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# Practical CLINICAL ONCOLOGY



*Editor-in-Chief*
**Praful Desai**







*Foreword*
**Farokh Udwadia**

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# 3 Geographic Variations in Frequency and Incidence: A Global Perspective

*Ganesh Balasubramaniam*

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## INTRODUCTION

Cancer forms one of the major components amongst noncommunicable diseases with increase in life expectancy, better control of communicable diseases and an aging population, demographic data shows a significant increase in frequency and incidence of cancer globally. As per the recent GLOBOCAN estimates, approximately 12.6 million new cancer cases (approximately 188 per 100,000 people) and 7.6 million cancer deaths occurred worldwide in 2008.[1] Figure 1 shows the number of common cancers and deaths estimated in men and women.[1] It

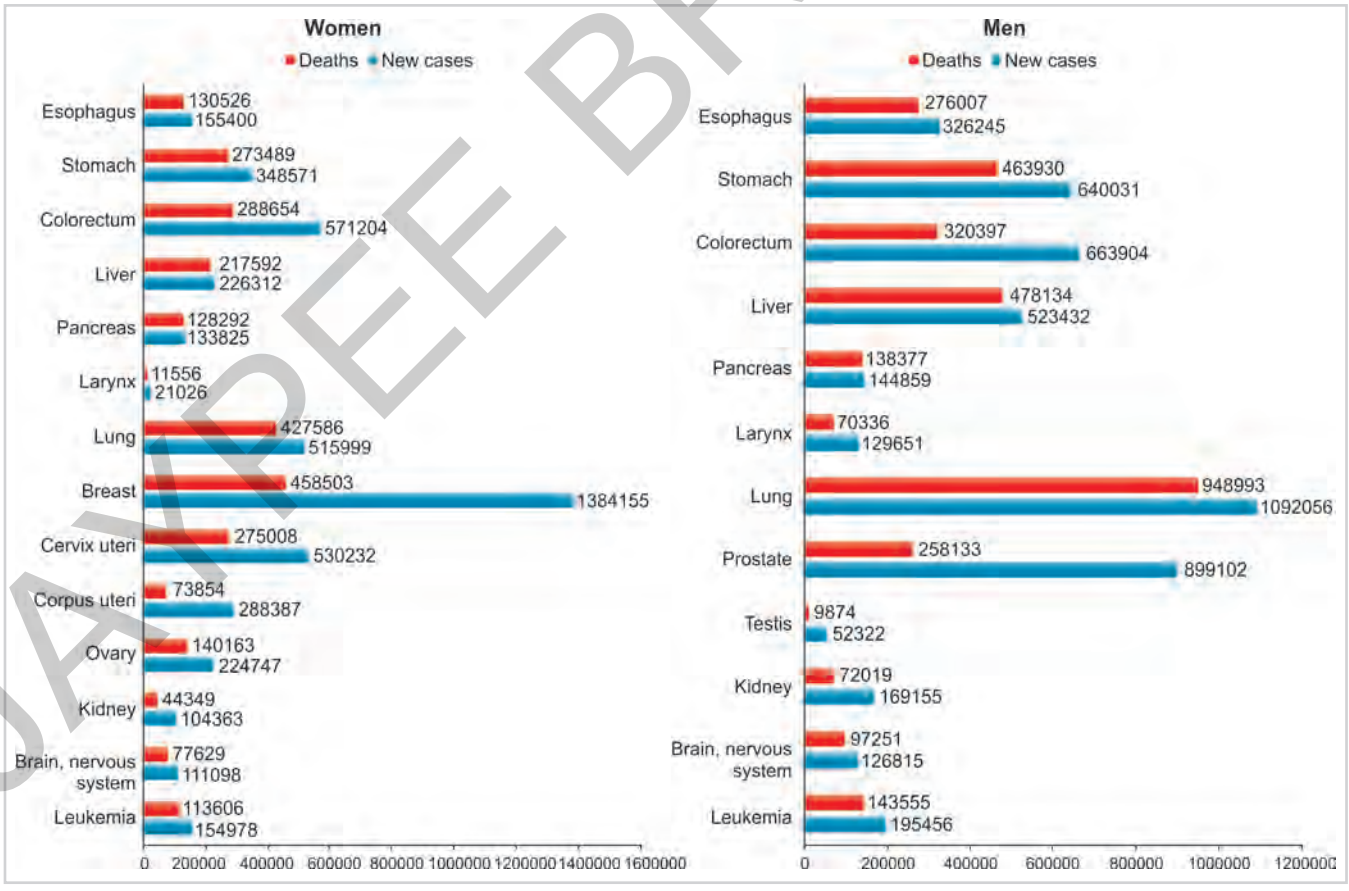


**Fig. 1:** Estimated annual number of new cancer cases/deaths in the world

is seen that among the males, lung, prostate, colorectum and stomach cancers are leading cancers, whereas among the females, breast, colorectum, cervix uteri and lung cancers are the leading cancer sites. It is known that cancer incidence varies by age, gender, geographic region, race and ethnicity.[2] This overview reviews data from the USA, UK, Japan, India, Europe and China, which covers a major portion of the world population and is also representative of the cancer burden in general.

## GEOGRAPHIC VARIATIONS IN INCIDENCE

Cancer incidence worldwide is more than a fifth higher in men than in women, with world age-HYPERLINK "http://www.cancerresearchuk.org/cancer-info/cancerstats/world/the-global-picture/ssLINK/news-age-standardised"standardized incidence rates of 203 and 164 per 100,000, respectively, in 2008 (Fig. 2).[3] Male incidence rates vary almost four-fold across the different regions of the world.[3]

