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## Epidemiology, Diagnosis and Treatment Outcomes of Skin Melanoma in the Republic of Belarus

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### Authors' contributions

This work was carried out in collaboration between all authors. Author AGZ designed the study and wrote the protocol. Author AEO performed the statistical analysis, analyses of the study and wrote the first draft of the manuscript. Author PIM managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

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### ABSTRACT

The primary incidence of skin melanoma in the Republic of Belarus over 25 years (from 1991 through 2015) has increased 3.3-fold (from 2.6 to 9.0 per 100,000 population). A higher level of urban population incidence, a large proportion of people affected at the employable age. In 2015 the proportion of prognostically unfavourable pT3-pT4 neoplasms was 38.2%. Metastatic disease was detected in 12.4% of the patients.

**Methodology:** Material of the paper is based on the data of Belarusian Cancer Registry using the principles of data collection, monitoring and processing recommended by the IARC.

**Results:** The proportion of stage IB neoplasms made up almost one third of the cases assigned to stage I. Of the cases assigned to stage II, the proportion of neoplasms with a high prognostic index of metastatic spread (T3b-T4b) was more than 70%. The recurrence rate is 15.1% even at melanoma invasion depth of up to 1 mm (with ulceration), while it rises to 32.4% at pT2b. The cumulative 5-year disease-specific survival of all patients in 2005 was  $54.1 \pm 1.5\%$ , and in 2015 it was  $64.0 \pm 2.2\%$ .

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**Conclusion:** A strong correlation is observed between survival of patients and the extent of invasion and ulceration of the primary focus. For metastasis-free pT1a melanoma, the 5-year survival was 92.2%, for T1b – 79.9%, for pT2b – 72.5%, for pT3b – 55.1%, for pT4b – 49.1%. According to the Cancer Registry data, ulceration of the primary neoplasm is frequently observed: it amounts to 41.1% of the cases with melanoma invasion depth up to 2 mm (pT2), to 55.9% with 2-4 mm (pT3) and to 76.3% with the tumor thickness of more than 4 mm (pT4).

*Keywords: Skin melanoma; incidence; diagnosis; survival.*

## 1. INTRODUCTION

The medical and social significance of skin melanoma (ICD-10:C43) is determined by its incidence growth, high potential of malignancy, early metastatic disease, frequent recurrence after treatment, and a high proportion of patients in the employable age.

In the European region, the standardized rates of skin melanoma incidence vary quite widely – from 4.0 to 20.3 per 100,000 population (standardized World values, WHO, GLOBOCAN 2012) [1]. The highest melanoma incidence rates are in Switzerland, the Netherlands, Denmark, Sweden, Great Britain. This value is 3-4-fold lower in Poland, Lithuania, Latvia, Ukraine, and Russia. The situation on the other continents is greatly variable but is also not related directly to insolation. Evident ethnic differences can be traced. India and Japan, countries with a rather high insolation level but predominantly aboriginal population, have a low melanoma incidence (0.2 - 0.6 per 100,000 population). Israel and the US, countries with a high percentage of fair-skin migrants and strong ultraviolet radiation, register quite high incidence levels (11.4-14.3 per 100,000 population), but they are significantly lower than in the Netherlands and Denmark. The highest incidence was noted in Australia (34.9 per 100,000) [1]. The most significant risk factors of skin melanoma development are excess ultraviolet radiation associated with genetic predisposition (fair skin susceptible to sunburns with numerous melanocyte nevi, familial atypical nevi syndrome [FAMM syndrome], germ-line mutations in cell cycle regulation genes CDKN2A and CDK4, and also in other genes) [2-6].

A Swedish study [4] based on the Cancer Registry data found a statistically significant association of skin melanoma incidence with office work. It was most evident on clothes-covered body areas while no difference was observed on uncovered ones. The standardized hazard ratio was 1.08 (95% CI:1.02-1.15).

The skin melanoma incidence risk is significantly increased in younger people tanning in solaria. A meta-analysis of 10 studies [7] found an increased relative risk of skin melanoma associated with solarium tanning (from 1.25 [95%CI: 1.05-1.49] to 1.69 [95%CI: 1.32-2.18] compared to those never practicing artificial tanning.

The objective of this study is an analysis of the basic epidemiological patterns of skin melanoma prevalence in the Republic of Belarus, the rates and terms of the disease progression, and cumulative cause-specific survival.

## 2. MATERIALS AND METHODS

The material of the paper is based on the data of Belarusian Cancer Registry which is the most comprehensive information resource of newly and previously registered cases of malignant neoplasms within the confines of this country, using the principles of data collection, monitoring and processing recommended by the IARC. The analysis of skin melanoma incidence data according to ICD-10 C43.0-C43.9 codes was made for the period of 1991-2015. To compare the incidence by sex and residence, standardized World values per 100,000 population were used. To compare skin melanoma incidence and mortality in certain countries of the world, the GLOBOCAN 2012 electronic resource was used. The values of cumulative disease-specific survival presented in this paper were actuarially calculated using standard techniques and were derived from the data on the newly diagnosed cases in 2000-2004 (by the end of 2005) and 2010-2014 (by the end 2015). In the cases of malignant second primaries occurring with skin melanoma, only melanoma-related deaths were taken into account. The deaths from other causes including other malignancies were allowed for as censored. The TNM distribution of the diseases was made in accordance with the 7<sup>th</sup> edition of the TNM classification.

