UDC: 614.2+616-006.81.04 DOI: 10.52532/2663-4864-2020-1-55-16-24

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Melanoma: incidence and mortality in the world and Kazakhstan in 2018

Relevance: *Melanoma is one of the most aggressive and unpredictable tumors. Melanoma most often affects the skin. Over the past 50 years, the incidence of melanoma in the world has been overgrowing. The highest rates were observed among fair-skinned people and in the regions with lower latitude. The incidence is higher among older adults but is also one of the common forms of cancer among young people. Melanoma incidence and mortality depend on gender, age, ethnicity, as well as on the region of residence.*

The purpose of the study *was to assess the skin melanoma epidemiology in the world and Kazakhstan in 2018.*

Results: *Melanoma incidence was growing throughout the world during the past decades, with an annual incidence of 4-6%. Melanoma incidence is expected to reach 450,000 cases a year in the next two decades.*

Kazakhstan has experienced an increase in melanoma incidence by 63% over the past ten years. Females made 61% of cases. The incidence remained high in the East Kazakhstan region and the cities of Almaty and Karaganda. High mortality was registered in North Kazakhstan, East Kazakhstan, and Pavlodar regions, and the city of Almaty. Since 2009, the five-year survival with melanoma in the Republic of Kazakhstan has decreased by 2.2%.

Conclusion: *Melanoma morbidity and mortality is growing worldwide. Even though its incidence is below one-tenths of other types of skin cancer, the ability of melanoma to quickly metastasize and affect young adults makes this disease as a serious social problem.*

It is necessary to improve the methods of primary, secondary, and tertiary prevention of melanoma aimed at identifying individuals at high risk of tumor development and optimize the methods of its early diagnostics and definition of the risk of metastasis.

Keywords: *epidemiology, incidence, melanoma, mortality.*

Introduction: Melanoma is a malignant tumor resulting from the uncontrolled proliferation of pigment-producing melanocytes. Cutaneous melanoma is most common and accounts for 90% of cases (65% on unchanged skin, 30% against nevus of the skin, 5% are senile formations on the skin). Still, melanoma can also occur on the mucous membrane (2%), the uvea (2-3%), or in other unknown locations (5%).

Historically, melanoma was a rare form, but in the last 50 years, its incidence is growing faster than any other cancer. Although melanoma still accounts for about 5% of all skin cancers, its share in skin cancer mortality is high [1]. In the case of early detection, the prognosis for melanoma is favorable. However, melanoma is an aggressive malignant neoplasm that tends to early lymphogenous and hematogenous metastasis.

The incidence of melanoma is continuously increasing over the past decades throughout the world [2]. The annual incidence is 4-6% among the fair-skinned population, which prevails in such regions as North America, Northern Europe, Australia, and New Zealand [3]. The increase in incidence rates varies significantly by ethnicity and geographical affiliation, as well as by age and gender [2]. Melanoma rates vary more among different ethnicities than in the structure of cancer as a whole. UV radiation is known to cause both skin cell apoptosis and malignant transformation; it is considered the primary risk factor for melanoma [4].

The incidence of melanoma among people of the same ethnicity varies by geographical location [5] depending on the variations in the incident UV radiation. In 1956, Lancaster discovered an increase in mortality from melanoma approaching the equator and called this phenomenon a "latitude gradient" [5]. Since then, similar trends in the incidence of melanoma have been reported worldwide.

The purpose of the study was to assess the skin melanoma epidemiology in the world and Kazakhstan in 2018.

Materials and methods: The materials of the cancer database GLOBOCAN 2018 of the International Agency for Research on Cancer (IARC) [6] were used to analyze skin melanoma epidemiology in the world. Data on mortality from skin melanoma were obtained from the WHO online mortality database.

The statistical data of the Oncological Service of the Republic of Kazakhstan (RK) for recent years was used to analyze the incidence, mortality, survival, neglect by regions of the Republic of Kazakhstan.

Results and discussion: In 2018, 287 723 new cases of melanoma were registered in the world; of them, 150 698 cases in men, and 137 025 cases in women. Melanoma ranks 19th (1.7%) in the overall structure of cancer (Figure 1) and 15th in men and women separately (1.7%).

