World Cancer Research Journal WCRJ 2023; 10: e2620

TEMPORAL TRENDS OF FEMALE BREAST CANCER BETWEEN 2010 AND 2019, IN ASIAN COUNTRIES BY GEOGRAPHICAL REGION AND SDI: A COMPARISON WITH GLOBAL DATA

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Abstract – *Objective:* Breast cancer is one of the most common cancers in women. Although breast cancer is a global health problem, its incidence has increased significantly in several Asian countries. High-risk populations according to epidemiological statistics can help to design interventions to reduce health inequalities. Therefore, this study was conducted to investigate the trend of breast cancer in Asia during 2010-2019.

Materials and Methods: We collected breast cancer data from the 2019 Global Burden of Disease (GBD) study from 2010 to 2019 in 49 Asian countries and territories. Annual case data and age-standardized rates (ASRs) were used to investigate the incidence, prevalence, mortality, and disability-adjusted life-years (DALYs) of breast cancer from 2010 to 2019 in 49 countries based on the socio-demographic index (SDI). Relative difference (%) between years was used to show the comparative changes in selected indicators' age-standardized rates. Data were reported in values with a confidence interval (CI) of 95%.

Results: The results of the study show that age-standardized incidence rate (ASIR), age-standardized death rate (ASDR), age-standardized prevalence rate (ASPR), and DALYs ASR of breast cancer from 2010 to 2019 increased by 14, 5, 14, and 5%, respectively. Central Asia experienced a decreasing trend in ASDR and DALYs ASR. Only, High-income Asia Pacific experienced a decreasing trend in four indicators. Asian women aged 50 to 54 are most affected by breast cancer. Palestine experienced the highest ASIR and ASPR increasing trend among Asian countries, and Timor-Leste had the highest ASDR and DALYs ASR. United Arab Emirates experienced the highest ASIR and ASDR decreasing trend among Asian countries; Myanmar had the highest ASPR and DALYs ASR.

Conclusions: American and European countries are experiencing a decreasing trend in the ASIR, ASDR, and DALYs ASR caused by breast cancer, while in Asia only High-income Asia Pacific and Central Asia countries are witnessing a decreasing trend. Breast cancer is a threat to the health of many women in high and middle-SDI Asian countries. Breast cancer control measures such as screening programs, early diagnosis, and correcting modifiable risk factors are recommended to be designed and implemented based on the epidemiology and available resources of each country.

KEYWORDS: *Breast cancer, Incidence, Death, Burden, Asia.*

DOI: 10.32113/wcrj_20237_2620

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INTRODUCTION

Breast cancer is one of the most common cancers in women. It ranked top among all cancers in 2020, with 2.3 new cases and 684,000 deaths. According to statistics, one out of every four cancer cases and one out of every six cancer–related deaths are due to breast cancer[1]. It is expected that by 2070, the number of people with breast cancer will reach 4.4 million[2]. Many genetic and non-genetic factors, such as tumor biology, response to treatment, lifestyle, reproductive factors, population structures, socioeconomic status and cultural values are different in different races, and therefore, epidemiological statistics are expected to be different in different geographic regions[3,4].

Although breast cancer is a global health problem, its incidence has increased significantly in several Asian countries[5]. This health challenge accounts for 24.5% of all women's cancers, and almost half of these cases affect Asian women[1]. Asia with forty-eight countries and approximately 32% of the world's female population is the most populous continent in the world with the most demographic diversities[6]. Although the high-income countries of this region, such as Israel, Kuwait and Qatar, have made significant progress in health services in recent decades, most of the people in this region live in low or middle-income countries, where the burden of disease is high[7]. In addition to putting pressure on the medical systems, breast cancer affects the lives of many families[8]. On the other hand, in recent years, with the emergence of the COVID-19 crisis due to the increased risk of COVID-19 infection, patient-doctor communication decreased, which led to misdiagnosis and delays in the diagnosis of procedural complications[9]. Also, access to emergency surgery departments increased due to overcrowding[10]; the need for invasive treatments and hospitalization increased while multiplying the risk of infection with COVID-19[9]. Thus, accurate knowledge about the epidemiology of breast cancer and the identification of high-risk populations according to epidemiological statistics can help to design interventions to reduce health inequalities and properly allocate limited health resources[8]. Therefore, this study was conducted as a basis for future interventions to investigate the trend of breast cancer in Asia during 2010-2019.

MATERIALS AND METHODS

Data Source

The annual data on the incidence, mortality, and DALYs of breast cancer according to the International Classification of Diseases 10 (ICD-10) code (C50.0-C50.9) from 2010 to 2019 was extracted from the Global Health Data Exchange (GHDx) query tool which is a catalog of global health and demographic data from the GBD study 2019.