### 3. RESULTS AND DISCUSSION

In 2015 skin melanoma accounted for 1.7% (1.4% in males, 2.1% in females) in the incidence distribution of all malignant neoplasms, including leukemia, in the Republic of Belarus.

The most common site affected by melanoma was the skin of the trunk and upper and lower extremities which in total amounted to 81.1% of all registered cases in 2011-2015 (Table 1), with preferential melanoma involvement of clothes-covered body areas.

The comparison of the two 5-year periods shows that skin melanoma of the trunk and upper extremities, including the shoulder girdle, tended to occur more commonly (by 15%), while the lower extremities were affected less commonly by (14%). This tendency is observed in both men and women, with male tumor sites on the trunk skin accounting for 52.9% over the past 5 years. In women, the incidence rate of lower extremity melanoma decreased from 47.7% to 33%, still being the most common tumor site.

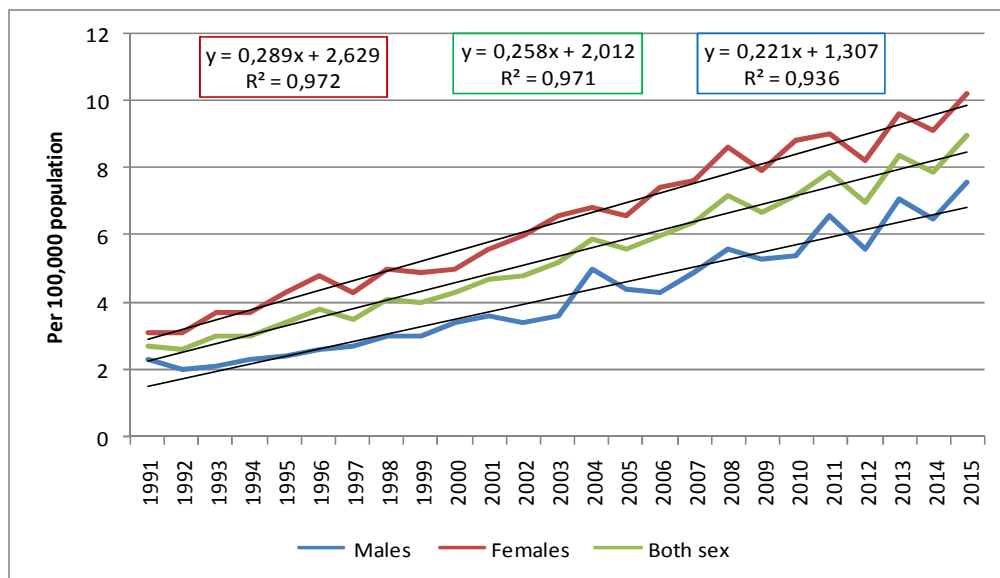
The analysis of crude values demonstrates a significant growth of new cases of the disease. Over the 25 years (1991-2015), the primary incidence rose 3.3-fold (from 2.6 to 9.0 per 100,000 population), owing to both female (from

3.1 to 10.2) and male (from 2.3 to 7.6) incidence growth (Fig. 1).

The standardized values also corroborated this incidence growth but their growth rates were almost 2 times lower than those of the crude ones (regression ratios 0.142 and 0.258, respectively), suggesting an approximately equal contribution of the changes in the age distribution of the population, including the gain in lifespan and the impact of other etiological factors, to the incidence rates rise (Figs. 1 and 2).

One of the distinctive features of skin melanoma incidence trends in this country is its more rapid growth among the urban residents (Fig. 3). The urban dwellers are 1.5-fold more likely to be affected by melanoma, which may be partially determined by their longer lifespan and, seemingly, by frequent sporadic tanning.

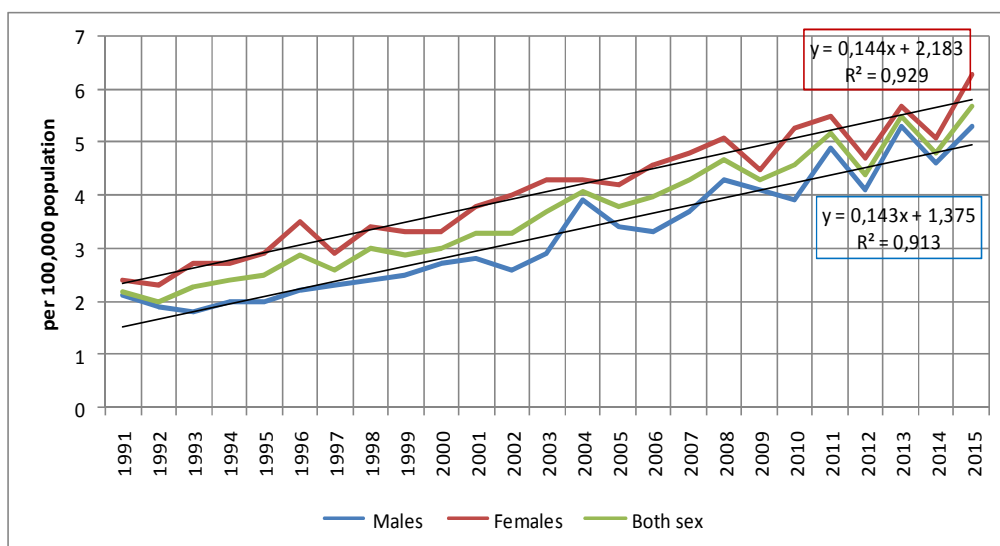
In the Republic of Belarus, just as in many other world regions, skin melanoma incidence in women is higher than that in men. At the same time, male incidence is higher in a number of neighbouring countries such as Lithuania and Poland. A similar tendency is noted in the USA, Canada, Slovakia, Israel and Finland<sup>1</sup>. However, statistically significant differences in incidence by sex are observed only among rural residents of this country, with no phenomenon of this kind among townsfolk (Fig. 3).