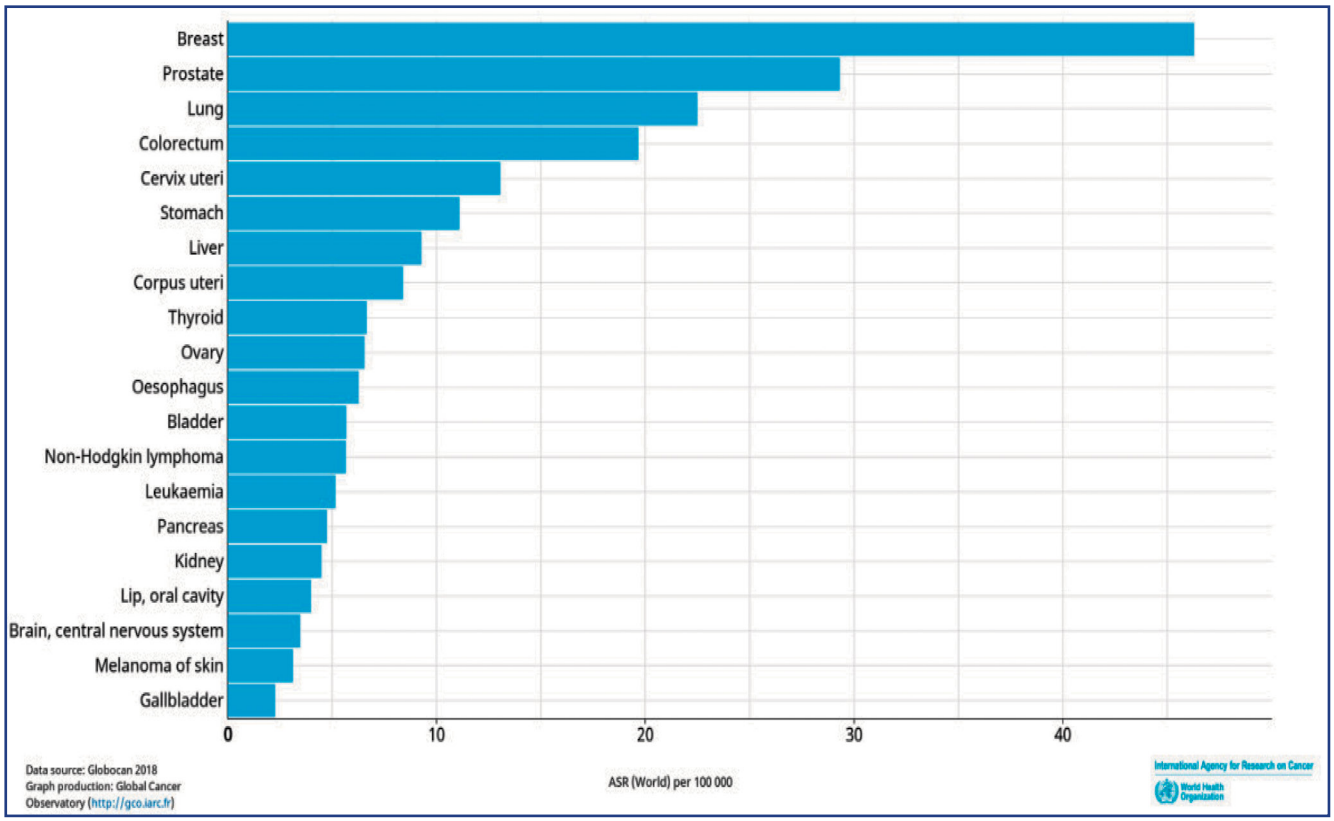

Figure 1 - The structure of cancers in various countries of the world, 2018 [6]

Out of 184 countries evaluated by IARC, the highest incidence rates were recorded in Australia (33.6:100000 cases a year), followed by New Zealand (33.3:100000 cases a year). An increased incidence was registered in Norway (29.6:100000 cases a year), Denmark (27.6:100000 cases a year), the Netherlands (26:100000 cases a year), and Sweden (24.7:100000 cases a year) (Figure 2).

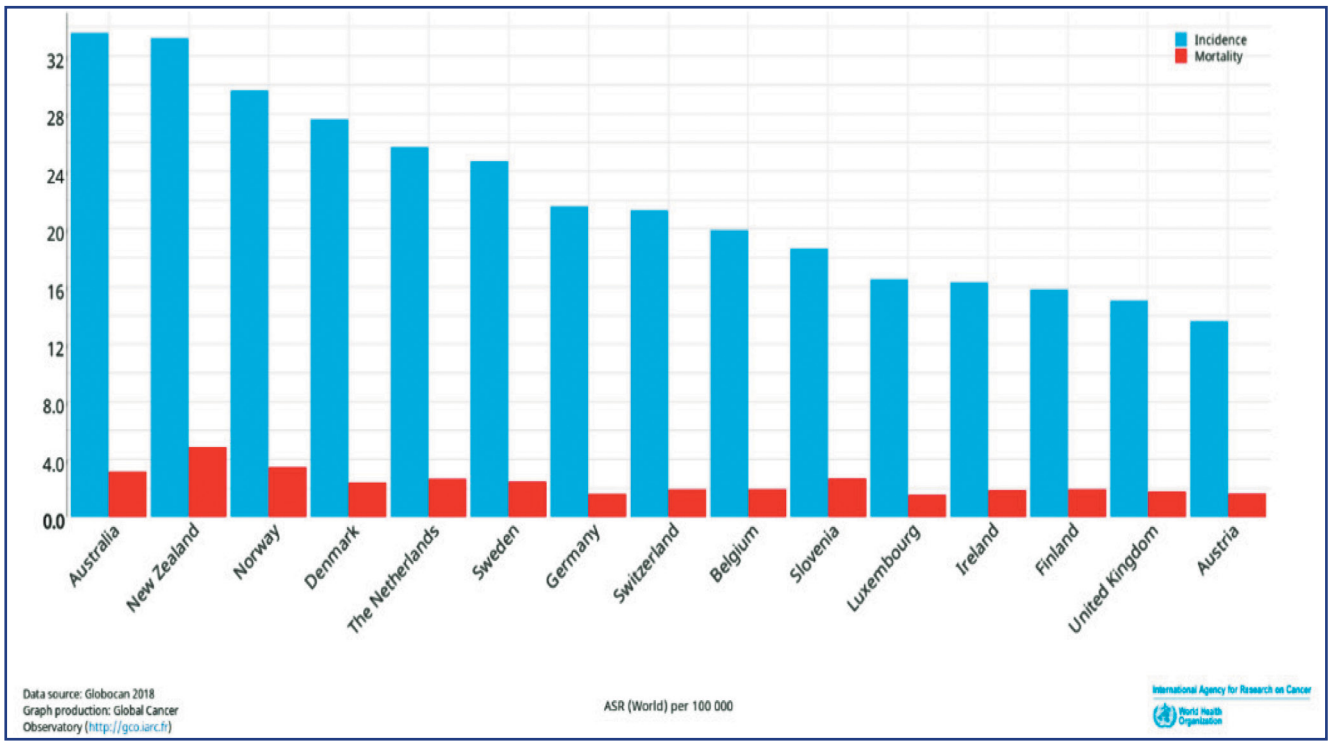

Figure 2 - Incidence and mortality from melanoma in the world, 2018 [6]

In Australia, melanoma is more common in those who live closer to the equator and therefore are more exposed to the sun [7]. In Europe, an inverse latitude gradient is observed [8]. In Europe, the incidence of melanoma in the northern countries of Scandinavia is 3-6 times higher than in southern countries such as Spain and Italy. The different incidence correlation between northern and southern countries in Europe may be partly due to different pigmentation characteristics. Among the population of Africa, Asia, and the Pacific region, as well as the mixed population of Central and South America, the incidence is regularly below 4:100,000 a year. Although many Asian countries are located near the equator, the incidence among the Asians remains mostly unchanged and minimal, probably due to a homogeneous population with darker pigmentation [2].

In countries with high and low latitudes, the areas with higher elevations are associated with a higher incidence of melanoma [9]. Similarly, incidence rates are significantly higher among people who regularly participate in high-mountain activities, such as mountain climbing [10].