The GBD study 2019, conducted by the Institute of Health Metrics and Evaluation (IHME), is the most extensive and complete study to date, providing data on epidemiological characteristics and worldwide trends. The GBD 2019 estimates were generated for 286 causes of death, 369 causes of non-fatal burden, and 87 risk factors, and providing time-series estimates from 1990 to 2019 for 204 countries and territories, which by GBD and based on the geographical area were grouped into 7 super-regions and 21 regions[11,12]. GBD Asian regions contain six regions: Central Asia, East Asia, High-income Asia Pacific, North Africa and Middle East, South Asia, and Southeast Asia. Also, the relative difference (%) was obtained from the GHDx query tool (http://ghdx.healthdata.org/gbd-results-tool) for 2010 to 2019. All data were presented as numbers and ASR. In this study, data were also extracted and presented for 49 Asian countries, 6 Asian regions, global, and continents based on an age group and SDI. SDI is the geometric mean of lag-distributed income per capita, average educational attainment for people aged 15 years and older, and the total fertility rate (in people aged <25 years) indicators and ranged from 0 to 1[13,14]. Overall, SDI= 0 has the lowest level of health-related development and SDI=1 has the highest health-related development[15]. Based on SDI values, countries and territories were categorized into five groups: low, low-middle, middle, high-middle, and high[14,16,17]. Terms definitions are available at https://www.healthdata.org/terms-defined and https://www.healthdata.org/gbd/.

For GBD, an internationally standardized form of QALY has been developed, known as the DALY. DALY is defined as the years of life lost due to premature death and the years lived with a disability of specified severity and duration. A DALY is, therefore, a wasted year of healthy living. "Premature" death is defined as a death occurring before the age at which the dying person would have expected to survive if they were part of a standardized population with a life expectancy at birth equal to that of the longest surviving population in the world, Japan. For calculating the total number of DALYs for a given condition in a population, years of life lost (YLLs) and years of disability of known severity and duration (Years of healthy life lost due to disability (YLDs)) for this condition should be estimated and then added together[18].

This study was approved by the Ethics Committee of the Birjand University of Medical Sciences in Iran (Ethical code: IR.BUMS.REC.1400.316). In this study, consent was not required due to anonymized electronic data collection.

Statistical analysis

In the present study, the age-standardized rates of incidences, deaths, and DALYs of breast cancer were reported in figures per 100.000 population. Age-standardized rates were used to ensure the comparability of statistical indicators and to eliminate the impact of the composition of different age groups in the population. The chosen indicators were presented separately for the different classifications. The relative difference (%) between years was used to show comparative shifts in age-standardized indicator rates. The relative difference is equal to the value of the absolute difference divided by the value of the source year and then multiplied by 100[19,20]. Data were reported in values with a CI of 95%.

RESULTS

Female breast cancer (FBC) in Asia comparison with global and other continents data

In 2019, the estimated number of incident cases of breast cancer in Asia was 914878 (95% CI: 815789_1025502), with an age-standardized 35.88 (95% CI: 32.01_40.17) per 100.000. The incidence cases compared with 2010 increased by 1.45-fold. Generally, in 2019, 46.3% of world FBC new cases happened in Asian countries. ASIR of FBC between 2010 and 2019 in Asia increased by 14%. In this period, the ASIR of FBC globally increased by 2% and in Africa by 14%, and American and European countries experienced 5% and 4% decreases, respectively. (**Supplementary Table 1** and Figure 1). In 2019, the estimated absolute number of deaths due to breast cancer in Asia was 337822 (95% CI: 301545_375251), with an age-standardized 13.41 (95% CI: 11.99_14.89) per 100.000. The death cases compared with 2010, increased 1.36- fold. Generally, in 2019, 49.1% of world FBC death cases happened in Asian countries. ASDR of FBC between 2010 and 2019 in Asia increased by 5%. While, in this period, the ASDR of FBC globally decreased by 2%, in American countries by 6%, and in European countries by 9%. Also, the ASDR of FBC in Africa increased by 6%.

In 2019, the estimated absolute number of females who lived with breast cancer in Asia was 8335803 (95% CI: 7483728_9198306), with an age-standardized 327.23 (95% CI: 293.82_361.32) per 100.000 (**Supplementary Table 1** and Figure 1).

Fig. 1. Temporal trend of incidence, prevalence, death and DALYs age standard rates (per 100.000 population) of breast cancer in ASIA comparison with global data from 2010 to 2019.

The prevalence cases compared with 2010, increased by 1.46-fold. Generally, in 2019, 43.7% of world FBC patients lived in Asian countries. The ASPR of FBC between 2010 and 2019 in Asia increased by 14%. In this period, the ASPR of FBC globally increased by 2% and in Africa by 146%, while American and European countries experienced 5% and 2% decreases, respectively (**Supplementary Table 1** and Figure 1).

