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Devastating Disease Cancer: A Theoretical Study and Recent Trends Review

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ABSTRACT

Cancer is a lethal disease and the whole world is affected by this. Cancer is the second most dangerous and death leading disease all over the world. In the normal human body, cells can grow and after some time a cell leads to death and another cell grows, by this procedure, particular cells and all types of cells remain constant but in Cancer disease, abnormal cells develop and divide uncontrollably and destroy the normal body cells and tissues mainly mutation is responsible for cancer. This research paper is trying to help in understanding all the important points about cancer disease. Cancer is the elementary unit of tumors, it leads to uncontrolled division of cells. Chronological growth of mutation in oncogenesis is responsible for the origin of cancer. Unbounded division of cells gives birth to the tumor, which is of two types, benign tumor and another is malignant tumor which is also known as cancer. There are many types of tumor antigens that are present in the human body and sometimes react against these antigens in the form of destroying tumors, NK cell activity, and many other ways. This lethal sickness is of many types as breast cancer, lung cancer, bladder cancer, kidney and renal pelvis cancer, thyroid cancer, melanoma of the skin, pancreatic cancer, liver cancer. In all among Cancer pancreatic cancer is difficult to recognize and diagnose that's why it is rapidly killing cancer. The death rate is higher among men than women. According to IARC in the year of 2020, the graph of death increases by cancer, a total of 19.3 million cases appear and 10 million had to lose their lives. As reported by the National Cancer Institute there are some methods that are helping in the healing of carcinoma disease:- Hormone therapy, immunotherapy, radiotherapy, surgery, stem cell transplantation, etc. This research paper outlines the current research and development to prevention and cure of cancer and explains all about cancer, and we try to give some little contribution to get rid of this dangerous disease.

Keywords: *Cancer; Tumor; Tumor antigens; Therapies; Recent discoveries of cancer.*

1.0 Introduction

Today Cancer is the most popular disease, and it is a hazardous illness as we know that most types of cancers are incurable and it can result in death. Cancer is a lethal disease in which cells multiply rapidly, it can damage whole cells of the body and spread into surrounding tissues. In the normal body or healthy body, cells receive signals and transfer to another cell, and at the end of the cell cycle, the cell stops dividing and leading to cell death that is called apoptosis but during cancer, cells neglect the signals and cannot remove unneeded cells [1-3]. Some expressions of cancer are responsible for the visible and detectable development that is known as tumors [2, 4]. There are two types of tumor: benign and

malignant, benign tumors form in one place without spreading and malignant tumors spread into surrounding tissues and it is very dangerous. Cancer or tumors arise genetically, and infection can be transferred from progeny to children [5]. Some environmental factors and our lifestyle is also responsible for the arising of cancer, this dangerous illness is also known as the silent killer disease [6-7].

2.0 History of Cancer

The Greek physician Hippocrates who is also known as the father of medicines used the word carcinoma and discovered the name of Cancer. The word tumor was invented by Galen and another

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Roman physician, Galen also gave contribution by introducing the mode of surgery for cancer [9-10].

Surgery was the primary tool accessible in the cure of cancer. In 1809 first surgery was present in the United States [11]. During the 19th and early 20th century, many surgeons proved that surgery is very effective in the cure of cancer because in 1867 Joseph Lister originated the antiseptic surgery that was very much useful in the cure of cancer [12-13]. In 1895 the period of radiation therapy began and after some years, 1928 is known as a milestone for cancer treatment because neck cancer was cured by fractionated radiation therapy [14-15].

1950 is known as the modern era of radiation therapy as cobalt teletherapy found in this year in which gamma rays occurred and directly entered into the patient's body and killed tumor tissues, in this treatment radiotherapy or teletherapy machines are used [15-16].

Hormone therapy was discovered by Thomas Bealson in the 19th era. He used the aromatase, tamoxifen inhibitors to stop breast cancer [17]. Immunotherapy was invented at the end of 1990, in this year monoclonal antibodies were discovered to cure breast cancer and lymphomas, after some years genetically engineered lymphocytes were used to treat cancer, and many therapies discovered like cell transfer therapy [19]. In the nineteenth century, the technique name chemotherapy was developed by German chemist Paul Ehrlich, in this therapy, chemicals are used to treat cancer, and for example, lymphomas were cured by the chemical that is nitrogen mustard [10].

