers are major reported cancer cases in male patients (Figure 1).

In case of females, breast cancer gets the highest number cases with 2,296,840 cases (23.8%), ranked in 1st, followed by lung (9.4%) in 2nd and colorectal (8.9%) in 3rd (Table 2). So, Breast and lung cancers are major reported cancer cases in female patients (Figure 2). Colorectal cancer is also seen among them. (Table 2).

For both genders (Table 3), it is seen that colorectal cancer, the prime theme of this study, remains 3rd position worldwide. Here, lung and breast cancer are in first and second position. Prostate occupies 4th position in the rank list. Over all, breast, lung, prostate and colorectal are leading cancers worldwide in 2022.

It must be remarkable that any invention needs to solve other's problem. Data from Tables 1, 2 and 3 also say that number of colorectal cancer patients accounts nearly 10% (i.e. 19, 26, 425 patients annually) of the cancer patients. Invention of the bowel vaccine is required and hence, Dr. Tony's bowel cancer vaccine is one of the biggest achievements of medical research worldwide in 21st century for mankind.

Global Cancer Cases and Mortality

Table 4 shows top 10 incidences of cancer and global mortality rate for males and females. Here, it is observed that nearly 19-20 million people are being affected with cancer annually worldwide, whereas about 10 million people were died due to cancer per annum worldwide in 2022 (WHO Global Cancer Observetory, 2024). Top most leading cancer sites worldwide are lung (2.48 m, 12,4%), breast (2.31 m, 11.6%), colon and rectum (colorectal) (1.92 m, 9.6%) respectively in the rank. Patients mostly (18.7%) die for lung cancers, followed by colorectal (9.3%), lung cancer (7.8%) and breast cancer (6.9%). So, lung cancer is more reported cancer cases in both male and female patients worldwide in 2022. Contrary, lung cancer, colorectal cancer, liver cancer and breast cancer are the major causes for deaths in 2022. So, there is a need to develop novel therapeutics to fight against these cancers.

Rank of Cancer Site and Deaths Worldwide

Table 5 shows rank of cancer sites and death continent wide as per WHO Global Cancer Observatory statistics 2022. This table finds lung cancers (1st in rank) are the major reported cases in male patients in Asian countries, followed by colorectal (2nd) and stomach (3rd). Maximum number of deaths happens in Asian countries for lung cancer and then by liver and stomach. Whereas breast, lung and thyroid cancer are the major recorded cases in female patients and mostly dies with breast (1st in line) and lung cancer (2nd) in Asia. In Europe, male patients are suffered from prostate (1st), lung (2nd) and colorectal cancer (3rd) and they die more with them also; whereas breast, colorectal and lung cancer are the more reported cancer cases and death by them also in female patients. In case of Latin America, number of prostate, colorectal and lung cancer patients is more among males; and deaths more with prostate, colorectal and lung respectively. For females, breast, colorectal and cervix uteri are the more recorded case. Breast and lung are the most lethal. Prostate cancers (1st) mostly are seen among male people in North America, then comes lung (2nd) and colorectal cancer (3rd). Here, cancer death happens due to lung, prostate and colorectal cancer. Breast (1st), lung (2nd) and colorectal (3rd) cancer are the more reported cases in female patients; death also appears because of same diseases in North America. In Africa, prostate, liver and colorectal are the more reported chancer cases in the male patients; and prostate, liver and lung are the main causes for death here. Breast, cervix uteri and colorectal cancer case are mostly seen among female patients whereas more deaths occurs due to breast, cervix uteri and liver cancer. Over all, colorectal (bowel) cancer has ranked as 3rd in case of male and female and even same in case of mortality. So, bowel cancer is the third most common cancer in both male as well as female patients worldwide (Table 4).

Table 2: Statistics for Top 5 cancer sites for females worldwide 2022.

Rank	Cancer cites	Number of Female cases	
		Total	%-age
1	Breast	2 296 840	23.8
2	Lung	908 630	9.4
3	Colorectal (bowel)	856 979	8.9
4	Cervix uteri	662 301	6.9
5	Thyroid	614 729	6.4
	Others	4 325 410	44.8
Total		9 664 889	100

Data source: (WHO Global Cancer Observetory, 2024).

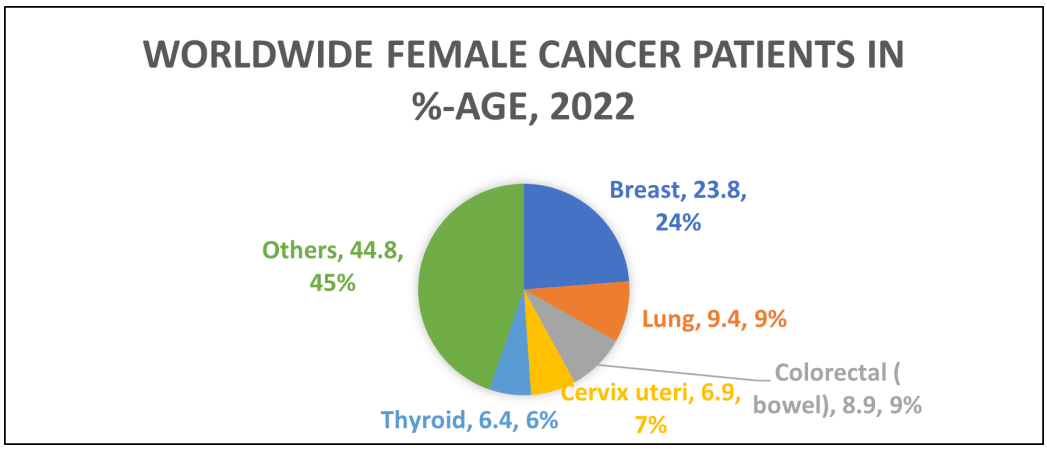

Figure 2: Leading cancers in female worldwide, 2022.

Table 3: **Statistics for Top 5 cancer sites for both genders worldwide, 2022.**

Rank	Cancer cites	Number of Both gender cases	
		Total	%-age
1	Lung	2 480 675	12.4
2	Breast	2 310 051	11.6
3	Colorectal (bowel)	1 9 26 425	9.6
4	Prostate	1 467 854	7.3
5	Stomach	968 784	4.8
	Others	10 822 710	54.2
Total		19 976 499	100

Data source: (WHO Global Cancer Observetory, 2024).

Table 4: **Top 10 cancer cases and mortality worldwide, 2022.**

Cancer sites	Number of cases			Mortality (Death)		
	Total	Rank	%-age	Total	Rank	%-age
Lung	2 480 675 (2.48 m)	1	12.4	1 817 469 (1.81 m)	1	18.7
Breast	2 310 051 (2.31 m)	2	11.6	669 846 (0.66 m)	4	6.9
Colorectal	1 926 425 (1.92 m)	3	9.6	904 019 (0.90 m)	2	9.3
Prostate	1 467 854 (1.46 m)	4	7.4	397 430 (0.39 m)	8	4.1
Stomach	968 784 (0.96 m)	5	4.9	660 175 (0.66 m)	5	6.8
Liver	866 136 (0.86 m)	6	4.3	758 725 (0.75 m)	3	7.8
Thyroid	821 214 (0.82 m)	7	4.7	47 507 (0.04 m)	24	0.49
Cervix uteri	662 301 (0.66 m)	8	3.3	348 874 (0.34 m)	9	3.6
Bladder	614 298 (0.61 m)	9	3.2	220 596 (0.22 m)	13	2.3
Non-Hodgkin lymphoma	553 389 (0.55 m)	10	2.8	250 679 (0.25 m)	11	2.6
Total	12671127	--	--	60,75,320	--	--
Others	7 305 372	--	36.6	36,685,12	--	37.41
Grand Total	19 976 499	--	100	9,743,832	--	100

Data Source: (WHO Global Cancer Observatory, 2024).

Cancers Cases and Death by Continents

World fact sheet of cancers as per WHO Global cancer Observatory statistics, 2022 in Table 6 shows rank of continent wise number of cancer cases and deaths. There is the highest 9,826, 539 (49%) cancer patients out of 19,976, 499 (nearly 19-20 million) and mortality is 54, 64, 454 (56%) out of 97, 43,832 (nearly 10 million) in Asian countries, followed by European countries with nearly 4.4 million cases; and deaths 1.98 million (Figure 4). Minimum number of cancer patients is available in the continent of Oceania (Table 6 and Figure 3). Awareness is very much needed to the people of the Asian and European countries.

Rank of Cancer Cases and Death in India

Table 7 illustrates top 10 cancer cases and mortality in India. According to the India cancer fact sheet of WHO Global Cancer Observatory, 2022, breast cancers is major reported cases in female patients (13.6% annually of total cancer cases) and maximum number of mortality occur due to breast cancer i.e. 10.7% annually, followed by Lip, oral cavity cancers 1, 43,759 patients and mortality 98,337 patients, Cervix uteri 1, 27, 526 and death rate 79,906 annually. Apart, Table 8 represents also rank of top three cancer types (sites) and mortality for the both gender in India. It shows that out of three, lip, oral cavity cancers are the major reported case for male and breast cancers are the leading case for female. These two are the most lethal in male and female patients respectively. It should be noted that recently, Indian Government announced to take cervical cancer vaccine free of cost to 9-14 years' girls all over India. This age-range of the girls is the idea time for the vaccine. 'Human Papilloma Virus' causes this cancer. This virus is infected cervix through the men's body at the time of intercourse. It can prevent if precaution is taken by the guardian of every girls-child. WHO took initiative to build a world, free from cervical cancer (Nath, 2024). In addition, a current report says that number of breast cancer are

Table 5: **Cancer sites wise cases and death worldwide (Gender wise) 2022.**

Continents	Males						Female						Both genders					
	Cancer type in rank			Mortality in rank			Cancer type in rank			Mortality in rank			Cancer types In rank			Mortality in Rank		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Global	LU	PR	CoR	LU	LI	CoR	BR	LU	CoR	BR	LU	CoR	LU	BR	CoR	LU	CoR	LI
Asia	LU	CoR	ST	LU	LI	ST	BR	LU	TH	LU	BR	CR	LU	BR	CoR	LU	LI	ST
Europe	PR	LU	CoR	LU	CoR	PR	BR	CoR	LU	BR	LU	CoR	BR	CoR	LU	LU	CoR	BR
Latin Americas and Caribbean	PR	CoR	LU	PR	LU	CoR	BR	CoR	CR	BR	LU	CoR	PR	BR	CoR	LU	CoR	PR
Northern America	PR	LU	CoR	LU	PR	CoR	BR	LU	CoR	LU	BR	CoR	BR	LU	PR	LU	CoR	PA
Africa	PR	LI	CoR	PR	LI	LU	BR	CR	CoR	BR	CR	LI	BR	CR	PR	BR	CR	LI
Oceania	PR	ME	CoR	LU	PR	CoR	BR	CoR	LU	BR	LU	CoR	BR	PR	CoR	LU	CoR	BR

Data Source: (WHO Global Cancer Observatory, 2024); Abbreviations: LU: Lung; ST: Stomach; LI: Liver; BR: Breast; CR: Cervix uteri; PR: Prostate; CoR: colorectal, ME: Melanoma; TH: Thyroid; PA: Pancreas.

