

Global Cancer Incidences, Causes and Future Predictions for Subcontinent Region

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ABSTRACT

Cancer is a significant health concern throughout the globe and a leading cause of death. In this review, we provide the summary of global incidences, causes and future trend of cancer incidences in subcontinent region from 2015 to 2035, based on population data driven by World health organization (GLOBOCAN) online prediction calculator. Data on the estimated number of new cancer cases, mortality rate and global prevalence is available on GLOBOCAN for all the countries and regions of the world. Data from the Cancer facts and figures by World Cancer Research Fund International and World-wide Cancer Statistics by Cancer Research UK is also utilized. GLOBOCAN provide global data on 27 different cancer types except nonmelanoma dermal cancer. It shows data for both genders at all age groups. Demographic effect of projected cancer incidences in subcontinent in both genders has been compared with global demographic effect which predicted an expected constant rise in all the years projected from 2015 to 2035. Cancer

friendly behaviors and cancer causing factors in the world are expected to increase the global economic burden due to growth and aging of population. A collective response from all the sectors of society will be helpful to design and implement a coordinated and integrated comprehensive program to control the rapidly growing burden of cancer in subcontinent.

Keywords: Cancer cases, death rates, incidence, mortality, survival, demographic effect, disability-adjusted life year

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INTRODUCTION

Cancer is a significant health concern throughout the globe and a leading cause of death. In this review, we provide the summary of global incidences, causes and future trend of cancer incidences in subcontinent region from 2015 to 2035 based on population data driven by World health organization (GLOBOCAN) online prediction calculator.¹

Humans and animals are suffering from cancer in entire recorded history and people have written about cancer since the dawn of human history. Earliest record of cancer is found through tumors in fossilized bones, and osteosarcoma in ancient Egyptian mummies and prehistoric manuscripts. Oldest record of history of cancer was discovered in 3000 BC, in Egypt called as *Papyrus Edwin Smith*, part of an ancient text book on trauma surgery, which stated eight different tumors of breast that were surgically removed with the help of a tool called fire drill and mentioned about the disease, "There is no cure." Globally it's estimated that one in every seventh death is due to the cancer while cancer causes more deaths than HIV, tuberculosis, and malarial infection when grouped together.² Socioeconomic categorization of world discovered that cancer is the leading cause of death in high-income countries after cardiovascular diseases and in low to middle income countries it is third after cardiovascular, parasitic and infectious diseases.³ Each year around 8.2 million people die from cancer which is 13 percent of total deaths worldwide, and more than 70 percent increase is expected over the next 2 decades. There are more than hundred types of cancers exist each one of it must be diagnosed and treated uniquely and individually. Global cancer statistics on incidences and mortality are extracted from the IARC (international agency for research on cancer) GLOBOCAN data base, WHO (world health organization) Global Health Observatory and UN (united nation) World Population Prospects report.^{5,6}

Uncontrolled growth and spread of abnormal cells in the body is designated as cancer and if left untreated can lead to death. It's mainly caused by endogenous factors like inherited genetic mutations, hormonal

imbalances, immune disorders but largely affected by the exogenous factors, for example tobacco smoke or chewing, certain organisms, unhealthy diet, environmental chemicals, and literally hundreds of different agents. Cancer may or may not appear after immediate exposure of these factors, it may take ten or more years to be detectable depending upon the nature, type, route of exposure and complex interplay of genes with external stimuli. Cancer can be treated by various methods like surgery, radiation therapy, antineoplastic chemotherapy, hormonal drugs, immune modulators and precision medicine (drugs specifically targeted towards cancerous cells).⁷⁻⁹

According to the GLOBOCAN most prevalent types of cancers are respiratory tract and breast cancer in females, gastrointestinal and prostate in males which account for 4 in 10 of all diagnosed cancers worldwide. In men lung cancer was found single most common type globally. It was found that certain factors affected on geographic differences in cancer incidences which may include but not limited to age of population, exposure of risk factors, cancer diagnostic tools and facilities, and treatment quality. Infection related neoplasm are more prevalent in developing than developed countries.¹⁰ In 2012, hepatic and gastric cancers in men and cervical and gastric in women were found to be associated with infections, whereas nearly 16 percent of global cancer incidences are caused by infections which is thrice (23%) in underdeveloped countries and seven percent in developed countries.¹¹ About 8.2 million peoples died from cancer in 2012 according to the global cancer observatory and it is predicted that this figure will rise upto 13 million by 2030, similarly the expected cancer incidences will reach up to 22 million in 2030. These projections are based on the rise in global population and age. This huge surge is mainly due to the poor lifestyle patterns which are likely to increase cancer risk, for example cigarette smoking, unhealthy diet (e.g., consumption of less vegetables and fruits and high salt intake), very low physical activities, and lower pregnancies in developing world. Besides all the other cancer causative factors; age significantly increases likelihood