Worldwide, standard age melanoma incidence rates continue to grow and reach a peak in the seventh and eighth decades of life (Fig 3-5, differences by age) [2]. This trend is observed among the majority of high-risk groups, including Australia, New Zealand, and Northern Europe. However, in the United States, the incidence reaches a peak in the sixth decade of life. Patients aged 55 to 74 account for 44.9% of all diagnosed melanomas in the United States [13]. At the same time, melanoma is one of the most frequently diagnosed cancers in young people around the world [2].

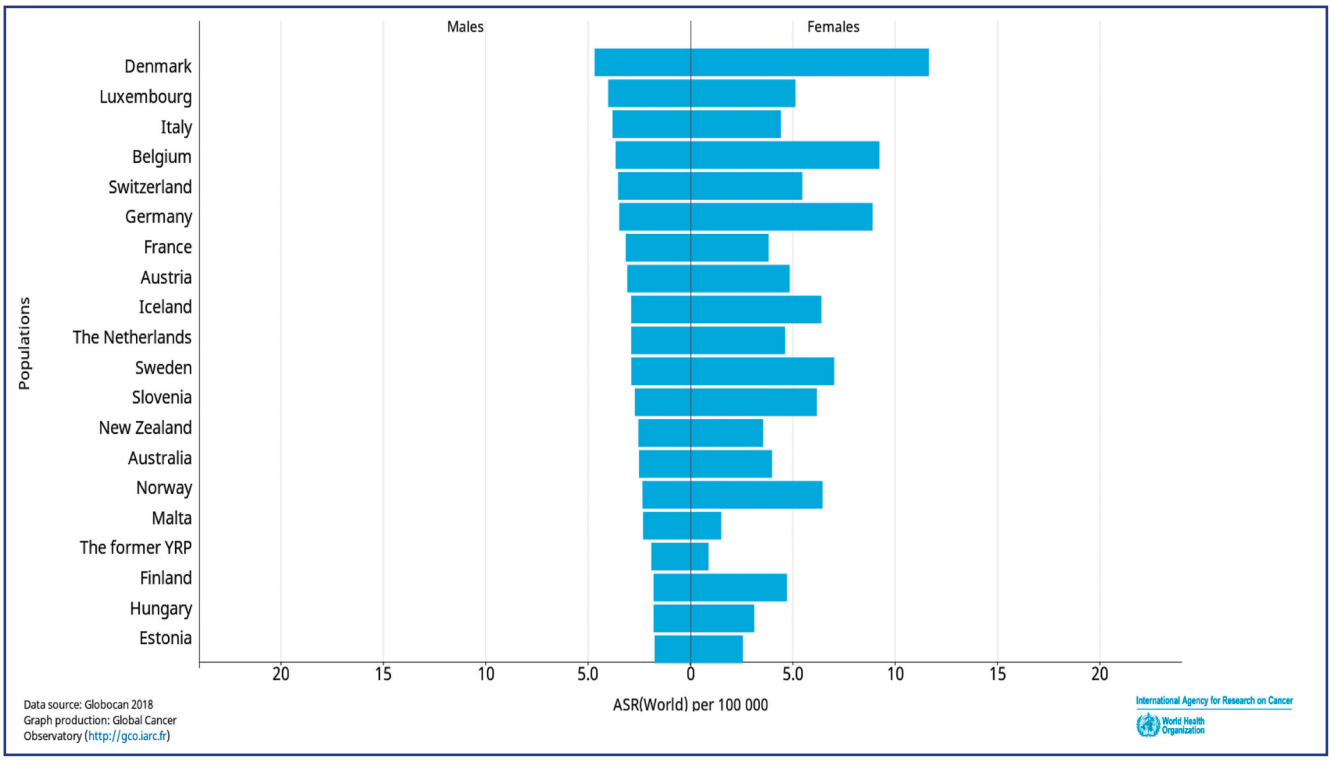

Figure 3 - The incidence of skin melanoma by age (0-34 years) (per 100,000 cases a year) [6]

According to some authors, men are generally more susceptible to melanoma, which may be partly due to androgens [16]. Historically, in Scotland and Canada, at higher latitudes and lower incidence rates, the incidence was significantly higher in women. In Scotland and Canada, at higher latitudes and lower prevalence, the incidence was significantly higher rates in women. In Scotland, the incidence in women was reported to be twice higher than in men [17]. On the contrary, in most middle and low latitude countries, the incidence of melanoma is higher in men than in women, like in the US (men – 14.9 per 100000, women – 11.0 per 100000), Australia (men – 40.4 per 100000, women – 27.5 per 100000) and New Zealand (men – 35.8 per 100000, women - 31.1 per 100000) [2].

Melanoma occurs more often on the back and shoulders in men and on the legs – in women [18]. These results are used as evidence that proves the theory of intermittent exposure to UV [19]. In Australians of both sexes, melanoma is more common in anatomic areas with high exposure to the sun, such as the head and neck. This calculation was done by adjusting the surface areas of the compared body parts [20]. The lowest rates of melanoma were found on the buttocks in both sexes and on the scalp in women [21]. Melanoma that develops on the body is more common in 50-60-years old patients, whereas melanomas that develop in areas of the body with high exposure to UVR such as the head and neck are found in the eighth decade [22].

Melanoma affects women and men in different ways (Figures 3-6). Perhaps, this is reflected in the incidence of melanoma among the population (Figure 3) [2]. Young and middle-aged women are more prone to melanoma than men [14], partly because women sunbathe more often [15]. Nevertheless, after 40 years, the indicators change, and the incidence among men is higher than among women [13, 14].