## INCIDENCE RATES BASED ON ECONOMIC DEVELOPMENT

There are differences in age-standardized rates of cancer between developed and developing countries. Although cancer is often considered to be more of a developed world issue, in fact, 56% of all cancers occur in developing countries and 44% in developed countries.[3] Due to larger population, there are more cancer cases in the developing regions than in developed regions of the world; however, cancer incidence and cancer deaths estimated in China are three-fold more than in India. There were 256 cases of cancer diagnosed per 100,000 in developed countries, compared to 148 in developing countries in 2008.

The rates of cancer of the cervix uteri in developing countries are twice than in developed countries, while breast cancer rates in more developed countries are three times higher than seen in less developed countries (Fig. 3).[3] For nasopharyngeal cancer, the rate was nearly four times higher in developing than developed countries. Lung, colorectum, breast, prostate, stomach, pancreas and kidney cancers are higher in developed countries while esophagus, larynx and liver cancers are higher in developing countries. Among both sexes the rate for all cancers was 1.7 times higher in more developed as compared to less developed countries (Fig. 4).

Comparison of incidence rates seen in different countries, viz., USA, UK, China, Japan, India and Europe reveals that the incidence rates in India are the lowest and they are one-third of that seen in USA, UK, Europe and Japan, while it is double than China among men and there are no remarkable differences among women between these locations; nonetheless there are distinct differences in rates with regard to the leading cancer sites (Fig. 4).[3]

Figures 5A to F show the age-standardized incidence rates (ASR) of different countries among men;[3] it is seen that lung, prostate, stomach and colorectum are the top-ranking sites in USA, UK, Europe and Japan except in India and China, where lung, esophagus and stomach are among the leading sites.

Similarly, among females, breast is one of the leading sites in all locations except in India, where cervix uteri is the leading cancer site; current registry data reveals that incidence of breast cancer has overtaken that of cervix in