In 2019, estimated DALYs counts of breast cancer in Asia were 10.9 million (95% CI: 9.75_12.11), with age-standardized 425.95 (95% CI: 381.43_474.1) per 100.000. The DALYs counts of breast cancer compared with 2010, increased 1.31- fold. Generally, in 2019, 53.6% of world FBC DALYs were allocated to Asian countries. In Asia, the age standardized DALYs rate of FBC between 2010 and 2019, the same for Africa, increased by 5%. While, during this period, the ASR DALYs of FBC globally decreased by 1%, in America by 6%, and in European countries by 10% (**Supplementary Table 1** and Figure 1).

Female breast cancer in Asian regions

In 2019, the highest ASIR of FBC was observed in East Asia countries (56.3 (95% CI: 47.14_67.18)), with a 2% decrease compared with 2010. While other regions experienced an increasing trend from 2010 to 2019 by 2% to 24%. The South Asia countries experienced the highest increasing trend from 2010 to 2019 (by 24%), and the lowest increase was reported from central Asia (by 2%) (Figure 2).

In 2019, the highest ASDR of FBC was observed in Southeast Asia countries (19.23 (95% CI: 16.62_22.01)); with a 1% decrease compared with 2010. Also, the Central Asia and High-income Asia Pacific countries experienced a decreasing trend of 88 and 6%, respectively. While South Asia countries experienced the highest increasing trend from 2010 to 2019 (by 12%) (Figure 2).

In 2019, the highest ASPR of FBC was observed in High-income Asia Pacific countries (618.39 (95% CI: 540.76_714.5)), with a 1% increase compared with 2010. Also, other Asian

Fig. 2. Temporal trend of incidence, prevalence, death and DALYs age standard rates (per 100.000 population) of breast cancer in ASIAN regions from 2010 to 2019.

regions experienced an increasing trend of 4 to 25%. South Asia countries experienced the highest increasing trend from 2010 to 2019 (by 25%) (Figure 2).

In 2019, the highest DALYs ASR of FBC was observed in Southeast Asia countries (621.22 (95% CI: 534.07_719.1)); with a 2% decrease compared with 2010. North Africa and Middle East countries and East Asia countries experienced a stable trend. East Asia countries experienced an increasing trend of 12%. Two other Asian regions experienced a decreasing trend from 2010 to 2019 (by 8%) (Figure 2).

Age-specific distribution of FBC in Asia

In 2019, age-specific incidence of FBC was peaking at 50-54 years with 133709 (95% CI: 115906_153104) new cases. Age-specific death counts were peaking at 50-54 and 55-59 years with 44442 (95% CI: 38632_50502) and 44180 (95% CI: 38977_49896) death, respectively. Age-specific prevalence counts were peaking at 50-54 with 1164060 (95% CI: 1020693_1319573) patients. Also, most DALYs counts were recorded in 50-54 years with 1737185 (95% CI: 1512460_1961686) (Figure 3).

Based on SDI

High SDI Asian countries

In 2019, among high SDI Asian countries, Qatar (103.72 (95% CI: 80.2_131.22)) and Cyprus (101.33 (95% CI: 83.59_122.19)) have the highest ASIR of FBC, and Kuwait (42.77 (95% CI: 34.39_54.66)) has the lowest rate. While 8 of 11 Asian high SDI countries experienced a decreasing trend between 2 and 21% from 2010 to 2019; Saudi Arabia, Brunei Darussalam, and the Republic of Korea recorded an increasing trend of 25%, 17%, and 6%, respectively.

Qatar (36.91 (95% CI: 28.9_45.78)) reported the highest ASDR of FBC, and the Republic of Korea (8.73 (95% CI: 7.71_9.73)) has the lowest rate. While 10 of 11 Asian high SDI countries experienced a decreasing trend between 1% and 37% from 2010 to 2019; Brunei Darussalam recorded an increasing trend of 9%.

Cyprus (1051.81 (95% CI: 904.45_1228.24)) reported the highest ASPR of FBC, and Saudi Arabia (394.18 (95% CI: 306.75_503.53)) has the lowest rate. While 5 of 11 Asian high SDI countries experienced a decreasing trend between 2% and 12% from 2010 to 2019; 5 countries recorded an increasing trend between 1% and 29% and Japan reported a stable trend.