of cancer in developing countries, more than half of the newly detected malignancies found at the age of 65 years and higher, which is less than 40 percent in developed countries.^{12,13} Cancer is strongly related to family history but not entirely, involvement of lifestyle and other environmental factors with a defective gene are also major contributors. Individuals are at high risk if they possess hereditary cancers closely linked with mutated genes. Variations in cancer incidences by region is based on the prevalence of different risk factors in various regions of the world. Most common preventable cause of death is smoking in all over the world while most of the smokers found in underdeveloped countries. Six percent deaths in all over the world is caused by alcohol consumption, 1 in every 8 deaths is due to cancer and it is prevalent in Europe and America.^{14,15} One of the important rapidly growing region of low socioeconomic in Asian is India, Pakistan and Bangladesh commonly known as sub-continent. This region has all the potential contributing cancer causing factors like poor diet and lifestyle, environmental factors, and less developed health facilities to diagnose the cancer at early stage. This will pose a significant threat on the region's economy and demands a plan to deal with the early cancer detection and proper treatment.

Data Sources and Methods

Data generated by IARC and presented on WHO-GLOBOCAN online prediction has been used. Data on the estimated number of new cancer cases, mortality rate and global prevalence is available on GLOBOCAN for all the countries and regions of the world. Data from the Cancer facts and figures by World cancer research fund international and worldwide cancer statistics by Cancer Research UK is also utilized. GLOBOCAN provide global data on 27 different cancer types except non-melanoma dermal cancer. It shows data for both genders at all age groups. Complete database with sources and methodologies is available on GLOBOCAN online (http://globocan.iarc.fr/Pages/burden_sel.aspx). Countries are further categorized in to 21 world regions based on level of development whereas calculations are based on population-weighted mean of incidences and mortality rates. According to the United Nations classification Japan, European, North American countries, Australia and New Zealand are designated as developed countries and in less developed countries including African, Asian, Southern American, West Indies, Melanesia, Micronesia, and Polynesia regions. Segi and Doll et al.^{16,17} modified method of standardization in World Standard Population per 100,000 person years is used. Besides a large number of variations of cancer burden within regions and countries, data is generally expressed on the basis of region to provide concise worldwide data.

Results and Discussion

Approximately 15 million peoples diagnosed with cancer and half of them died in 2015 worldwide. In females breast cancer and lung cancer in both males and females are most prevalent and leading causes of death in underdeveloped countries. In developed part of the world prostate in men and lung in women are most prevalent and leading cause of death. Other type of cancers like hepatic, gastric, colorectal are common among males and gastric, cervical, uterine are common in females while in developed areas of the world bladder cancer in men and uterine cancer in women are prevalent (Fig 1). In underdeveloped countries hepatic, gastric and cervical neoplasms are associated with infection. At large cancer is more prevalent in developed part of the world. For instance cancer rate of all sites are twice as higher in Western Europe than in East Africa. Even though the incidences are twice higher in developed countries but the mortality rates are only 8-15 percent higher, this deviation is evident by the availability of diagnostic and treatment facilities, considering the example of highly fatal hepatic carcinoma which is more prevalent in underdeveloped areas and caused disproportionate effect on rates in these regions. Another reason for this disparity