Table 6: **Continent wide incidence of cancer cases 2022.**

Rank	Continents	Cancer cases		Mortality	
		Total	%-age	Total	%-age
	Global	19 976 499	100	9743832	100
1	Asia	9 826 539	49.19	5464451	56.08
2	Europe	4 471 422	22.38	1986093	20.38
3	Latin Americas and Caribbean	1 551 060	7.76	749240	7.69
4	Northern America	2 673 174	13.38	706427	7.25
5	Africa	1 185 216	5.94	763843	7.84
6	Oceania	269 088	1.35	73776	0.76

Data source: (WHO Global Cancer Observatory, 2024).

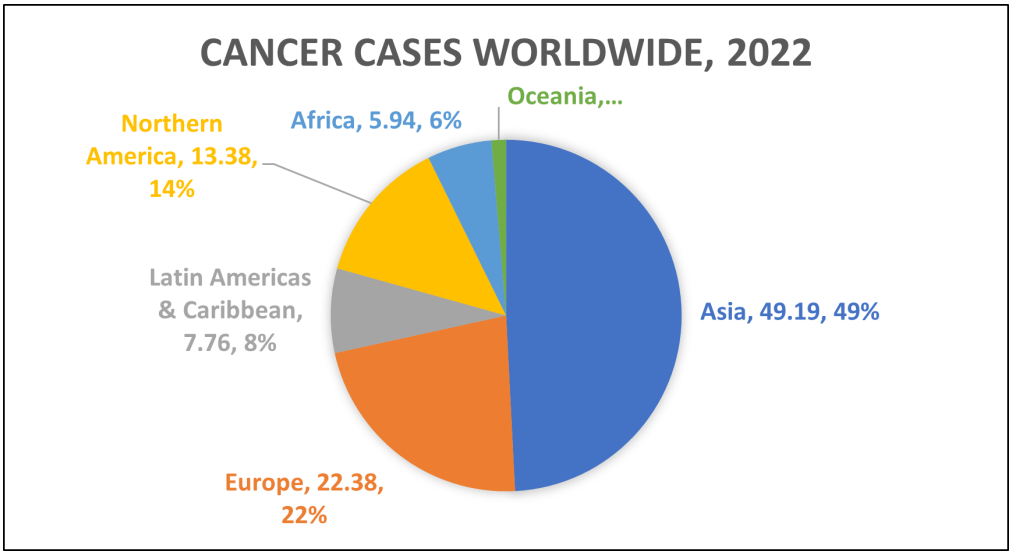

Figure 3: Continent wise cancer patients, 2022.

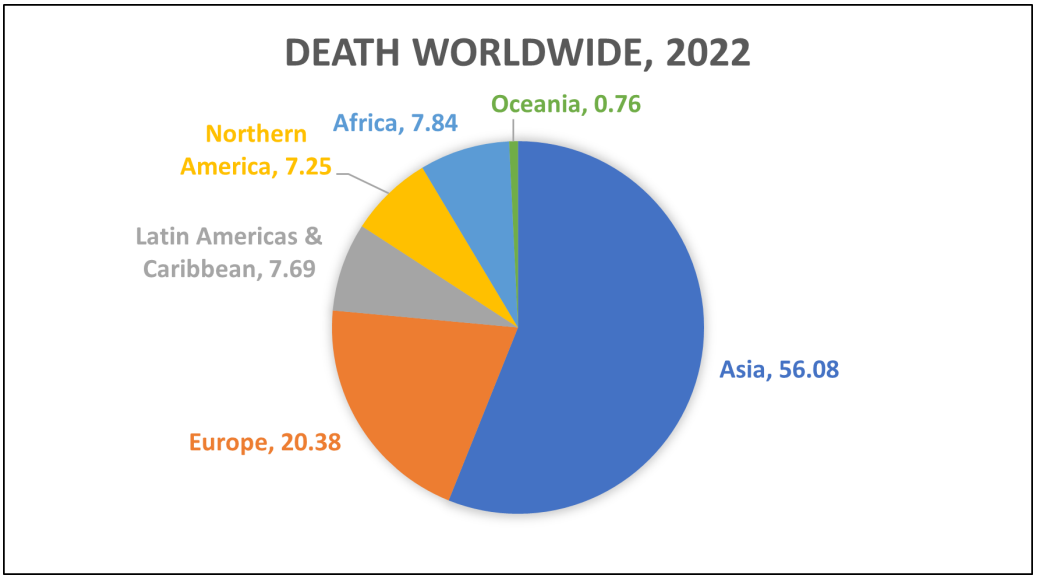

Figure 4: Continent wise death, 2022.

Table 7: Top 10 leading cancer cases and Mortality in India, 2022.

Cancer sites	Number of cases			Mortality (Death)		
	Total	Rank	%-age	Total	Rank	%-age
Breast	1 92 020	1	13.6	98 337	1	10.7
Lip, oral cavity	1 43 759	2	10.2	79 979	2	8.7
Cervix uteri	1 27 526	3	9.0	79 906	3	8.7
Lung	81 748	4	5.8	75 031	4	8.2
Oesophagus	70 637	5	5.0	66 410	5	7.2
Colorectal	70 038	6	5.0	40 993	7	4.5
Stomach	64 611	7	4.6	57 727	6	6.3
Leukaemia	49 883	8	3.5	6 871	9	4.0
Ovary	47 333	9	3.3	32 978	10	3.6
Non-Hodgkin lymphoma	30 736	10	2.8	22872	12	2.5
Total	877291		62.8	591104		64.4
Others	536025		37.2	325722		35.6
Grand Total	1 413 316		100	9 16 827		100

Data source: (WHO Global Cancer Observatory, 2024a).

more reported in the females of Jammu and Kashmir valley. Here, nearly two women die every day and 732 women were died with breast cancer in 2023 whereas it was 654 in 2019, that is the great anxiety of the general people (Hasan, 2024).

Top 3 States with Cancer Patients in India

Table 9 shows year wise top 3 cancer affected states in India. It finds that in Uttar Pradesh, the highest cancer affected state, there were 1.96 lakh cancer patients in 2019 and it became 2.1 lakh in 2022. It gradually has increased year to year. In case of West Bengal, it has also increased to 1.13 in 2022 from 1.05 in 2019. Number of cancer patients in Maharashtra was 1.13 lakh in 2019, but it reached to 1.18 lakh in 2022. It is clear that day to day, over all trends in number of cancer patients is going to up wards in India also.

BOWEL CANCER

Bowel cancer develops from the inner layer of the bowel or intestine (s). It usually starts as a small unhealthy growth called polyp (Cancer Council, Australia, n.d.). Most polyps are harmless; over time, some polyps can develop into cancer. Bowel cancer includes colon or rectal (or anal) cancer as it starts in the layer of the large bowel (colon) or back passage (rectum) or bowel opening (anus). It is scientifically known as colorectal (colon+rectum) cancer. (Cancer Council, Australia, n.d.; Cancer Research, UK, n.d.; Chhikara and Parang, 2023). Bowel cancer

Table 8: 3 Leading cancer sites and deaths in India (2022) for both genders.

Males				Female				Both genders			
Cancer type in rank		Mortality in rank		Cancer type in rank		Mortality in rank		Cancer types in rank		Mortality in Rank	
Cancer cites	Rank	Cancer cites	Rank	Cancer cites	Rank	Cancer cites	Rank	Cancer cites	Rank	Cancer cites	Rank
LoC	1	LoC	1	BR	1	BR	1	BR	1	BR	1
LU	2	LU	2	CR	2	CR	2	LoC	2	LoC	2
OE	3	OE	3	OV	3	OV	3	CR	3	CR	3

Data Source: (WHO Global Cancer Observatory, 2024a); Abbreviations: LoC: Lip, Oral cavity; OE: Oesophagus; Ov: Overy.

Table 9: Statewide top cancer cases in India (both genders) (Lakh).

State	2019			2020			2021			2022		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Uttar Pradesh	1.96			2.01			2.06			2.10		
Maharashtra		1.13			1.16			1.16			1.18	
West Bengal			1.05			1.08			1.10			1.13

Data Source: (Kumar, 2024; Kumar and Anupoma, 2022; Shekhar, 2022; WHO Global Cancer Observatory, 2024).

Table 10: Year, age and authorship status wise distribution of papers of Dhillon.

Year	TAP	CAP	AA	PPA	SAP	MAP	Authorship Position (P)										CoA	DC=MAP/TAP
							P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_{10}	$>P_{10}$		
2003	1	1	32	1		1	1										1	1.00
2004	3	4	33	2		3		3									13	1.00
2005	6	10	34	3		6	2	1		1		1	1				40	1.00
2006	3	13	35	4		3	1	1	1								17	1.00
2007	1	14	36	5		1		1									10	1.00
2009	2	16	38	7		2	1				1						16	1.00
2010	1	17	39	8		1	1										6	1.00
2012	1	18	41	10		1			1								6	1.00
2014	1	19	43	12	1												-	0.00
2018	1	20	47	16		1					1						5	1.00
2019	1	21	48	17		1										1	14	1.00
2020	2	23	49	18		2									1	1	29	1.00
2021	1	24	50	19		1									1		16	1.00
2022	3	27	51	20		3									1	2	46	1.00
2023	2	29	52	21		2								1		1	50	1.00
Total	29				1	28	6	6	2	1	2	1	1	1	3	5	269	0.96

Abbreviations: TAP: Total annual papers; CAP: Cumulative annual papers; AA: Author's age; PPA: Paper productivity Age; SAP: Single authored paper; MAP: Multiple-authored paper; C0: co-authors; DC: Degree of collaboration.

is one of the most common malignancies across the world (WHO GLobal Cancer observatory, 2020) and is the third most common cancer out of five cancer type among men in India that has been shown in Tables 1, 2 and 3. Nearly 17088 people were diagnosed with bowel cancer in Australia (WHO Global Canncer Observatory, 2022). The risk of colorectal cancer increases with age. Most cases affect people over 50 years old (WHO, 2023). The average age at diagnosis is 69 years old. This cancer is the fourth most commonly diagnosed cancer in Australia and it is fact that one in 20 people is diagnosed at the age 85 (Cancer Council,

Table 11: **Authorship pattern.**

No. of authors	1 A	2 A	3 A	4 A	5 A	6 A	7 A	8 A	9 A	10 A	11 A	14 A	15 A	17 A	18 A	20 A	41 A	TP
No. of non-collaborative	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		1
No. of collaborative	-	1	3	1	1	1	4	1	2	2	4	1	1	3	1	1	1	28

Abbreviations: 1A: one-authored, 2A: two-authored and so on. TP: Total Paper.