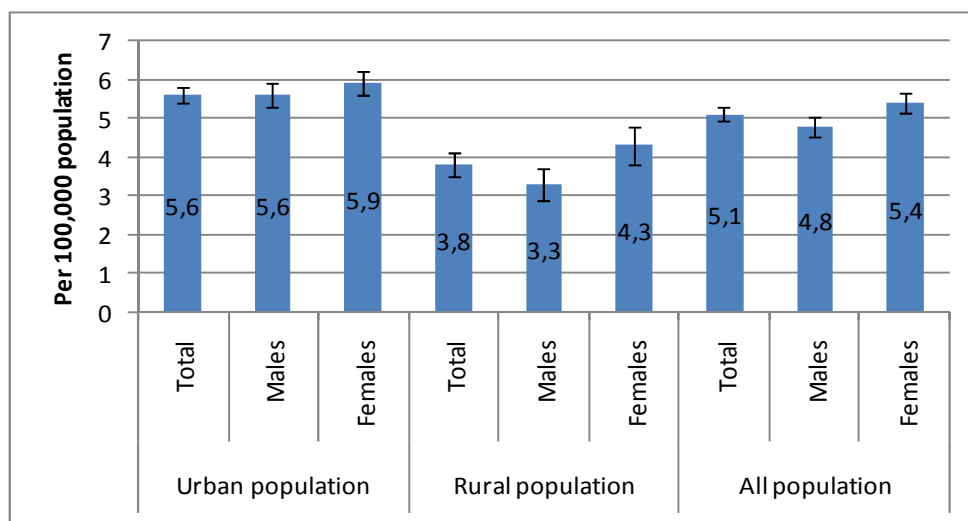
**Fig. 1. The trends in crude values of skin melanoma incidence per 100,000 male and female population of the Republic of Belarus, 1991-2015**

**Table 1. The number of registered cases and skin melanoma incidence distribution in the Republic of Belarus, 1991-1995 and 2011-2015**

Site	1991-1995						2011-2015					
	Males		Females		Both sexes		Males		Females		Both sexes	
	N	%	N	%	N	%	N	%	N	%	N	%
C430 Lip	0	0	2	0,2	2	0,1	1	0,1	4	0,2	5	0,1
C431 Eyelid, including palpebral commissure	6	1,1	8	0,8	14	0,9	4	0,3	13	0,6	17	0,4
C432 Ear, and external acoustic meatus	11	2,1	16	1,6	27	1,8	16	1,1	47	2,0	63	1,7
C433 Other facial parts	41	7,7	111	11,4	152	10,1	108	7,3	252	10,8	360	9,5
C434 Hairy portion of head and neck	45	8,4	26	2,7	71	4,7	101	6,9	56	2,4	157	4,1
C435 Trunk	218	40,8	198	20,3	416	27,6	778	52,9	658	28,2	1436	37,8
C436 Upper extremity including the shoulder joint area	84	15,7	121	12,4	205	13,6	231	15,7	466	20,0	697	18,3
C437 Lower extremity including the hip joint area	117	21,9	464	47,7	581	38,6	178	12,1	770	33,0	948	24,9
C438 Spreading beyond one site	6	1,1	14	1,4	20	1,3	16	1,1	14	0,6	30	0,8
C439 Not otherwise specified (NOS)	6	1,1	13	1,3	19	1,3	38	2,6	51	2,2	89	2,3
Total:	534	100	973	100	1507	100	1471	100	2331	100	3802	100



**Fig. 2. The trends in standardized world values of skin melanoma incidence per 100,000 male and female population of the Republic of Belarus, 1991-2015**