is very late diagnosis of cancer in these countries.¹¹⁻¹³

Most frequently occurred neoplasm and their mortality rates are discussed briefly and summarized in graphical forms in Figures 2 and 3. Predominant cancer among females is breast cancer, 25 percent of all the cancers cases worldwide causes 15 percent cancer deaths.¹⁸ Colorectal cancer is ranked 3rd most common in men and 2nd in women. Incidences are highest in Australia, New Zealand, Europe and United States.¹⁹ Lung cancer is accounted 13 percent of all new cancer diagnosis and leading cause of death in 2012, affected mostly developed countries and second leading cause of mortality in underdeveloped parts of the world.²⁰ In developed countries prostate cancer is the most common cancer whereas worldwide it is second most common cancer diagnosed among men. Gastric carcinoma is mostly found in East Asia (China, Japan, Korea and Mongolia), Eastern and Central areas of Europe and Latin America and lowest in most of the African region and North America.²¹ Hepatic carcinoma affected more men than women and second leading cause of cancer related death in developing countries, where as in advanced countries it's ranked sixth for cancer associated deaths.²² Cervical malignancies are very common in developing nations and third leading cause of death, its incidences are highest in South American countries, sub-Saharan region, Caribbean islands, Melanesia, Western Asian region, Australia, New Zealand, and North America.²³ Esophageal carcinoma is thrice as common in men compared to women in East Asian region, South and East of Africa, it varies country to country by a factor of more than twenty, it has two main types; squamous cell carcinoma and adenocarcinoma.²⁴ Another major cancer diagnosed in men is bladder cancer, there is a 10 fold variation found worldwide, highest in North American, Western Asia, Northern Africa, and Europe and its incidences are lowest in East, Middle and West of Africa.²⁵ Incidences of Non-Hodgkin Lymphoma are greatest in Australia, West and North of Europe, and Northern America, whereas it is less common in Asia and Eastern Europe.²⁶ The rate of incidences of oral cavity and lip cancer are considerably higher in Melanesia, South-Central Asian region, Central and Eastern Europe and lesser in Western African and Eastern countries. Multiple risk factors are involved in oral cancer like tobacco smoking, alcohol consumption, and Human Papilloma Virus infection, concomitant use of tobacco and alcohol produce a synergistic effect, whereas smoking alone account for more than seventy percent of death related to oral cancers predominantly in low income regions. In Taiwan, India and in neighboring countries smokeless tobacco products and betel quid are major contributors of oral cavity related cancers.²⁷⁻³⁰ Growing death toll by cancer is a real threat to the economy of low to middle income countries in developing world. True epidemiological data on prevalence incidences and mortality rate of cancer is a great demand of these countries, it will help them to design and implement the proper strategies to prevent, early detection and treatment. An early and timely diagnosis is the key to reduce economic burden on finances and to keep the community healthy, and improve the quality of life of people. According to the American cancer society in 2008 over 895 billion dollars were spent; represented more than one and half percent of world's gross domestic product (GDP) which is 20 percent higher than cardiovascular diseases, second leading cause of economic loss of the world. In September 2011 U.N. General Assembly meeting on cancer and other non-communicable disease wake up the world and revealed that the death and disability from various prevalent cancers account the largest economic cost on global scale. It was declared in studies that the cancer is appearing as a silent pandemic, spreading specially in developing part of the world.¹² This can compromise the public health system, social structures and threaten the economic development in these countries. For example various interventional studies proved effective to reduce the tobacco related oral and lung cancers and significantly curtail the economic burden of the region. Recently, a global health agenda been dominated

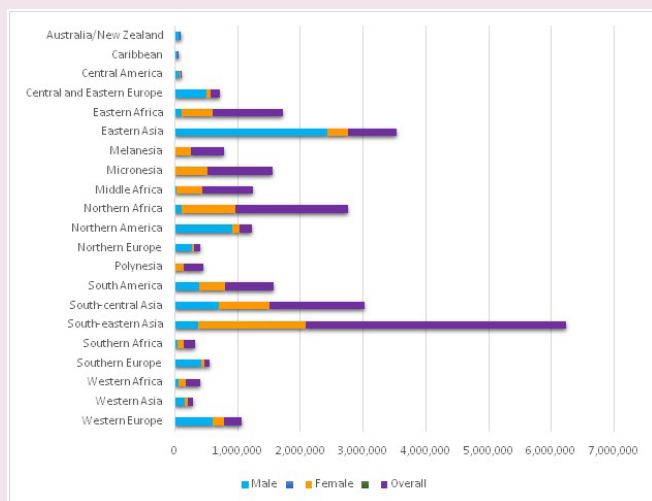


Figure 1: Estimated Number of New Cancer Cases in 21 World Areas.

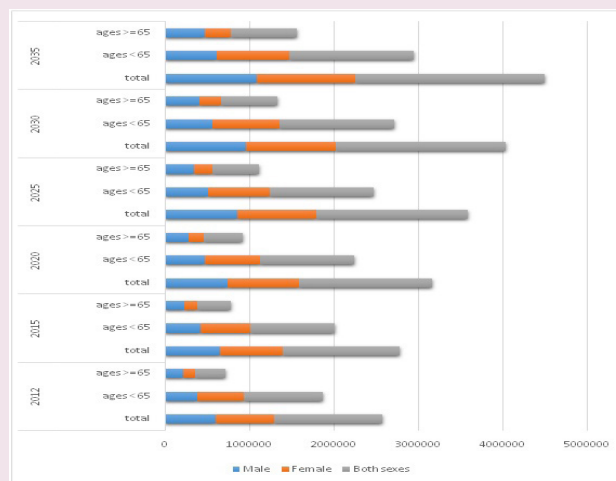


Figure 4: Projected all cancer incidence in subcontinent in two age groups of male, female and total number of cases except non-melanoma skin cancer.

