

Incidence and Mortality of Malignant Melanoma in Berlin (West) from 1980 to 1986

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Newly diagnosed melanomas were investigated utilizing the histological reports from the 4 Departments of dermatology as well as from 3 Departments of pathology in Berlin (West) during the years 1980–86. The study included 960 melanomas and documented the histological features, age, gender and nationality of the patients involved. 936 patients were Germans (379 males, 557 females), and the mean age-adjusted incidence rate (for the European standard population) was 7.1 cases per 100,000 inhabitants and year for both genders with an increase between 1980–81 and 1985–86 in men from 6.0 to 9.8 and in women from 5.8 to 7.8/100,000 and year. Thus a 49% increase in incidence was observed for both genders combined during a 5-year period. In this study, a preponderance of male incidence rates was observed for the first time in Germany. Interestingly, the age-adjusted incidence rate for the Turkish population, which is the largest foreign population with more than 100,000 inhabitants in Berlin, was only 1.3/100,000 and year. 162 men and 145 women died of melanoma in the time period examined. From 1980–81 to 1985–86, the age-adjusted mortality rate changed from 3.5 to 2.6 for men and from 1.2 to 1.6 for women per 100,000 and year, thus revealing a slight decrease in mortality for both genders combined. **Key words:** *Epidemiology; Incidence; Mortality; Gender; Age distribution; Localisation; Tumour thickness.*

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Until short time ago, Berlin (West) was an island inside East Germany with the Wall as its border. No inhabitants of peripheral regions could request the services of Berlin (West) health institutions, and thus this city was an interesting location for pop-

ulation-based epidemiological investigations in an urban area. No nationwide cancer registry exists in the Federal Republic of Germany and only the federal states of Saarland and Hamburg established population-based cancer registries that were accepted by the International Agency for Research on Cancer (IARC) (1). The Saarland cancer registry reliably documented malignant melanomas in a more rural region, but the Hamburg cancer registry only collected most cases from death certificates (2,3). Thus a significant percentage of newly diagnosed melanomas was not recorded, and a severe underestimation of incidence rates must be taken into account. In the predominantly rural Saarland region with about 1,000,000 inhabitants, incidence rates of 6.1 were documented for both females and males in the years 1985–1986, and a doubling of incidence rates within 15 years was calculated (4). In Europe, higher incidence rates of up to 8–12 per 100,000 inhabitants and year have been reported from Scandinavian countries, like Denmark (5,6), Sweden (7) and Norway (8). In Switzerland as well, incidence rates were just as high in the cantons of Geneve and Vaud (9,10). Therefore the question arises, whether the Saarland data on age-adjusted melanoma incidence derived from a more rural area are representative for the entire FRG or whether urban regions display higher incidence rates for melanoma, as has been reported from Norway (11).

The purpose of the present study was to determine the age-adjusted incidence and mortality rates in Berlin (West) from 1980 to 1986 utilizing as a data base the histological reports from four departments of dermatology as well as from important departments of pathology and the official statistics on causes of death (12). This investigation was performed to examine whether incidence rates were higher in urban than in rural areas of Germany and whether the increase of melanoma incidence and mortality observed in the sixties and seventies (2)

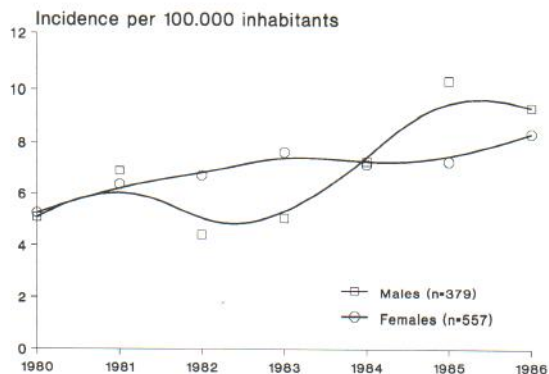


Fig. 1. Incidence rates of malignant melanoma in Berlin (West) from 1980 to 1986 (age-adjusted for the European standard population).

had continued in the eighties. This population-based study also evaluated additional histological features usually not included in registration forms (13,14), such as tumour thickness, level of invasion and histological subtype.

MATERIAL AND METHODS

Data sources

The main data source for newly diagnosed melanomas were the histological reports of the dermatological departments. A large majority of melanomas were seen and histologically diagnosed at the dermatological departments in Berlin (West) (total number: 4 depts.). Three of them actually performed the histological examinations and identified 798 melanomas in 72,694 histological reports. Histological examinations for the 4th dermatological department were carried out by the pathological institute in the same hospital, and 102 melanomas were diagnosed in 101,141 reports. Three departments of pathology were expected by the Pathological Society of Berlin to see the majority of melanomas diagnosed elsewhere, they covered more than 25% of all histological examinations by pathologists in Berlin (West); they were therefore included in this study after consultation of the Berlin Pathological Society. An additional 60 melanomas were detected by reviewing 299,513 reports. The heads of the other 10 pathological departments in Berlin (West) were asked to estimate the number of melanomas in the time period investigated, and they reported a probable number of 103 cases in about 760,000 histological reports. These estimated cases were not included in the following calculations.