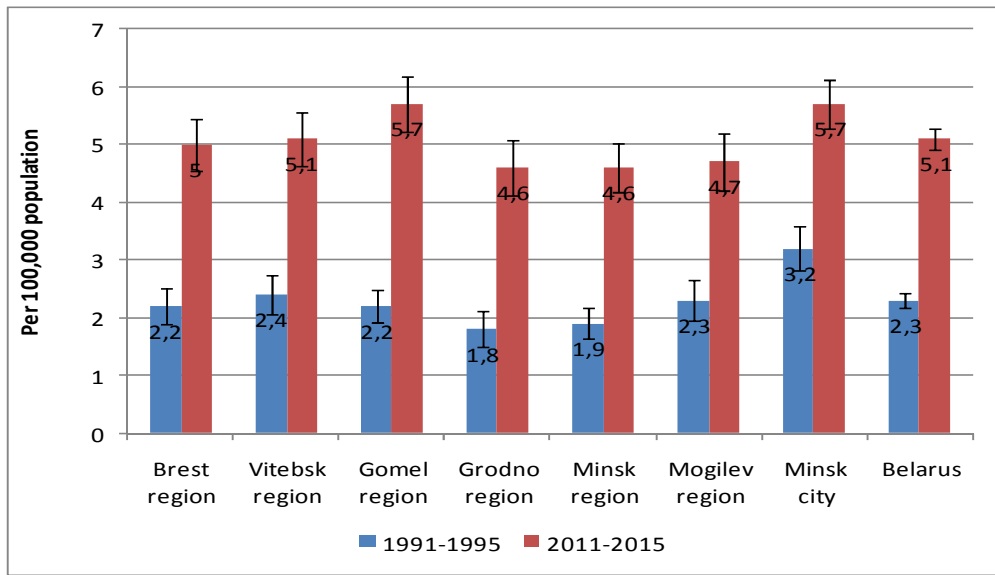
**Fig. 3. Mean 5-year levels (2011-2015) of skin melanoma incidence in the population of the Republic of Belarus, depending on sex and residence (standardized world values per 100,000 population and 95% confidence intervals)**

The highest level and the largest incidence increase were in the southern Gomel region (Fig. 4). Generally, the incidence level in the whole population of Gomel region does not statistically differ from the mean national level, nor from the level of Vitebsk region, the farthest northern one. However, these differences are prominent in the analysis of urban population incidence (Fig. 5).

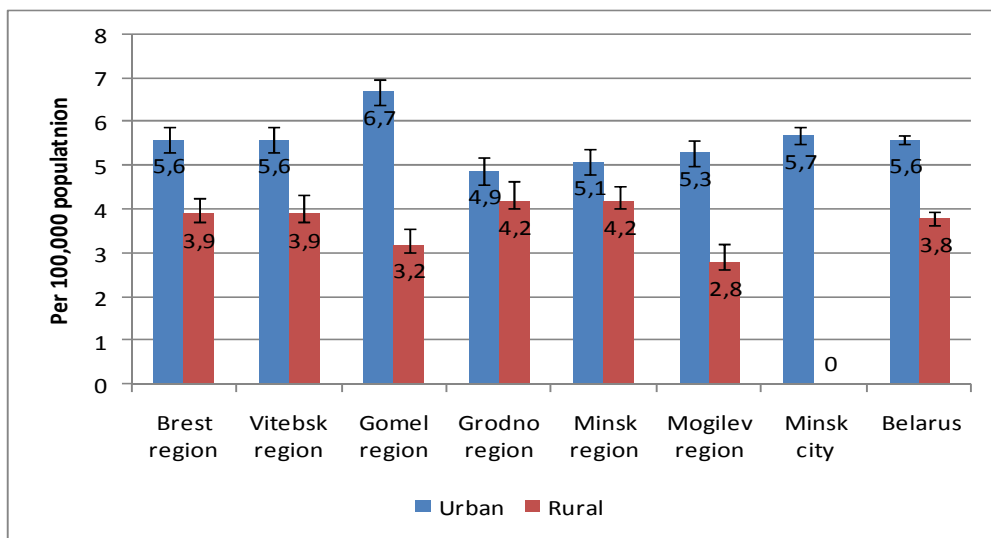
The incidence among the urban residents of Gomel region proved to be the highest in the country, while it was statistically significantly

lower than in most other regions among the villagers. It should be noted that this region was most of all radionuclide-contaminated as the result of the Chernobyl accident.

Nevertheless, no relation to melanoma incidence is found, although rural residents are at the highest risk of direct skin contact with long-lived isotopes. So the incidence among the villagers of Gomel region is statistically significantly lower than in Vitebsk region virtually unpolluted with long-lived isotopes.



**Fig. 4. Mean 5-year levels of skin melanoma incidence in the population of the Republic of Belarus (standardized world values per 100,000 population and 95% confidence intervals, 1991-1995 and 2011-2015)**



**Fig. 5. Mean 5-year levels of skin melanoma incidence in the urban and rural population of the Republic of Belarus (standardized world values per 100,000 population and 95% confidence intervals), 2011-2015**

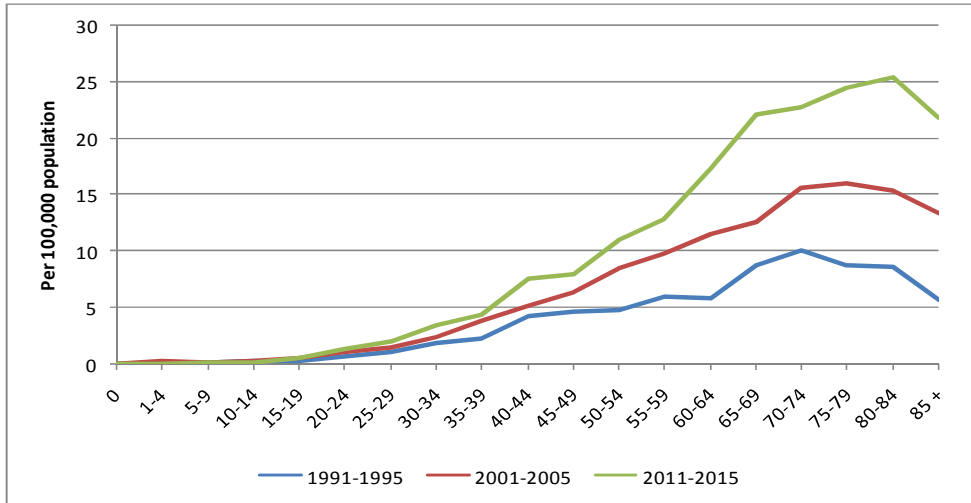
Skin melanoma incidence rates grow with age, the increase beginning from the age of 20 (Fig. 6). Compared with 1991-1995 period, the incidence peak shifted from the 70-74 age group to 80-84. The bulk of the growth was in the age group of people older than 50. The incidence levels among younger persons increased to a lesser extent vs the initial period. Variances in incidence age distribution are observed between