Table 12: **Status of Dhillon in the byline of authors.**

Type of Papers	Status or position in the byline														
	1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	15th	16th	17th	40th	Total
2AP	1														01
3AP	1	1	1												03
4AP		1													01
5AP	1														01
6AP					1										01
7AP	2	1	1												04
8AP		1													01
9AP	1	1													02
10AP				1			1								02
11AP		1			1	1		1							04
14AP									1	1					02
15AP											1				01
17AP									1			1	1		03
18AP									1						01
41AP														1	01
Total	06	06	02	01	02	01	01	01	03	01	01	01	01	01	28

Table 13: **Quinquennium wise publications.**

Year	AA	PPA	APC	%-age
2003-2007	32-36	1-5	14	48.28
2008-2012	37-41	6-10	4	13.79
2013-2017	42-46	11-15	1	3.45
2018-2022	47-51	16-20	8	27.59
2023-2027	52-56	21-25	2	6.89
Total			29	100

Australia, n.d.; Cancer Research, UK, n.d.). Bowel cancer is the sixth most common cause of mortality in the United Kingdom (Hobbs, 2000). It is the 3rd most common cancer in men in India in 2020 and 2022 (WHO GLobal Cancer observatory, 2020, 2022) and the 2nd most common cancer in women (WCRFI, n.d.; WHO, 2023). From the several literature studies, it is also learnt that World Cancer research Fund International (WCRFI) analyzed total 99 studies on bowel cancers worldwide. It observed more than 29 million adults and over 247,000 bowel cancer cases (WCRFI, n.d.). There is a balanced growth of colon cancer over India, ranging from 20% to 124% per year (Mathew and *et al.*, 2020). A large database of hospitals from Southern India found that rectum was the most common site, followed by rectosigmoid, colon and anorectum (Patil and *et al.*, 2017). Its death rate more and less high because it is often diagnosed at a later stage when cancer is already spread to different organs of the body (Uniyal, 2023). In 2020, there are more than 1.9 million new cases of colorectal cancer and more than 930 000 deaths worldwide. The highest cancer cases were in Europe, Australia and New Zealand and the top most mortality rates were in Eastern Europe. By 2040,

the colorectal cancer will increase to 3.2 million per year (an increase of 63%) and 1.6 million deaths per year (an increase of 73%) (WHO, 2023). As per WHO Global cancer statistics, 2022, bowel cancer is the third rank in case of males, females and in both cases (Tables 1, 2 and 3). Apart, from the rank list of top ten cancers, bowel cancer is also placed in 3rd position (Table 4).

Symptoms of Bowel Cancer

Colorectal cancer or bowel cancer affects the colon and rectum. This cancer is associated with food consumption habits. It also includes microenvironment in the colon, rectum and inflammatory response responsible for the development of bowel cancer (Chhikara and Parang, 2023). Few symptoms of bowel cancer are diagnosed as diarrhea, problem with passing stool, or the feeling of incomplete emptying; thin bowel stools; blood in the stools; abdominal pain, an excess buildup of gas, air or fluids in the intestines or severe pain in the abdomen; anal or rectal pain; a lump in the anus or rectum; weight loss; unexplained fatigue; weakness and breathlessness or anemia; blood in the urine or passing urine frequently, especially during the night; change in urine colour either dark or rusty or brown (Cancer Council, Australia, n.d.; WHO, 2023).

Causes of Bowel Cancer

Several lifestyle factors are the causes of colorectal cancer such as a high intake of processed meats and low intake of fruits and vegetables, lifestyle involving a lot of sitting down or not active, obesity, smoking and excessive alcohol consumption (WHO, 2023; Cancer Council, Australia, n.d.). Risk factors for this cancer are: over 50 years old; a family history of colorectal cancer or certain genetic conditions; individuals who have had colorectal cancer before or certain types of polyp; unhealthy lifestyle choices, such as a diet high in processed meats and low in fruits and vegetables, obesity, smoking and excessive alcohol consumption (NHS, n.d.; WHO, 2023).

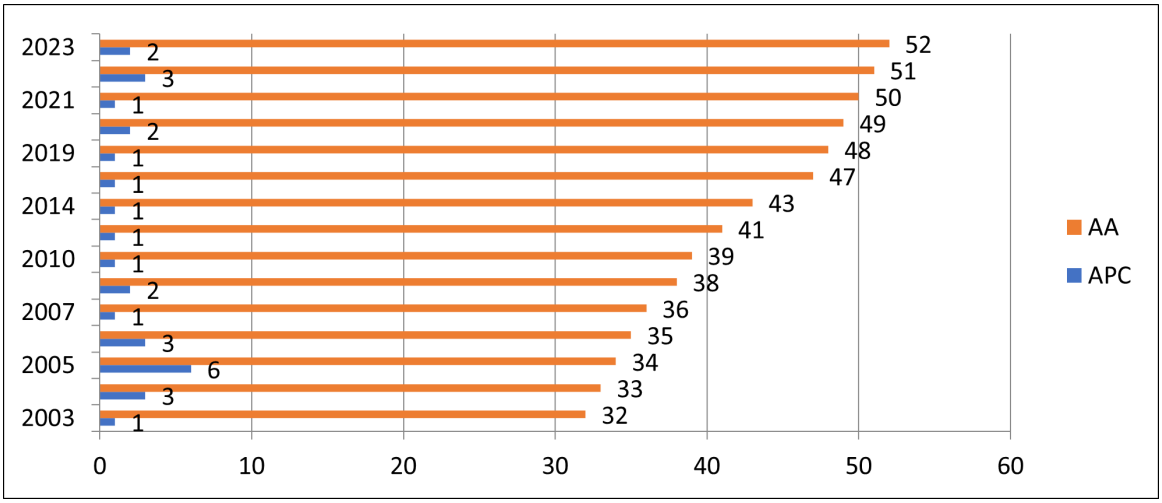

Figure 5: Year and age wise publications. Age (AA) and annual publication count (APC).

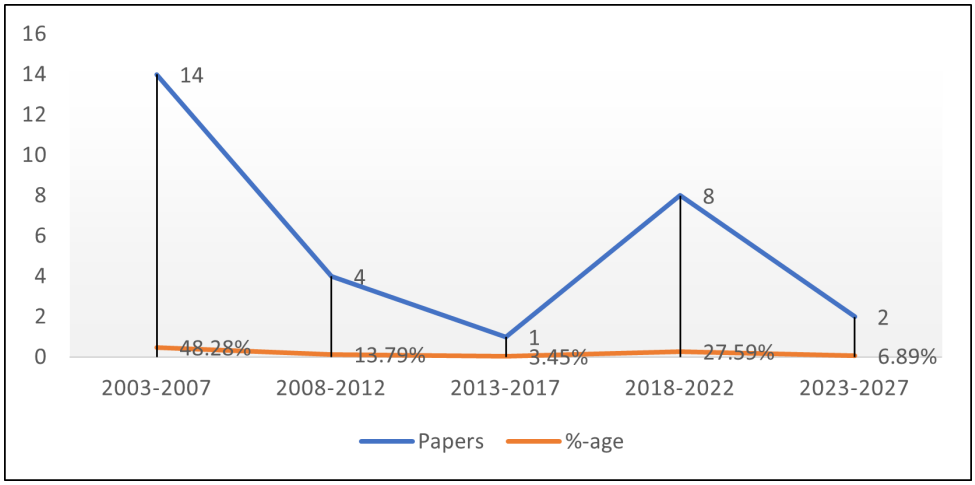

Figure 6: Peak time of publications.

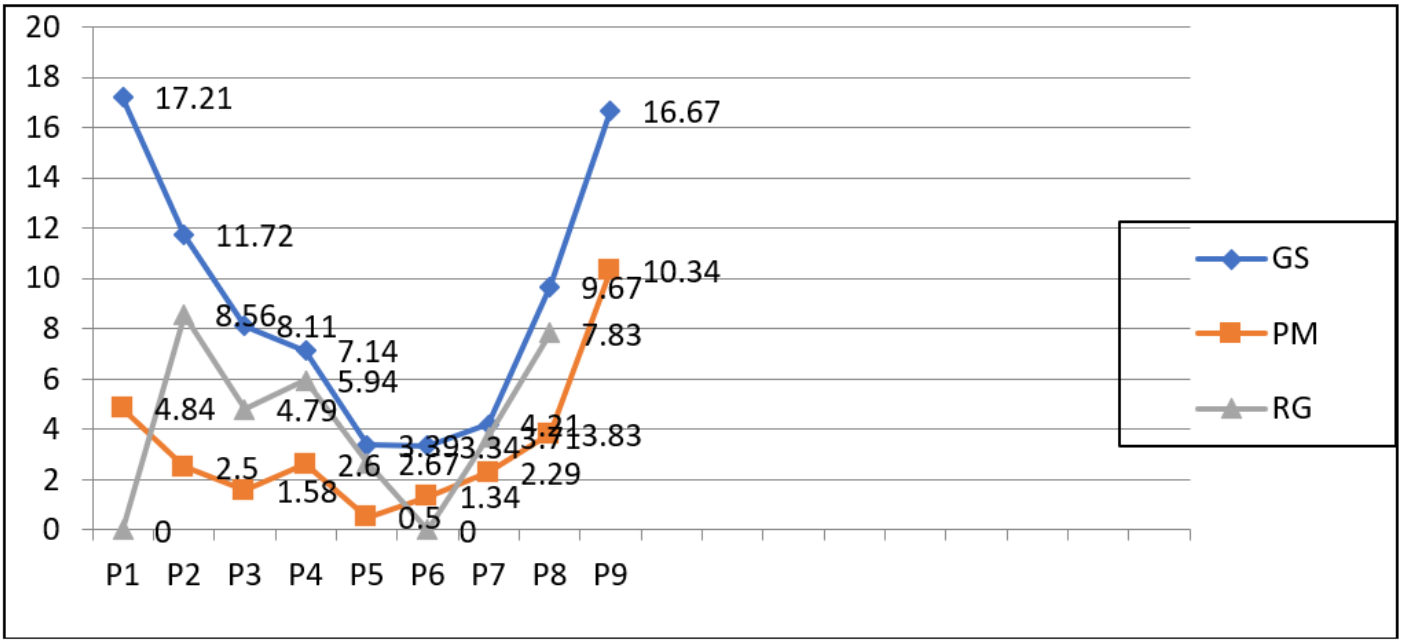

Figure 7: Citation growth rate of Dhillon's papers in GS, PM, and RG, 2003-2023.

Treatment for Bowel Cancer

Treatments of bowel cancer are surgery, chemotherapy and radiotherapy. Screening test like colonoscopy can help detect it early. Modern techniques based laparoscopy, robotic surgery are now available (Dutta, 2024). Yet, bowel cancer treatment can be categorized as follows (Cancer Council, Australia, n.d.; WHO, 2023): (a) For early bowel cancer, Surgery, Radiation therapy (radiotherapy), Adjuvant treatment, Chemotherapy, Palliative care; (b) For advanced stage, Systemic treatment (i.e., chemotherapy and targeted therapies), Surgery. Some anti-inflammatory herbal drugs/anticancer agents such as *terpenes, terpenoids, flavonoids*, etc., are also used for bowel cancer treatment (Sharma, Thulasingam and Nagarajan, 2017; Wróblewska-Łuczka and *et al.*, 2023; Chhikaraand and Parang, 2023; Kopustinskiene and *et al.*, 2020). A long list of cancer drugs has approved by the Food and Drug Administration (FDA), US, for colon and rectal cancer (Colorectal or bowel cancer) along with their generic and brand names (Nationa Cancer Institute, US, 2023). Recently Tony Dhillon in collaboration with Tim Price in Australia has developed a vaccine to treat bowel (colorectal) cancer without surgery. Though, it has been under trial.

Prevention

Taking a healthy diet rich in fruits and vegetables, no smoking tobacco, keeping an active lifestyle, limiting/leaving alcohol consumption, avoiding exposure to environmental risk factors, etc., can be minimized the risk of development of colorectal cancer/bowel cancer (WHO, 2023). Colorectal or bowel cancer can be prevented and even cured at early stage, if people led normal life style (Sharma, Thulasingam and Nagarajan, 2017) with balanced diet.

