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Original Article / Оригинални рад

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Trends in incidence of non-melanoma and melanoma skin cancers in central Serbia

Тренд инциденце немеланомског рака и меланома коже у централној Србији

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SUMMARY

Introduction/Objective The incidence of both non-melanoma (NMSC) and melanoma skin cancers has been increasing over the past decades worldwide. NMSC is the most common cancer in white population and melanoma is one of the deadliest cancers today.

The objective of the paper was to determine trends in age-standardized incidence rates of NMSC and melanoma in the central Serbia from 1999 to 2013.

Method Descriptive epidemiological study was done. Data about incidence for NMSC and melanoma were obtained from the Serbian Cancer Registry and data about population originated from census 1991, 2001, 2011. Crude incidence rates were calculated per 100 000 inhabitans. Direct method of standardization was performed with the World population as a standard. Trend lines were estimated using linear regression.

Results During a 15-year period a total number of new NMSC cases was 41719 (21690–52% in men and 20029–48% in women). There were a 5781 new cases of melanoma (2969–51,4% in men 2812–48,6% in women). A significantly increasing incidence trend for NMSC both in men (y=0,617x+24,29, R^2=0,500) and in women (y=0.672x+0.670, R^2=0.670) was determined. At the same period a statistically significant increase of incidence trend for melanoma was determined in men (y=0,111x+3,708, R^2=0,384) and in women (y=0,098x+3,375, R^2=0,409). NMSC was registered in persons ofallages. NMSC incidence increased rapidly in persons older than 50 years. Melanoma predominated in children in the persons bellow 60 years of age.

Conclusion Our findings showed significantly increasing trend of age-standardized incidence rates both for NMCC and melanoma. In the observed period there were 7.2 times more new cases of NMSC than melanoma in the population of central Serbia. There were more registered new cases of NMSC and melanoma in men than in women. Screening of skin cancers may improve treatment and prognosis by earlier diagnosis.

Keywords: non-melanoma skin cancers; melanoma; trend; incidence

САЖЕТАК

Увод/Циљ Инциденца немеланомског рака коже (НМРК) и меланома коже је у сталном порасту последњих деценија у свету. Немеланомски рак коже је најчешћи рак у белој популацији, а меланом коже је један од најсмртоноснијих канцера данас.

Циљ рада је био да утврди трендове стандардизованих стопа инциденце НМРК и меланома у централне Србије у периоду 1999–2013.

Методе Примењена је дескриптивна студија. Подаци о инциденци рака коже добијени су из Регистра за рак у централној Србији. Подаци о становништву су из пописа становништва 1991, 2001, 2011. Рачунате су нестандардизоване стопе инциденце на 100 000 становника, стандардизоване методом директне стандардизације. према стандрдној популацији света. Рачунат је линеарни тренд.

Резултати У посматраном периоду регистровано је укупно 41719 новооболелих од НМРК (52% мушкараца и 48% жена). Регистровано је 5781 новооболелих од меланома коже (51,4% мушкараца и 48,6% жена). Утврђен је значајан пораст тренда стандардизованих стопа инциденце НМРК и код мушкараца (y=0,617x+24,29, R^2=0,500) и код жена (y=0.672x+0.670, R^2=0.670). У истом периоду утврђен је статистички значајан пораст тренда стандардизованих стопа инциденце меланома коже код мушкараца (y=0,111x+3,708, R^2=0,384) и код жена (y=0,098x+3,375, R^2=0,409). НМРК регистрован је код особа свих узраста, а нагли пораст регистрован је код старијих од 50 година. Меланом коже је чешћи код деце и адолесцената и региструје се чешће од НМРК код особа млађих од 60 година.

Закључак Резулати показују значајан пораст тренда инциденције НМРК и меланома коже у централној Србији. Регистровано је значајно више новооболелих од НМРК него од меланома и значајно више у мушкој него у женској популацији. Скрининг, рано откривање и лечење рака коже може значајно побољшати прогнозу болести.

Кључне речи: немеланомски рак коже; меланом; инциденца

INTRODUCTION

Skin cancer, including melanoma and non-melanoma skin cancers (NMSC), represents the most common type of malignancy in the white population [1]. They are often classified as non melanoma skin cancers (NMSC) and melanoma [2]. Melanoma and NMSC are the most common types of skin cancers with documented increasing incidence in several past decades [3,4].