the male and female population: the incidence rates in women under 60 are higher than in men, while they are considerably lower in older age groups (Fig. 7). Thus, a higher-female incidence as a whole is determined by higher incidence rates in women of young and middle age. A similar age distribution is noted in urban residents, their incidence rates being higher. The incidence among rural women exceeds that of

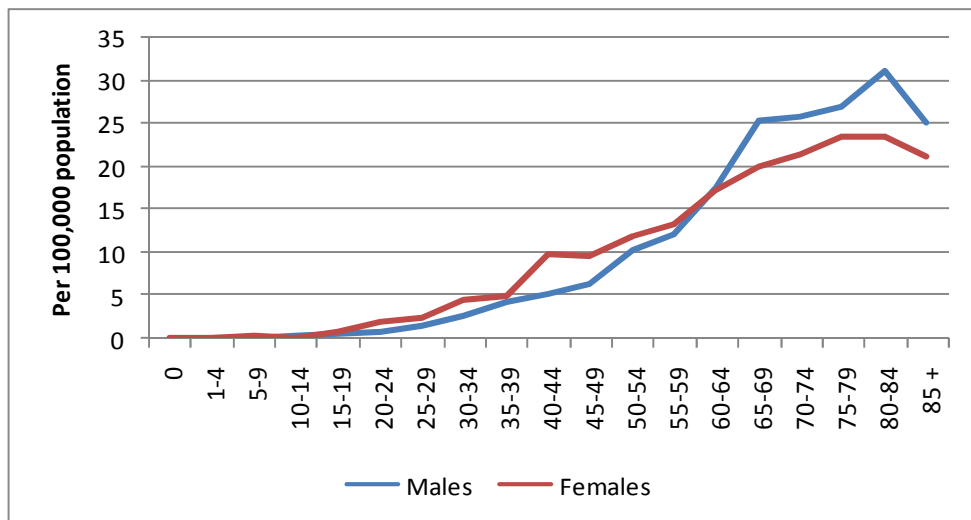
rural men in all age groups, and the incidence levels in the villagers older than 50 are 1.5-3-fold lower than in the townsfolk.

In general, the proportion of melanoma cases in the employable population was 42.1% in 2015: 48.8% were male cases and 37.7% were female, which is mainly due to earlier retirement age of women.

Early diagnosis of skin melanoma is still a pressing issue. The state of things has somewhat improved over the past 10 years. The share of patients with neoplasms diagnosed in stage I has increased while the proportion of stage III and IV patients has decreased (Fig. 8). At the same time, the conventional four-stage presentation of the information is far from the complete perception of the problem status.



**Fig. 6. Age values of skin melanoma incidence in the population of the Republic of Belarus (mean values per 100,000 population of the relevant age, 1991-1995, 2001-2005 and 2011-2015)**



**Fig. 7. Age values of skin melanoma incidence in the male and female population of the Republic of Belarus (mean values per 100,000 population of the relevant age and sex, 2011-2015)**

It is well known that the potential of the supposed melanoma progression is associated with the tumor depth and its ulceration. A more detailed characterization of newly diagnosed skin melanoma cases entered in the cancer registry in 2015 is shown in Tables 2 and 3.

Summing up the data of Table 3, it is worth noting that the proportion of pT4b tumors with poor prognosis amounted to 38.2% of cases diagnosed in II stage. Metastatic disease stages were found in 12.4% of the of all newly diagnosed cases, including distant metastases in 4.7%. The share of metastatic melanoma stages (regional and distant metastases) with pT1-pT2 primary tumor was 3.2% with pT3-pT4 - 17.4%. Of 32 patients with primary tumors impossible to be assessed (TX), 18 cases had distant metastases and 3 had regional ones (N3). Stage IB neoplasms accounted for almost one third of the cases assigned to stage I.

Of all the cases assigned to stage II, the proportion of tumors with high prognostic index of metastatic disease (stages IIB and IIC, T3b-T4b) was more than 70%.

Of 4258 patients taken ill with skin melanoma in 2010-2015, 88.9% received curative treatment. During that time period, of all the patients subjected to curative treatment, there were 1625 (39.7%) cases of disease progression, including regional and distant metastases requiring repeat management.

The overwhelming majority of relapses and metastases (72.7%) developed in the course of less than 3 years after treatment completion. Melanoma progression occurred 5 years later in 15% of the cases.

