

# Prevalence Estimates and Associated Risk Factors of Cancer in India an Analytical Review

Akhter Hussain Bhat

Designation: Ph. D Research Scholar

Institute: Department of Sociology, Aligarh Muslim University, Aligarh, India, 202002

**Abstract:-** Cancer is one of the main causes of death and illness, and it is also one of the biggest health problems in the world today. Even though science and medicine have made a lot of progress, cancer has passed heart disease as the second-leading cause of death around the world. About 1 in 6 deaths worldwide are caused by cancer. Cancer is induced by tendencies and triggers. Tendencies are caused by internal, genetic factors, whereas external surroundings, the way someone lives, or an infection might operate as triggers. Based on the analytical review of the various secondary sources of data, the present paper attempts to provide an estimate of the prevailing trends and patterns of cancer and its associated risk factors in India. The results so analysed reveal that there were estimated 1.32 million cancer cases with 0.85 million cancer caused deaths in India in 2020. Breast cancer is the most common cancer, affecting both sexes and people of all ages, and it ranks first among all cancer types. By outlining a detailed discussion of the various cancer risk factors, the work concludes that India's cancer burden is not the outcome of any single factor; instead, there are hidden socio-cultural trajectories that need special attention in research and policy formulation.

**Keywords:-** Cancer, Prevalence, Risk Factors, Tendencies, Triggers, Treatment

## I. INTRODUCTION

Chronic non-communicable diseases (NCDs), often known as non-infectious diseases, are becoming more prevalent in both developed and developing countries. In developed countries, cardiovascular disease and cancer are the primary causes of death. The prevalence of chronic diseases is increasing, and this trend is likely to continue for a variety of reasons. For one reason, most countries' life expectancy is rising, and an increasing number of individuals are living to longer ages, putting them at greater risk for chronic diseases of various types. Another factor is that people's lives and behavioural patterns are fast changing, which favours the onset of chronic diseases. When assessed in terms of loss of life, disability, family suffering, poverty, and economic loss to the country, the impact of chronic diseases on people's lives is substantial (Park, 2019: 391). The World Health Organization (WHO) reports that NCDs account for 41 million deaths annually, or 71 percent of all deaths in the world. Between the ages of 30 and 69, more than 15 million people succumb to a non-communicable disease every year; 85 percent of these

premature deaths occur in low- and middle-income countries. Cardiovascular diseases account for the majority of NCD deaths, at 17.9 million people annually; cancer comes in second at 9.3 million; respiratory diseases account for the third at 4.1 million; and diabetes rounds out the list at 1.1 million (1.5 million).<sup>1</sup> More than 60 percent of the global disease burden was caused by NCDs, 28 percent by infectious, maternal, neonatal, and nutritional problems, and 10 percent by accidents in 2017 (Roser et al., 2016). Reducing the global burden of non-communicable diseases is an overriding priority and necessary for sustainable development (WHO, 2014). Now, developing countries are being told to take the right steps to avoid the epidemics of non-communicable diseases that are likely to come with changes in the economy and health (Park, 2019: 391).

Cancer is rapidly becoming the most feared non-communicable disease in the world. Cancer appears to occupy a distinct position in the spectrum of human diseases. Cancer is so terrifying that it frequently causes significant psycho-trauma, social hardship, and suffering, not only for the victim but also for their family (Kakande et al., 2001: 1; Iqbal et al., 2016: 1672). Cancer develops when normal cells in a particular body part grow out of control. It is a process of uncontrolled cellular growth that can manifest in over 200 different ways (Buckman, 1995 as cited in Bhat & Bhat, 2013: 50). Park (2015: 381), in his textbook on preventive and social medicine defines cancer as "a group of diseases characterised by an abnormal growth of cells, able to invade adjacent tissues and even distant organs leading to the eventual death of the affected patient if the tumour has progressed beyond that stage when it can be successfully removed." Cancer is a major public health challenge worldwide. It is the second leading cause of death after cardiovascular disorders world over. As a leading cause of most premature deaths, there is an immediate requirement of making the health care system more responsive to address preventive and curative measures. According to the estimates released by the International Agency for Research on Cancer (IARC) on December 14, 2020 and available online as GLOBOCAN 2020, the global burden of cancer has risen to 19.3 million cases and 10 million cancer deaths in 2020 as compared to 18.1 million cases and 9.6 million deaths in 2018. The estimates suggest that globally one in five people develop cancer during their

<sup>1</sup><https://www.who.int/news-room/factsheets/detail/noncommunicable-diseases> (Accessed Jan 9, 2023)

lifetime, and one in eight men and one in eleven women die from the disease. The new figures suggest that more than 50 million people live within five years of a cancer diagnosis (GLOBOCAN World Fact Sheet, 2020).