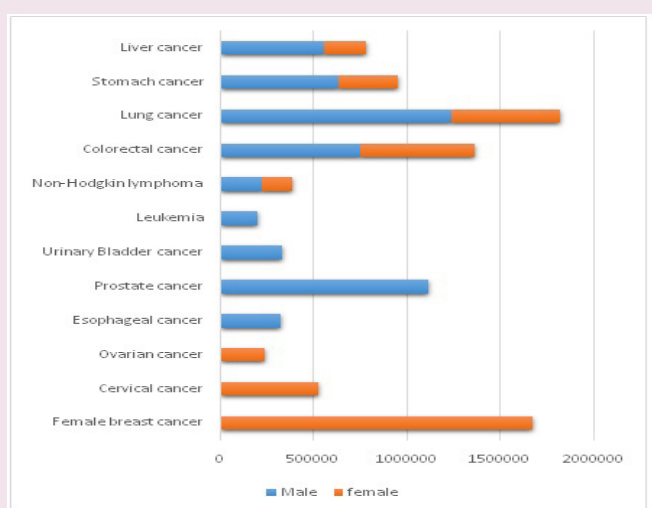


Figure 2: Global incidences of most prevalent type of cancer in males and females.

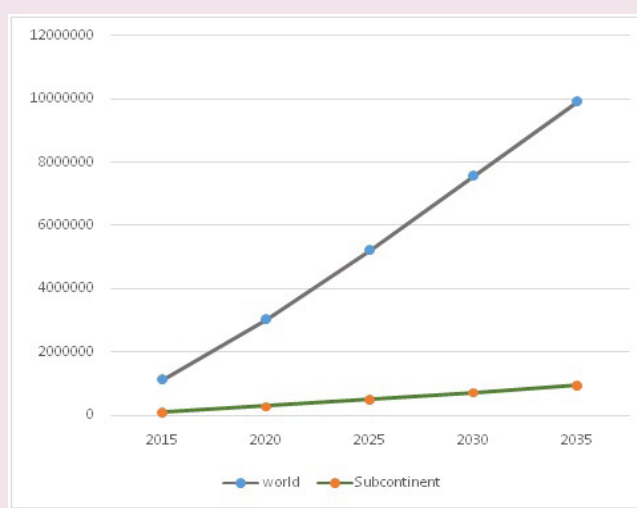


Figure 5: Subcontinent demographic change trend compared with global demographic change from 2015 to 2035.

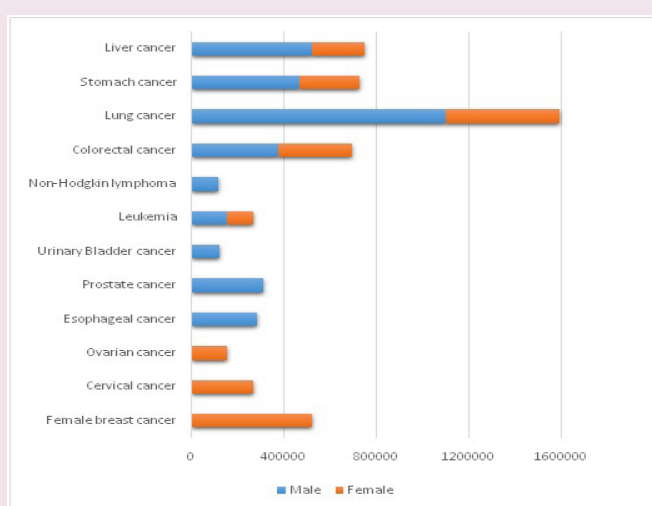


Figure 3: Global mortality rate due to major cancer types in males and females.



Figure 6: Projected subcontinent cancer incidences compared with global incidences of both male and female with trend line of combined sexes from 2015 to 2035.