2.1 Tumor antigens

Tumor antigens produced in tumor cells. They are specific and do not occur in normal cells. These are antigenic materials, the main reason by which tumor antigens have arisen is mutation. They are cellular proteins and responsible for inducing the buildup of helper t cells and antigens are helpful to induce the antibody in the body against cancer [19-21]. There are mainly three types of tumor antigens that are point mutation, viral proteins, and cancer germline gene. These tumor antigens are very important in the identification of the type of cancer [22]. Some antigens like Tyrosine, Alpha-Fetoprotein (AFP), Epithelial Tumor Antigen (ETA) are used in the identification of breast cancer, lung cancer, and many other cancers. Tumor antigens are used for the preparation of tumor vaccines [23-24].

2.2 Categories of cancer

- Melanoma: It can originate in melanocytes.
- Lymphomas: It can occur in B and T lymphocytes or lymph nodes.
- Sarcoma: This is the type of muscle and bone cancer.
- Leukaemia: It occurs in blood-forming tissues.
- Adenoma: This cancer arises in glands, like the pituitary gland, thyroid gland, and many others [6]. Carcinoma: It is initiated by epithelial cells, it can mainly affect the lungs, colon, and breast, it is the most common category of cancer [25-26].

2.3 Types of cancer

There are many types of cancer

- Breast Cancer
- Pancreatic cancer
- Liver cancer
- Prostate cancer
- Colon and rectum cancer
- Stomach cancer
- Leukemia
- Nasopharynx cancer
- Kidney cancer
- Ovarian cancer
- Lung cancer
- Lip and oral cavity cancer
- Cervical cancer
- Brain tumor
- Bladder cancer

Some common cancers are

2.3.1 Breast cancer

The cells of the breast grow out of control in breast cancer. There are three main parts of the breast: lobules, connective tissues and ducts. Cancer can start spreading from any part of the breast and start damaging the breast. Breast Cancer starts from lymph nodes and moves to further parts of the body [27-28].

2.3.2 Lung cancer

Lung cancer is the highest killing cancer. Smoking and air pollution are the reasons for lung cancer. It causes many problems like coughing, breathing problems, bone pain, body ache, etc. [29-30].

2.3.3 Prostate cancer

It is the main common cancer in men and it occurs when the cells of prostate glands begin to expand out of control, it is the main cause of death among men [31].

2.3.4 Brain cancer

In this, cells grow excessively and make a clump of tissues that is known as a tumor. This disease is very dangerous because, in this, the brain loses its memory, sensations and loses its activity. The main reasons for brain cancer are -smoking, headache, stress, radiation, etc. [32].

2.3.5 Pancreatic cancer

Pancreas is the essential endocrine organ of the body. In this cancer occurs and starts disturbance of its function. Pancreatic cancer is the rapid killing cancer and it is very difficult to diagnose (33).

3.0 Symptoms of Cancer [34-38]

- Fatigue
- Blood in the urine
- Night sweat
- Loss of appetite
- Changes in bowel
- Difficulty swallowing
- Headache
- Cough
- Body ache
- Indigestion

3.1 Causes of cancer [39-40]

- U.V.Rays
- Viruses
- Pollution
- Smoking
- Unhealthy foods
- Chemical and physical carcinogens
- Plastic
- Genetic abnormalities
- Alcohol

3.2 Numbers of deaths by cancer till 2018 [41-43]

- Because of colorectal cancer 862000 people died.
- Due to lung cancer 1.76 million people dead,
- Stomach cancer killed 783000 people.

- Due to liver cancer 782000 people's dead.
- Breast cancer killed 627000 people.

4.0 Prevention of Cancer

- Stop smoking
- Reducing the use of alcohol
- Take a healthy diet
- Protect themselves from infections disease
- Avoid direct contact with sun
- Reduce the use of plastic, and never burn it
- Exercise regularly
- Change lifestyle
- Avoid direct contact of carcinogens
- Always take care of yourself when working in a laboratory.

4.1 Therapies to treat cancer [44-45]

4.1.1 Surgery

If cancer is spread only in only one part of the body then surgery is used to diagnose cancer, in this treatment surgeon may detach lymph nodes to stop the spreading of this deadly illness.

4.1.2 Radiation therapy

In this therapy high energy particles are used to demolish the cancer cells.

4.1.3 Immunotherapy

In these medicines and some other treatment like yoga, meditation and exercise are used to boost the immunity.

4.1.4 Hormone therapy

In this treatment hormones are used to control the growth of cancer, mainly prostate and breast cancers are treated by this therapy.

4.1.5 Laser treatment

In this, a beam of light is used as a surgery tool for treatment.

4.1.6 Chemotherapy

In this therapy chemicals and medicines are used to cure cancer.

4.1.7 Stem cell transplantation

It is a very good therapy because in which healthy stem cells transfer into the patient's body by

needle, this blood forming stem cell takes the place of the dead cell.