Unlike other cancers, the incidence of NMSC is not well documented. Many cancer registries do not register all primary NMSC. Small forms of NMSC and recurrent cases are not registered [5]. NMSC are sometimes treated without histological confirmation, and some cancer registries do not attempt to register cases of NMSC. Overall, this leads to under reporting of the true burden of NMSC on the health system [6,7].

The World Health Organization (WHO) estimates 2-3 million cases of NMSC per year which are most likely to be under-reported [8]. NMSC is associated with high morbidity and costs, few cancer deaths overall and decreased quality of life [9,10].

There are wide variation in incidence rates of NMSC among different countries and continents. The highest incidence rates of NMSC are registered in Sweden (estimated incidence of 23.9 in 2012, Switzerland and Great Britain higher than 16.9 per 100,000 for 2012). The Balkan countries, Central Serbia, Moldova and Bosnia and Herzegovina, are standing at the lower incidence levels (<5.3 per 100,000 for 2012) [11].

New Zealand and Australia have the highest incidence and mortality rates from NMSC and melanoma in the world. The incidence of NMSC is 18-20 times higher than incidence of melanoma [12].

About 90 percent of NMSC are associated with exposure to ultraviolet (UV) radiation from the sun and especially with the exposure to the UVB radiation. The most important risk factors in the development of melanoma are: the number of common nevi and atypical nevi, skin phenotype, a family history of melanoma (in 8-12% patients), actinic damage, ≥65 years of age, history of sunburns and intermittent sun exposure (especially in childhood), geographic localization [13].

The incidence of melanoma in Europe vary considerably between countries. The lowest rates are observed in East and South-East Asia, and in South Asia [14].

The objective of the paper was to determine and analyze trends in age-standardized incidence rates of NMSC and melanoma skin cancers in the central Serbia in the period 1999–2013.

METHODS

Descriptive study was performed. Data were obtained from the Serbian Cancer Registry. Data were analyzed for the central of Serbia which included the territory of Serbia excluding the territory of Autonomous Province Vojvodina and Autonomous Province of Kosovo and Metohija [15]. Cancer diagnosis was coded according to the Tenth Revision of International Classification of Diseases-ICD-10th (code C43 for melanoma and code C44 for NMSC) [16].

Cancer reporting is obligatory by the law in Serbia. The Serbian Cancer Registry existed from 1970. After a successful reorganization during 1996-1998, which substantially improved data quality, the Serbian Cancer Registry became a member of International Agency for Research on Cancer (IACR) and European Network of Cancer Registries (ENCR) [18].

Statistical analysis

Crude- and age-standardized incidence rates were calculated. Method of direct standardization was performed [17]. Population of the World was used as a standard. Data about population of the central Serbia were obtained from census 1991, 2002, 2011. For the period in-between data were obtained from the estimates published by the Republic Statistical Institute for inter-census years.

Trend lines were estimated using linear regression. The least–squares method was used to estimate the linear trends. Correlation coefficients were calculated, a positive value indicate an increasing trend, while a negative values was indicative of a decreasing trend. P<0,05 value was considered significant statistically.

RESULTS

The total number of 47500 new cases of skin cancers were registered in the period 1999-2013.NMSC accounts for the 87.8% of all registered new cases of skin cancers and melanoma represented 12.2%. The total number of 41719 NMSC new cases were registered (21690 in men and 20029 in women) during the observed period. Men represented 52% of all registered cases and women 48%. The men to women incidence ratio for NMSC was 1.08:1.

The total number of new melanoma cases was 5781 (2969 in men and 2812 in women). Men represented 51.4% of all registered melanoma cases and women 48.6%. The men to woman incidence ratio for melanoma was 1.05:1.

There were 7.2 times more new cases of NMSC than melanoma in average.

The total number of new cases of NMSC in men was 7.8 times higher than the new melanoma cases in men. At the same time there were 7.6 times more new cases of NMSC in women compared with the number of new melanoma cases in women.

Table 1. Annual age-standardized incidence rates for non-melanoma and for melanoma skin cancers in men and in women, central Serbia, 1999-2013.