Of certain interest is the distribution of patients with non-metastatic stage of skin melanoma by the disease progression rates after curative treatment, with regard to the pT category.

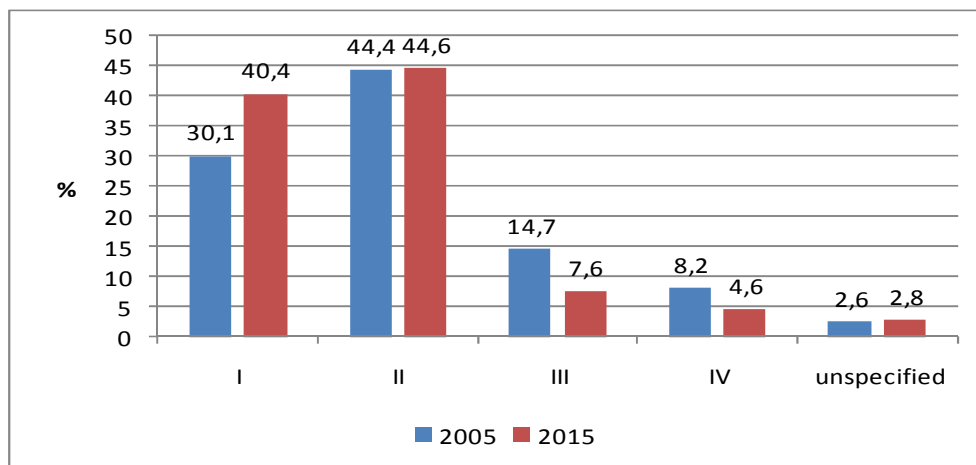


Fig. 8. Stage distribution of newly diagnosed skin melanoma cases

Table 2. Distribution of newly diagnosed skin melanoma cases in 2015 according to TNM

T	N (M0)					M			Total
	0	1	2	3	x	1	x	x	
1	93	0	1	0	1	1	0	0	96
1a	157	0	0	1	0	2	1	0	161
1b	14	0	2	0	0	0	0	0	16
2a	93	1	1	0	2	3	0	0	100
2b	30	1	0	0	0	0	0	0	31
3a	74	0	4	2	2	3	1	1	86
3b	61	3	0	3	0	1	1	1	69
4a	50	5	3	2	0	6	1	1	67
4b	133	17	5	10	3	5	1	1	174
x	7	0	0	3	1	18	3	3	32
Total	712	27	16	21	9	39	8	8	832



**Table 3. pTNM stage distribution of skin melanoma cases newly diagnosed in 2015**

Stage	TNM	Number	% of total	% of stage subtotal
I	T1N0M0	93	11,2	26,0
IA	T1aN0M0	157	18,9	44,0
IB	T1b-T2aN0M0	107	12,9	30,0
<b>I (subtotal)</b>		<b>357</b>	<b>43,0</b>	<b>100,0</b>
IIA	T2b -T3aN0M0	104	12,5	29,9
IIB	T3b-T4a N0M0	111	13,3	31,9
IIC	T4bN0M0	133	16,0	38,2
<b>II (subtotal)</b>		<b>348</b>	<b>41,8</b>	<b>100,0</b>
III	T1-4N1-3M0	64	7,7	100,0
IV	T1-4N1-3M1	39	4,7	100,0
unspecified		24	2,8	100,0
Total		832	100,0	

The data presented in Fig. 9 and Table 4 demonstrate that the progressing frequency of disease is highly dependent on tumor depth and ulceration presence.

A low risk of melanoma progression after curative treatment is noted only with pT1a. With tumor depth up to 1mm but having ulceration, the recurrence rate is already 15.1%, and with pT2b and pT3b it grows up to 32.4% and 51.1%, respectively (2-4 times higher).

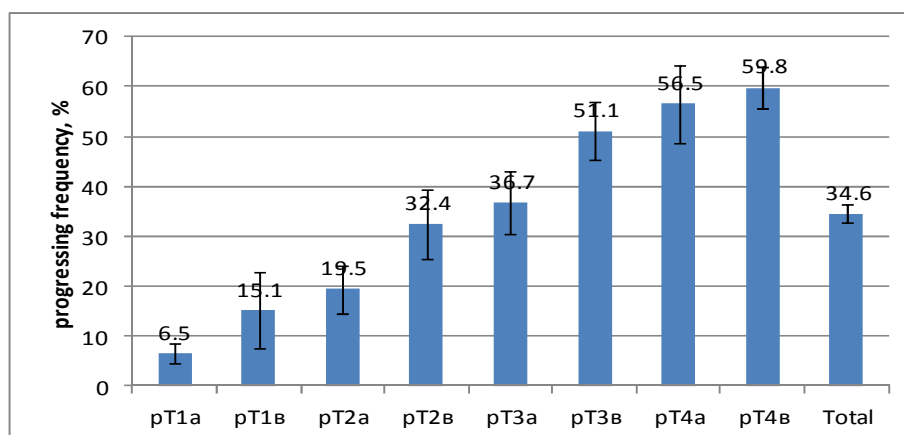
The relapses detected in the course of the first year after curative treatment of melanoma suggest that the primary tumor was of a more advanced character which is not always manageable to be assessed using routine examination techniques.