Medicometric Portrait

There are many biobibliometric studies on/ about various scientists either living or death from different disciplines. Authors of the studies have mostly used terms 'Biobibliometric study' or 'Biobibliometric portrait' or 'Scientometric portrait' (Kalyane, 1996; Koley and Sen, 2016; 2021 Dutta, 2019; Koley, 2023) etc. and the 'Medicometric portrait' for medical scientists, researchers or medical practitioners, is newly generated phrase by the author of this study.

BIOGRAPHICAL INFORMATION OF DR. TONY DHILLON

Early Life and Family

Dr. Perminder Tony Singh Dhillon alias Dr. Tony Dhillon was born in Maidenhead, England, United Kingdom on September, 1971 and grew up in a Punjabi family under the guardianship of Dr. Dhillon's paternal grandfather who lived in Southall first. They migrated to the UK in the early 1950s from Surja village, Jalandhar district, Punjab to work in the "Brylcreem" factory. He was joined by his son in the 1960s. In 1967, Dr Dhillon's mother moved to the UK from Bigla in Jalandhar district to marry his father and both his parents worked in the factory (Canton, 2024; Surrey Oncology Limited, 2016; Thakur, 2024). His parents were not formally educated but they wanted that his son Tony became educated and built name and fame for himself throughout world.

Educations

Dr Dhillon obtained his Bachelor of Science (B.Sc.) in 1994. After going to University College London (UCL) for medical school, Tony qualified MBBS in medicine from UCL in 1997 and he did his Ph.D. on cancer cell signalling at Imperial College London in 2009 funded by a CR-UK clinical training fellowship, which was followed by post-graduate work at Oxford (University of Surrey, UK, n.d.). Dr. Tony has the Membership of the Royal College of Physicians, shortly, MRCP, that is, postgraduate diploma in internal medicine in the United Kingdom.

Professional Career

Dr. Tony Dhillon is an UK based renowned Consultant Medical Oncologist and specialist in colon, liver, biliary and pancreatic cancer and also in gastrointestinal cancers. His National Health Service (NHS) base is at the Royal Surrey, UK. NHS-UK is a government-run free health service organization. His private practice is based at the Guildford Nuffield. He works as Leaders in Oncology Care (LOC) in Harley Street. He is a Senior Lecturer in Oncology at the University of Surrey. He has been a *Welcome Trust fellow* at the University of Oxford and a lecturer in physiology at the University of Oxford (UK Oncology, 2018). He has been practicing since 1997. He is presently working as Consultant Medical Oncologist at the Royal Surrey County Hospital since 2010. He took memberships of *Association of Cancer Physicians, European Society of Medical Oncology, American Society of Medical Oncology, American Association of Cancer Research.* He also works with the several private medical insurance providers (Nuffield Health, 2024).

Research and Discoveries

Dr. Tony Dhillon is a guiding light in the realm of oncology, celebrated for his trailblazing advancements in cancer treatment and research. He jointly worked with Professor Tim Price in Australia over the past four years to formulate and refine a pre-surgery bowel cancer vaccine (Canton, 2024). He later started working as a medical oncologist, where he specialized in rare cancers such as "Gastrointestinal Stromal Tumour (GIST)" and "Neuroendocrine Tumour (NET)" in collaboration with Cancer Research UK Southampton Clinical Trial Units at the University of Southampton, in partnership with the Royal Surrey NHS Foundation Trust and Queen Elizabeth Hospital in Adelaide, Australia. It is the first vaccine that can bring a paradigm changes in the treatment of gastrointestinal cancer. It is an international level research. It will be benefited for hundreds of thousands of people (Thakur, 2024) as well as our societies. Dr. Dhillon's scholarly pursuits center for investigating novel therapies for bowel, liver and pancreatic cancer, with a special care on immuno-oncology. His scholarly efforts emphasize a faithful commitment to driving medical science forward and enhancing patient welfare (NRI Affairs, 2024). This vaccine will be life changing because potentially there is no need of patient's surgery. Dr Dhillon believes that the trial will show new sun rising to treating bowel cancer in the future (Morris, 2020).

Implications of Bowel Cancer Vaccine

The vaccine will be administrated the patients before surgery. Three doses of the vaccine will be given to the patient. It is anticipated that vaccine may bolster the immune system for protection against the possibility of recurrence. If even patients go to operation after that there would not be much cancer left and in some cases, it might kill cancer completely. It will probably support the body's immune system so that the patients cannot turn back again into the worse. He made headlines recently as the chief investigator of a groundbreaking global trial of that vaccine. This vaccine has been designed by "Imugene", a clinical-stage immune-oncology company in Australia. The trail will run by the Cancer Research UK Southampton Clinical Trials Unit at the University of Southampton in collaboration with Royal Surrey and Queen Elizabeth Hospital in Adelaide, Australia with forty-four patients in 10 patient enrollment centers across the UK (four) and Australia (six), for over a period of 18 months. The vaccine trial, a vision to reality is headed by Dr. Dhillon. His experiences and confidence glimpse a light of hope of winning against this disease (NRI Affairs, 2024). He is trying to prove the vaccine applicable for other cancer types also (Canton, 2024; PTI, 2024). A £500,000 grant has been given to Dr Tony Dhillon for working on bowel cancer clinical trials in Australia, sanctioned by the Medical Research Future Fund (MRFF). MRFF aids health and medical research and innovation, with the objective of improving the health and wellbeing of Australians (Guildford dragon News, 2020). The scientists of Royal Surrey NHS Foundation Trust are hopeful that the first vaccine to treat bowel cancer could be available in just two years (Pickles, 2024).

OBJECTIVES

The main objectives of the study are:

To highlight the year- and age-wise distribution research papers contributed by Dr. Tony Dhillon;

To determine the position of Dhillon as main author and co-author;

To measure the degree of collaboration (collaboration coefficient);

To calculate author productivity;

To identify the research team with co-authors;

To find out peak period of productivity;

To identify channel wise scattering of publications;

To highlight top 9 highly cited scholarly works of Dr. Tony;

To analyze year-wise citation received and Citation Growth Rate (CGR);

To calculate Relative Uncited Citation (RUC) and Relative Citation Impact (RCI);

To examine the Lotka's Law for Co-authors;

To verify Bradford's law for communication channels.

SCOPE AND METHODOLOGY

This study covers 29 publications of the medical scientist Dr. Tony Dhillon, published during 2003-2023. His publications on cancer include research articles were collected from Google Scholar (GS), PubMed (PM) and ResearchGate (RG) data bases through searching term "Tony Dhillon". Apart, other data has been accumulated from several offline and online resources. A compiled list of 29 publications of Dhillon was prepared for this study. The collected data were transferred into MS-excel and Words and tabulated. Then, the present study investigates authorship pattern, main authors and co-authors, author productivity and research spectrum from 29 papers. Various others facts such as collaboration coefficient, age wise publication pattern, peak period of publications, channel-wise scattering of publications, citation analysis including Citation Growth Rate count, Relative uncitedness index as well as Relative citation index are generated. In addition, it has also been examined whether the data sets are being followed Lotka's Law and Bradford's law or not. Finally, on the basis of the data, results are discussed in the following sections.

DATA ANALYSIS AND DISCUSSION

Authorship Scenario

Table 10 and Figure 1 show yearly and age-wise publications during 21 years. Here, out of 29 papers, one two-authored paper was first published in 2003, while he was 32 years old. A highest number of papers i.e., six, joint-authored papers were published in 2005. There are 13 mega-authored publications (more than 10 authored, ranging from 10 to 18 authored) and one is 41-authored paper in 2023. Papers with the highest number of authors have been found in the year 2023 (N50), 2022 (N46); 2005 (N40) and 2020 (N29). In 29 papers, he is the first and second position as an author in 6 papers each; third and fifth position in 2 papers each; fourth, sixth, seventh and eighth position in 1 paper each; tenth position in 3 papers; and more than tenth position in 5 papers including one paper in 40th position. In all, he has published 28 publications as co-author and yet he has occupied the positions as first and second author. More multi-authored research papers are the symbol of team research in this case. Surprisingly, he has no publication in 2008, 2011, 2013 and 2015-2017. His productivity peaked in 2005 when he was published 6 papers at the age of 34 and he brought out total 18 papers during first half of present 21 years' working period in this study i.e., at the age 42. Dr. Dhillon contributed one single-authored paper in the year 2014 at the age of 43, during 2003-2023.

Authorship Pattern

Table 11 shows single and collaborative papers. Dhillon has contributed only one paper without any collaboration during 2003-2023. All other 28 papers have been produced with collaboration. Of the collaborative papers, 3 are three-authored, 4 each seven-and-eleven-authored, 3 seventeen-authored, 2 each nine-and- ten-authored; among rest, 1 each as 2, 4, 5, 6, 14, 15, 18, 20-and 4–authored paper.

Status in the Byline of Dhillon

Table 12 represents Dhillon's position in the byline of authors in his collaborative 28 papers during 2003-2023. He appears as the first and second author each in six papers. This is the best credit to his authorship position among other collaborators. He occupies third and fifth position each in two papers; 10th position in 03 papers. Lastly, he appeared in five papers as author in more than 10th position and 40th position in one 41-authored paper.

Quinquennium wise publications

Table 13 shows quinquennium wise publication of Dhillon during 2003-2023. The highest contribution identified 14 during 1st quinquennium, when his was age 32 to 36. It is his peak period of publication during 2003-2023 (Figure 6), followed by 8 during 4th quinquennium (age 47-51), 4 contributions during 2nd quinquennium (age 37-41). His least contribution was 1 at the age 42-46 (2013-2017) followed by 2 at the age 52-56 (2023-2027). It is learnt that the author's productivity has been decreased up to the age 52.

Co-authors and Leading Co-authors

Table 14 represents the name of the first authors and the co-authors of Dhillon's papers and Table 15 shows leading co-authors in production of papers with the scientist. The ranked list of the co-authors is also enumerated including number of year taken for publishing paper(s) and paper per year of a co-author shown in the 4th and 5th columns respectively. The top-ranked co-author is Michael Seckl (co-authored 9 papers in 8 years, nearly 1 papers per year), the most productive collaborator of Tony Dhillon. A group of 2nd ranked co-authors are Mark Bower, Carlo Palmieri, Anna-Mary Young who co-authored 7 papers each in 3, 4 and 4 years respectively. They each have produced nearly 2 papers per year. The third ranked co-authors includes David Lau, Edward Newlands, Justin Stebbing who have contributed 5 papers each during 5, 4 and 14 years respectively. Thus, Dr. Dhillon has produced several publications during 2003-2023 with 153 co-authors (individual name wise).

Co-authorship and Latka's Law

Lotka's general equation for scientific productivity is "x^n. y=constant". It indicates the relation between the frequency y of authors making x contributions. Hertzel described the meaning of the equation in this way that: "*the number of persons making 2*

Table 14: List of first author and co- author of research articles, 2003-2023.