Year	Non-melanoma skin cancers age-standardized incidence rate (World)		Melanoma-skin cancers age-standardized incidence rate (World)	
	Men	Women	Men	Women
1999	19.7	15.2	4.1	3.8
2000	26.6	19.5	4.4	3.7
2001	25.7	17.4	3.9	3.6
2002	26.1	18.2	3.6	3.9
2003	27.2	19.7	5.0	4.0
2004	30.7	24.3	3.7	3.6
2005	27.5	21.9	4.2	3.9
2006	35.4	27.7	3.4	3.0
2007	29.5	22.8	5.1	4.4
2008	33.5	25.4	4.7	4.7
2009	30.7	25.2	5.5	4.5
2010	30.8	25.3	5.5	4.4
2011	30.9	24.7	6.2	6.0
2012	30.7	24.2	5.1	4.7
2013	30.7	26.0	4.6	4.3

Annual age-standardized incidence rates for NMSC in men, ranged from 19.7 (1999) up to 35.4 (2006). In women, annual age-standardized incidence rates for NMSC ranged from 15.2 (1999) up to 27.7 (2006).

The lowest annual age-standardized incidence rates for melanoma both for men and for women was registered in 2006 (3.4 in men and 3.0 in

women). The highest annual age-standardized incidence rates was in 2011 in men 6.2 and in women 6.0 The men to women ratio was 1.05:1.

In the observed period, a statistically significant increasing incidence trend for NMSC was determined in men (y=0,617x+24.29, R^2=0.500) and in women (y=0.672x+0.670, R^2=0.670).

There is a significant increasing incidence trend for melanoma both in men (y=0,111x+3,708, R^2=0,384) and in women (y=0,098x+3,375, R^2=0,409).

During the observed period, NMSC was registered in all ages. There were 0.2% new cases in persons bellow 19 years of age, 20-29 (0.6%), 30-39 (2.0%), 40-49 (5.4%), 50-59 (14.6%), 60-69 (27.0%) and 70+ (50.2%). The number rapidly increasing after the 50 years of age. More than 50% of new diagnosed cases were 70 years old or older.

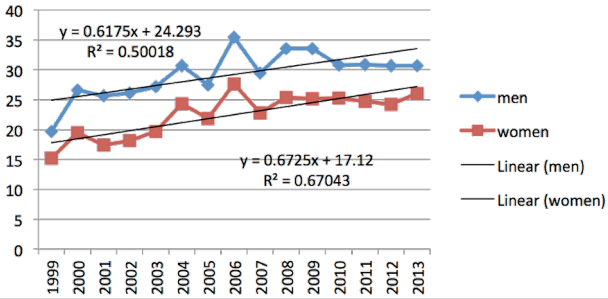

Figure 1. Linear trends for NMSC in men and in women, based on age-standardized incidence rates, central Serbia, 1999-2013.

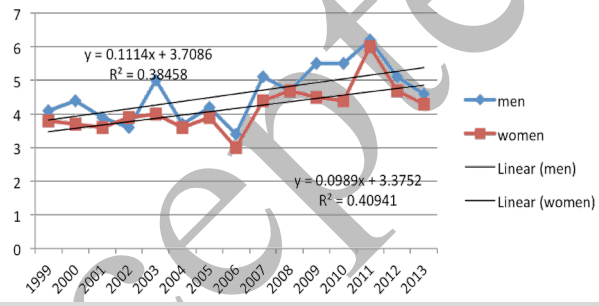

Figure 2. Linear trend for melanoma based on age-standardized incidence rates in men and in women, central Serbia, 1999-2013.

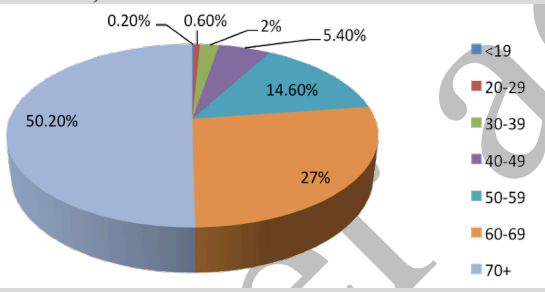

Figure 3. The percentage of new cases of NMSC according to the age groups, central Serbia, 1999-2013.

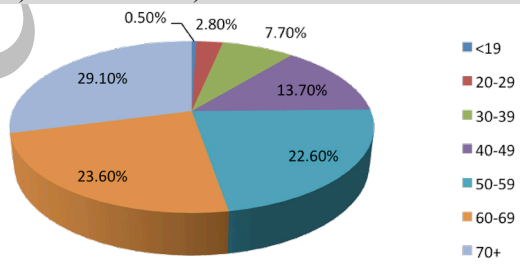

Figure 4. The percentage of new cases of melanoma by age groups, central Serbia, 1999-2013.