This is also supported by the fact that of 256 skin melanoma-related deaths in 2015, more than a half of the cases had early stages of the disease (stage I – 18.4%, stage II – 54.9%).

The survival of patients with skin melanoma is an integral checkup index of diagnosis, treatment and surveillance efficacy. The cumulative 5- year disease- specific survival of all patients all stages, irrespective of treatment newly diagnosed in 2000-2004 (by the end of 2005) was  $54.1\pm 1.5\%$ , in 2010-2014 (by the end of 2015) –  $64.0\pm 2.2\%$ .

Over the 10–year period, the 5-year survival considerably increased only in stage I patients (from  $74.9\pm 2.7\%$  to  $87.4\pm 1.6\%$ ), with no statistically significant changes in survival with stage II and IV, and decreased survival in stage III patients (from  $42.8\pm 2.6\%$  to  $31.5\pm 3.8\%$ ).

Significant sex-dependent differences in survival are noticeable: The survival rates in the female cohort are considerably and statistically significantly higher than those in men (69.9% and 51.4%, respectively). A similar relationship is also observed in gender-dependent survivals compared for the (2005-2009) time period with calculating the values for 2010.

**Fig. 9. Progressing frequency with non-metastatic stage of skin melanoma curative treatment completion (2010-2015)**

A strong association is observed between 5-year cumulative disease-specific survival of patients with non-metastatic stages and tumor depth and ulceration presence in the primary focus, demonstrating the aggressive potential of melanoma.

The 3-year survival rates of pT1b-pT2a melanoma patients are 96-98%, their 5-year rates being 80-83%, i.e. the disease recurs mainly in the time period exceeding 3 years. With primary pT2b-pT4b disease, the survival rates deteriorate just in the first follow-up year (Table 5).

The analysis of primary melanoma ulceration incidence found a definite relation with its depth with tumor depth of 2 mm (pT2), ulceration of the primary tumor focus occurs in 41.1% of the cases, with tumor depth of 2 to 4 mm (pT3) in 55.9%, and with a depth of more than 4 mm. (pT4) in 76.3%.

Table 6 presents the cumulative rates of disease-specific survival of skin melanoma patients receiving curative treatment, with regard to tumor stage. One-year survival and mortality/incidence ratio are among the most important indices characterizing the quality of specialized medical care provision and melanoma diagnosis.

The values of incidence, mortality and mortality/incidence ratio for skin melanoma are at great variance in different countries (Table 7). Unfortunately, it should be stated that the Republic of Belarus is not among the countries with low mortality/incidence ratios. In 2012 the mortality/incidence ratio for melanoma was 32.6%, in 2015 - 28.1%, suggesting of considerable reserves on organization of early detection and treatment of skin melanoma. Over the recent decade, the vector of the trend for this index changed, although it is less prominent and associated with improvements in treatment rather than in diagnosis.

**Table 4. Curative treatment coverage and disease progression rates in patients with non-metastatic stage of skin melanoma, depending on its pT extension, 2010-2015**

pT	Number of newly diagnosed cases	Completed radical treatment		Disease progression		Of them, in the course of (%)			
		Number	%	Number	%	Less than 1 year	1-2 years	3-4 years	5 years and more
pT1a	565	556	98,4	36	6,5	33,3	36,1	30,6	0
pT1b	87	86	98,9	13	15,1	46,2	38,5	15,4	0
pT2a	267	261	97,8	51	19,5	13,7	62,7	23,5	0
pT2b	174	173	99,4	56	32,4	39,3	51,8	8,9	0
pT3a	232	229	98,7	84	36,7	42,9	46,4	9,5	1,2
pT3b	286	282	98,6	144	51,1	43,1	46,5	9,7	0,7
pT4a	155	154	99,4	87	56,5	50,6	41,4	8,0	0
pT4b	538	523	97,2	313	59,8	54,6	39,6	5,1	0,6
Total	2304	2264	98,3	784	34,6	45,9	44,0	9,6	0,5

**Table 5. Cumulative disease-specific survival of patients with non-metastatic stages of skin melanoma, depending on the extent of primary tumor spread (pT) (all newly-diagnosed patients in 2010-2014 with calculating the values for 2015)**

	Probability to survive up to the end of the follow-up period, %									
	1 <sup>st</sup> year	SE	2 <sup>nd</sup> year	SE	3 <sup>rd</sup> year	SE	4 <sup>th</sup> year	SE	5 <sup>th</sup> year	SE
pT1a	100	0	99,4	0,4	98,1	0,9	95,1	1,7	92,2	2,6
pT1b	100	0	98,4	1,6	88,6	4,9	79,7	7,4	79,7	7,4
pT2a	100	0	95,9	1,5	90,9	2,5	85,7	3,4	83,2	4,1
pT2b	98,6	1,0	95	2,0	79,9	4,5	77,5	5	72,5	6,7
pT3a	98,9	0,8	92,9	2,1	82,6	3,4	81,4	3,5	72,9	5,1
pT3b	95,8	1,4	85,4	2,6	75,2	3,6	64,3	4,7	55,1	5,9
pT4a	97,5	1,4	87,8	3,3	80,1	4,5	65,1	6,3	61,4	6,9
pT4b	91,4	1,4	74,4	2,4	60,9	3	53,2	3,5	49,1	3,9

