Epidemiology

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1.1 Background

Breast cancer is an important public health challenge accounting for one in four cancers diagnosed in women and almost one in seven cancer-related deaths in women globally. In 2020, 2.25 million incident breast cancers and 685,000 breast cancer-related deaths were recorded, and these estimates are projected to rise to 3.2 million incident cases and over a million deaths by 2040. Although historically considered a "disease of the west", it should be noted that in 2018 roughly 50% of all incident cases and almost 70% of all breast cancer-related deaths occurred in less developed regions of the world [1].

Breast cancer incidence rates are highly correlated to *human development*. The *human development index* (HDI) is a composite measure taking into account health (measured by life expectancy), education (measured by years of schooling) and standard of living (measured by gross national income per capita) and is considered to be a fairer comparator of countries/regions than the use of income level alone [2].

Breast cancer mortality rates are also correlated with development, with the most unfavourable outcomes from the disease seen in the lowest resource settings [3]. There have been significant gains made in breast cancer survival in more developed countries largely achieved through early detection and diagnosis and access to comprehensive cancer care [4]. The reasons for disproportionate poorer survival in lower resource settings are multifactorial and complex but include low levels of cancer awareness, delays in presentation and variable levels of treatment provision [5].

The global age-standardised annual incidence rate for breast cancer is 47.8/100,000 but varies from an average of 75.6/100,000 in countries with a very high HDI to 36.1/100,000 in countries with a low HDI. Although the incidence rates of breast cancer are higher in more developed countries, the absolute burden of disease is almost equal in less developed countries due to their larger population numbers. Over 80% of the world population live in less developed regions, and as these countries develop, their breast cancer incidence rates will increase largely as a result of increasing life expectancy, but also due to changing reproductive patterns and lifestyles within these populations.

Age is the most important risk factor for breast cancer. In the UK, 80% of breast cancer occurs in women over the age of 50 years, and one third in women over the age of 70 years, with the highest

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age-specific risks seen in the oldest of women [6]. In comparison, only half of breast cancer occurs in women over the age of 50 years in poorer countries which is largely explained by their younger populations [7]. Female global life expectancy from birth varies by almost two decades, with an average of 81 years in Europe and 63 years in Africa [8] and explains in part the lower incidence of breast cancer in less developed regions of the world. However, the increase in life expectancy that is associated with development will contribute significantly to the expected increase in breast cancer incidence globally.

The other risk factors of importance for the development of breast cancer can be classified into reproductive and non-reproductive. There is a large body of evidence supporting the role of hormones, and in particular exposure to endogenous and exogenous oestrogens in the subsequent development of breast cancer. An increased breast cancer risk is associated with earlier menarche and later menopause but with differing magnitudes of effect. The excess risk associated with lengthening a woman's reproductive years by 1 year at menarche is greater than the excess associated with 1 year's lengthening at menopause [9]. Childbearing reduces the risk of breast cancer and the higher the number of full-term pregnancies, the greater the protection. There is no effect of breast cancer risk associated with loss of pregnancy either as a result of spontaneous or induced abortion [10]. The risk of breast cancer reduces by 7% with each full-term pregnancy, and overall women who have had children have a 30% lower risk than nulliparous women. Women who breastfeed reduce their risk of developing breast cancer compared with women who do not breastfeed, and there is a dose-dependent effect as breast cancer risk reduces by 4% for every 12 months of breastfeeding [11]. The use of exogenous hormones in reproductive life, in the form of the contraceptive pill, is associated with a small increased risk of breast cancer [12], as is the use of hormone replacement therapy in non-reproductive life [13].

Non-reproductive factors for breast cancer of importance include alcohol consumption and obesity and should be considered modifiable risk factors for the disease. Alcohol consumption increases breast cancer risk in women who consume 2–3 units of alcohol daily [14, 15]. Post-menopausal obesity is associated with increased breast cancer risk probably due to increased circulating oestrogens [16], and taller women are also at an increased risk [17]. There is little evidence to show that vegetarian diets are protective [18, 19].

Up to 5% of breast cancer in Western countries may be a result of a genetic predisposition to the disease, such as the *BRCA1* and *BRCA2* gene mutations. High-risk allele mutations probably account for most of the families with four or more cases of breast cancer, and for around 20–25% of the familial breast cancer risk overall, but for only 5% of all breast cancers [20]. Women who have a positive history of breast cancer are at a two-fold increased relative risk of breast cancer; however, most of these women will never develop breast cancer and most who do will do so after the age of 50 years [21].

1.2   Summary

The epidemiology of breast cancer is complex but understanding differences in the epidemiology of breast cancer in different countries will underpin the development of effective breast cancer care and control policies which have utility in different resource settings and are relevant to the needs of local populations and translate to improved outcomes from the disease.

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