Further, the data show that breast cancer has surpassed lung cancer by incidence for both sexes for all ages, while lung cancer is still the number one cause of cancer deaths.<sup>2</sup> Globally, several factors appear to be driving this increase, mainly the growing and aging population and an increase in exposure to cancer risk factors linked to social and economic development. For rapidly growing economies, the data suggest a shift from poverty or infection-related cancers to those associated with lifestyles more typical in industrialized countries.<sup>3</sup> There continue to be significant disparities between higher and lower-income countries, with GLOBOCAN 2020 predicting that countries classified with low or medium human development index will have the most significant relative increase in cancer incidence by 2040.

Cancer is a multi-cause disease with a long duration. Available research shows that two types of factors generally give rise to cancer. These are the tendencies and the triggers (Bhat & Bhat, 2013: 51-52). The tendencies that may also refer to internal factors of cancer indicate an inclination or predisposition towards cancer due to genetic, ethnic, or hereditary factors. The triggers or external factors that are located outside the body of the individual can arise from the environment, from one's lifestyle, or some virus (Bhat & Bhat, 2013: 52). These external factors are generally identified as environmental factors and include different risk influences in the form of lifestyle, dietary habits, infections, pollution, occupational hazards, tobacco and alcohol consumption, socio-cultural, psychological, and economic conditions, and so on. Environmental attributes influence our health and illness in many ways. The environment appears to be the most significant contributor to many types of human cancers, accounting for 80–90 percent of cancer cases (Park, 2015: 384; Anand et al., 2008: 2097). Of the external factors, the lifestyle factors, which include smoking, improper diet, alcohol, infections, physical inactivity, stress, occupation, and sun exposure (Ali et al., 2011; Anand et al., 2008; Irigaray et al., 2007: 641; McCormack & Boffetta, 2011: 2349-50), are considered the major contributors to cancer incidence in any society.

#### ➤ *Objective*

With the above delineation as the background of the study, this work attempts to provide an estimate of the prevailing trends and patterns of cancer and its associated risk factors in India.

#### ➤ *Methodology*

Being analytical and descriptive in methodology, this study is primarily based on secondary data sources. The data

<sup>2</sup> <https://www.uicc.org/news/globocan-2020-new-global-cancer-data> (Accessed April 28, 2022)

<sup>3</sup> <https://www.uicc.org/news/global-cancer-data-globocan-2018> (Accessed April 28, 2022)

used in this paper is taken from various online and offline sources like books, journals, research articles, and government reports of national and international importance. Of major significance, the findings used in this work are based on the prevalence estimates of cancer produced by the International Agency for Research on Cancer in the form of GLOBOCAN. GLOBOCAN is an online accessible database created by the International Agency for Research on Cancer (IARC). It provides estimates of incidence and mortality for all cancer sites combined worldwide using the best accessible information in every nation to build a global cancer profile.

## II. RESULTS AND DISCUSSION

### ➤ *Prevalence of Cancer in India-2020*

Cancer is a significant health problem world over. It has emerged as the second leading cause of death after cardiovascular disease. The trends and patterns of cancer differ from country to country with the levels of development. Due to the fast-growing economy along with changes in lifestyle-related behaviors, India is also experiencing a simultaneous increase in cancer cases (Reddy et al., 2005: 1745). The magnitude of the cancer problem in the Indian sub-continent is increasing due to poor to moderate living standards and inadequate medical facilities (Ali et al., 2011: 56). As per the latest estimates released by the International Agency for Research on Cancer (IARC), there were estimated 1.32 million cancer cases with 0.85 million cancer caused deaths in 2020 In India (GLOBOCAN India Factsheet, 2020) compared to 1.15 incident cases of cancer and 0.78 million cases of deaths in 2018 (GLOBOCAN India Factsheet 2018). The five-year prevalence of cancer is estimated to be 2.72 million cases (GLOBOCAN India Factsheet, 2020) compared to 2.25 million cases in 2018. In India, the most frequently observed prevalent cancer among both sexes for incidence and mortality is the cancer breast (13.5% of the total cases) and ranks number one among all cancer types. This (breast) cancer is followed by lip, oral cavity cancers (10.3%), cervix (9.4%), and lung (5.5%) by incidence and cancer cervix (9.1%), lip, oral cavity cancers (8.8%), lung (7.8%) by mortality. Table 1 presents the overall summary of the top ten cancers in India among both sexes for all ages. Here it must be noted that in 2018 breast cancer was followed by oral cavity cancers both by incidence and mortality, while in 2020, it is cancer cervix which has surpassed oral cavity cancers for incidence and jumped to second place by mortality after breast cancer. Similarly, lip and oral cavity cancers have surpassed lung cancer for mortality and ranked number three in 2020 compared to lung cancer in 2018.

Further, the gender-wise distribution of the data reveals that amongst Indian males, the most common forms of cancers are related to lip and oral cavities (16.2% of total cases), followed by lung (8.0%) and stomach (6.3%) cancers. Among Indian females, breast cancer (26.3%) is the most commonly reported cancer. Here the figures are the same as the global prevalence of cancer. Breast cancer among Indian females is followed by cancers of the cervix (18.3%), ovary (6.7%), lip, and oral cavity (4.6%).