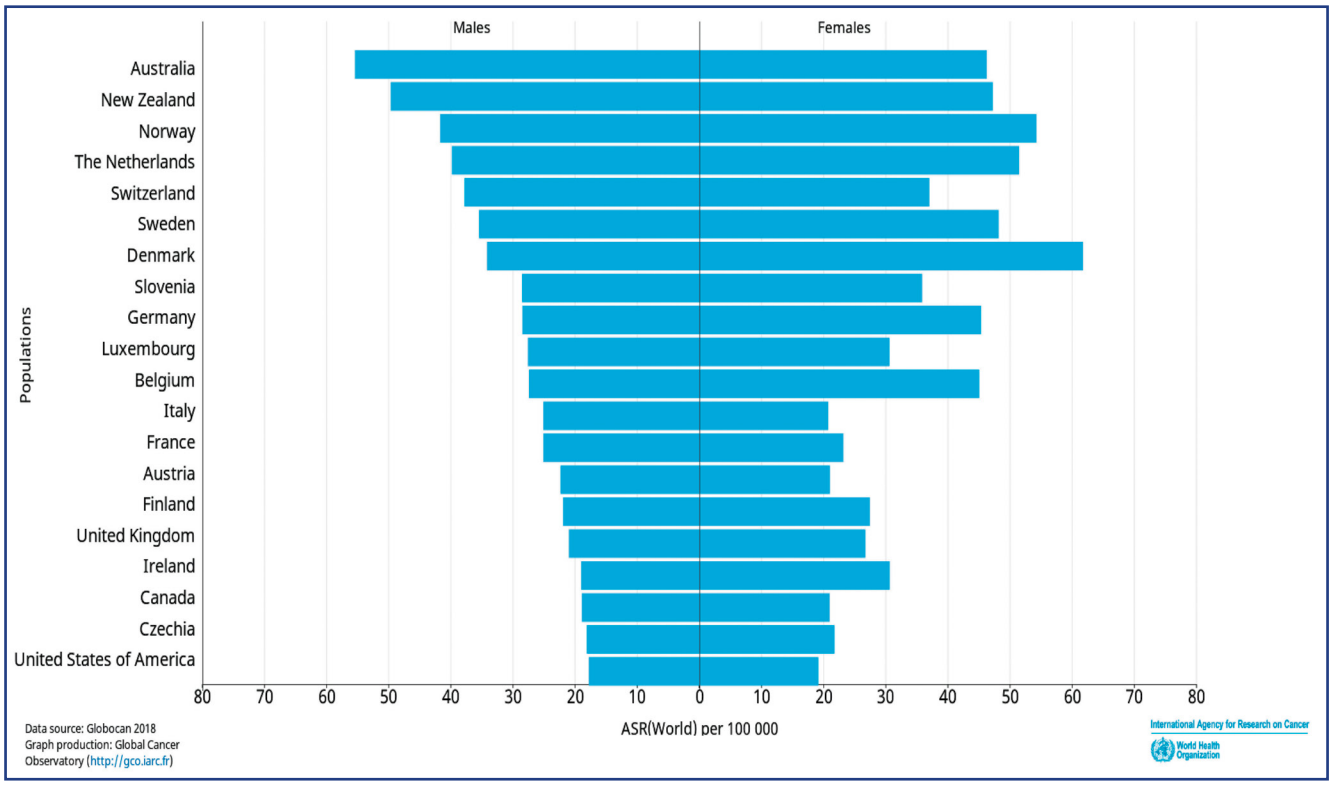

Figure 4 - The incidence of skin melanoma by age (35-59 years) (per 100,000 cases a year) [6]

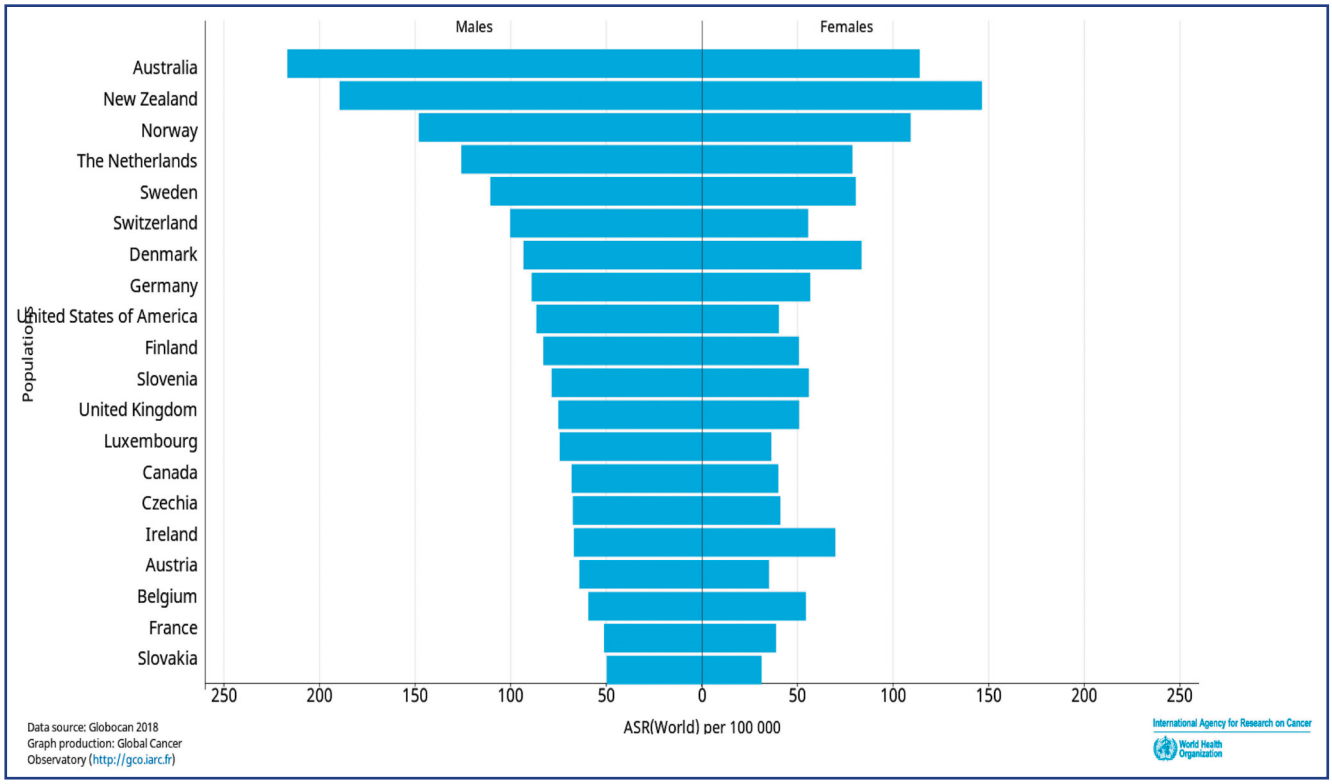

Figure 5 – The incidence of skin melanoma by age (60+) (per 100,000 cases a year) [6]

Trends in mortality from melanoma vary and, as well as incidence, are dependent on geography, ethnicity, age, and gender [14]. As in the case of the incidence of melanoma, the highest mortality among the fair-skinned people is observed in low latitudes (Figure 7). The mortality from melanoma is also age- and gender-dependent. Worldwide, the mortality among men is higher than among women. Taking into consideration the annual incidence of melanoma, the annual death rate from melanoma in the world is the highest among people who

have not reached the seventh decade [2]. High rates of mortality from melanoma were reported in New Zealand (4.8 cases a year per 100000 population).