The official records on causes of death kept by the Berlin statistics office contain the yearly numbers of deaths due to malignant melanoma subclassified for sex and age groups and were used in this study for the calculation of age-adjusted mortality rates. The death certification activities did not change during the time period under examination and the accuracy of the German statistics on causes of death is believed to be rather reliable (4).

Calculations of annual incidence and mortality rates

were based on the annual reports of the Berlin (West) population statistics. The calculation of rates for the entire period was related to the figures of 1984 with a German population of 1,609,757 and a Turkish population of 109,600 inhabitants. During the time period under investigation the German male population and the Turkish population remained nearly constant, while the German female population decreased from 942,391 to 887,376 from 1980 to 1986.

Parameters examined

The following were recorded as far as possible: date of the first diagnosis, data source, age, gender and nationality of the patients, localisation, histological subtype, tumour thickness and level of invasion of each tumour.

Statistics

The data were computerised and evaluated by the statistics program SPSS. The chi-square statistics were used to test differences when applicable. Incidence and mortality rates were calculated on the basis of the official annual population statistics for Berlin (West) and adjusted for the European standard population in agreement with the methods used by the IARC (1).

RESULTS

Incidence rates

936 German melanoma patients were documented (379 males and 557 females) and the mean crude incidence rates from 1980 to 1986 were 7.5 for men and 8.8 for women per 100,000 inhabitants and year. After age adjustment for the European standard population, both genders showed an average incidence rate of 7.1/100,000 and year. Incidence rates clearly increased during the time period examined. Age-adjusted incidence rates rose between 1980–81 and 1985–86 from 6.0 to 9.8 in men and from 5.8 to 7.8 in women (Fig. 1). Thus a 49% increase in incidence was observed for both genders combined within 5 years. Seven melanoma patients were Turkish and thus belonged to the largest foreign population in Berlin (West). Their crude incidence rate was 0.9 for both genders and 1.3/100,000 and year after age adjustment.

Sex and age distribution

Of the 960 patients documented 395 (41%) were males and 565 (59%) females. The age distribution curves were similar for both genders without significant differences ($p = 0.24$) and showed two peaks, the first in the 5th decade and the second in the 8th decade of life. This peculiar distribution is related to the special age structure of the Berlin population with a relatively high proportion of inhabitants 70 to

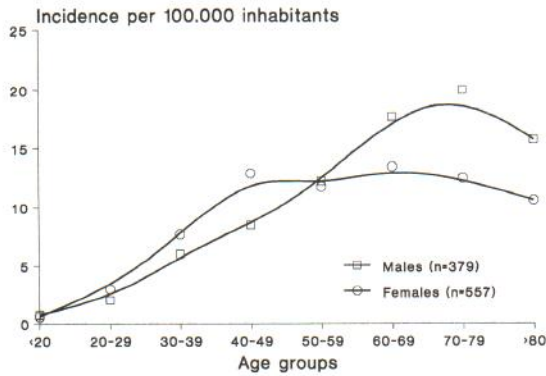


Fig. 2. Age specific incidence rates of melanoma for the time period 1980–1986 in Berlin (West).

79 years old (16% of all women and 8% of all men). The age-specific incidence increase was similar for both genders and continued in males until the 8th decade of life. In women, however, the age specific incidence rates were already highest in the 5th decade of life and showed no other obvious increase thereafter. Men over 60 clearly had a higher age-specific incidence than women (Fig. 2).

Site of the primary tumour

Detailed information on the primary tumour site was available for 865 patients (missing $n=95$). The two genders significantly differed with respect to the site distribution of melanomas ($p < 0.0001$). Men predominantly developed melanomas on the upper trunk (35.1% vs. 16.6% in women), whereas women

Table I: Localisation of the primary tumours (in percent)

Localisation	Males $n=354$	Females $n=511$	Combined $n=865$
Face	9.9	6.5	7.9
Scalp	6.5	4.3	5.1
Neck	1.6	0.8	1.2
Breast	18.1	8.6	12.5
Dorsum	17.0	8.0	11.7
Abdomen	3.5	3.0	3.2
Buttocks	1.1	1.2	1.1
Upper arm	18.4	12.9	15.1
Lower arm	2.8	6.7	5.1
Hand	1.1	2.7	2.1
Thigh	6.5	5.9	6.1
Lower leg	6.2	22.5	17.5
Foot	4.5	11.0	8.3
Mucous membr.	1.8	1.2	1.5
Eye	0.5	0.5	0.5
Occult	0.5	1.5	1.0