Year	1st author's name	Co-author's name
2003	Dhillon, Tony	Waxman, J.
2004	Young, Anna-Mary; Seckl, Michael; Palmieri, Carlo	Bower, Mark; Dancey, Gairin; Foskett, Marianne; Paradinas, Fernando; Rees, Helene; Sebire, Neil; Vigushin, David; Newlands, Edward; Young, Anna-Mary; Seckl, Michael; Palmieri, Carlo; Coombes, Charles.
2005	Bower, Mark; Seckl, M; Dhillon, Tony; Stebbing, Justin	Bower, Mark; Nelson, Meta; Young, Anna-Mary; Thirlwell, Christina; Newsom-Davis, Tom; Mandalia, Sundhiya; Holmes, Paul; Gazzard, Brian; Stebbing, Justin; Powles, Tom; Gaya andrew; Nelson, Mark; Seckl, M; Mitchell, Hugh; Newlands, E; Hancock, B.; Palmieri, Carlo; Franks, J; Powles, Thomas; Nelson, Meta;
2006	Dhillon, Tony; Palmieri, Carlo; Bower, Mark	Palmieri, Carlo; Sebire, Neil; Lindsay, Ian; Newlands, Edward; Schmid, Peter; Savage, Philip; Frank, John; Seckl, Michael; Thirlwell, Christina; Newsom-Davis, Tom; Young, Anna-Mary; Nelson, Meta; Gazzard, Brian; Bower, Mark.
2007	Palmieri, Carlo	Palmieri, Carlo; Fisher, Rosemary; Young, Anna-Mary; Short, Delia; Mitchell, Hugh; Aghajanian, Carol; Savage, Philip; Newlands, Edward; Hancock, Barry; Seckl, Michael.
2009	Marinov, Marin; Dhillon, Tony.	Marinov, Marin and Ziogas, Algirdas and Pardo, Olivier and Tan, Liwen and Mauri, Francesco and Lane, Heidi and Lemoine, Nicholas and Zangemeister-Wittke, Uwe and Seckl, Michael and Arcaro, Alexandre; Bellezza, G.; Cagini, L.; North, B.; Barbareschi, M.; Seckl, M.
2010	Dhillon, Tony	Mauri, Francesco; Bellezza, Guido; Cagini, Lucio; Barbareschi, Mattia; North, Bernard; Seckl, Michael.
2012	Gately, K	Gately, K.; Al-Alao, B.; Mauri, F.; Cuffe, S.; Seckl, M.; O'Byrne, K.
2018	Leen, E	Leen, E.; Picard, J.; Stebbing, J.; Abel, M.; Wasan, H.
2020	Lau, David; Rohit Rao	Lau, David; Kalaitzaki, Eleftheria; Church, David; Pandha, Hardev; Tomlinson, Ian; Annels, Nicola; Gerlinger, Marco; Sclafani, Francesco; Smith, Gillian; Begum, Ruwaida; Crux, Richard; Gillbanks, Angela; Wordsworth, Sarah; Chau, Ian; Starling, Naureen; Cunningham, David; Rao, Rohit; Basu, Bristi; Prasad, Debi; Lau, David; Darby, Suzanne; Orr, James; Margetts, Jane; Hubner, Richard; Baijal, Shobhit; Sharma, Rohini; Faluyi, Olusola Olusesan; Lee, Lennard; Thillai, Kiruthikah.
2021	Pinato, David	Pinato, David; Cortellini, Alessio; Ajithkumar, Sukumaran; Cole, Tom; Pai, Madhava; Habib, Nagy; Spalding, Duncan; Sodergren, Mikael; Martinez, Maria; Dhillon, Tony; Tait, Paul; Thomas, Robert; Ward, Caroline; Kocher, Hemant; Yip, Vincent; Slater, Sarah; Sharma, Rohini.
2022	Challoner, Benjamin; Merali, Nabeel; D'Alessio, Antonio	Challoner, Benjamin; Woolston andrew; Lau, David; Buzzetti, Marta; Barber, Louise; Lund, Tom; Sansano, Harold; von Loga, Katharina; Lázare-Iglesias, Héctor; Begum, Ruwaida; Crux, Richard; Cunningham, David; Chau, Ian; Starling, Naureen; Ruiz-Bañobre, Juan; Gerlinger, Marco; Merali, Nabeel; Chouari, Tarak; Kayani, Kayani; Rayner, Charles; Jimenez, Jose; Krell, Jonathan; Giovannetti, Elisa; Bagwan, Izhar; Relph, Kate; Rockall, Timothy; Pandha, Hardev; Annels, Nicola; Frampton, Adam; D'Alessio, Antonio; Pai, Madhava; Spalding, Duncan; Rajagopal, Poyyamozhi; Talbot, Thomas; Goldin, Robert; Fulgenzi, Claudia; Ward, Caroline; Yip, Vincent; Slater, Sarah; Sodergren, Mikael; Tait, Paul; Habib, Nagy; Thomas, Robert; Cortellini, Alessio; Sharma, Rohini; Pinato, David.
2023	Merali, N; Challoner, Benjamin R	Merali, N., Chouari, T., Terroire, J., Jessel, M.D., Liu, D.S., Smith, J.H., Wooldridge, T., Jiménez, J.I., Krell, J. and Roberts, K.J; Challoner, Benjamin R; Woolston andrew; Lau, David; Buzzetti, Marta; Fong, Caroline; Barber, Louise J; Anandappa, Gayathri; Crux, Richard; Assiotis, Ioannis; Fenwick, Kerry; Begum, Ruwaida; Begum, Dipa; Lund, Tom; Sivamanoharan, Nanna; Sansano, Harold B; Domingo-Arada, Melissa; Tran, Amina; Pandha, Hardev; Church, David N; Eccles, Bryony; Ellis, Richard; Falk, Stephen: Hill, Mark; Krell, Daniel; Murugaesu, Nirupa; Nolan, Luke; Potter, Vanessa; Saunders, Mark; Shiu, Kai-Keen; Guettler, Sebastian; Alexander, James; Lázare-Iglesias, Héctor; Kinross, James; Murphy, Jamie; Loga, Katharina von; Cunningham, David; Chau, Ian; Starling, Naureen; Ruiz-Bañobre, Juan; Gerlinger, Marco.

Table 15: List of co-authors and their publications, 2003-2023 with Dr. Dhillon.

Rank	PWD	Co-author's name	Year taken	Paper/year
1	09	Seckl, Michael [01]	8	1.13
2	07	Bower, Mark; Palmieri, Carlo; Young, Anna-Mary [03]	3, 4, 4	2.33, 1.75, 1.75
3	05	Lau, David; Newlands, Edward; Stebbing, Justin [03]	5, 4, 14	1, 1.25, 0.36
4	04	Chau, Ian; Crux, Richard; Cunningham, David; Gazzard, B; Gerlinger, Marco; Mauri, Francesco; Newshom-Davis, T; Pandha, Hardev S.: Starling, Naureen; Thirlwell, Christina [10]	5, 5, 5, 2, 5, 4, 2, 5, 5, 2	0.8, 0.8, 0.8, 2, 0.8, 1, 2, 0.8, 0.8, 2
5	03	Annels, Nicola E.; Begum, Ruwaida; Church, David N; Mandalia, Sundhiya; Nelson, Meta [05]	4, 4, 5, 1, 2	0.75, 0.75, 0.6, 3, 1.5
6	02	Barbareschi, M; Barber, Louise J; Bellezza, Guido; Buzzetti, Marta; Cagini, Lucio; Challoner, Benjamin R; Chouari, Tarak; Cortellini, Alessio; Frank, John; Gillbanks, Angela; Habib, Nagy; Hancock, B.; Jiménez, J.I.; Kalaitzaki, Eleftheria; Krell, J; Lázare-Iglesias, Héctor; Lund, Tom; Mitchell, Hugh; North, Bernard.; Pai, Madhava; Pinato, David; Ruiz-Bañobre, Juan; Sansano, Harold B.; Savage, Philip; Sclafani, Francesco; Sebire, Neil; Sharma, Rohini; Slater, Sarah; Sodergren, Mikael; Spalding, Duncan; Tait, Paul; Thomas, Robert; Tomlinson, Ian; Vigushin, David; Ward, Caroline; Woolston andrew; Yip, Vincent; Merali, Nabeel [38] [i.e., 14.13%)	2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 3, 2, 1, 2, 2, 2, 3, 2, 2, 2, 2, 2, 2, 2, 2, 3, 2, 2, 2, 2, 2, 2, 2, 1, 1, 2, 2, 2.	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0.67, 1, 2, 1, 1, 1, 0.67, 1, 1, 1, 1, 1, 1,1, 0.67, 1, 1, 1, 1, 1, 1, 1, 2, 2, 1, 1, 1
7	01	Abel, M.; Aghajanian, Carol; Ajithkumar, Sukumaran; Al-Alao, B.; Alexander, James; Anandappa, Gayathri; Arcaro, Alexandre; Assiotis, Ioannis; Bagwan, Izhar; Begum, Dipa; Basu, Bristi; Cole, Tom; Coombes, Charles; Cuffe, S.; D'Alessio, Antonio; Dancey, Gairin; Domingo-Arada, Melissa; Eccles, Bryony; Ellis, Richard; Falk, Stephen; Fenwick, Kerry; Fisher, Rosemary; Fong, Caroline; Foskett, Marianne; Frampton, Adam.; Fulgenzi, Claudia; Gately, K.; Gaya andrew; Giovannetti, Elisa; Goldin, Robert; Guettler, Sebastian; Hill, Mark; Holmes, Paul; James Orr; Margetts, Jane; Jessel, M.D.; Kayani, Kayani; Kinross, James; Kiruthikah Thillai.; Kocher, Hemant; Krell, Daniel; Lane, Heidi; Leen, E.; Lemoine, Nicholas; Lee, Lennard; Lindsay, Ian; Loga, Katharina von; Liu, D.S.; Marinov, Marin; Martinez, Maria; Murphy, Jamie; Murugaesu, Nirup; Nelson, Mark; Nolan, Luke; O'Byrne, K.; Faluyi, Olusola Olusesan; Paradinas, Fernando; Pardo, Olivier; Picard, J.; Potter, Vanessa; Powell, Rachel; Powles, Thomas; Powles, Tom; Prasad, Debi; Rajagopal, Poyyamozhi; Rayner, Charles; Rees, Helene; Relph, Kate; Hubner, Richard; Rockall, Timothy; Roberts, K.J.; Rao, Rohit; Sharma, Rohini; Saunders, Mark; Schmid, Peter; Shiu, Kai-Keen; Baijal, Shobhit; Short, Delia; Sivamanoharan, Nanna; Smith, Gillian; Smith, J.H.; Darby, Suzanne; Talbot, Thomas; Tan, Liwen; Terroire, J.; Tran, Amina; von Loga, Katharina; Wasan, H.; Waxman, J.; Wooldridge, T.; Wordsworth, Sarah; Zangemeister-Wittke, Uwe; Ziogas, Algirdas [93] [i.e. 34.57% of total]	1 [each]	1 [for all authors]
Total		153 co-authors		

Abbreviations: PWD: Paper with Dhillon.

Table 16: Ranked list of communication channels of Tony Dhillon, 2003-2023.