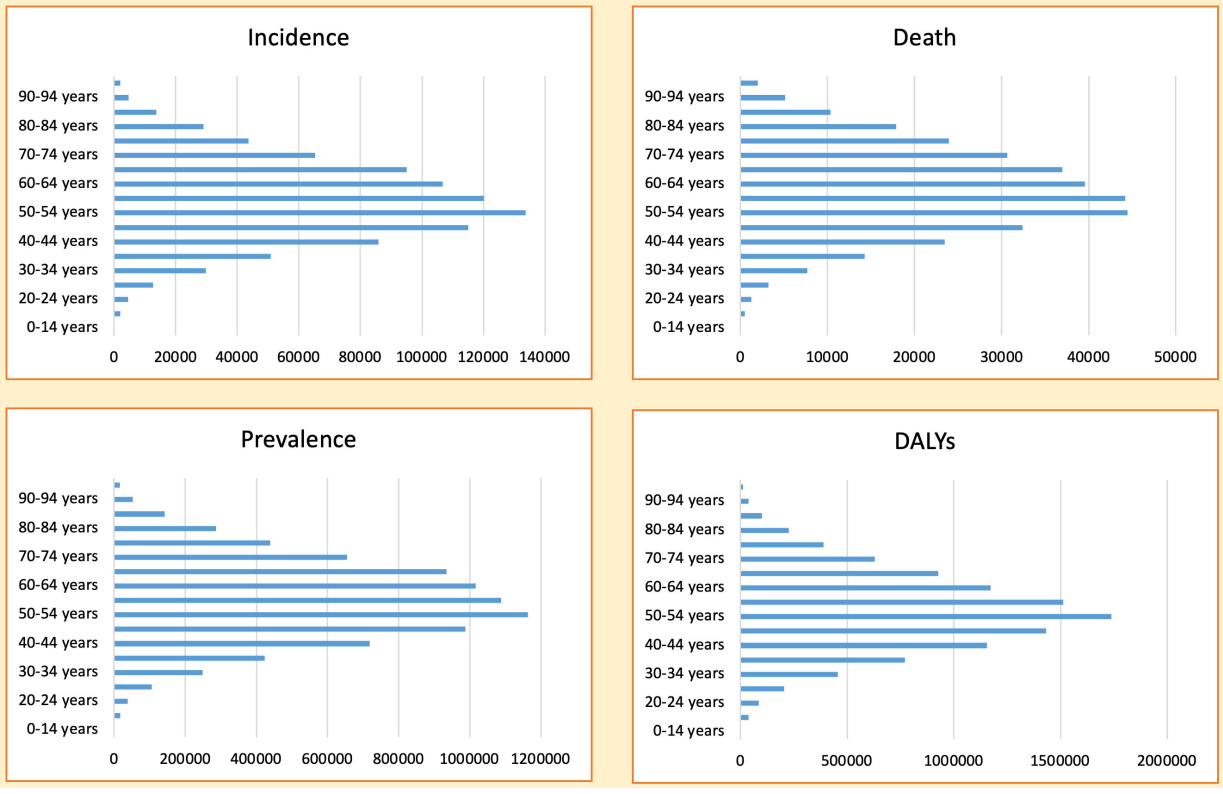

Fig. 3. Age specific incidence, death, prevalence and DALYs cases of female breast cancer in Asia, 2019.

Qatar (856.38 (95% CI: 662.5_1074.64)) reported the highest DALYs ASR of FBC, and the Republic of Korea (281.19 (95% CI: 247.83_316.56)) has the lowest rate. While 9 of 11 Asian high SDI countries experienced a decreasing trend between 4% and 29% from 2010 to 2019; Brunei Darussalam and Saudi Arabia recorded an increasing trend between 1% and 11%. More details are presented in **Supplementary Table 2**.

High-middle SDI Asian countries

In 2019, among high-middle SDI Asian countries, the highest ASIR of FBC allocated to Lebanon (122.51 (95% CI: 92.11_160.69)), and Sri Lanka (29.78 (95% CI: 21.86_40.03)) has the lowest rate. While 7 of 9 Asian high-middle SDI countries experienced an increasing trend between 2% and 28% from 2010 to 2019; Oman and Georgia recorded a decreasing trend of 5%, and 3%, respectively.

The highest ASDR of FBC allocated to Lebanon (35.49 (95% CI: 27.21_46.4)), and Sri Lanka (12.14 (95% CI: 8.99_16.07)) has the lowest rate. While 6 of 9 Asian high-middle SDI countries experienced a decreasing trend between 4% and 17% from 2010 to 2019; Malaysia and Sri Lanka recorded a decreasing trend of 13%, and 1%, respectively; Lebanon recorded a stable trend.

The highest ASPR of FBC allocated to Lebanon (1083.52 (95% CI: 844.55_1383.48)), and Sri Lanka (261.12 (95% CI: 201.43_339.79)) has the lowest rate. While 7 of 9 Asian high-middle SDI countries experienced an increasing trend between 9% and 28% from 2010 to 2019; Georgia and Oman recorded a decreasing trend of 3% and 2%, respectively.

The highest DALYs ASR of FBC allocated to Lebanon (1066.95 (95% CI: 808.61_1407.26)), and Sri Lanka (345.01 (95% CI: 252.16_463.13)) has the lowest rate. While 6 of 9 Asian high-middle SDI countries experienced a decreasing trend between 5% and 19% from 2010 to 2019; Malaysia, Lebanon, and Sri Lanka recorded an increasing trend of 14%, 2% and 1%, respectively. More details are presented in **Supplementary Table 2**.