Figures and 3 present the estimates for cancers in Indian males and females as produced by GLOBOCAN, 2020.

Table 1 Top Ten Cancers in India Among Both Sexes For all Ages

Cancer Type	Number	Rank	Percentage	Deaths	Rank	Percentage
Breast	178361	1	13.5	90408	1	10.6
Lip/Oral Cavity	135929	2	10.3	75290	3	8.8
Cervix Uteri	123907	3	9.4	77348	2	9.1
Lung	72510	4	5.5	66279	4	7.8
Colorectal	65358	5	4.9	38161	7	4.5
Oesophagus	63180	6	4.8	58342	5	6.9
Stomach	60222	7	4.5	53253	6	6.3
Leukemia	48419	8	3.7	35392	8	4.2
Ovary	45701	9	3.5	32077	9	3.8
NHL	35828	10	2.7	20390	10	2.4

Source: GLOBOCAN India Fact Sheets, 2020

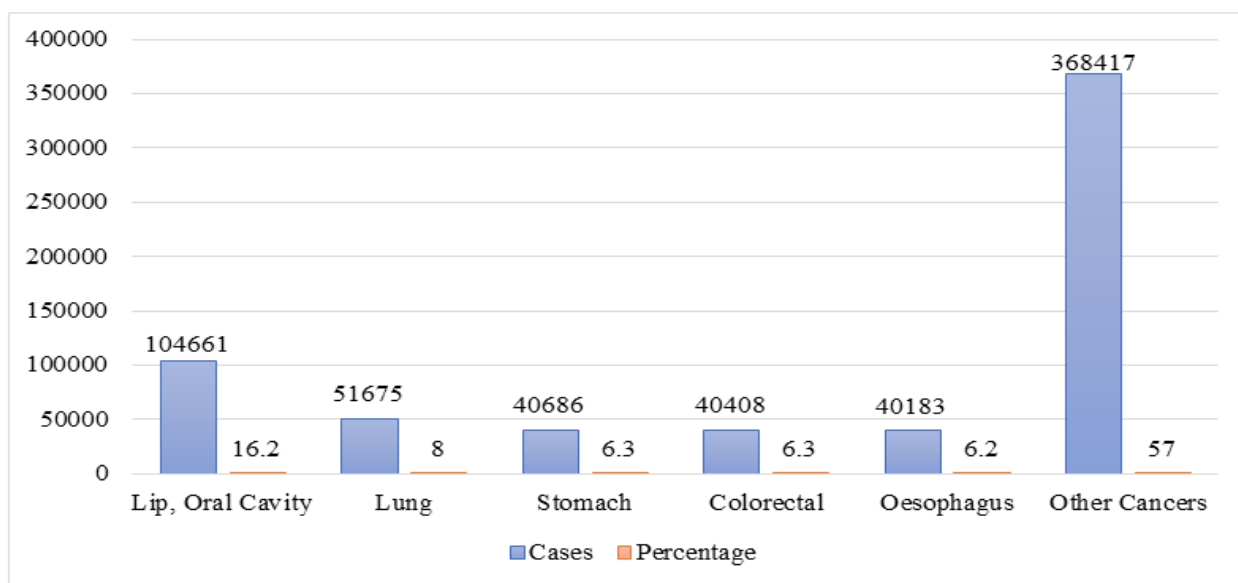


Fig 1 Major Types of Cancer Among Males for all Ages in India

Source: GLOBOCAN India Fact Sheets, 2020

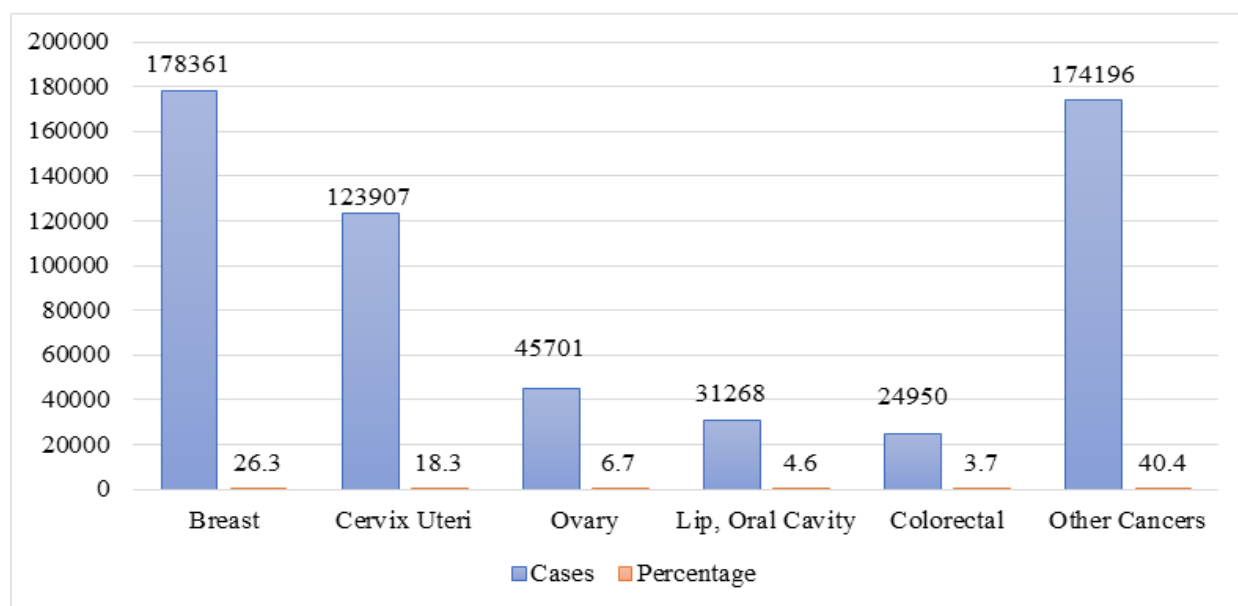


Fig 2 Major Types of Cancer Among Females for all Ages in India

Source: GLOBOCAN India Fact Sheets, 2020

➤ *Risk Factors an Overview*

World Health Organization (2022)<sup>4</sup> reported five prominent risk factors implicating one-third of deaths due to cancer. These factors include tobacco (smoking and smokeless), alcohol consumption, sedentary living, low physical activity, high body mass index, and low fruit and vegetable intake. Tobacco (smoked or smokeless) is the major risk factor for cancer development. It is responsible for almost 22 percent of cancer deaths, followed by cancer-causing infections such as human papillomavirus (HPV) for cervical cancer and hepatitis B or C for liver cancer which cause up to 30 percent of cancer burden in low and lower-middle-income countries (LMICs) (Dar & Sharma, 2019; Forouzanfar et al., 2016; Plummer et al., 2016). In LMICs, including India, cancer patients have a poor diagnosis attributed to late presentation, lack of awareness, and skewed cancer care facilities. More than 80 percent of cancers in India present in advanced stages, making their management difficult (Takiar et al., 2010). Approximately 70 percent of Indian cancers are caused by avoidable risk factors, including tobacco (40%), infection (20%), and others (10%) (Gandhi et al., 2017). Overall, the findings reveal that breast cancer has emerged as leading cancer by incidence and mortality among both sexes in 2020 and accounts for more than one-fifth of all female cancer mortality.