Sl. No.	Communication Channels	Papers	%-age	C-%-age	FYP	LYP	Origin	IP
	Zone I (34.45%).							
1	Journal of Clinical Oncology.	6	20.69	20.69	2005	2020	USA	45.3
2	Cancer Research.	2	6.88	27.57	2009	2022	USA	12.701
3	The Journal of Reproductive Medicine.	2	6.88	34.45	2004	2006	USA	0.839
	Zone II (34.5%).							
4	Annals of Internal Medicine.	1	3.45	37.90	2005	2005	USA	39.3
5	BMC Cancer.	1	3.45		2021	2021	UK	4.4
6	BMJ: British Medical Journal.	1	3.45		2004	2004	UK	107.7
7	British Journal of Cancer.	1	3.45		2003	2003	UK	9.0
8	Cancers	1	3.45		2022	2022	Ireland	5.2
9	Clinical Cancer Research.	1	3.45		2009	2009	USA	11.5
10	Clinical Colorectal Cancer.	1	3.45		2014	2014	USA	2.813
11	ESMO Open	1	3.45		2020	2020	USA	5.329
12	Expert Review of Anticancer Therapy.	1	3.45		2005	2005	UK	3.3
13	Gynecologic Oncology.	1	3.45		2007	2007	USA	4.7
	Zone III (31.05%).							
14	HIV Medicine.	1	3.45	72.40	2006	2006	UK	3.094
15	Journal of Gastrointestinal Oncology.	1	3.45		2018	2018	China	2.1
16	Journal of Hepatology.	1	3.45		2022	2022	Netherlands	25.7
17	Journal of Thoracic Oncology.	1	3.45		2010	2010	USA	20.121
18	Lung Cancer	1	3.45		2012	2012	Switzerland	5.6
19	The Journal of Pathology.	1	3.45		2023	2023	German	7.996
20	The Lancet Oncology.	1	3.45		2004	2004	UK	51.1
21	Current Opinion in Infectious Diseases.	1	3.45		2006	2006	Netherlands	3.9
22	International Journal of Molecular Sciences.	1	3.45	100.00	2023	2023	Switzerland	6.208

Abbreviation: IP: Impact factor.

contributions is about one-fourth of those making one; …the number making n contributions is about 1/n² of those making one and the proportion of all contributors, that make a single contribution, is about 60 per cent" (Hertzel, 1985; Maheswarappa, 1997) i.e., 60 authors out of 100 will have one publication. In other words, it is to be said that out of all the authors, 60% authors will contribute just one publication, 15% authors will contribute 02 publications (i.e., $1/2^{2x}$ 60), 7% authors will contribute 03 publications (i.e., $1/3^2$ x 60) and so on (Dutta, 2019; Maheswarappa 1997). In this study, there are 153 co-authors of Dhillon during 2003-2023. Out of which 93 co-authors i.e. 60.78% have single paper, 38 co-authors (24.83%) have two papers, 5 co-authors (3.26%) have three papers, 10 co-authors i.e. 6.53% have four papers, 3 co-authors i.e. 1.96% have five papers and so on. So, it does not follow the Lotka's law.

Degree of Collaboration

Degree of Collaboration (DC) identifies a relationship between main authors and co-authors. It is also known as 'Collaboration co-efficient'. It is calculated as *"total multiple papers" divided by "total papers"* for each year. It is observed from Table 1 that during 21 years of productive publication life, the DC had its highest value is one (1) only. The same was zero for one year in 2014 as one single-authored papers was published by the author. Over all, DC value is 0.96.

Communication Channels

Table 16 shows the ranked list of 22 communication channels where Dhillon's papers were published. He published 29 papers during the period of 2003-2023 and all are journal articles. *Journal of Clinical Oncology, Cancer Research and The Journal of Reproductive Medicine* are most favorite journals of his publications. Dr. Dhillon has published highest number of papers in *Journal of Clinical Oncology* (N06), followed by *Cancer Research (N02) and The Journal of Reproductive Medicine (N02).* Table 16 also provides locations from where his publications has emanated such as UK, USA, Switzerland, Netherlands, Ireland, China, etc. A largest number of papers has published from UK

Table 17: Ranking of publications by number of citations received.

Sl. No.	Title of paper	Communication channels (Year)	Times Cited (TC)			Ranks			Age of the paper (A) in 2023	Citation Growth Rate =TC/ A		
			GS	PM	RG	GS	PM	RG		GS	PM	RG
01	Immune Reconstitution Inflammatory Syndrome Associated with Kaposi's Sarcoma.	Journal of Clinical Oncology (2005)	327	92	--	01	01	--	19	17.21	4.84	--
02	AIDS-related malignancies: Changing epidemiology and the impact of highly active antiretroviral therapy.	Current Opinion in Infectious Diseases (2006)	211	45	154	02	02	01	18	11.72	2.50	8.56
03	A prognostic index for systemic AIDS-related non-Hodgkin lymphoma treated in the era of highly active antiretroviral therapy.	Annals of Internal Medicine (2005)	154	30	91	03	07	02	19	8.11	1.58	4.79
04	AKT/mTOR Pathway Activation and BCL-2 Family Proteins Modulate the Sensitivity of Human Small Cell Lung Cancer Cells to RAD001.	Clinical Cancer Research (2009)	107	39	89	04	03	03	15	7.14	2.60	5.94
05	Value of whole body 18FDG-PET to identify the active site of gestational trophoblastic neoplasia.	Journal of Reproductive Medicine (2006)	61	09	48	05	11	05	18	3.39	0.50	2.67
06	Pulmonary Kaposi sarcoma in the era of highly active antiretroviral therapy.	HIV Medicine (2006)	60	24	--	06	08	--	18	3.34	1.34	--
07	Overexpression of the Mammalian Target of Rapamycin A Novel Biomarker for Poor Survival in Resected Early-Stage Non-small Cell Lung Cancer.	Journal of Thoracic Oncology (2010)	59	32	52	07	04	04	14	4.21	2.29	3.71
08	Percutaneous irreversible electroporation with systemic treatment for locally advanced pancreatic adenocarcinoma.	Journal of Gastrointestinal Oncology (2018)	58	23	47	08	09	06	06	9.67	3.83	7.83
09	PRIME-HCC: phase Ib study of neoadjuvant ipilimumab and nivolumab prior to liver resection for hepatocellular carcinoma.	BMC Cancer (2021)	50	31	--	09	05	--	03	16.67	10.34	--

Table 18: Ranking of publications by number of citations received pattern.

No. of Citation received	Number of publications (frequency)			%-age of publications			Total Citations (TC)		
	GS	PM	RG	GS	PM	RG	GS	PM	RG
Up to 0	06	09	11	20.69	31.04	37.93	00	00	00
1-10	06	09	04	20.69	31.04	13.79	13	34	04
11-20	02	01	02	6.89	3.45	6.89	31	19	28
21-30	01	03	03	3.45	10.33	10.35	29	77	82
31-40	03	05	01	10.34	17.24	3.45	110	164	31
41-50	03	01	04	10.34	3.45	13.79	133	45	182
51-60	03	00	01	10.34	00	3.45	177	00	52
61-70	01	00	00	3.45	00	00	61	00	00
71-80	00	00	00	00	00	00	00	00	00
81-90	00	00	01	00	00	3.45	00	00	89
91-100	00	01	01	00	3.45	3.45	00	92	91
Above 100	04	00	01	13.81	00	3.45	799	00	154
Total (TC)	29	29	29	100.00	100.00	100.00	1553	431	713
Citations per article	--	--	--	--	--	--	53.55	14.86	24.59
Paper productive age = PPA (years)	--	--	--	--	--	--	21	21	21
Citations per year=TC/ PPA	--	--	--	--	--	--	73.95	20.52	33.95

(N6) and USA (N16). His publications has selected by the high impact journals such as *BMJ: British Medical Journal* (IP 107.7), *Journal of Thoracic Oncology* (IP 20.121), *Cancer Research* (IP 12.701), *Clinical Cancer Research* (IP 11.5), etc.

Bradford's Law and Communication channels

Each of three zones according to Bradford's Law should be 33% of publications, but in this case, these are respectively 34.45%, 34.5% and 31.05%. In other way, as per Bradford's Law (Maheswarappa, 1997; Hertzel, 1985), numbers of communication channels in the first and succeeding zones should be in the ratio, 1: n: n^2. Here, the ratio is 3:10: 9=1: 3.3: 3. Hence, the data set does not satisfy the Bradford's Law.

Citation Analysis

Highly Cited Scholarly Works and Citation Growth Rate (CGR)

This section counts the top 9 papers of Dhillon which have been "cited by" others according to three online free Abstracting and Indexing databases, like Google Scholar (GS), Pub Med (PM) and Research Gate (RG). A list of top cited articles along with their communication channels, year of publication has been listed in Table 17. It also shows graphical presentation of CGR in Figure 7. The first top cited paper ranked first in GS (327 times), in PM (92 times) with the CGR 17.21 and 4.84 respectively and the same has not received any citation in RG. Second one received first position in RG (with 154 times) whereas second in GS (211 times) and in PM (45 times). In this case, its CGR are 11.72, 2.5 and 8.56 respectively in GS, PM and RG. CGRs for the first, second and ninth paper are high i.e., 17.21, 11.27, 16.67 in GS, whereas 10.34 in PM for ninth paper.

Citation Received Pattern

Dr. Dhillon's 29 articles have collectively received 1553, 431 and 713 citations in GS, PM and RG respectively (Table 18). This indicates citations per article, 53.55 citations in GS, 14.86 in PM and 24.59 in RG. On average, he received 73.95 citations in GS, 20.52 in PM and 33.95 in RG per year. Among 29 articles, there are 06 (20.69%), 09 (31.04%) and 11 (37.93%) papers that have not received any citations in GS, PM and RG respectively.

Remaining 23 articles in GS, 20 in PM and 18 in RG have been cited between 1 to more than 100 times. There are 4 papers in GS have cited by 327, 211,154, 107 times respectively and one paper in RG has cited by 154 times. The five papers only have received citation more than 100 times.

Relative Un-cited Index (RUI) in GS, PM and RG

A higher RUI number suggests a lower citation impact (Sidlingappa and *et al.*, 2023). A value of zero indicates that there are no un-cited papers. Table 19 shows relative uncited index in GS, PM and RG.

Table 19: Relative un-cited index comparison between GS, PM and RG.

Year [1]	Total Papers [2]	%-age [3]	Uncited paper						Relative Uncited Index (RUI) (comparison)= 5/3		
			Total [4]			Ratio=citation/total citation [5]					
			GS	PM	RG	GS	PM	RG	GS	PM	RG
2003	1	3.45	0	0	1	0.00	0.00	0.09	0.00	0.00	0.03
2004	3	10.35	1	1	0	0.16	0.11	0.00	0.02	0.01	0.00
2005	6	20.68	1	2	4	0.16	0.22	0.36	0.01	0.01	0.02
2006	3	10.35	0	0	1	0.00	0.00	0.09	0.00	0.00	0.01
2007	1	3.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
2009	2	6.89	1	1	1	0.16	0.11	0.09	0.02	0.02	0.01
2010	1	3.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
2012	1	3.45	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
2014	1	3.45	1	1	1	0.16	0.11	0.09	0.04	0.03	0.03
2018	1	3.45	0	0	1	0.00	0.00	0.09	0.00	0.00	0.03
2019	1	3.45	0	1	0	0.00	0.11	0.00	0.00	0.03	0.00
2020	2	6.89	0	1	0	0.00	0.11	0.00	0.00	0.03	0.00
2021	1	3.45	0	0	1	0.00	0.00	0.09	0.00	0.00	0.03
2022	3	10.35	1	1	1	0.16	0.11	0.09	0.02	0.01	0.01
2023	2	6.89	1	1	1	0.16	0.11	0.09	0.02	0.02	0.01
Total	29	100.00	6	9	11	--	--	--	--	--	--
%-age			20.69	31.03	37.93						

Table 20: Relative citation impact comparison between GS, PM and RG.