**Table 6. Cumulative disease-specific survival of skin melanoma patients receiving curative treatment, with regard to tumor stage (treated in 2010-2014 with calculating the values for 2015)**

Stage*	Number of patients at the start of the follow-up period	Died of malignant neoplasms during the follow-up period	Died of other diseases during the follow-up period	Quitted the follow-up, their lot unknown	Number of patients at the end of the follow-up period	Cumulative survival rate	Cumulative rate error
I	823	38	24	139	662	90,2	1,7
IA	410	11	6	75	318	92	2,7
IB	290	27	10	37	216	81,3	3,8
IIA	291	27	10	38	216	81,4	3,8
IIB	347	74	31	54	188	57,7	4,5
IIC	396	123	34	54	185	50,0	4,0
IIIB	66	29	6	3	28	35,1	10,2
IIIC	91	53	8	6	24	25,4	5,9
IV	37	19	2	4	12	33,6	10,7

*\*No data on stage IIIA as the number of patients was insufficient for calculating cumulative disease-specific survival*

**Table 7. Incidence, mortality and mortality/incidence ratios (%) (GLOBOCAN 2012) [1]**

Countries	Incidence			Mortality			Mortality/incidence ratio%
	Male	Female	Both sexes	Male	Female	Both sexes	Both sexes
Belarus*	3,6	4,6	4,1	1,8	1,6	1,7	41,5
Belarus**	4,0	4,7	4,3	1,7	1,3	1,4	32,6
Great Britain	13,7	15,6	14,6	2,2	1,5	1,8	12,3
Germany	11,1	12,0	11,4	1,7	1,1	1,4	12,3
Denmark	16,6	22,1	19,2	2,5	1,8	2,1	10,9
Latvia	5,4	6,0	5,6	2,2	2,0	2,0	35,7
Lithuania	5,4	5,1	5,2	2,5	1,3	1,8	34,6
Netherlands	17,2	21,8	19,4	3,2	2,5	2,8	14,4
Poland	4,3	3,9	4,1	2,5	1,6	2,0	48,8
Russian Federation	3,7	4,4	4,1	1,9	1,4	1,6	39,0
Slovakia	10,9	9,2	9,9	2,6	1,7	2,1	21,2
Ukraine	3,7	4,4	4,0	1,9	1,4	1,6	40,0
Finland	14,4	11,2	12,6	2,7	1,1	1,8	14,3
France	10,0	10,6	10,2	1,9	1,1	1,5	14,7
Spain	6,6	7,2	6,9	1,2	0,9	1,0	14,5
Switzerland	20,2	20,8	20,3	3,3	1,7	2,4	11,8
Sweden	17,6	18,8	18,0	3,5	2,1	2,8	15,6
Estonia	6,4	8,4	7,4	2,9	1,6	2,2	29,7
Greece	2,9	2,0	2,4	1,2	0,7	0,9	37,5
Israel	13,0	10,2	11,4	2,8	1,5	2,1	18,4
RSA	5,5	4,0	4,5	1,7	0,9	1,2	26,7
Canada	10,4	9,1	9,6	2,4	1,2	1,8	18,8
USA	16,8	12,6	14,3	2,7	1,2	1,9	13,3
Japan	0,5	0,7	0,6	0,2	0,2	0,2	33,3
India	0,2	0,2	0,2	0,1	0,1	0,1	50,0
Australia	40,5	30,0	34,9	5,8	2,3	4,0	11,5

Notes:\* - according to WHO data, GLOBOCAN 2012 (forecast)

\*\*-according to the Belarusian cancer-register for 2012

#### 4. CONCLUSION

Belarus is within the group of countries with a relatively low skin melanoma incidence. The distinctive features of skin melanoma incidence trends in the population of the Republic of Belarus are its rapid growth (a 3.3-fold incidence increase over 25 years), a high incidence level among urban residents, especially in the southern part of the country, a large proportion of persons affected at the employable age, and a higher incidence risk for urban women of young and middle age.

Despite the fact that melanoma is diagnosed in stages I and II in 85% of the cases, Belarus is among the countries with a high mortality/incidence ratio (28.1%) and is far behind countries with a 2-4 times lower ratio. For this reason, one of the burning issues is diagnosis of early melanoma. It is worth noting

that the advances in this area are mainly associated with high-quality professional training of general practitioners and dermatologists, wide use of dermatoscopy in practice enhancing the diagnostic accuracy by 20-30% vs naked eye clinical examination [8], rather than with preventive excision of melanocyte nevi or activities within screening programs (no screening programs for melanoma or those in studies evaluating their efficacy).

A no less important field in the system of activities aimed at early melanoma detection is systematic education of the population about the factors facilitating its development, early symptoms of the disease, including mandatory informing of solarium customers about the risk of malignant skin neoplasm origination.

In the recent years, the technical potential for the diagnosis of the extent of melanoma spread

considerably increased (positron emission tomography, biopsy of sentinel lymph nodes). The potential of drug therapies for disseminated melanoma has significantly improved.

### CONSENT AND ETHICAL APPROVAL

Concerning consent and ethical approval to our article this is not applicable because we use only statistical data and do not use personal data.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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