Similarly, cancer cervix has emerged as the third most reported cancer by incidence and the second most by mortality after breast cancer. For both of these cancers, researchers have developed volumes of scholarly works to attribute these to heredity and genetic, lifestyle and dietary changes, reduced physical activity, sedentary living and increasing obesity, increasing prevalence of poverty, lower/higher socioeconomic status, HPV prevalence, early age at marriage and first intercourse, lower parity or multiparity, tobacco consumption, early age at menarche or late menopause, no children or late age at first birth, lack of breastfeeding, urbanization, lack of screening, lack of awareness, multiple sex partners, early onset of menstrual periods, long term use of oral contraceptives, sexual behavior of a male partner, number of live births, poor genital hygiene, alcohol intake and so on (Asthana et al., 2014; Bobdey et al., 2016; Engmann et al., 2017; Monica & Mishra, 2020; Sathishkumar et al., 2021; Tripathi et al., 2014).

According to the GLOBOCAN (2020) estimates, lung cancer is the fourth most common cancer by incidence and mortality among both sexes for all ages in India. By gender, it is the second most common cancer among males by incidence after lip and oral cavity cancers. However, it does not find any place among the top five cancers affecting females. Smoking and other occupational exposures are the leading cause of lung cancer. According to the American Cancer Society (ACS), about 80 percent of lung cancer

deaths result from smoking.<sup>5</sup> In India association of lung cancer with tobacco smoking in various forms like cigarettes and bidis, especially among Indian males, has been highlighted by multiple studies (Behera & Balamugesh, 2012; Malik & Raina, 2015; Mohan et al., 2020). Cancers of the stomach, colorectum, and esophagus are ranked third, fourth, and fifth in incidence among males in India in 2020. Among Indian females, colorectal cancer stands at number five, while cancer stomach and esophagus do not find any place in the top five cancers by incidence. Overall, among both sexes for all ages, colorectal, oesophagus, and stomach cancers stand at number fifth, sixth, and seventh, respectively, by incidence, while by mortality, there are variations. By mortality, cancer stomach stands at number fifth after lung cancer, followed by cancer stomach at sixth and colorectal cancers at seventh.