Year	TP	% of TP	Cited papers (CP)			Cited received						Citation per paper= TC/CP			Relative Citation Impact (RCI) =% of TC/ % of TP		
						Total citation (TC) and % -age											
						GS		PM		RG							
			GS	PM	RG	TC	%	TC	%	TC	%	GS	PM	RG	GS	PM	RG
2003	1	3.45	1	1	0	6	0.45	1	0.24	0	0.00	6.00	1.00	0.00	0.13	0.07	0.00
2004	3	10.35	2	2	3	70	5.17	9	2.09	58	8.14	35.00	4.50	19.33	0.49	0.20	0.79
2005	6	20.68	5	4	2	518	38.29	128	29.69	118	16.55	103.60	32.00	59.00	1.85	1.44	0.80
2006	3	10.35	3	3	2	332	24.54	78	18.09	202	28.33	110.67	26.00	101.00	2.37	1.75	2.74
2007	1	3.45	1	1	1	36	2.66	3	0.69	29	4.07	36.00	3.00	29.00	0.77	0.20	1.78
2009	2	6.89	1	1	1	107	7.91	39	9.05	89	12.48	107.00	39.00	89.00	1.15	1.31	1.81
2010	1	3.45	1	1	1	59	4.36	32	7.43	52	7.29	59.00	32.00	52.00	1.26	2.15	2.11
2012	1	3.45	1	1	1	42	3.10	19	4.41	42	5.89	42.00	19.00	42.00	0.89	1.28	1.71
2018	1	3.45	1	1	1	58	4.29	23	5.34	47	6.59	58.00	23.00	47.00	1.24	1.55	1.91
2019	1	3.45	1	0	1	17	1.26	00	0.00	15	2.10	17.00	0.00	15.00	0.37	0.00	0.61
2020	2	6.89	2	1	2	42	3.10	31	7.19	46	6.45	21.00	31.00	23.00	0.45	1.04	0.94
2021	1	3.45	1	1	0	50	3.69	31	7.19	0.	0.00	50.00	31.00	0.00	1.07	2.08	0.00
2022	3	10.35	2	2	2	15	1.11	36	8.35	14	1.96	7.50	18.00	7.00	0.11	0.81	0.19
2023	2	6.89	1	1	1	1	0.07	1.00	0.24	1	0.15	1.00	1.00	1.00	0.01	0.03	0.02
Total	29	100	23	20	18	1353	100	431	100	713	100	---	---	---	---	---	---

Abbreviations: TP: Total papers.

Table 21: Keyword Frequency.

Rank	Keywords	Frequency
Group 1	Antiretroviral therapy, Colorectal cancer, Early stage, Hepatocellular carcinoma, Carcinoma, Adenocarcinoma, Prognostic index (Collins India. (2013).	3 times each
Group 2	Adjuvant treatment, Avelumab, Chemotherapy, Colon cancer, Genetic, Healthy women, Ib study, Immune landscape evolution, Liver resection, Mammalian Target, Management, MMR deficient colorectal cancer, Neoadjuvant ipilimumab, Non-small cell lung cancer, Novel Biomarker, Lung cancer, Overexpression, Pancreatic Ductal Adenocarcinoma, Phase III randomised study, POLE exonuclease domain mutant colon cancer, POLEM, Poor Survival, PRIME-HCC, Rapamycin, Rapamycin (mTOR), Whole body (Koley, S. and Sen, B. K. (2016).	2 times each
Group 3	(PTI. (2024) Adjuvant bisphosphonate, AIDS-associated Kaposi's sarcoma, AIDS-related malignancies, AKT/mTOR Pathway Activation, Angioinvasion, BCL-2 Family Proteins, Bile Microbiome Signatures, Cancer Research., Cardiotoxicity, Cells to RAD001, Changing epidemiology, Elevated serum β-hCG, Fluoropyrimidine-based chemotherapy, Gestational age, Gestational trophoblastic neoplasia, Gestational Trophoblastic Tumors (GTTs), hCG, Human Small Cell Lung Cancer, Hydatidiform mole, Immune Reconstitution Inflammatory Syndrome, Intravenous bisphosphonate, Khaposi's Sarcoma, Liposomal anthracyclines, Mechanisms, Microbiome, Nivolumab, NSCLC, Mammalian target, Osteoporosis, Paclitaxel, Pancreatic adenocarcinoma, Percutaneous irreversible electroporation, persistently elevated, Fluoropyrimidine-based chemotherapy, Poor prognostic factors, Positron Emission Tomography (PET), Pulmonary Kaposi sarcoma, Real-world experience, Regorafenib in patients, EGFR inhibitors, Stage III dMMR, Stage III mismatch, Systemic AIDS-related lymphoma, Systemic AIDS-related non-Hodgkin lymphoma, Systemic treatment, UK Pilot Study, United Kingdom study, 18FDG-PET (PTI. (2024).	1 time each

In this case, out of 29 papers produced during the time span 2003-2023, 6 (20.69%) in GS, 9 (31.03%) and 11 (37.93%) have remained un-cited. The RUI values for the study period ranged from 0.01 to 0.04 in three databases.

Relative Citation Impact

Variant values of the Relative Citation Impact (RCI) for Dr. Dhillon is shown in Table 20. The highest RCI values are 2.74 in RG, 2.37 in GS in 2006; 2.15 in PM in 2010. Contrary, the lowest RCI values are counted for the year 2023 in GS (0.01). It may be noted that the RCI result indicates fluctuations in his publications' receiving pattern and citation impact (Sidlingappa and *et al.*, 2023).

Keyword Frequency

Table 21 classified keywords into three groups according to their frequencies extracted from 29 title of his papers. Firstly 10 key-words (Group 1) including *Antiretroviral therapy, Colorectal cancer, Early stage, Hepatocellular carcinoma, Carcinoma, Adenocarcinoma, Prognostic index* have been used three times each. Colorectal cancer is the prime theme of this study. Secondly, a group of 26 keywords (Group 2) appeared 2 times each and finally, 48 keywords used once each.

CONCLUSION

At one time, malaria, cholera, typhoid, TB and even recently COVID 19 were taken epidemic form around the world. People are now free to some extent from such diseases by the blessing of medical research. Thus, people got success in different fields of our lives. Our scientists are going to or sending rocket to the Moon successfully, but still now, the scientists could not be able to stop deaths for cancer after even hard and soul efforts. Day by day, over all, number of cancer patients and its deaths are being tremendously increased. The main aim of this study is aware the people about the bowel or colorectal cancer and newly developed technique in its treatment, especially current discovery of bowel cancer vaccine by the scientist with the devotion of last four years. He believes that his vaccine will bring changes in lives of bowel cancer patients in future because its first treatment vaccine will be able to cure cancer without surgery. Dr. Dhillon looks a possibility to cure other cancers (beyond bowel cancer) applying the same vaccine and it's just waiting for the success of the trail, phase 2. It must be noted for awareness of people that the incidence of cancer cases in India estimated to increase by 12.8 per cent in 2025 as compared to 2020 and would increase to 2.08 million (i.e., 57.5 per cent) in 2040 from 2020 (Sathishkumar and *et al.*, 2022). Whole world becomes very worried for huge increment of cancer cases and death due to it day to day. Now, cancer is one of the illnesses that cause more deaths worldwide (Piña-Sánchez and *et al.*, 2021). Everyone must aware of cancer and keep safe and free from this dangerous disease. So, World Cancer Day, a leading international awareness day, is held every 4 February, a global initiative led by the Union for International Cancer Control (UICC), USA. By raising worldwide awareness, sharing knowledge and accelerating personal, collective and government action, everyone should get together to build a new world for the prospective aims: "*millions of cancer deaths are prevented*" and *"access to life-saving cancer treatment*" and *"care is equitable for*

all". The slogan for the World Cancer Day campaign, 2022-2024 is "*Close the Care Gap*" i.e., we should join together 'on 4 February and help close the cancer care gap for a cancer-free world' (World Cancer Day, 2024). Finally, it is hopefully expected that bowel cancer vaccine will be available after two years around the world. Outstanding discovery of Dr. Tony Dhillon in the 21st century will be helpful in cancer treatment of humankind. Thus, once cancer may be eradicated from the world by the collective efforts of individual. Until then, let us lead normal life with balanced diet and keep it in mind that early cancer detection saves lives.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

REFERENCES

American Cancer Society. (2014, June 12). History of Cancer Epidemiology: 18th Century to Present. https://www.cancer.org/cancer/understanding-cancer/history-of-cancer/cancer-epidemiology.html.

American Cancer society. (2024). Cancer Glossary: Definitions and Phonetic Pronunciations. https://www.cancer.org/cancer/understanding-cancer/glossary.html.

American Cancer Society. (2024a). Understanding What Cancer Is: Ancient Times to Present. https://www.cancer.org/cancer/understanding-cancer/history-of-cancer/what-is-cancer.html.

Anandabazar Ptrika, Kolkata. (2024). Cancer Gobesanay Safollo, Dhabi 100 Takay Tablet (in bengali) =[Success in cancer research, claims of tablet for Rs. 100]/ discovered by Mumbai Tata Memorial Cancer Hospital. The Anandabazar Patrika, p.4.

Cancer Council, Australia. (n.d.). Types of Cancer: Bowel Cancer. https://www.cancer.org.au/cancer-information/types-of-cancer/bowel-cancer.

Cancer Research, UK. (n.d.). What is bowel cancer?. https://www.cancerresearchuk.org/about-cancer/bowel-cancer/about-bowel-cancer.

Canton, N. (2024, February 4). British Punjabi doctor leads ground-breaking international trial of bowel cancer vaccine. The Times of India. https://timesofindia.indiatimes.com/nri/other-news/british-punjabi-doctor-leads-groundbreaking-international-trial-of-bowel-cancer-vaccine/articleshow/107391031.cms.

Chhikara, B. S., and Parang, K. (2023). Global Cancer Statistics 2022: the trends projection analysis. Clinical Biology Lettters, 10(1), 451-. https://pubs.thesciencein.org/cbl

Collins Dictionary. (2024). CANCER definition and meaning. https://www.collinsdictionary.com/dictionary/english/cancer. Retrieved from Collins English Dictionary: https://www.collinsdictionary.com/dictionary/english/cancer

Collins India. (2013). Collins Essential School Dictionary. Noida: Collins Inda.

Dewey, M. (2003). Dewey decimal Classification and relative Index { DDC 22) (22 ed., Vols. 3:Schedules 600-999). Dublin, Ohio: OCLC.

Dutta, B. (2019). Biobiliometric potrait of B K Sen, A librarian, information scientist and sientometrician. Malaysian Journal of Library and Information Sciene, 24(1), 1-21.

Dutta, R. (2024a, February 09). Bowel Cancer-er Tika Aabiskar Bharatoya Bongsodvuto Doctor Dhillion(Bengali) [Bowel Cancer discovered by Dhillon, Doctor of Indian Origin]. The Bartaman.