Table II: Histological classification (in percent)

Histological types	Males $n=343$	Females $n=499$	Combined $n=842$
Superficial spreading melanoma	38.2	36.9	37.4
Nodular melanoma	27.7	24.0	25.5
Lentigo maligna melanoma	19.5	23.3	21.7
Acral lentiginous melanoma	2.6	6.2	4.8
Other types	7.9	5.8	6.7
Unclassifiable	4.1	3.8	3.9

most frequently had primary tumours on the lower extremities (42.1% vs. 17.2 in men). A rather high proportion of men had their melanomas on the upper arm (18.4%). There were only few melanomas of the mucous membranes (1.5% for both genders) and eyes (0.5% for both genders). Lymph-node melanomas without any primary tumour on the skin or elsewhere were designated as occult (1.0% for both genders) (Table I).

Histological subtypes

Definite information on the histological classification of the tumours was available in 842 cases (missing $n=118$). The tumours most frequently found were superficial spreading melanomas (SSM) (37.4%), followed by nodular melanoma (NM) (25.5%), lentigo maligna melanoma (LMM) (21.7%) and acral lentiginous melanoma (ALM) (4.8%). There were only minor differences in the sex distribution of histological melanoma subtypes ($p > 0.05$; ns.): a somewhat higher proportion of NM in men and of LMM and ALM in women. 10.6% were otherwise classified – mainly as naevus-associated melanoma, mucous-membrane melan-

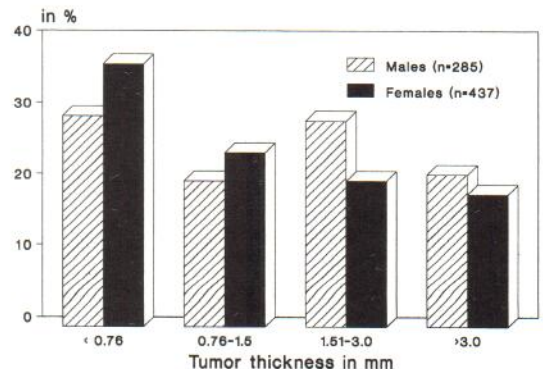


Fig. 3. Tumour thickness in mm (Breslow index) for percent of cases (striped bars: males, black bars: females).

Table III: Level of invasion (Clark) in percent

Level	Males	Females	Combined
I	6.4	6.8	6.7
II	15.8	24.5	20.9
III	33.4	29.1	30.9
IV	40.5	34.7	37.0
V	3.9	4.9	4.5

oma and eye melanoma – or found to be unclassifiable (Table II).

Tumour thickness and level of invasion

Measurements of tumour thickness (Breslow index) were available for 722 patients (missing: n=238). The mean tumour thickness was 2.1 mm for men and 2.0 mm for women (median 1.5 mm and 1.1 mm). Tumours < 0.76 mm thick were diagnosed in 30% of the males and 37% of the females, and there was a significant sex-specific difference in tumour-thickness distribution (p < 0.05), with thick primary tumours being found in a higher proportion of males (Fig. 3). The level of invasion (Clark level) was determined in 764 cases (missing: n=196). Only 6.7% were in-situ melanomas with level I. Clearly more level II melanomas were diagnosed in women (24.5%) than in men (15.8%). Correspondingly, a higher proportion of level >III melanomas was found in men (44.4%) than in women (39.6%), and the sex distribution of the 5 levels of invasion differed significantly (p < 0.05) (Table III).

Mortality rates and mortality/incidence ratios

The mean crude mortality rate from 1980 to 1986 was 3.2 for men (n=162) and 2.3 for women (n=145) per 100,000 inhabitants and year. The age-adjusted values were 3.0 for men and 1.4 for women. From 1980–81 to 1985–86, mortality decreased from 3.5 to 2.6 for males and increased from 1.2 to 1.6 for females per 100,000 inhabitants and year; a slight decrease from 2.4 to 2.1 was found for both genders (Fig. 4). The mortality/incidence ratio was found to be significantly higher for men at 0.42 than for women 0.20 for the time period from 1980 to 1986. During the years 1980–81 to 1985–86, the mortality/incidence ratio clearly decreased in men from 0.62 to 0.27 but remained constant in women at 0.21 initially and 0.20 ultimately (Table IV).

