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Original Research

Mongolian Breast Cancer Incidence: A Follow-up Report

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Objective: Understanding variance in global breast cancer incidence rates may help identify risk factors and could lead to increased efforts for prevention. In our previous study on breast cancer in Mongolia from 1998-2005, we reported that the incidence of breast cancer, though on the rise, remains lower in Mongolia than in adjacent Asian countries. Through the addition of almost a decade of data (2006-2014), we provide a study update and describe trends in breast cancer incidence and staging distributions within Mongolia, with further analyses examining women in urban and rural regions.
Methods: Age-standardized breast cancer incidence and staging distributions were obtained from the Mongolian National Oncology Center and were used to describe trends in cancer over time.
Results: Our findings indicate that the overall incidence of breast cancer has continued to increase in Mongolia, with rural women still experiencing lower risk than their urban counterparts. Given similarities in cancer staging, the observed geographic variation does not appear to result from differences in cancer stage at diagnosis over time or by region.
Conclusions: Considering the variation in rural and urban populations, data from this study could be used to better understand the influence of westernization on cancer risk in Asian countries and beyond. Further research on demographic shifts in breast cancer incidence within Mongolia may elucidate novel risk factors explaining variations active among other populations.

Introduction

Breast cancer is a leading cause of mortality in women in developed and developing countries around the world. While Asia is responsible for a large proportion of the global burden of cancer, breast cancer rates across the continent have been historically low in comparison with more westernized countries [1]. The incidence and mortality rates of breast cancer in Mongolia are lower than in other Asian countries, at 8.0 per 1,000 [1]. However, rates have been steadily increasing on an annual basis and vary by geographic regions, with the highest incidence rates in the most urban districts [2]. A similar urban-rural difference has been reported in other Asian countries, engendering questions about the potential long-term impacts of westernization and lifestyle change on health [3].

In our previous study analyzing breast cancer rates in Mongolia from 1998 to 2005, we reported that the incidence of breast cancer, though on the rise, remained lower in Mongolia than in other Asian countries [4]. Since our original paper was published, other studies describing similar trends have raised concerns about the growing cancer risk for the region. Using registry data from 2009-2013, researchers identified a substantial and consistent increase in breast cancer, supporting the trend that was first described in our original paper [4].

Other studies have considered the implications of an increasing prevalence of breast cancer by studying shifts in survival rates. Although cancer survival data is limited, emerging evidence suggests that most breast cancers in Mongolia are diagnosed at a late stage, as the 5-year breast

cancer survival rate is considerably lower than that observed in more westernized countries [5-6]. Since mammography screening is known to reduce breast cancer mortality in Western countries, the lack of a population-based screening program in Mongolia is of interest to researchers and clinicians. According to recently published national guidelines, breast screening is not currently instituted in Mongolia due to its low relative incidence compared to other cancers and limited resources [7]. Consequently, Mongolian women predominantly rely on self-screening and routine clinical exams to detect breast cancers. As a potential result, Mongolian women are more likely to be clinically diagnosed with later-stage tumors, leading to an increased rate of mortality from breast cancer [4-6]. Although evidence has not yet been published, one possibility is that insufficient access to health services could contribute to a delay in diagnosis. Thus, we hypothesize that limited access to clinical exams in more remote regions of Mongolia could result in a higher risk of later-stage breast cancer among rural women.

As described in our original paper and supported by other recent epidemiological studies, geographic variations in breast cancer risk exist within Mongolia. We previously reported that the annual percent increase in breast cancer rates was higher in urban areas than in rural areas. We also found that breast cancer staging was similar across time and geographic groups, with most cases at stage III or IV at diagnosis [4]. Researchers have since proposed that risk factors associated with westernization such as lifestyle factors (e.g., diet, physical activity), breast density, and hormone levels could account for geographic variations in Mongolia, but more data are needed to comprehensively address these hypotheses [8]. Here we provide an update to our original study and analyze breast cancer trends in Mongolia through the addition of nearly a decade of cancer registry data (2006-2014). With the additional data, we describe variations in breast cancer risk and breast cancer staging within Mongolia, overall and for urban and rural populations over time. We present a more thorough analysis of incidence and risk that is crucial to understanding the burden of breast cancer in Mongolia. Given the demographic shift towards a more Western-influenced lifestyle among many Asian countries, temporal data from Mongolia could tell us more about the inherent biological changes and risks that result from increased urbanization.

Materials and Methods

We used annual age-specific breast cancer registry data available from the Mongolian National Oncology Center (NOC) to describe trends in the population from 1995 to 2014. In Mongolia, incident cancer cases are first reported to one of the 21 Mongolian aimags, provinces, and then submitted to the NOC. The NOC data are presented by geographical area and population density, allowing separate analyses of rates among rural-urban groups.