Over the next 20 years, an increase in the incidence of melanoma is projected up to 450000 cases a year.

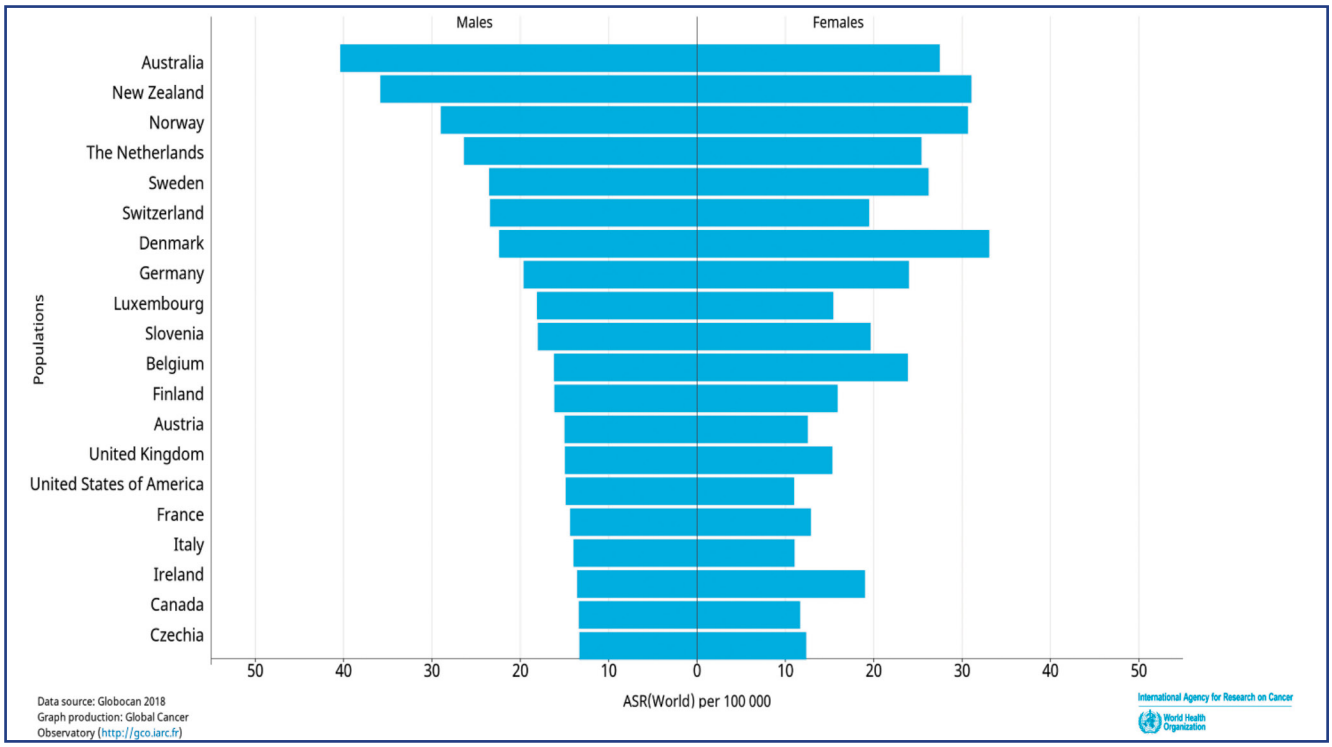

Figure 6 - The incidence of melanoma among men and women in 2018, all ages [6]

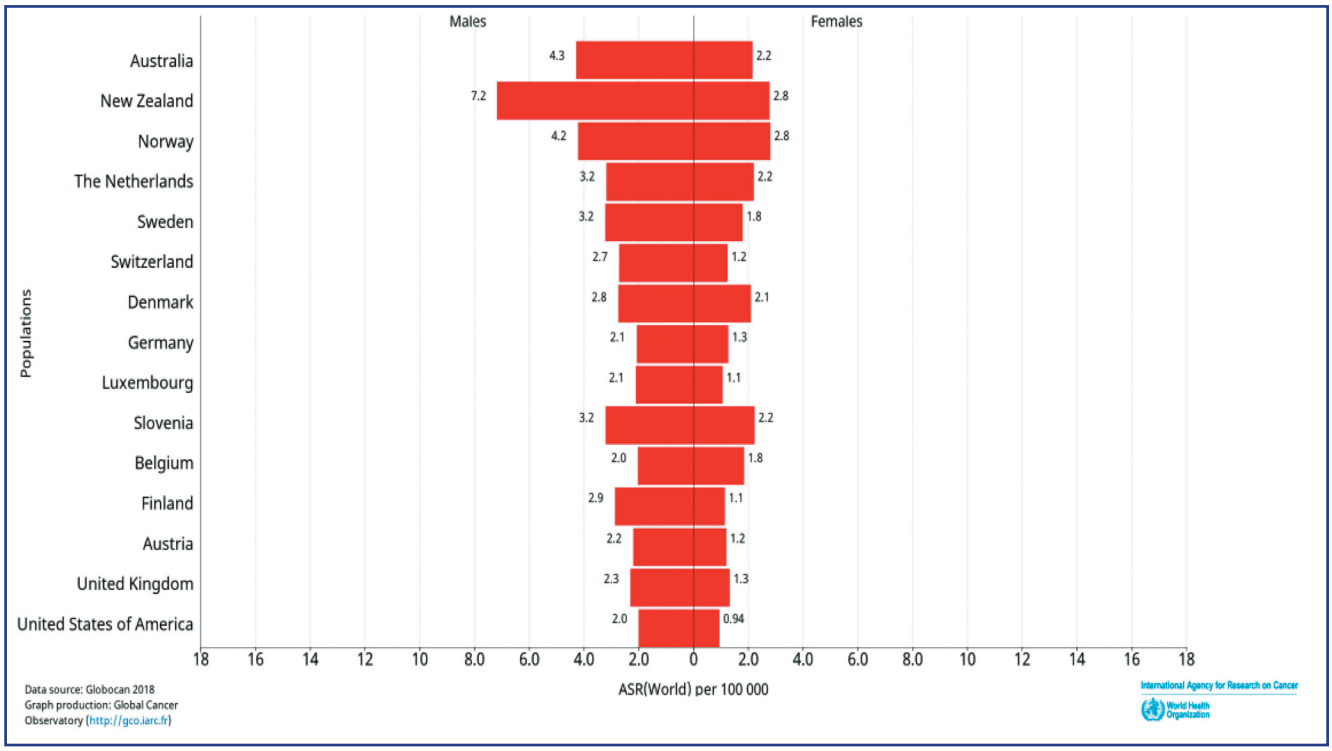

Figure 7 - The mortality from melanoma in different countries of the world, by sex, in 2018, all ages [6]