**Fig. 2:** Age-standardized incidence rates (ASR per $10^5$) by geographic locations in the world

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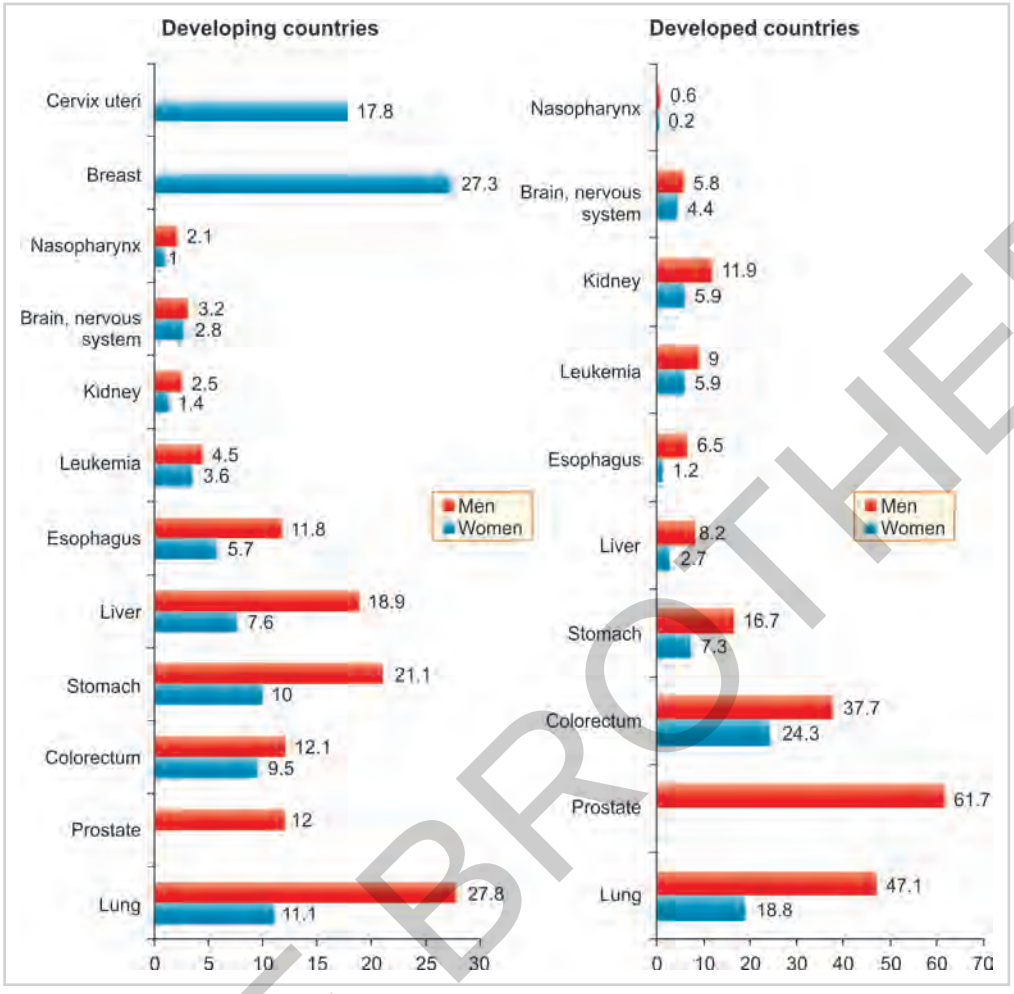