4.2 Recent discoveries of cancer

- Researchers invented that the behavior of cancer is different in all persons [46].
- Scientists claim that vaccines are helpful to treat cancer because they are helping in boosting our immune power [47].
- Scientists said that exercise may help to inhibit the abnormal growth of cancer cells because exercise is responsible for many changes in our body like the production of hormones, and metabolites, these metabolites activate the immune cells [48].
- Robot surgery is very helpful because in this, doctors insert the tools into small cuts [49].
- Researcher of IISC Bangalore has discovered the technique that can detect cancer; this treatment nanomotors are helpful in the detection of cancer [50].
- IISC researchers developed a bandage made with magnetic nanofibers; they claim that this bandage is used to treat skin cancer by administering heat to the tumor cells. They said that skin cancer is mainly caused by the exposure of UV rays that's why this bandage is very effective to cure cancer [50].

5.0 Conclusions

Cancer is a devastating disease. It is the second death leading illness all over the world. In this review paper, I tried to highlight all the important information about cancer because of the lack of awareness people didn't understand the symptoms of cancer, and at the last stage, they lost their life, so that's why the death rate increased. 4 February is known as the world cancer day, on this day we should start some knowledgeable programs to spread awareness in common people. In the above review paper I tried to explain the reasons, symptoms, prevention, types, therapies, and recent discoveries of cancer that will help in understanding cancer. We know that cancer treatment is very costly, so the government should start free of cost checkup for every person that will help in controlling the cases of cancers. I think that we can make a prototype, which is similar to a glucometer or pregnancy test kit, in which needle is situated, and by inserting the needle

we can easily test the cancer disease and detect the abnormal growth of cells, but it is difficult to search which type of material is required for this device. It is concluded that we need to study more and more about cancer and try to discover new techniques and therapies to cure cancer and change the lifestyle to prevent cancer.

References

- [1] National Cancer institute
- [2] Cancer facts & figures 2017. (2017). <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2017/cancer-facts-and-figures-2017.pdf>
- [3] Cancer facts & figures 2018. (2018) <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2018/cancer-facts-and-figures-2018.pdf>
- [4] Common cancer types. (2018, February 26) <https://www.cancer.gov/types/common-cancers>
- [5] The genetics of cancer. (2017, October 12) <https://www.cancer.gov/about-cancer/causes-prevention/genetics>
- [6] What is cancer? (2015, December 8) <https://www.cancer.org/cancer/cancer-basics/what-is-cancer.html>
- [7] What is cancer? (2015, February 9) <https://www.cancer.gov/about-cancer/understanding/what-is-cancer>
- [8] www.cancer.org/acs/groups/cid/documents/webcontent/002048.pdf
- [9] <http://www.cancer.org/cancer/cancerbasics/the-historyofcancer/index>
- [10] <http://cancer.about.com/od/historyofcancer/a/cancerhistory.htm>
- [11] Warren JC. Inhalation of ethereal vapor for the prevention of pain in surgical operations. *Boston Med Surg J* 1846;35: 375–9.