Middle SDI Asian countries

In 2019, among middle SDI Asian countries, the highest ASIR of FBC allocated to Armenia (61.17 (95% CI: 49.78_73.72)), and the Syrian Arab Republic (26.88 (95% CI: 18.87_37.33)) has the lowest rate. While 10 of 12 Asian middle SDI countries experienced an increasing trend between 6 and 35% from 2010 to 2019; Armenia and Thailand recorded a decreasing trend of 4% and 1%, respectively.

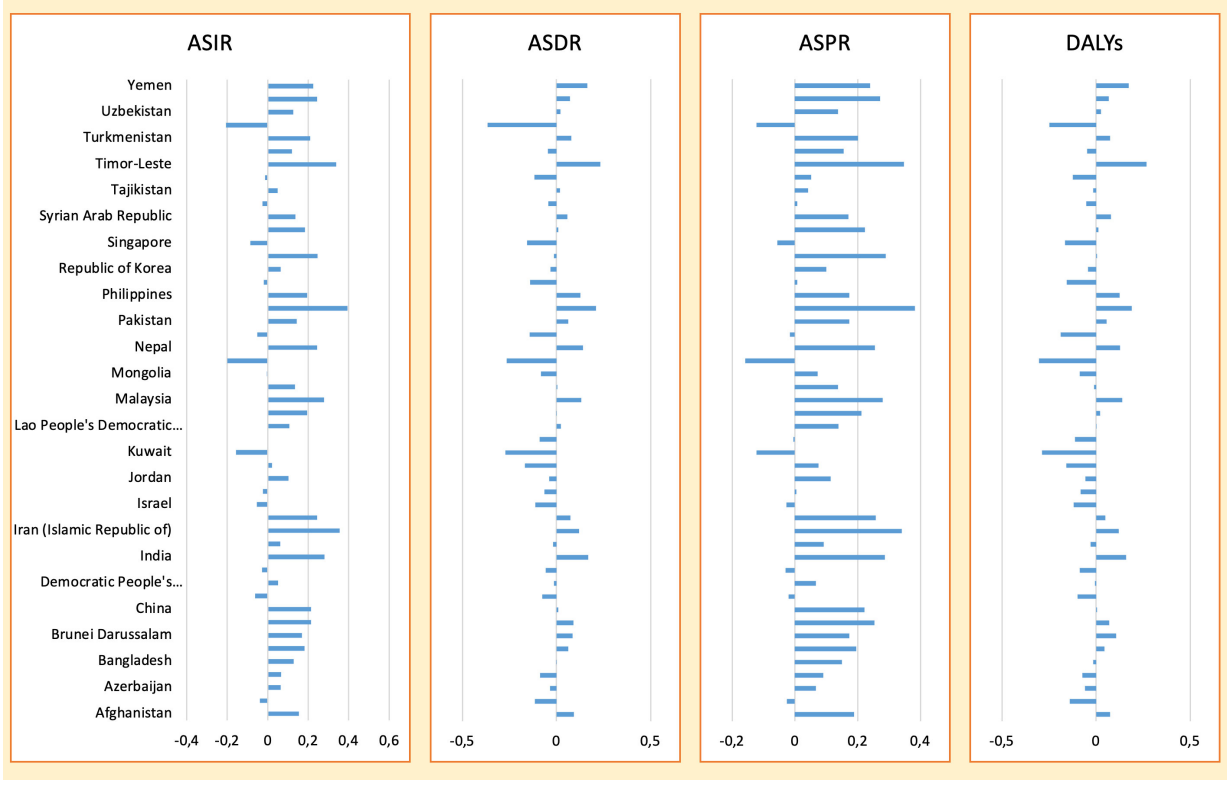

Fig. 4. Age-standardized incidence, death, prevalence, and DALYs rate of female breast cancer in Asian countries, 2019.

The highest ASDR of FBC was allocated to Armenia (23.95 (95% CI: 19.86_28.52)), and China (9.02 (95% CI: 7.19_11.1)) has the lowest rate. While 8 of 12 Asian middle SDI countries experienced an increasing trend between 1% and 13% from 2010 to 2019; Armenia, Azerbaijan, Indonesia, and Thailand recorded a decreasing trend of 12%, 3%, 2% and 12%, respectively.

The highest ASPR of FBC was allocated to Armenia (589.61 (95% CI: 499.95_686.86)), and the Syrian Arab Republic (244.82 (95% CI: 184.63_324.47)) has the lowest rate. While 11 of 12 Asian middle SDI countries experienced an increasing trend between 5% and 34% from 2010 to 2019; Armenia recorded a decreasing trend of 3%.