All these three cancers, including liver cancer, have been linked to diet and infections. *Helicobacter pylori* are the major risk factor for the development of stomach cancer and is attributed to approximately 90 percent of gastric cancers (Plummer et al., 2015). Numerous studies have revealed an elevated risk of colorectal cancers with consuming processed and red meat though the carcinogenic mechanism is unclear (Bouvard et al., 2015; Sinha et al., 2009). With every 100 gm of red meat consumed daily and every 50 gm of processed meat consumed daily, the risk of colon cancer rises by 17 percent and 18 percent, respectively (Bouvard et al., 2015; Dar & Sharma, 2019). The food in Indian culture is distinctive in many ways because of its cultural diversity. The main risk factors for gastric/stomach cancers in both sexes have been identified as consumption of deep-fried and hot food with a significant amount of spices and food additives, dried fish, and other processed foods (Dikshit et al., 2011; Mathew et al., 2000; Rao et al., 2002).

Since it is the most prevalent cancer in India and affects a significant portion of people of all ages, oral cavity cancer is a severe public health concern. Due to their disproportionate exposure to risk factors, people with low incomes are most at risk. Continuous use of tobacco in various forms, such as cigarettes, hookah, bidi, Mawa, Kharra, Khaini, and other tobacco products, is a significant factor in the development of oral cancer in both young and adult populations in the Indian subcontinent (Borse et al., 2020; Coelho, 2012; Elango et al., 2009; Jayalekshmi et al., 2009; Khan et al., 2014; Mallath et al., 2014; Sharma et al., 2018; Shrestha et al., 2019). Tobacco use in various forms has been linked to cancers at several anatomical sites. It has become a global threat, including in India, because of its harmful effects and carcinogenicity. According to the recent report on cancer in sites associated with tobacco use in 2021, the projected number of cancers related to tobacco use in 2025 would be 427273 (males 313646 and females 113627). These cancers would contribute to 27.2 percent of India's total projected cancer cases (ICMR, 2021: 32).

<sup>4</sup> <https://www.who.int/news-room/factsheets/detail/cancer> (Accessed May 22, 2022)

<sup>5</sup> <https://www.cancer.org/cancer/lung-cancer/causes-risks-prevention/risk-factors.html> (Accessed May 22, 2022)

The NFHS-4 (2017: 343) reveals that 45 percent of men (N = 105411) and 7 percent of women (N = 699686) aged 15-49 use some form of tobacco. The most common forms of tobacco consumption among men are chewing *paan masala* or *gutkha* (15%), followed closely by smoking cigarettes (14%) and *Bidis* (13%). Among women, the most common forms of tobacco are chewing *paan masala* or *gutkha* or chewing *paan* with tobacco (2% each). In addition to tobacco smoking and the various other forms of tobacco use in India, the other risk factors for oral cancers include areca nut consumption, pan masala, opium and bhang, alcohol intake, human papillomavirus, family history, poor oral hygiene, increasing age, male gender, and socioeconomic status (Ali et al., 2011; Batra et al., 2020; Gupta et al., 2013; Varshitha, 2015).

### III. CONCLUSION AND SUGGESTIONS

While concluding the whole discussion, it can be said that cancer is one of the leading causes of mortality and morbidity worldwide. Globally, the cancer burden is increasing alarmingly by incidence, mortality, and prevalence. Various types and incidences of cancer exist in between and within the world due to geographical variation, socioeconomic conditions, behavioral patterns, and lifestyle-related factors. India is known for its geographic, social, cultural, religious, and economic diversity. The diverse nature of Indian society significantly impacts the variations of different cancer sites. A careful reading of the above discussion in this paper indicates an increasing cancer burden in India, estimated at over 1.32 million new cases and 0.85 million deaths in 2020, suggesting an alarming rise in this devastating disease in India. This calls for early detection policies and efficient prevention strategies implemented throughout the country without any socioeconomic disparities.

Overall top six cancer types can be reduced by adopting preventive measures, screening, early detection, and quality treatment at early stages. India has more than 60 percent avoidable cancer burden, which could be reduced by strengthening the appropriate public health system. It is advised to avoid risk factors like alcohol for stomach and lung cancers, tobacco use for lip, mouth, and lung cancers, and food and weight for colorectal cancers. To lower the rising incidence and death from cancers that may be prevented, tobacco control policies and programmes must be implemented nationwide. Increased consumption of fruits and vegetables, regular exercise, a good diet, and weight management are some critical preventive measures. Making cancer registration mandatory in India would help monitor, evaluate, and assess the efficacy of national cancer health programmes and provide data on the incidence, prevalence, morbidity, and mortality of cancer in the nation. The paper claims that hidden socio-cultural trajectories require particular attention in research and policy formulation rather than a single issue to blame for India's rising cancer burden. People must be made fully aware of the devastation that cancer causes and how to prevent it. The government and NGOs should undertake appropriate and comprehensive cancer control programmes to raise cancer awareness and

promote screening examinations to decrease the incidence rate and improve the survival of cancer patients.