In 2018, Kazakhstan ranked first among Asian countries in the incidence of melanoma, with a rate of 1.2 cases per 100000 population a year (Figure 8). In terms of mortality from melanoma, Kazakhstan ranked second, with a rate of 0.7 cases per 100000 population a year (Figure 9).

In 2018, 369 new cases of melanoma were registered in Kazakhstan; of them, 226 (61%) cases in women and 143 (39%) cases in men. Melanoma ranked 21st in the structure of cancer (Figure 10).

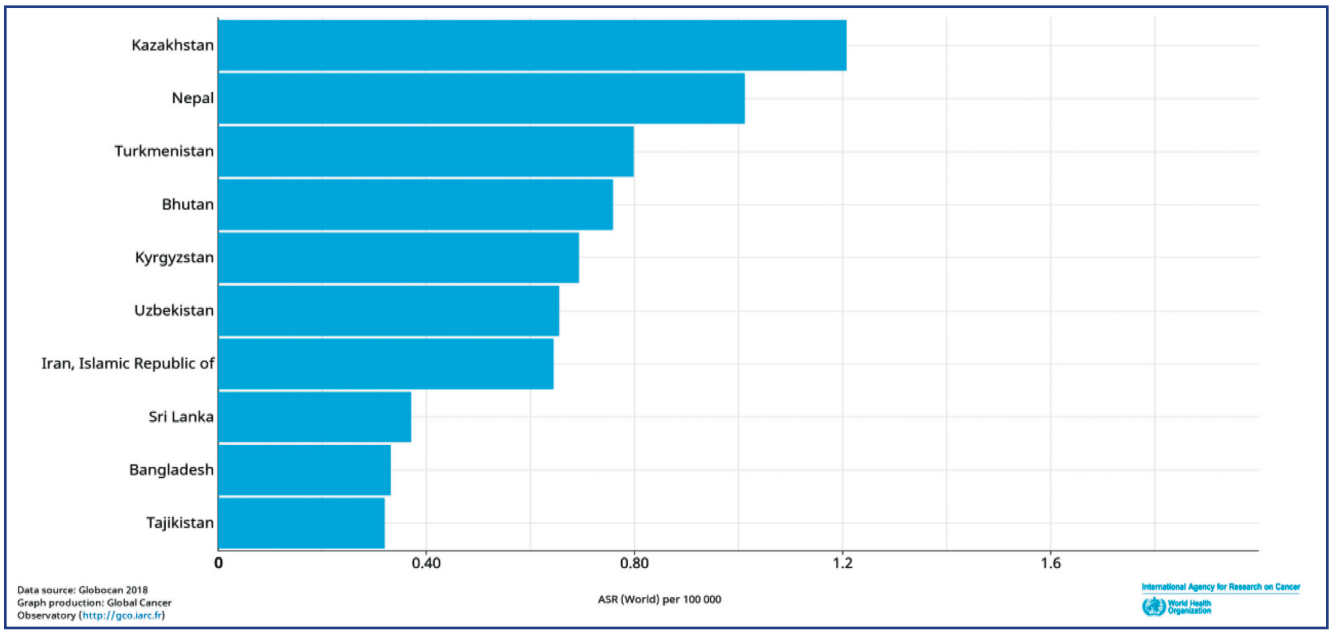

Figure 8 - The incidence of melanoma in Asia in 2018, both sexes, all ages [6]