Using annual population data for each aimag, we calculated age-specific breast cancer incidence rates for women in 5-year age groups. Age-specific rates (i.e., the number of cases divided by the number of women in that age group) were then multiplied by the corresponding number of women in the World Standard Million. The World Standard Million is a standard population value calculated by the Surveillance, Epidemiology and End Results (SEER) program [9]. Each value was divided by the total number of women above the age of 20 in the World Standard Million. Products were summed across age groups for each calendar year and province and then multiplied by 100,000. In summary, we calculated a weighted average of the age-specific rates, weighing each rate by the corresponding fraction of the World Standard Million. We then analyzed the age-standardized rates by the calendar year of diagnosis, urban-rural residence, and breast cancer stage.

Results

Since the data from the NOC are presented by geographic areas and population density, it is important to understand population demographics for the country of Mongolia. Based on estimations for July 2020, Mongolia’s population is about 3.2 million and is relatively young

compared to other countries [10]. In 2019, 31.2% of the population was <15 years of age and 4.1% of the population was >65 years of age [11]. The median age of females in Mongolia was 30.7 years old and life expectancy for women in Mongolia is 75.2 years of age [10-11]. These values have changed since our previous publication, showing an increase in the overall population and an aging of the population.

Although many Mongolians live as nomads or semi-nomadic herdsmen, the population of Mongolia has experienced a recent shift in urbanization [10]. In 2019, approximately 67.8% of the population resided in urban areas, while in 2008, only 54.6% of the population were considered urban [4-11]. In our original paper, we reported that approximately 60% of the population lived in the capital city of Ulaanbaatar (UB), whereas in 2018, an estimated 46.1% of the population resided in UB [4-11]. As degrees of urbanization continue to change in Mongolia, the potential health effects of western lifestyles remain relevant and of increasing interest.

Based on our analyses, the updated data from the NOC indicate a steadily increasing incidence of breast cancer in Mongolia, further supporting the findings in our original paper. As shown in Figure 1, the updated rates indicate that the overall incidence of breast cancer has continued to increase in Mongolia, with rural women still experiencing a lower risk than urban women. These results support our earlier findings and suggest further research on demographic shifts in breast cancer incidence within Asia is necessary.

Figure 1: Age-standardized Breast Cancer Incidence Rates in Mongolia by Population (cases/100,00) from 1998-2014.

To address the hypothesis that greater access to clinical exams could lead to earlier diagnoses for urban women, we analyzed tumor staging by comparing the proportion of women diagnosed at each cancer stage from 1998 to 2014. As shown in Figure 2, breast cancer staging was found to be relatively consistent between women in urban and rural Mongolia. These results suggest that breast cancer staging distributions have not changed substantially over time in Mongolia.

Figure 2: Breast Cancer Incidence by Percent Stage at Diagnosis for Mongolia from 1998-2014.

Discussion

Our findings indicate that the overall incidence of breast cancer has continued to increase in Mongolia, with rural women experiencing a lower cancer risk than their urban counterparts. While the overall prevalence of breast cancer screening in Mongolia is low compared to other countries, greater access to clinical breast screening examinations in urban areas could result in geographic differences in incidence [8-12]. Given Mongolia’s demographic shifts and a steady increase in urbanization, the urban-rural incidence differences raise questions about the influence of westernization on breast-cancer risks.

Mongolia’s high breast cancer mortality rate led us to consider that a lack of available routine mammographic screening could result in a higher prevalence of late-stage cancers in rural women. However, our results indicate that breast cancer staging was similar for cases in urban and rural women. For both groups, stage III accounted for the highest proportion of breast cancer cases while stage I accounted for the lowest proportion. This high prevalence of late-stage cancer is compatible with findings from other studies and perhaps reflects the absence of a national screening program, rather than regional differences [13]. Although we did not find a significant

difference in cancer staging over time, evidence from other sources finds that staging has changed for many cancers in Mongolia. In 2018, Mongolia's Annual Health Report found that 76.1% of incident cancers were diagnosed at later stages, compared to 90% in 2008 [4-11].

Limitations of this report are like those that impacted our original study. Given the high tendency for back and forth migration over time in Mongolia, misclassification of women's residence as urban or rural could have occurred. However, unless women are systematically relocating to urban areas before a breast cancer diagnosis, the misclassification of residence concerning cancer would be considered random. Additionally, the completeness of the data could have affected our findings. Interviews with the individuals involved in the registry have led us to believe that cancer reporting in Mongolia is generally high. Since cancers may need to advance before being diagnosed, the accuracy and completeness of diagnoses are unknown. However, the non-localized stage of many of the cancers suggests that advanced disease is being diagnosed and reported to the NOC.

The additional data included in this short report strengthens our previous observation that breast cancer incidence in Mongolia is increasing and remains higher in urban provinces than in rural regions. The differing urban and rural incidence rates could imply an emerging difference between women living in traditional settings and those moving to urban areas, offering a possible explanation for why breast cancer incidence rates vary between Mongolia and more westernized Asian countries. We conclude that further research on demographic shifts in breast cancer incidence within Asia should be considered, as it may elucidate novel cancer risk factors active among other populations.

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Statement of Conflict of Interest

The authors declare no conflict of interest.

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