### REFERENCES

- [1]. Ali, I., Wani, W. A., & Saleem, K. (2011). Cancer scenario in India with future perspectives. *Cancer Therapy*, 8(8), 56–70.
- [2]. Anand, P., Kunnumakara, A. B., Sundaram, C., Harikumar, K. B., Tharakan, S. T., Lai, O. S., Sung, B., & Aggarwal, B. B. (2008).
- [3]. Cancer is a preventable disease that requires major lifestyle changes. *Pharmaceutical Research*, 25(9), 2097–2116. <https://doi.org/10.1007/s11095-008-9661-9>
- [4]. Asthana, S., Chauhan, S., & Labani, S. (2014). Breast and cervical cancer risk in India: An update. *Indian Journal of Public Health*, 58(1), 5. <https://doi.org/10.4103/0019-557X.128150>
- [5]. Batra, P., Saini, P., & Yadav, V. (2020). Oral health concerns in India. *Journal of Oral Biology and Craniofacial Research*, 10(2), 171–174. <https://doi.org/10.1016/j.jobcr.2020.04.011>
- [6]. Behera, D., & Balamugesh, T. (2004). Lung cancer in India. *The Indian Journal of Chest Diseases & Allied Sciences*, 46(4), 269–281.
- [7]. Bhat, V., & Bhat, N. (2013). *My Cancer is Me: The Journey from Illness to Wholeness*. India: Hay House.
- [8]. Bobdey, S., Sathwara, J., Jain, A., & Balasubramaniam, G. (2016). Burden of cervical cancer and role of screening in India. *Indian Journal of Medical and Paediatric Oncology*, 37(4), 278–285. <https://doi.org/10.4103/0971-5851.195751>
- [9]. Borse, V., Konwar, A. N., & Buragohain, P. (2020). Oral cancer diagnosis and perspectives in India. *Sensors International*, 1(January), 1–14. <https://doi.org/https://doi.org/10.1016/j.sintl.2020.100046>
- [10]. Bouvard, V., Loomis, D., Guyton, K. Z., Grosse, Y., Ghissassi, F. El, Benbrahim-Tallaa, L., Guha, N., Mattock, H., Straif, K., Stewart, B. W., Smet, S. D., Corpet, D., Meurillon, M., Caderni, G., Rohrmann, S., Verger, P., Sasazuki, S., Wakabayashi, K., Weijenberg, M. P., ... Wu, K. (2015). Carcinogenicity of consumption of red and processed meat. *The Lancet Oncology*, 16(16), 1599–1600. [https://doi.org/10.1016/S1470-2045\(15\)00444-1](https://doi.org/10.1016/S1470-2045(15)00444-1)
- [11]. Coelho, K. R. (2012). Challenges of the oral cancer burden in India. *Journal of Cancer Epidemiology*. <https://doi.org/10.1155/2012/701932>
- [12]. Dar, M., & Sharma, K. (2019). Burden of cancer in India: GLOBOCAN 2018 Estimates Incidence, Mortality, prevalence and future projections of cancer in India. *Journal of Emerging Technologies and Innovative Research*, 6(6), 505–514. <https://doi.org/10.1729/Journal.22750>
- [13]. Dikshit, R. P., Mathur, G., Mhatre, S., & Yeole, B. B. (2011). Epidemiological review of gastric cancer in India. *Indian Journal of Medical and Paediatric Oncology*, 32(1), 3–11. <https://doi.org/10.4103/0971-5851.81883/BIB>