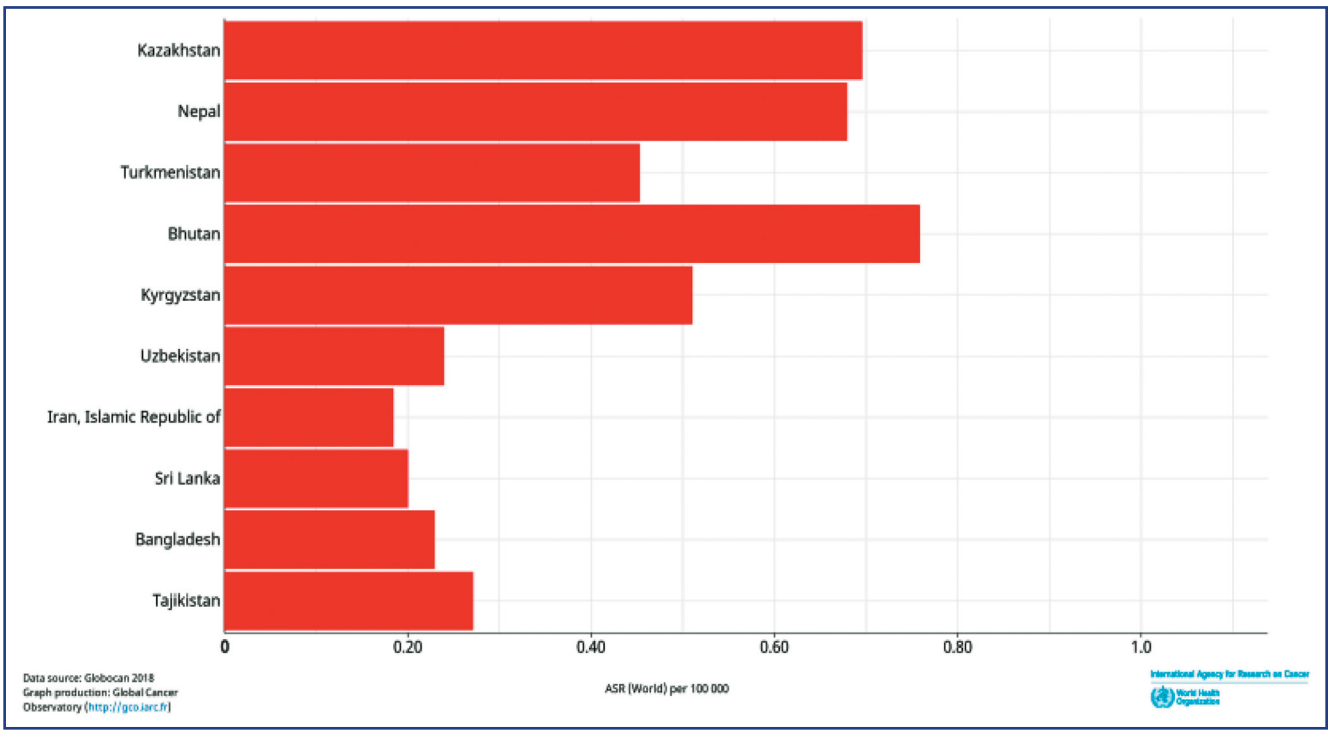

Figure 9 – The mortality from melanoma in Asia in 2018, both sexes, all ages [6]

Over a decade (2009-2018), the incidence of skin melanoma in the Republic of Kazakhstan has added 63% (Figure 11).

In Kazakhstan, in 2018, the incidence remained the highest in East Kazakhstan – 68 cases (18%), followed by the city of Almaty – 52 (14%) and the city of Karaganda – 46 (12%).

The number of deaths from skin melanoma in 2018 was 106 (0.7%). High mortality rates were registered in North Kazakhstan (2.2%), East Kazakhstan and Pavlodar regions (1.2% each), and the city of Almaty (1.0%) (Figure 12).

The number of patients with skin melanoma registered in 2018 amounted to 24900 (13.5%). Of them, 4.3% died from the disease, and 57.1% remained under the supervision of Kazakhstani cancer institutions for more than five years.

In Kazakhstan, the annual mortality is higher among men (0.6%) than among women (0.5%), at the total annual mortality of 0.7% (Figure 13).

Over the past decade, the incidence of skin melanoma in the Republic of Kazakhstan has added 63%. The incidence remains high in East Kazakhstan, the cities of Almaty and Karaganda. High mortality is registered in North Kazakhstan, East Kazakhstan, Pavlodar region, and the city of Almaty. In Kazakhstan, the incidence is higher in women (61%). The five-year survival with melanoma in RK has decreased by 2.2% since 2009.

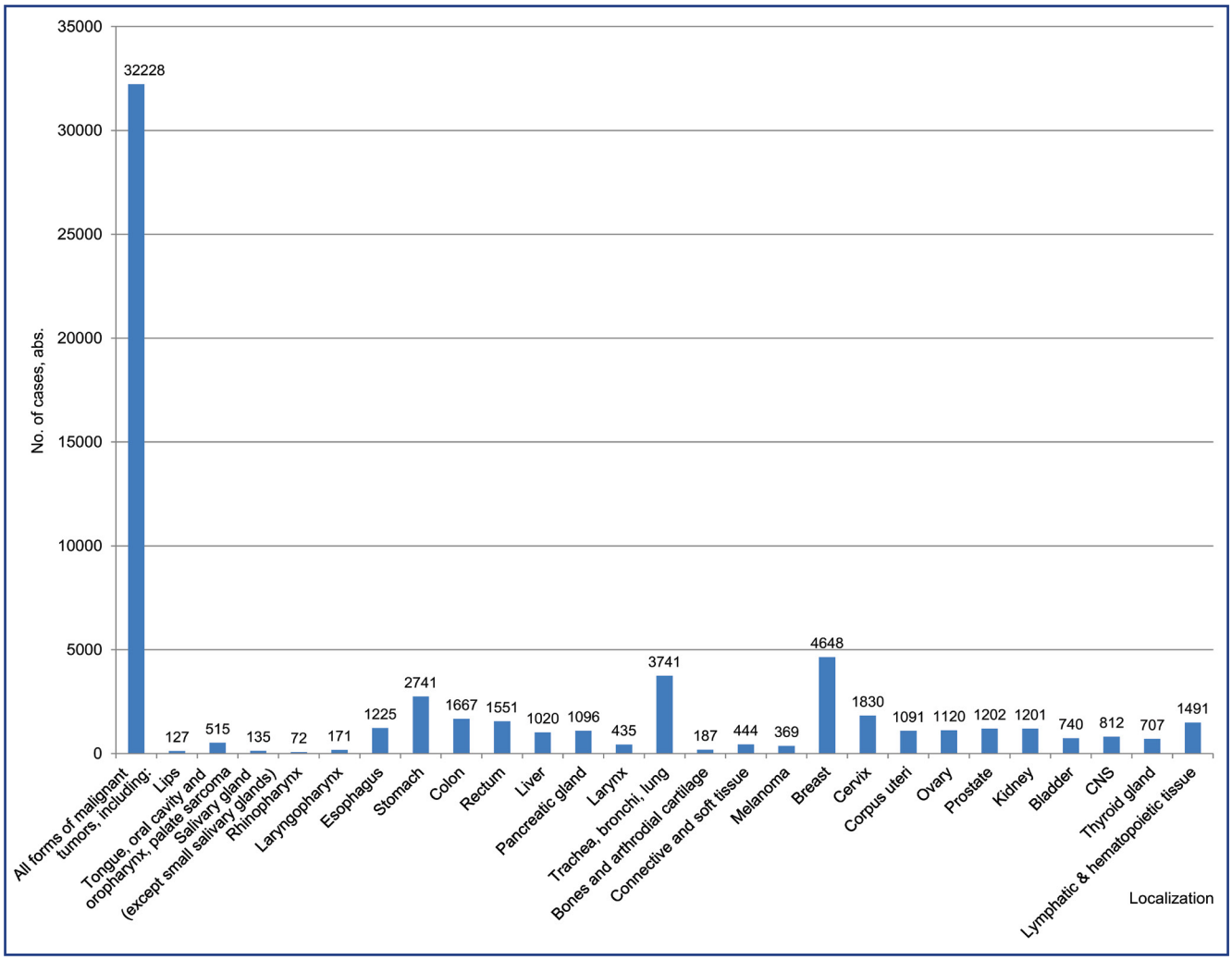

Figure 10 – The incidence of certain forms of malignant tumors among the population of Kazakhstan by region, in 2018 (abs. figures)