The highest DALYs ASR of FBC allocated to Iraq (714.85 (95% CI: 529.92_957.21)), and China (277.98 (95% CI: 224.35_339.93)) has the lowest rate. While 8 of 12 Asian middle SDI countries experienced an increasing trend between 1% and 13% from 2010 to 2019; 4 remaining countries recorded a decreasing trend of 3% to 12%. More details are presented in **Supplementary Table 2**.

Low-middle SDI Asian countries

In 2019, among low-middle SDI Asian countries, the highest ASIR of FBC allocated to Palestine (57.14 (95% CI: 46.88_68.79)), and Mongolia (17.86 (95% CI: 12.9_24.03)) has the lowest rate. While 10 of 13 Asian middle SDI countries experienced an increasing trend between 5% and 34% from 2010 to 2019; Myanmar recorded a decreasing trend of 20%; Mongolia and Kyrgyzstan reported a stable trend.

The highest ASDR of FBC allocated to Palestine (25.48 (95% CI: 21.15_30.5)), and Mongolia (9.94 (95% CI: 7.35_13.24)) has the lowest rate. While 8 of 13 Asian middle SDI countries experienced an increasing trend between 1% and 23% from 2010 to 2019; Myanmar, Mongolia, the Democratic People's Republic of Korea, and Kyrgyzstan recorded a decreasing trend of 26%, 8%, 1%, and 9%, respectively. Bangladesh reported a stable trend.

The highest ASPR of FBC allocated to Palestine (472.5 (95% CI: 396.93_558.4)), and Mongolia (153.21 (95% CI: 118.66_195.3)) has the lowest rate. While 11 of 13 Asian middle SDI countries experienced an increasing trend between 7% and 35% from 2010 to 2019; Myanmar and Kyrgyzstan recorded a decreasing trend of 16% and 1%, respectively.

The highest DALYs ASR of FBC allocated to Palestine (738.92 (95% CI: 609.47_879.05)), and Mongolia (292.72 (95% CI: 210.54_397.49)) has the lowest rate. While 7 of 13 Asian middle SDI countries experienced a decreasing trend between 1% and 30% from 2010 to 2019; 5 remaining countries recorded an increasing trend of 1% and 19%, respectively. Lao People's Democratic Republic reported a stable trend. More details are presented in **Supplementary Table 2**.

Low SDI Asian countries

In 2019, in low SDI Asian countries, the highest ASIR of FBC was allocated to Pakistan (1570.06 (95% CI: 1177.2_2135.47)), and Yemen (434.07 (95% CI: 605.80_314.75) has the lowest rate. All 4 Asian low SDI countries experienced an increasing trend between 7% and 17% from 2010 to 2019.

The highest ASDR of FBC allocated to Pakistan (51.94 (95% CI: 39.03_69.76)), and Yemen (13.44 (95% CI: 10.02_18.37)) has the lowest rate. All 4 Asian low SDI countries experienced an increasing trend between 6% and 16% from 2010 to 2019.

The highest ASPR of FBC allocated to Pakistan (542.81 (95% CI: 417.97_704.5)), and Afghanistan (153.05 (95% CI: 121.76_192.81)) has the lowest rate. All 4 Asian low SDI countries experienced an increasing trend between 17% and 26% from 2010 to 2019. More details are presented in **Supplementary Table 2**.

National distribution and trend

Among Asian countries, 35 countries experienced an increasing trend in the FBC incidence rate between 2010 and 2019; the greatest increase was detected in Palestine (increase in ASIR = 0.4 (95% CI: 0.09_0.75)) and the greatest decrease was detected in the United Arab Emirates (decrease in ASIR = -0.21 (95% CI: -0.36_-0.01)) (Figure 3).

In 2019, the highest ASIR (per 100.000) of FBC was reported in Cyprus (108.2), Qatar (105.75), Lebanon (102.47), Israel (83.26), and United Arab Emirates (72.36). The lowest ASIR of FBC was reported in Bhutan (17.64), Mongolia (17.95), India (18), Yemen (18.51), and Timor-Leste (18.64).

Among Asian countries, 26 countries experienced a decreasing trend in the FBC mortality rate between 2010 and 2019; the greatest increase was detected in Timor-Leste (increase in ASDR = 0.23 (95% CI: -0.02_0.57)) and the greatest decrease was detected in the United Arab Emirates (decrease in ASDR = -0.37 (95% CI: -0.49_-0.21)) (Figure 3).

In 2019, the highest ASDR (per 100.000) of FBC was reported in Pakistan (48.85), Qatar (42.91), United Arab Emirates (41.31), Lebanon (35.59), and Georgia (29.7). The lowest ASDR of FBC was reported in China (8.93), the Republic of Korea (9.02), Iran (Islamic Republic of) (10.59), the Syrian Arab Republic (10.66), and Japan (10.84).