- [14]. Elango, J. K., Sundaram, K. R., Gangadharan, P., Subhash, P., Peter, S., Pulayath, C., & Kuriakose, M. A. (2009). Factors affecting oral cancer awareness in a high-risk population in India. *Asian Pacific Journal of Cancer Prevention*, 10(4), 627–630. <https://iranjournals.nlai.ir/handle/123456789/31793>
- [15]. Engmann, N. J., Golmakani, M. K., Miglioretti, D. L., Sprague, B. L., & Kerlikowske, K. (2017). Population-attributable risk proportion of clinical risk factors for breast cancer. *JAMA Oncology*, 3(9), 1228–1236. <https://doi.org/10.1001/jamaoncol.2016.6326>
- [16]. Forouzanfar, M. H., Afshin, A., Alexander, L. T., Biryukov, S., Brauer, M., Cercy, K., Charlson, F. J., Cohen, A. J., Dandona, L., Estep, K., Ferrari, A. J., Frostad, J. J., Fullman, N., Godwin, W. W., Griswold, M., Hay, S. I., Kyu, H. H., Larson, H. J., Lim, S. S., ... Zhu, J. (2016). 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. *The Lancet*, 388(10053), 1659–1724. [https://doi.org/10.1016/S0140-6736\(16\)31679-8](https://doi.org/10.1016/S0140-6736(16)31679-8)
- [17]. Gandhi, A. K., Kumar, P., Bhandari, M., Devnani, B., & Rath, G. K. (2017). Burden of preventable cancers in India: Time to strike the cancer epidemic. *Journal of the Egyptian National Cancer Institute*, 29(1), 11–18. <https://doi.org/10.1016/j.jnci.2016.08.002>
- [18]. GLOBOCAN India Fact Sheets. 2020. International Agency for Research on Cancer. World Health Organization. <https://gco.iarc.fr/today/data/factsheets/populations/356-india-fact-sheets.pdf> (Accessed 5 May, 2022).
- [19]. GLOBOCAN India Factsheet. 2018. Vol. 468; [https://www.gco.iarc.fr/today/data/factsheets/populations/356 India fact sheets.pdf](https://www.gco.iarc.fr/today/data/factsheets/populations/356%20India%20fact%20sheets.pdf). (Accessed 4 November, 2018).
- [20]. GLOBOCAN World Fact Sheets. 2020. International Agency for Research on Cancer. World Health Organisation. <https://gco.iarc.fr/> (Accessed 5 May, 2022).
- [21]. GLOBOCAN World. 2018. International Agency for Research on Cancer. World Health Organization. <http://gco.iarc.fr/> (Accessed 29 October, 2018).
- [22]. Gupta, B., Ariyawardana, A., & Johnson, N. W. (2013). Oral cancer in India continues in epidemic proportions: Evidence base and policy initiatives. *International Dental Journal*, 63(1), 12–25. <https://doi.org/10.1111/j.1875-595x.2012.00131.x>
- [23]. Indian Council of Medical Research-National Centre for Disease Informatics and Research. (2021). Clinicopathological Profile of Cancers in India: A Report of the Hospital Based Cancer Registries, 2021. [https://ncdirindia.org/All\\_Reports/HBCR\\_2021/](https://ncdirindia.org/All_Reports/HBCR_2021/) (Accessed 5 February, 2022).
- [24]. Iqbal, Q. M., Ganai, A. M., Bhat, G. M., & Fazili, A. B. (2016). Pattern and magnitude of various cancers registered at regional cancer centre of a tertiary care institute in north India. *International Journal of Community Medicine and Public Health*, 3(6), 1672–1680. <https://doi.org/10.18203/2394-6040.IJCMPH20161648>
- [25]. Irigaray, P., Newby, J. A., Clapp, R., Hardell, L., Howard, V., Montagnier, L., Epstein, S., Belpomme, D. (2007). Lifestyle-Related Factors and Environmental Agents Causing Cancer: An overview. *Biomedicine & Pharmacotherapy*, 61, 640-58.
- [26]. Jayalakshmi, P. A., Gangadharan, P., Akiba, S., Nair, R. R. K., Tsuji, M., & Rajan, B. (2009). Tobacco chewing and female oral cavity cancer risk in Karunagappally cohort, India. *British Journal of Cancer*, 100(5), 848–852. <https://doi.org/10.1038/sj.bjc.6604907>
- [27]. Kakande, I., Ekwaro, L., Obote, W. W., NassaLi, G., Kakande, R. I., & Kabuye, S. (2001). The pattern of cancer in Kampala, Uganda. *East and Central African Journal of Surgery*, 6(1).
- [28]. Khan, Z., Tönnies, J., & Müller, S. (2014). Smokeless tobacco and oral cancer in South Asia: A systematic review with meta-analysis. *Journal of Cancer Epidemiology*, 1–14. <https://doi.org/10.1155/2014/394696>
- [29]. Mallath, M. K., Taylor, D. G., Badwe, R. A., Rath, G. K., Shanta, V., Pramesh, C. S., Digumarti, R., Sebastian, P., Borthakur, B. B., Kalwar, A., Kapoor, S., Kumar, S., Gill, J. L., Kuriakose, M. A., Malhotra, H., Sharma, S. C., Shukla, S., Viswanath, L., Chacko, R. T., ... Sullivan, R. (2014). The growing burden of cancer in India: epidemiology and social context. *The Lancet Oncology*, 15(6), e205–e212. [https://doi.org/10.1016/S1470-2045\(14\)70115-9](https://doi.org/10.1016/S1470-2045(14)70115-9)
- [30]. Malik, P. S., & Raina, V. (2015). Lung cancer: Prevalent trends & emerging concepts. *Indian Journal of Medical Research, Supplement*, 141(JAN 2015), 5–7. <https://doi.org/10.4103/0971-5916.154479>
- [31]. Mathew, A., Gangadharan, P., Varghese, C., & Nair, M. K. (2000). diet and stomach cancer: a case-control study in South India. *European Journal of Cancer Prevention*, 89-97. <https://doi.org/https://doi.org/10.1097/00008469-200004000-00004>
- [32]. McCormack, V. A., & Boffetta, P. (2011). Today's Lifestyles, Tomorrow's Cancers: Trends in Lifestyle Risk Factors for Cancer in Low- and Middle-Income Countries. *Annals of Oncology*, 22 (11), 2349-2357.
- [33]. Mohan, A., Garg, A., Gupta, A., Sahu, S., Choudhari, C., Vashistha, V., Ansari, A., Pandey, R., Bhalla, A. S., Madan, K., Hadda, V., Iyer, H., Jain, D., Kumar, R., Mittal, S., Tiwari, P., Pandey, R. M., & Guleria, R. (2020). Clinical profile of lung cancer in North India: A 10-year analysis of 1862 patients from a tertiary care center. *Lung India*, 37(1), 190–197. <https://doi.org/10.4103/lungindia.lungindia>