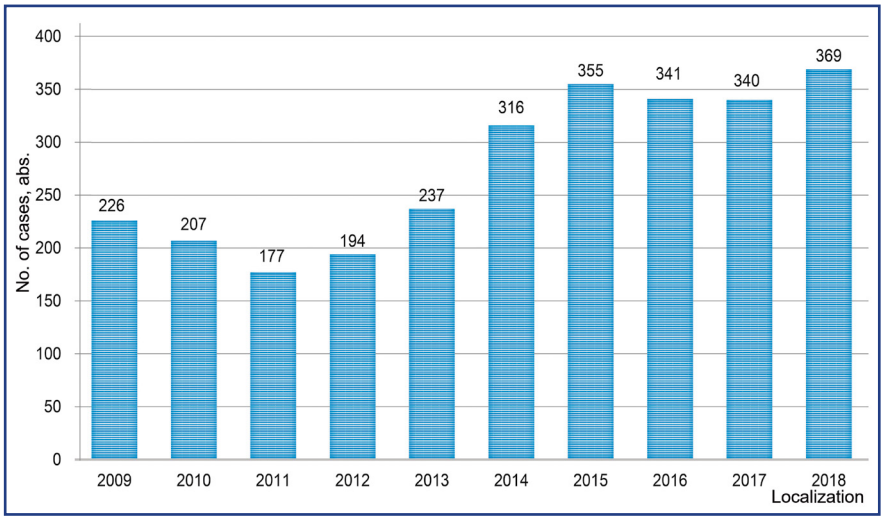

Figure 11 – The incidence of melanoma over ten years (2009-2018)

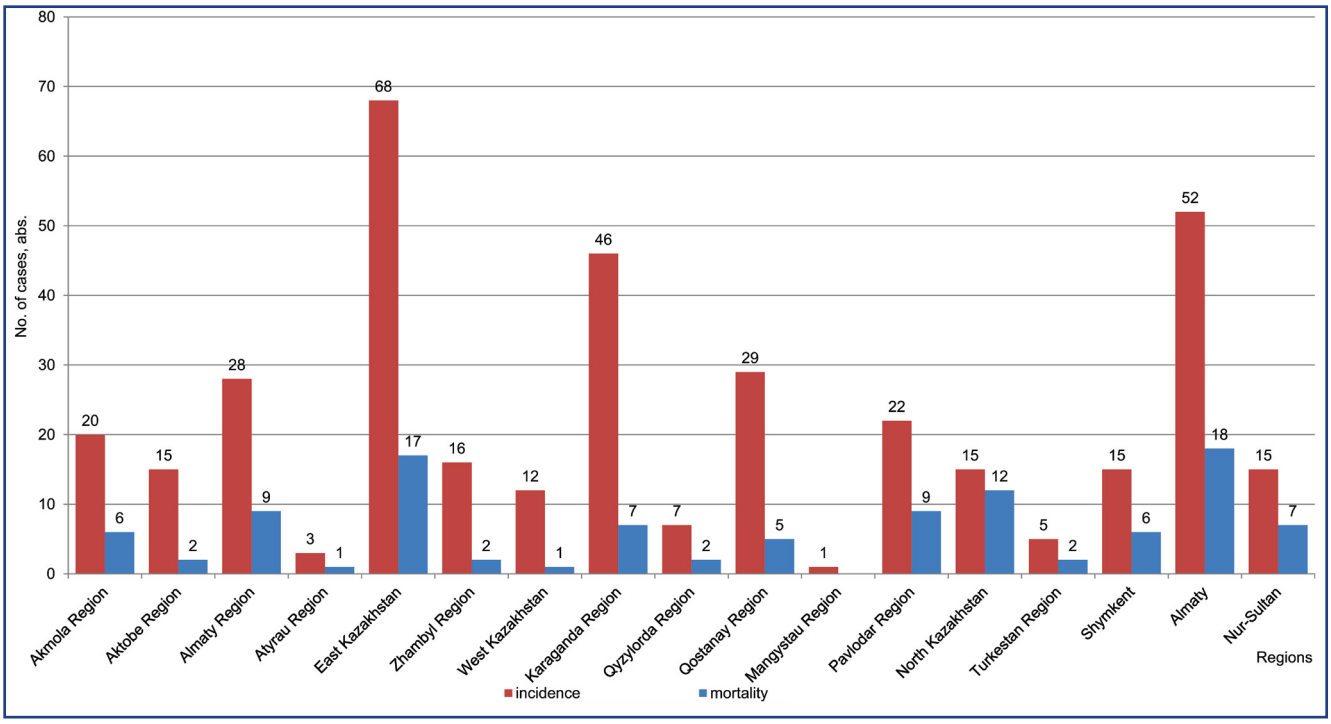

Figure 12 – Melanoma incidence and mortality rates in 2018 in Kazakhstan, by regions

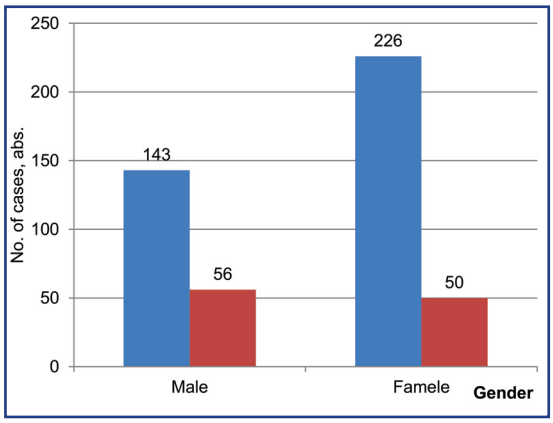

Figure 13 – Melanoma incidence and mortality rates in 2018 in Kazakhstan, by sex

Conclusions: It is necessary to improve the primary, secondary, and tertiary prevention of melanoma aimed at identifying individuals at high risk of tumor development, as well as to optimize the methods of early diagnostics of the disease and the definition of the risk of metastasis.

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