**Fig. 3:** Comparison of age-standardized incidence rates (ASR per $10^5$)—developed and developing countries

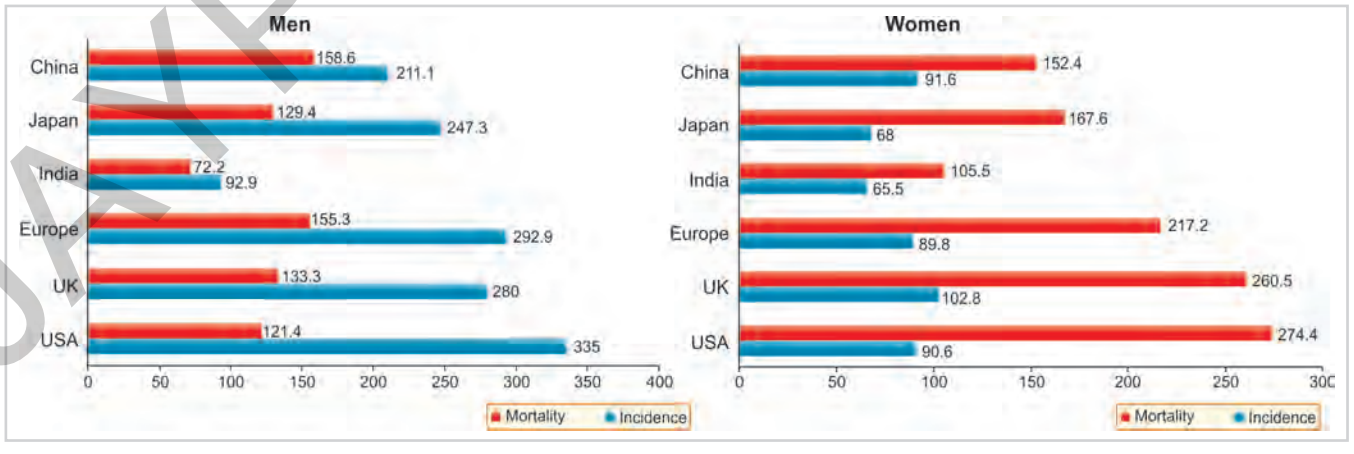


**Fig. 4:** Age-standardized incidence rates (ASR per $10^5$) for selected countries across the world—men and women

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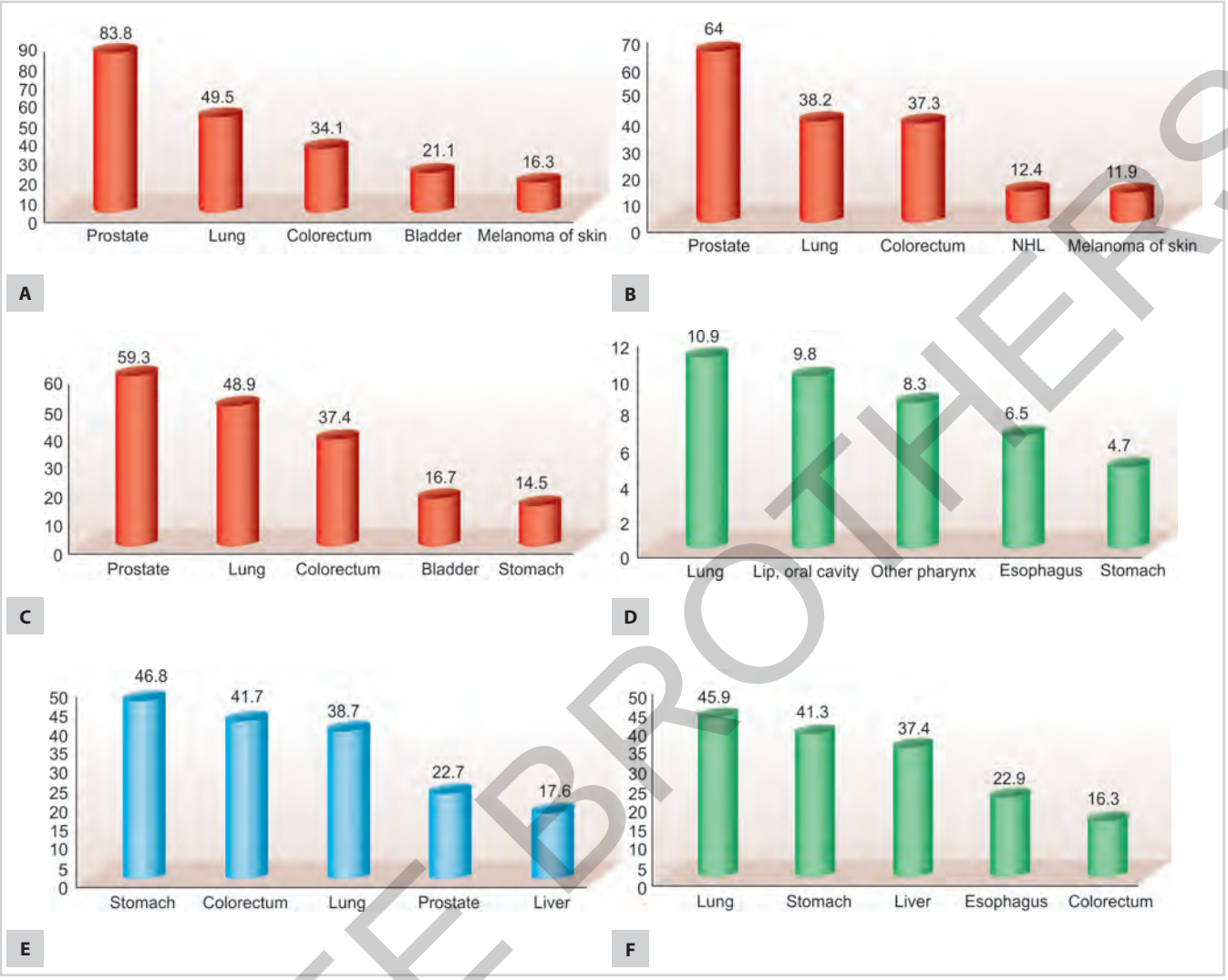