Among Asian countries, 39 countries experienced an increasing trend in the FBC prevalence rate between 2010 and 2019; the greatest increase was detected in Palestine (increase in ASPR = 0.38 (95% CI: 0.12_0.69)) and the greatest decrease was detected in Myanmar (decrease in ASPR = -0.16 (95% CI: -0.3_0.01) (Figure 3).

In 2019, the highest ASPR (per 100.000) of FBC was reported in Cyprus (1073.75), Lebanon (893.69), Qatar (873.42), Israel (866.44), and Singapore (714.32). The lowest ASPR of FBC was reported in Afghanistan (128.73), Timor-Leste (135.38), India (136.53), Bhutan (137.58), and Mongolia (142.81).

Among Asian countries, 26 countries experienced a decreasing trend in the FBC DALYs ASR between 2010 and 2019; the greatest increase was detected in Timor-Leste (increase in DALYs ASR = 0.27 (95% CI: -0.01_0.69)) and the greatest decrease was detected in Myanmar (decrease in DALYs ASR = -0.23 (95% CI: -0.38_0)) (Figure 3).

In 2019, the highest DALYs ASR (per 100.000) of FBC was reported in Pakistan (1487.53), United Arab Emirates (1053.72), Lebanon (1045.59), Qatar (1015.13), and Georgia (948.81). The lowest DALYs ASR of FBC was reported in China (276.54), the Republic of Korea (293.95), the Syrian Arab Republic (309.37), Mongolia (320.56) and Iran (Islamic Republic of) (329.14).

More details are presented in **Supplementary Table 2**.

DISCUSSION

The purpose of this study was to investigate the trend of breast cancer in Asia during 2010-2019. According to the results of this study, breast cancer affects most age groups, and the incidence, mortality and burden of the disease reaches its peak at the age of 50-54 years. Breast cancer, which was once considered one of the most important diseases in European countries, has now become an important challenge and concern in Asian countries[21]. According to the results of this study, about half of the breast cancer cases in the world occur in Asia, and during 2010-2019, the upward trend of breast cancer can be observed in most Asian countries. Developing countries in Asia that have adopted a Western lifestyle may face a breast cancer epidemic soon due to the increase in breast cancer cases and related deaths[22]. Race, culture, income and socioeconomic development play an important role in the pattern of cancer incidence[23]. Asian countries have a diverse mix of culture, geography and ethnicity, and the socio-economic inequalities along with the diverse healthcare systems have resulted in significant changes in the incidence and mortality of breast cancer[24-26].

Demographic factors, lack of belief in preventive health, low health literacy, cultural influences, socio-economic status, and lack of access to health care are the challenges of breast cancer control in Asian countries[27,28]. Breast cancer mortality in Asian countries is increasing at a faster rate than the global average, and if effective control and prevention are not implemented, population changes in recent decades are expected to create significant health challenges for the future of Asian countries. In this increasing trend, traces of several factors such as smoking, alcohol consumption, inactivity, obesity, and low-fiber / high-fat diet can be seen[29].

The epidemiology of breast cancer is different in high-income and low-income countries[30], which can be justified from different aspects. The high incidence of breast cancer reported in high-income Asian countries such as Korea, Japan and Singapore can be due to regular screening and better access to screening centers and experienced physicians[21]. Higher mortality in low-income countries is mainly due to the late diagnosis at advanced stages of cancer. Approximately, seven out of ten women with breast cancer in high-income countries such as Qatar, Singapore and Japan are detected at stage II and below of cancer. The patient visits to seek advice and treatment at stage I of cancer in Syria and Afghanistan has the lowest frequency compared to other Asian countries, and this statistic increases with the increase in the country's income[5]. Unlike European countries, screening in Asia is generally done opportunistically. Out of 47 Asian countries, only 13 countries implement population-based mammography screening programs, and among them, Israel is the only country that has reached its target with a participation rate of 70%[21]. The peak onset of breast cancer occurs in the age group of 40-50 years[31,32]. Therefore, with the increase in life expectancy in developed countries, the upward trend of this disease is expected to occur[33].

Asian countries cannot be considered as a homogeneous group, because the risk factors of breast cancer are different in different countries. In addition, race is an important predictor of disease survival, and mortality is higher in some races[4]. Therefore, considering the role of genetics in the incidence of various types of cancers including breast cancer, knowing the groups at genetic risk and examining common genes in Asian countries can help to increase screening programs and implement possible preventive interventions and early diagnosis in sensitive groups[34].