Dutta, S. (2024, February 4). Bangalider madhye kon kon cancer barche (Bengali) (Which cancers are increasing in Bengalees). p.7. (S. Nayak, and M. Mukhopadhay, Interviewers) Kolkata: Bartaman.

Eai Samay, Kolkata. (2024, February 12). Cancer Niramaye Naya Disha Dekhache CAR-T Therapy(Bengali){ CAR-T Therapy shows news ways in Cancer prevension. Eai Samay, p2.

Faguet, G. B. (2014, Auguest 11). A brief history of cancer: Age-old milestones underlying our current knowledge database. https://onlinelibrary.wiley.com/doi/full/10.1002/ijc.29134#:~dictinary.com. (n.d). Cancer. https://www.thefreedictionary.com/cancer.

Free dictinary.com. (n.d). Cancer. https://www.thefreedictionary.com/cancer.

Ghosh, A. (2024, February 4). Sachenata o Prayuktir mishele ekhon cancer has answer (bengali) (In the mix of awareness and technology, cancer has answer now). Eai Samay, Kolkata, p.2.

Guildford dragon News. (2020, February 5). News in Brief from the Royal Surrey County Hospital. https://guildford-dragon.com/news-in-brief-from-the-royal-surrey-county-hospital/

Hasan, F. (2024, March 1). Kashmire Barche Breast Cancer, Protidin gare mrito 2 (in Bengali) [Breast Cancer increasing in Kashimr, Averahe 2 deaths per day]. Bartaman Patrika.

Herndon, J.R. (2023, May 08). The History of Cancer: Discovery and Treatment.https://www.verywellhealth.com/the-history-of-cancer-514101

Hertzel, D. (1985). Bibliometrics, History of the Development of Ideas. In A. Kent, Encyclopedia of Library and Information Science (pp. 144-219). New York: Marcel Dekkker Inn.

Hobbs, F. D. (2000, Oct 28). The role of primary care. BMJ, 321(7268), 1068–1070. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1118852

Kalyane, V. L. (1996). Scientometric portrait of Nobel Laureate Pierre-Gilles de Gennes. Malaysia Journal of Library and Information Science, 1(2), 13-23.

Koley, S. (2023, Jyly-December). Biobibliometric portrait of Dr. Dilip Mhalanabis, pioneer of oral rehydration solution (ORS), the life-saving solution. International Journal of Library and Information Science, 15(2), pp. 14-31. doi:10.5897/IJLIS2023.1077

Koley, S. and Sen, B. K. (2016). Biobibliometric portrait of V L Kalyane, a steller biobibliometrician. Annals of Library and Information Studies, 63(2), 161-175.

Koley, S. and Sen, B. K. (2021). Biobibliometric portrait of A P J Abdul Kalam. PEARL- A Journal of Library and Information Science, 15(3), 141-152.

Kopustinskiene, D. M., *et al* (2020). Flavonoids as Anticancer Agents. Nutrients. 2020 Feb; 12(2): 457, 12(2), 457. Doi: 10.3390/nu12020457

Kumar, A. (2024, January 11). Top 10 Cancer States in India | 2023 Cancer Statistics in India. https://drarvindkumar.com/blog/top-10-cancer-states-in-india-2023-cancer-statistics-in-india.php

Kumar, P., and Anupoma, A. (2022). Incidence estimate of Cancer Cases in State/ UT o India from 2018-2021-v-1. International Journa of Cancer Research and Therapy, 7(2), 109-115.

Maheswarappa, B. S. (1997). Bibliometrics: an over view. In G. Devarajan, Bibliometric Studies (pp. 1-10). New Delhi: Ess Ess Publications.

Mandal, A. (2023, July 5). Cancer History. https://www.news-medical.net/health/Cancer-History.aspx

Mathew, T. V., *et al.* (2020). Trends in colorectal cancer incidence in India. JCO, 38 (15 Suppl):e16084.

Mint. (2023, November 07). National Cancer Awareness Day 2023: types of cancers, its causes and preventive measuresreness-day-2023-types-of-cancer-its-cause-and-preventive-measures.https://www.livemint.com/science/health/national-cancer-awareness-day-2023-types-of-cancer-its-caus.

Morris, L. (2020). Landmark international bowel cancer vaccine trial launches. https://www.nationalhealthexecutive.com/articles/landmark-international-bowel-cancer-vaccine-trial-launches.

Nath, U. (2024, February 17). Sacheton Hole aatkano Jay Survical Cancer (in bengali) [Survical Cance can prevent, if we take precaution]. Ananda Bazar Patrika.

Nationa Cancer Institute, US. (2023, November 29). Drugs Approved for Colon and Rectal Cancer.https://www.cancer.gov/about-cancer/treatment/drugs/colorectal#1.

National Cancer Institute. (n.d.). Cancer: A Historic Perspective. https://training.seer.cancer.gov/disease/history/

NCI. (2021, October 11). What Is Cancer? - NCI (National Cancer Institute). https://www.cancer.gov/about-cancer/understanding/what-is-cancer.

NHS. (n.d.). Bowel cancer. https://www.nhs.uk/conditions/bowel-cancer/.

NRI Affairs. (2024, February 5). From Vision to Reality: Indian-Origin Dr. Tony Dhillon's Journey to Combat Bowel Cance. https://www.nriaffairs.com/indian-origin-dr-tony-dhillons-combat-cancer/.

Nuffield Health. (2024). Dr Tony Dhillon. https://www.nuffieldhealth.com/consultants/dr-tony-dhillon

OUP. (2014). Little Oxford English Dictionary (9th ed ed.). (S. Hawker, Ed.) New Delhi: Oxford University Press.

Patil, P., *et al.* (2017). Colorectal cancer in India: An audit from a tertiary center ina low prevalence area. Indian J Surg Oncol, 8, 484-90.Physiopedia. (2024). Oncology - Physiopedia. https://www.physio-pedia.com/Oncology

Physiopedia. (2024). Oncology - Physiopedia. https://www.physio-pedia.com/Oncology

Pickles, K. (2024, January 26). First Bowel Cancer vaccine could be Available in two years as NHS Doctors trail the jab. https://www.dailymail.co.uk/health/article-13007931/bowel-cancer-vaccine-available-two-years.html.

Piña-Sánchez, P., *et al.* (2021). Cancer Biology, Epidemiology and Treatment in the 21st Century: Current Status and Future Challenges From a Biomedical Perspective. Doi: 10.1177/10732748211038735. Cancer Control., 28. Doi:10.1177/10732748211038735

PTI. (2024, February 5). British Indian doctor to undertake 'British Indian doctor to undertake 'ground-breaking' cancer vaccine trial.https://health.economictimes.

indiatimes.com/news/industry/british-indian-doctor-to-undertake-ground-breaking-cancer-vaccine-trial/107407168.

Sathishkumar, K., *et al.* (2022, 0ct-Nov). Cancer incidence estimates for 2022 and projection for 2025: Result from National Cancer Registry Programme,. India. Indian J Med Res, 156(4 and 5), 598-607. Doi: 10.4103/ijmr.ijmr_1821_22.

Sharma, S. H., Thulasingam, S. and Nagarajan, S. (2017). Terpenoids as anti-colon cancer agents-A comprehensive review on its mechanistic perspectives. European Journa of Pharmacology, 795, 169-178. Doi: 10.1016/j.ejphar.2016.12.008

Shekhar, N. (2022, December 20). Rise in Cancer cases in the Country(Annexure 1). https://sansad.in/getFile/annex/258/AU1555.pdf?source=pqars.

Sidlingappa, H. M., *et al*. (2023). Professor Madhav Gadgil: A Bibliometric Portrait. Data Sci. Info. Citation Studies., 2(3), 243-254. Retrieved from Doi: 10.5530/jcitation.2.3.32

Siegel, R., *et al.* (2023). Cancer statistics, 2023. CA Cancer J Clin, 73(1), 17-48. doi:10.3322/caac.21763

Smith, R. D. and Mallath, M. K. (2019). History of the Growing Burden of Cancer in India: From Antiquity to the 21st Century. J Glob Oncol, 5, 1-15. Doi: 10.1200/JGO.19.00048.

Statista. (2023, July 12). Age adjusted incidence rate of colorectal cancer in India between 2012 and 2016, by Population Based Cancer Registries and gender(per million population).https://www.statista.com/statistics/1244132/india-age-adjusted-incidence-rate-of-colorectal-cancer-by.

Surrey Oncology Limited. (2016). PSC and Officers: Surrey Oncology Limited. https://youcontrol.com.ua/en/catalog/gb-card/09098215/.

Thakur, C. (2024, February 27). Tony Dhillon: The British-Indian doctor leading the pioneering trial of bowel cancer vaccine. https://www.globalindian.com/story/global-indian-exclusive/dr-tony-dhillon-the-british-indian-doctor-leading-the-pioneering-trial-of-bowel-cancer-vaccine/...

UK Oncology. (2018). Dr. Tony Dhillon. https://www.uk-oncology.com/new-consultants/dr-tony-dhillon.html.

University of Surrey, UK. (n.d.). Dr. Tony Dhillon. https://www.surrey.ac.uk/people/tony-dhillon#.

Uniyal, P. (2023, February 4). World Cancer Day 2023: Top 4 deadliest cancers in India and their symptoms as per oncologists. https://www.hindustantimes.com/lifestyle/health/world-cancer-day-2023-top-4-deadliest-cancers-in-india-and-their-symptoms-as-per-oncologists-101675326448626.htm.

WCRFI. (n.d.). Colorectal cancer statistics./ World Cancer Research Fund International (WCRFI). https://www.wcrf.org/cancer-trends/colorectal-cancer-statistics/#:~:text=Colorectal%20(also%2

WHO GLobal Cancer observatory. (2020). India fact sheets. Available from: https://gco.arc.fr/today/data/factsheets/populations/356-india-fact-sheets.pdf.

WHO Global Cancer Observatory. (2024a). 356 India fact Sheet: Statistic at a glance, 2022. https://gco.iarc.who.int/media/globocan/factsheets/populations/356-india-fact-sheet.pdf.

WHO Global Cancer Observetory. (2024). 900 world Facrt Sheet (Cancer), 2022. https://gco.iarc.who.int/media/globocan/factsheets/populations/900-world-fact-sheet.pdf.

WHO Global Canncer Observatory. (2022). 36 Australia Fact Sheet: Statistics at a glance,2022. https://gco.iarc.who.int/media/globocan/factsheets/populations/36-australia-fact-sheet.pdf.

WHO. (2023, July 11). Colorectal cancer. https://www.who.int/news-room/fact-sheets/detail/colorectal-cancer.

Wisevoter. (2024). Cancer Rates by Country. https://wisevoter.com/country-rankings/cancer-rates-by-country/...

World Cancer Day. (2024). What is World Cancer Day. ttps://worldcancerday.org/what-world-cancer-day?...

World Economic Forum. (2022, May 12). 6 new breakthroughs in the fight against cancer. https://www.gavi.org/vaccineswork/6-new-breakthroughs-fight-against-cancer?gad_.

Wróblewska-Łuczka, P., *et al*, (2023). Anticancer effect of terpenes: focus on malignant melanoma. Pharmacol. Rep, 75, 1115–1125. Doi: 10.1007/s43440-023-00512-1

Zerbino, D. D. (1994). [Biopsy: its history, current and future outlook]: [Article in Russian]. Lik Sprava, Mar-Apr(3-4), 1-9.

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