**Figs 5A to F:** Age-standardized incidence rates (ASR per $10^5$) of leading cancers in men for selected geographic locations

the metropolitan regions of India. However, other sites as lung, colorectum and stomach are seen in all locations (Figs 6A to F);[3] however, lip, oral cavity, esophagus and ovary figure in the leading sites of cancer among women only in India.

## Variation in Indian Registries

Indian national cancer registries established by the National Cancer Registry Programme (NCRP) under the Indian Council of Medical Research (ICMR), started reporting in the 1980s on cancer incidence from major urban areas; however, over a period of time, several population and hospital registries have been set up. There are distinct variations in incidence rates seen across India.[4] In Figure 7, it is observed that overall there are no remarkable differences in the age-adjusted rates between registries;[4] nonetheless, the occurrence of cancers within India itself has many variations, which is unique to its geographic location.

Incidence rates of three major Indian registries are reported here since they are the oldest registries in India.[4] It is observed from Figure 8 that incidence rates among men are higher for prostate, lung and mouth caners in Mumbai;[4] however, the rates in Chennai for lung cancer and prostate cancer in Bangalore (now Bengaluru) are higher than Mumbai rates. In gastrointestinal (GI) cancers, esophagus and stomach are highest in Chennai. Similarly, among women, breast cancer stands out uniquely as the leading cancer in all registries followed by cervix cancer; cervix cancer is still predominant in rural setup and breast cancer is emerging as the leading cancer in urban registries. These differences between the registries within a country provide unique opportunities to identify the causes by conducting epidemiological studies.

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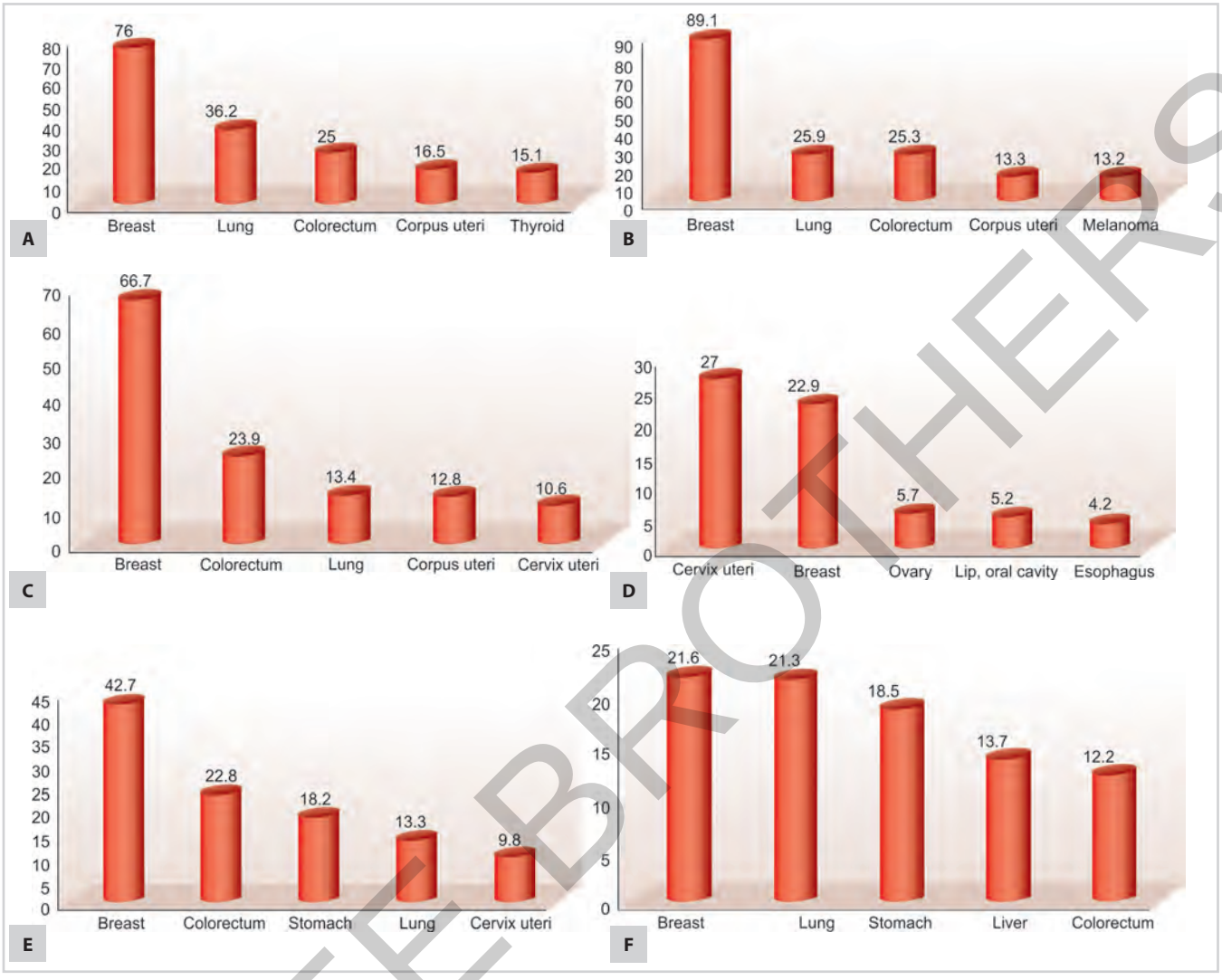