- [34]. Monica, & Mishra, R. (2020). An epidemiological study of cervical and breast screening in India: District-level analysis. *BMC Women's Health*, 20(1), 1–15. <https://doi.org/10.1186/s12905-020-01083-6>
- [35]. National Family Health Survey (NFHS 4) 2015-16: India and 29 States. 2017. Government of India-Ministry of Health and Family Welfare, Mumbai: International Institute for Population Sciences.
- [36]. Park, K. (2015). *Preventive and Social Medicine* (23rd Ed.). Jabalpur: Banarsidas Bhanot.
- [37]. Park, K. (2019). *Preventive and Social Medicine* (25th Ed.). Jabalpur: Banarsidas Bhanot.
- [38]. Plummer, M., Franceschi, S., Vignat, J., Forman, D., & De Martel, C. (2015). Global burden of gastric cancer attributable to pylori. *International Journal of Cancer*, 136(2), 487–490. <https://doi.org/10.1002/ijc.28999>
- [39]. Plummer, M., de Martel, C., Vignat, J., Ferlay, J., Bray, F., & Franceschi, S. (2016). Global burden of cancers attributable to infections in 2012: a synthetic analysis. *The Lancet Global Health*, 4(9), e609–e616. [https://doi.org/10.1016/S2214-109X\(16\)30143-7](https://doi.org/10.1016/S2214-109X(16)30143-7)
- [40]. Rao, D. N., Ganesh, B., Dinshaw, K. A., & Mohandas, K. M. (2002). A case-control study of stomach cancer in Mumbai, India. *International Journal of Cancer*, 99(5), 727–731. <https://doi.org/10.1002/ijc.10339>
- [41]. Reddy, K. S., Shah, B., Varghese, C., & Ramadoss, A. (2005). Responding to the threat of chronic diseases in India. *The Lancet*, 366(9498), 1744–1749. [https://doi.org/10.1016/S0140-6736\(05\)67343-6](https://doi.org/10.1016/S0140-6736(05)67343-6)
- [42]. Roser, M., Ritchie, H., & Spooner, F. (2016). Burden of Disease. Published online at OurWorldInData.org. Retrieved from: <https://ourworldindata.org/burden-of-disease> (Accessed Jan 5, 2023).
- [43]. Sathishkumar, K., N, V., Badwe, R. A., Deo, S. V. S., Manoharan, N., Malik, R., Panse, N. S., Ramesh, C., Shrivastava, A., Swaminathan, R., Vijay, C. R., Narasimhan, S., Chaturvedi, M., & Mathur, P. (2021). Trends in breast and cervical cancer in India under National Cancer Registry Programme: An Age-Period-Cohort analysis. *Cancer Epidemiology*, 74(June), 101982. <https://doi.org/10.1016/j.canep.2021.101982>
- [44]. Sinha, R., Cross, A. J., Graubard, B. I., Leitzmann, M. F., & Schatzkin, A. (2009). Meat Intake and Mortality. *Archives of Internal Medicine*, 169(6), 562. <https://doi.org/10.1001/archinternmed.2009.6>
- [45]. Sharma, S., Satyanarayana, L., Asthana, S., Shivalingesh, K. K., Goutham, B. S., & Ramachandra, S. (2018). Oral cancer statistics in India on the basis of first report of 29 population-based cancer registries. *Journal of oral and maxillofacial pathology: JOMFP*, 22(1), 18. <https://doi.org/10.4103/jomfp.JOMFP>
- [46]. Shrestha, A. D., Vedsted, P., Kallestrup, P., & Neupane, D. (2020). Prevalence and incidence of oral cancer in low- and middle-income countries: A scoping review. *European Journal of Cancer Care*, 29(2), 1–7. <https://doi.org/10.1111/ecc.13207>
- [47]. Takiar, R., Nadayil, D., & Nandakumar, A. (2010). Projections of number of cancer cases in India (2010-2020) by cancer groups. *Asian Pacific Journal of Cancer Prevention*, 11(4), 1045–1049.
- [48]. Tripathi, N., Kadam, Y. R., Dhobale, R. V., & Gore, A. D. (2014). Barriers for early detection of cancer amongst Indian rural women. *South Asian Journal of Cancer*, 3(2), 122–127. <https://doi.org/10.4103/2278-330X.130449>
- [49]. Varshitha, A. (2015). Prevalence of oral cancer in India. *Journal of Pharmaceutical Sciences and Research*, 7(10), 845–848.
- [50]. World Health Organization. (2014). Global status report on non-communicable diseases 2014 (No. WHO/NMH/NVI/15.1). World Health Organization. Retrieved 25 December, 2022 from: <https://www.who.int/publications/i/item/9789241564854>