Although high-income countries may have some extra risk factors, such as giving birth at an older age, less breastfeeding and more use of hormonal supplements, women in these countries have more access to screening programs and are more likely to participate in screening programs[35]. Also, the use of High-Tec equipment and experienced physicians increases the rate of diagnosis and subsequently, the incidence of breast cancer[36]. Also, utilization and development of non-invasive but accurate diagnostic methods in breast cancer diagnosis, such as vacuum-assisted mastectomy (VAE) guided by ultrasound (US-VAE)[37] and avoiding breast removal surgical treatments by using standard chemotherapy methods[38] can help to reduce inequalities and optimize the available limited resources, and prevent unnecessary biopsies. However, despite the mentioned factors, the incidence of breast cancer is still lower in high-income Asian countries. Therefore, these findings should be interpreted according to the socioeconomic status of each country.

Screening and early detection are essential for a longer and healthier life after breast cancer diagnosis[39]. There are several reasons why participation in screening programs is low in Asia. Low level of knowledge, socioeconomic barriers, cultural factors, determinism, insufficient social support, poor access to health care, lack of timely advice from healthcare personnel, and psychological factors are among the most important reasons for low mammography uptake in Asia[28]. Parallel to the socioeconomic development of countries, non-communicable diseases in most regions of the world take up a major share of healthcare resources in these regions[33]. Meanwhile, breast cancer is a threat to the health of many women in low and middle-income countries. Therefore, healthcare systems should use their maximum capacity to provide team-based and specialized care for breast cancer patients. At present, although some countries follow the treatment standards to a large extent, referring to the late stages of the disease, unfavorable diagnostic, therapeutic and palliative measures still create many problems for most Asian countries with low and medium resources[40]. The efforts of Asian countries in using digital services and setting up remote medical consultation through online platforms and smartphone applications regarding breast health and especially breast cancer can reduce the indirect, health and logistics costs of the health system of patients, and preserve the right to freely choose treatment, especially in weak patients or patients with limited freedom[41].

In addition to the differences between the epidemiological statistics of Asia and developed regions of the world, there are significant differences between Asian countries and even within a country. Therefore, breast cancer control measures are recommended to be designed and implemented based on the epidemiology and available resources of each country. Also, in addition to preventive measures, awareness raising, and early detection should be prioritized and the focus should be on eliminating inequalities to reduce the prevalence of breast cancer in deprived and underprivileged regions[32]. In low-income countries, raising awareness and implementing campaigns on the role of modifiable risk factors such as lifestyle, obesity, excessive alcohol consumption, smoking, physical inactivity, and unhealthy or inadequate diet can be useful in preventing the occurrence, recurrence, and death of breast cancer[42,43]. In this regard, one of the preventive approaches in the field of incidence, recurrence and death of breast cancer is teaching to use nutritional approaches. Among different diets, in clinical trials, the best results were reported for the "careful" diet and the green-Mediterranean diet. The prudent diet emphasizes the high consumption of fruits, vegetables, whole grains, and specific poultry, and the green Mediterranean diet is rich in polyphenols and restricts the consumption of red and processed meat compared to the diet of western countries[42]. On the other hand, supporting women who have recovered from breast cancer increases the patient's quality of life, including supporting working women in the field by delegating lighter tasks after returning to work[44] and facilitating breast reconstruction access[45].

This study had some limitations. First, although the GBD study incorporates methods to adjust incomplete data and data quality, there is still the possibility of data inaccuracies. Second, this is an ecological study, so the interpretations obtained from it, although broadly true, still need to be taken cautiously for each country and even for each province of a country.

CONCLUSIONS

American and European countries are experiencing a decreasing trend in the ASIR, ASDR, and DALYs ASR caused by breast cancer, while in Asia only High-income Asia Pacific and Central Asia countries are witnessing a decreasing trend. Breast cancer is a threat to the health of many women in high and middle-SDI Asian countries. Breast cancer control measures such as screening programs and early diagnosis are recommended to be designed and implemented based on the epidemiology and available resources of each

country. Also, correcting modifiable risk factors such as lifestyle, obesity, excessive alcohol consumption, smoking, lack of physical activity, and unhealthy or insufficient diet, may help to control and prevent breast cancer.

Ethics approval:

The study was approved by the Ethics Committee of the Birjand University of Medical Sciences (Ethics Committee approval code IR.BUMS.REC.1400.414316). As we used routinely collected anonymized electronic data, patient consent was not required.

Informed consent:

In this study, informed consent was not necessary because of the use of an online database.

Availability of data and material:

The data presented in this study are available on request from the corresponding author.

Conflict of interests:

All authors declare that they have no conflicts of interest.

Funding:

No specific funding was obtained for this study.

Authors contributions:

AM, HS, ZM and LA designed and conceived the study. AM and ZM collected the data. LA, AM, HS, and ZM analyzed and interpreted the data. All authors drafted the manuscript. HS, MZ and AM provided administrative, technical, or material support. HS, YK, and AM provided oversight. All authors contributed to the article and approved the submitted version.

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