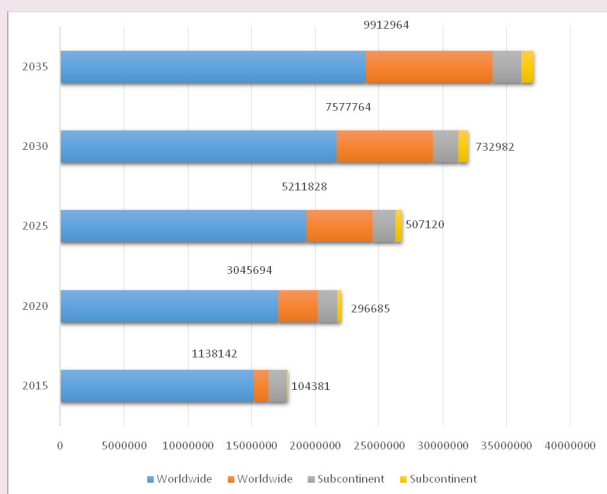


Figure 7: Subcontinent demographic effect versus global demographic effect in both male and female sexes.

by non-cancer public health problems. But as the more alarming data is accumulated on the cancer, necessitates the global health reforms on prevention and treatment of this issue. A virtual projection of the cancer burden will provide a firm evidence to design the proper strategies to deal with the disasters of cancer and to build the healthy society. In this article we have projected the cancer incidences from 2015 to 2035 in subcontinent region (Fig 4) with the help of online analysis predication by WHO-GLOBOCAN and compare the demographic trend (Fig 5) with the rest of world. Subcontinent comprised of three important countries of Asian region i.e., India, Pakistan and Bangladesh. Multiple studies have proved the involvement of various cultural, environmental and genetic factors including the provision of advance health care facilities in developing nations.¹⁰ A computation by WHO termed as DALY (disability-adjusted life year) defined death and disability dimension of illness in a single description and used to explain the overall disease burden. It is used to depict the economic value of a year of a healthy life to measure overall impact. Economic value calculated 15 global causes of death in 2008 in terms of DLY's lost, cancer was placed first on the list by 895.2 billion US dollars. It was also revealed in top 3 cancer sites that lung and related cancers, gastric and hepatic cancers were significantly higher in lower to middle income countries.³¹ These finding necessitate the projected values of cancer growth over next twenty years to draw a precise picture of these countries to allocate the budgets for health reforms. Demographic effect of projected cancer incidences in subcontinent in both genders has been compared with global demographic effect in Figures 6 and 7 showed an expected constant rise throughout the years projected from 2015 to 2035.

CONCLUSION

Cancer friendly behaviors and cancer causing factors in the world are expected to increase the global economic burden due to growth and aging of population. This problem of increasing cancer frequency is more drastic in low to middle income countries with historic low rates of certain cancers like breast cancer, pulmonary, colon and infection related cancers. Worldwide cancer burden and growth of cancer can be prevented by dissemination of published cancer statistic, facts and figures, tobacco control programs, hepatic and cervical cancer prevention vaccination, regular breast screening, promotion of healthy life styles and dietary programs and physical activities. Appropriate

treatment facilities and palliative care are vital to alleviate the further distress and premature death by cancer. As far as the causes of various important malignancies like prostate, hematopoietic and pancreatic and hepatic are concerned we still need to learn a lot. A collective response from all the sectors of society which may include but not limited to governmental, social, civic, private and personal level will be helpful to define, design and implement a very well structured, organized, coordinated and integrated comprehensive program to control the rapidly growing burden of cancer in subcontinent.

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SUMMARY

Cancer is the uncontrolled growth and spread of cells in the body. Cancer has been identified as global health concern, and U.N. declared it as silent pandemic. Growing number of worldwide cancer cases can compromise the public health system and social structure. It is a second leading cause of economic loss in the world. Cancer friendly behaviors and cancer causing factors are very common in India, Pakistan and Bangladesh for example ubiquitous use of tobacco and betel nuts. Cancer incidences have been projected via WHO's online prediction calculator GLOBOCAN from 2015 to 2035. It will help these countries to design strategic plans to address this issue properly.

ABOUT AUTHORS

Dr Noor Kamil: Dr. Kamil is a graduate of Faculty of Pharmacy, University of Karachi and he secured his PhD in Pharmacology from the same institute and University in Pakistan. Author has a keen interest in the neuropsychopharmacology of Antipsychotic drugs. Dr Kamil has a special interest in cancer prevalence, its treatment and toxicities associated with chemotherapy. He is particularly concerned in biohazards related to cytotoxic agents and published his work in the various scientific journals.

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