- [12] Lister J On the antiseptic principle in the practice of surgery. *Br Med J* 1867;2: 246–8.
- [13] Whipple AO, Parsons WB, Mullins CR. Treatment of carcinoma of the ampulla of Vater. *Ann Surg* 1935;102:763–79.
- [14] Roentgen K On a new kind of rays. Stanton A, trans. *Nature* 1896;53:274.
- [15] Curie P, Curie M, Bémont G. On a new, strongly radioactive substance contained in pitchblende. *CR (East Lansing, Mich)* 1898;127:1215–7. [Google Scholar]
- [16] Coutard H Roentgen therapy of epitheliomas of the tonsillar region, hypopharynx, and larynx from 1920 to 1926. *AJR Am J Roentgenol* 1932;28:313–31. [Google Scholar]
- [17] <http://www.rare-cancer.org/history-of-cancer.php>
- [18] www.cancerresearchuk.org/.../surgery3
- [19] Restifo, NP; Dudley, ME; Rosenberg, SA (Mar 22, 2012). "Adoptive immunotherapy for cancer: harnessing the T cell response". *Nature Reviews. Immunology*. 12 (4): 269–81. doi:10.1038/nri3191. PMC 6292222. PMID 22437939.
- [20] M Hareuveni, C Gautier, M Kieny, D Wreschner, P Chambon and R Lathe; Vaccination Against Tumor Cells Expressing Breast Cancer Epithelial Tumor Antigen; Proceedings of the National Academy of Sciences, Vol 87, 9498-9502, 1990.
- [21] Kumar, Abbas, Fausto; Robbins and Cotran: Pathologic Basis of Disease; Elsevier, 7th ed.
- [22] Coulie P. G., van den Eynde B. J., van der Bruggen P., Boon T. Tumour antigens recognized by T lymphocytes: at the core of cancer immunotherapy. *Nature Reviews Cancer*. 2014;14(2):135–146. doi: 10.1038/nrc3670. [PubMed] [CrossRef] [Google Scholar]
- [23] Coulie PG, Hanagiri T, Takanoyama M: From Tumor Antigens to Immunotherapy. *Int J Clin Oncol* 6:163, 2001.
- [24] Chapter on tumor antigens in Cancer Medicine at NCBI
- [25] <http://www.medicalnewstoday.com/info/cancer-oncology/>
- [26] National Cancer institute
- [27] Centres for Disease Control and Prevention
- [28] American Cancer Society recommendations for the early detection of breast cancer. (2017). cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/american-cancer-society-recommendations-for-the-early-detection-of-breast-cancer.html
- [29] American-Cancer-Society. Cancer facts & figures 2014. Atlanta: American Cancer Society. 2014 [Google Scholar]
- [30] Non-small cell lung cancer. National Comprehensive Cancer Network. https://www.nccn.org/professionals/physician_gls/default.aspx. Accessed Jan. 13, 2020.
- [31] Yang XJ. Interpretation of prostate biopsy. UpToDate. 2019. Accessed at <https://www.uptodate.com/contents/interpretation-of-prostate-biopsy> on March 15, 2019.
- [32] American Cancer Society. "Brain and Spinal Cord Tumors in Adults." <<https://www.cancer.org/cancer/brain-spinal-cord-tumors-adults.html>>.
- [33] cancer.org/cancer/pancreatic-cancer/causes-risks-prevention/prevention.html
- [34] Moscow, J.A., K.H. Cowan, L. In Goldman and A.I. Schafer, 2011. eds. Biology of cancer. Cecil Medicine. 24th ed. Philadelphia, Pa: Saunders Elsevier: chap., pp: 185.
- [35] Thun, M.J., A. Jemal, L. In Goldman and A.I. Schafer, 2011. eds. Epidemiology of cancer. Cecil Medicine. 24th ed. Philadelphia, Pa: Saunders Elsevier: chap., pp: 183.

- [36] Cancer. World Health Organization. <http://www.who.int/news-room/fact-sheets/detail/cancer>. Accessed Dec. 5, 2018.
- [37] Cancer: All sites. Surveillance Epidemiology and End Results. <http://seer.cancer.gov/statfacts/html/all.html>. Accessed April 23, 2015.
- [38] Symptoms. National Cancer Institute. <http://www.cancer.gov/cancertopics/diagnosis-staging/symptoms..>
- [39] Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C et al. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 Lyon, France: International Agency for Research on Cancer; 2013.
- [40] GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016 Oct; 388 (10053):1659-1724.
- [41] Plummer M, de Martel C, Vignat J, Ferlay J, Bray F, Franceschi S. Global burden of cancers attributable to infections in 2012: a synthetic analysis. *Lancet Glob Health*. 2016 Sep;4(9):e609-16. doi: 10.1016/S2214-109X(16)30143-7.
- [42] Stewart BW, Wild CP, editors. World cancer report 2014 Lyon: International Agency for Research on Cancer; 2014.
- [43] Global Initiative for Cancer Registry Development. International Agency for Research on Cancer.
- [44] <http://www.cancer.org/treatment/treatmentsandsideeffects/treatmenttypes/>
- [45] Blood- forming Stem Cell Transplants.
- [46] The Cancer Genome Atlas: "Impact of Cancer Genomics on Precision Medicine for the Treatment of Cancer."
- [47] National Cancer Institute: "Biological Therapies for Cancer," "Cancer Genomics Overview," "Cancer Vaccines," "Immunotherapy," "Radiation Therapy for Cancer."
- [48] <https://www.sciencealert.com/exercise-might-delay-the-spread-of-cancer-by-fuelling-the-immune-system>.
- [49] MemorialCare Cancer Institute: "Robotic-Assisted Cancer Surgery." Agency for Healthcare Research and Quality: "Robotic Surgery: Risks vs. Rewards."
- [50] Kaushik Suneet, Tamasa De, Annapoorni Rangarajan and Shilpee Jain. Magnetic nanofibers based bandage for skin cancer treatment: a non-invasive hyperthermia therapy. *Cancer Reports*. 2020;e1281. DOI: 10.1002/cnr2.1281 <https://onlinelibrary.wiley.com/doi/full/10.1002/cnr2.1281>.