**Figs 6A to F:** Age-standardized incidence rates (ASR per $10^5$) of leading cancers in women for selected geographic locations

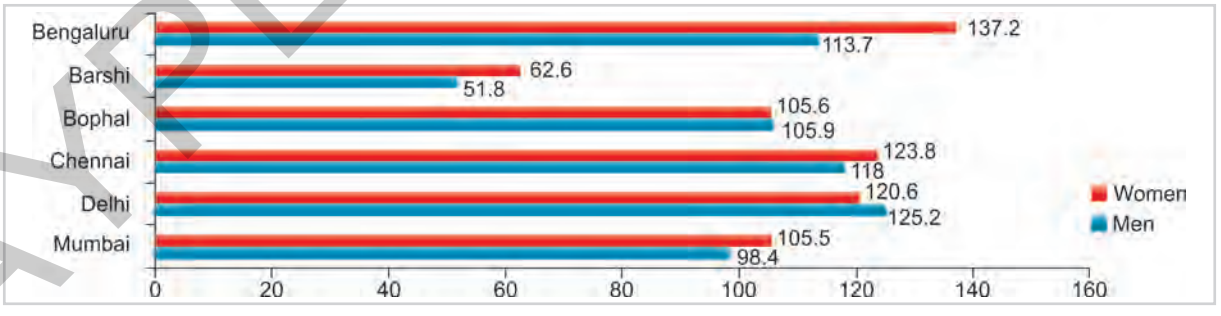


**Fig. 7:** Age-adjusted incidence rates (AAR per $10^5$) observed in Indian registries

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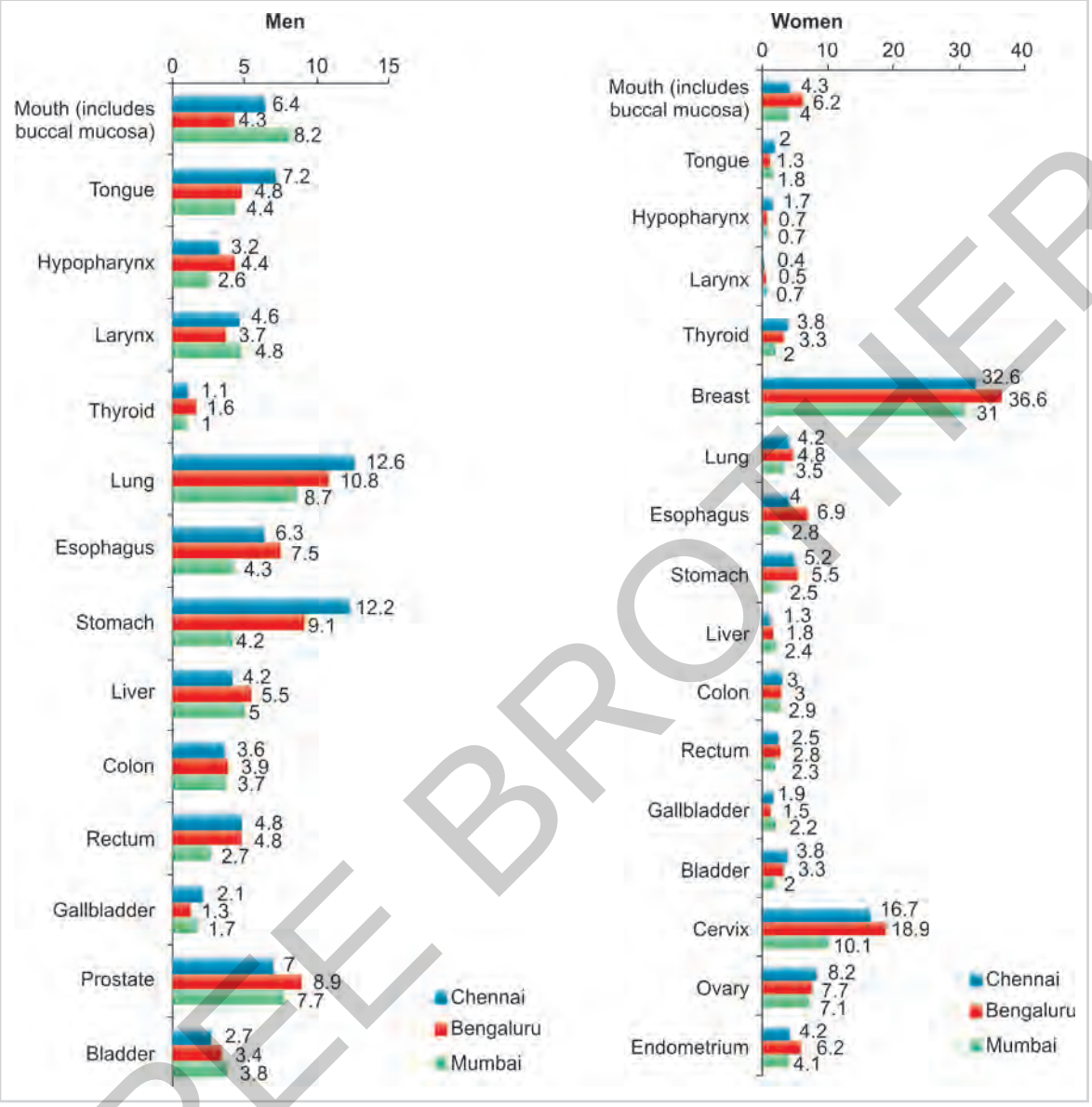


**Fig. 8:** Age-adjusted incidence (AAR per $10^5$) rates in Indian registries

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**Praful Desai** MS FRCS FACS has been in the field of oncology for 53 years. He was the Director and Chief of surgery for 16 years at the country's leading cancer center, the Tata Memorial Centre, Mumbai, Maharashtra, India. Technology transfer programs, professional education divisions, computerization of records, development of rural cancer units were initiated by Dr Desai. He has received national and international recognitions for his continued commitment to oncology in general and surgical oncology in particular. The International UICC Cancer Congress in 1994 in New Delhi, India, under his leadership was a landmark in oncology, which gave a major thrust to oncology in India. The Padma Bhushan in 1981, the Harvard Medical International Award for oncology worldwide in 2003 and the Mucio Athayde International Prize of the UICC in 1998 are a few of the important landmarks in his career as a committed oncologist striving to strengthen oncologic sciences for its onward transmission to the future ages. The legacy continues in a crescendo at the Tata Memorial Hospital and Centre.

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ISBN 978-93-5152-205-8
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