Melanoma continuously was registered after the age of 5. In children and teenagers (<19) there were 31 (0.5%) new cases. Incidence rates increase with age: 20-29 (2.8%), 30-39(7.7%), 40-49 (13.7%), 50-59 (22.6%), 60-69 (23.6%), 70+(29.1%). Rapidly increasing of new melanoma cases was registered after the 30 years of age. The highest number of new melanoma cases was registered in the age of 70 years and in older.

DISCUSSION

According to our findings, incidence trends of NMSC and melanoma increased statistically significant both in men and in women. There were more registered new cases of NMSC and melanoma in men than in women. In the observed period there were 7.2 times more new cases of NMSC than melanoma in the population of central Serbia.

Our findings showed that NMSC account for the majority of skin cancers in the population of central Serbia. According to our results, during a 15-year period, NMSC were registered in all ages predominantly in older age groups.

Melanoma predominated in children and in young adults. Melanoma was more frequent in persons of both gender below 60 years of age. In the older age, NMSC was more frequent than melanoma, especially in the persons older than 70 years of age. Men are exposed to a greater melanoma incidence risks. Melanoma is registrated in children above 5 years of age [18].

The incidence of NMSC in Albania shows an increasing trend over the past decade, with men being more often affected by such health conditions [19]. Countries in Serbian neighboring such as Montenegro, (2.6 per 100,000), Greece (2 per 100,000) and Albania (1.7 per 100.000), [19]. NMSC is the second most common cancer both in men and in women in the city of Belgrade [18].

Age-standardized incidence rates for both skin cancers are increasing in Iran, and they are higher in men than in women [21]. Increasing of age-standardized incidence rates for NMSC was determined in both men and women in the city of Belgrade in the period 1999-2011 [2].

Both skin cancers have a wide age distribution and the incidence increasing with age and it was higher in men than in women. Some studies have shown results about increasing age-standardized incidence rates in older age groups [2,18,21-24]. In 1999 melanoma was occurring slightly more in women than in men in the central Serbia [15].

These findings could be partially explained by exposure to ultraviolet (UV) radiation, The "pollutants" that are most distract the skin are: ultraviolet radiation, polycyclic aromatic hydrocarbons volatile organic compounds (benzene), heavy metals, and ozone. The genotoxicity of UV light is well documented (type of lesion or mutation, etc.) and its carcinogenic effect is clearly demonstrated*in vivo* in man. A few epidemiological studies describe the carcinogenicity of certain pollutants such as arsenic or lead on the skin cancers [25].

Both epidemiological surveys and experiments with animal models suggest that UVA, and perhaps the visible, may induce melanomas. It is known that Japanese have a much lower incidence of skin cancer than Caucasians, the dramatic rise in skin cancer in Japanese-Americans in Hawaii exposed to high-intensity irradiation raises concerns [26].

Development of skin cancers is a long process that may take decades. Evidence suggests that childhood and adolescence are critical periods in the etiology of skin cancer [27].

Skin cancers are the most common they are also a preventable cancers [5,21,26,27]. Studies measuring the effect of public education programs show a substantial change in attitudes and behavior in sunlight particularly in the younger age groups. Behaviour change might also be achieved through direct and indirect routes [28].

Primary prevention are more beneficial and effective in children, not only due to the particular importance of sunlight exposure during this period, but because this is when individuals are more open to changes and adopt new attitude and behavior [29].

In Serbia, skin cancers are expected to increase. Many persons are adopting the western life style with more ultraviolet light exposure during outdoor recreational activities. Our population is getting older and the population of elderly is growing. It will be notable more new skin cancers cases in the future.

There are some important limitations in this investigation. Data about histology of skin cancers and data about body localization of skin cancers are missing.

CONCLUSION

There were a continuous increasing trends of age-standardized incidence rates for NMSC and melanoma both in men and in women. Age-standardized rates were higher much more in men than in women. NMSC and melanoma, have a wide age distribution and the age-standardized incidence rates increasing with age. In order to prevent skin cancers it is necessary to promote education campaigns to limit uncontrolled sun exposure and to limit indoor tanning. Presented findings support the important role of primary prevention and early detection of NMSC and melanoma, in the earliest age. Screening of skin cancers may improve treatment and prognosis by earlier diagnosis.

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