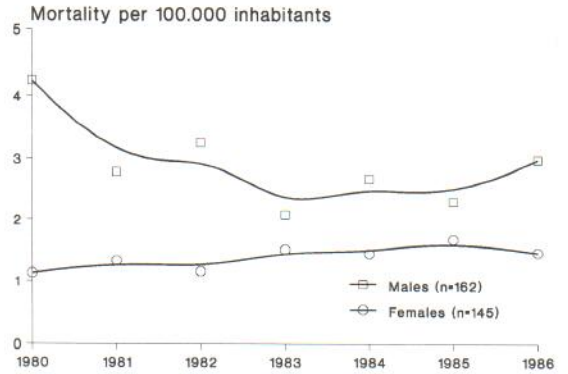


Fig. 4. Mortality rates of malignant melanoma in Berlin (West) from 1980 to 1986 (age-adjusted for the European standard population).

DISCUSSION

A thorough documentation of melanomas was performed in Berlin (West) from 1980 to 1986, and 960 melanomas have been registered in this study. For comparison, the Saarland cancer registry, which is the most important source of epidemiological cancer data in the FRG, only documented 510 cases within the 14-year-period from 1968 to 1981 (3). The completeness of incidence registration is frequently estimated from the mortality/incidence ratio. This ratio was found to be 0.90 in the Hamburg registry during the seventies, indicating that most cases were only recorded from the death certificates. The ratio was about 0.50 for the Saarland registry, which was judged to be an acceptable value with most cases collected from registration forms at first diagnosis (1). The average ratio in the present study was about

Table IV: Mortality/incidence ratios from 1980 to 1986 (calculated with the age-adjusted rates for the European standard population)

Year	Mortality/Incidence Ratios	
	Males	Females
1980	4.25/ 5.08 =0.83	1.13/5.25 =0.22
1981	2.78/ 6.91 =0.40	1.33/6.37 =0.21
1982	3.25/ 4.42 =0.73	1.16/6.72 =0.17
1983	2.08/ 5.06 =0.41	1.52/7.63 =0.20
1984	2.67/ 7.28 =0.37	1.45/7.16 =0.20
1985	2.30/10.31 =0.22	1.69/7.28 =0.23
1986	2.98/ 9.33 =0.32	1.47/8.34 =0.18
1980–86*	2.97/ 7.06 =0.42	1.42/7.05 =0.20

*age-adjusted for the Berlin population of 1984

0.30, which is indicative of an excellent incidence registration. Furthermore, this value exactly reflects the 70% percent survival rates calculated for melanoma patients in Berlin (West) (15). The review of histological reports guaranteed the complete registration of newly diagnosed cases in the institutes examined, and 473,348 reports were checked. Estimation of the number of cases diagnosed in those pathological departments not examined in this study yielded a possible 103 cases among 760,000 histological reports which have not been included in our calculations and may lead to an underestimation of the real incidence of not more than 10%.

Regarding the incidence rates, four findings are of major interest:

1. In Berlin (West), age-adjusted incidence rates were found to be clearly higher at 9.8 for men and 7.8 for women during 1985–86 than in the more rural Saarland area at 6.1 cases per 100,000 inhabitants and year for both genders (4).
2. The 49% increase of incidence in a time period of 5 years (1981–82 to 1985–86) clearly exceeded the figures specified in earlier reports from Germany (2,4,15), which estimated a doubling of incidence rates within 15 years. The increase in melanoma incidence was not influenced by any screening campaigns for melanoma during the time period under investigation.
3. For the first time, higher incidence rates were found for men than for women in Germany. In Europe, a female preponderance has been reported from countries with low melanoma incidence, like the British Isles (16,17). Conversely, a predominance of the male incidence was frequently found in white populations with high incidence rates as reported from the USA (1) and Australia (18,19). Our finding of a predominant incidence in males may indicate that the urban regions of Germany will become high incidence areas in the future.
4. There was a striking difference between the incidence of the large Turkish population of about 110,000 inhabitants and the German population in Berlin (West). The mean incidence of 1.3 cases per 100,000 inhabitants and year in the Turkish population was more than five times lower than in the German population with 7.1 cases. The possibility was considered, that Turkish inhabitants might seek treatment outside the dermatol-

ogy departments or the pathology departments included in this study. Most Turkish patients, however, came to the first diagnosis with advanced tumors and lateron developed tumor progression, which as a rule is treated in the dermatological departments in Berlin; and no patient was detected who was primarily not recorded but lateron treated in one of the dermatological departments. Therefore, we believe that there was no greater underestimation of the incidence in the Turkish population than in the German population. The melanoma incidence among populations differing in ethnic origin but living in the same region was found to vary widely in several US registries, e.g. in Los Angeles and Hawaii (1), but, as far as we know, such differences have never been reported from Europe.

The sex distribution of melanoma cases in Berlin exactly resembled that in the entire FRG (20). The age-distribution curve of melanoma patients for Berlin (West), however, showed some peculiarities compared to that for the entire FRG. While the latter curve typically peaked only once for patients 40–60 years old (21), the Berlin study showed two peaks for both genders: at the 5th and 8th decade of life. The second peak depends on the unusually high percentage of inhabitants 70 to 79 years old in Berlin (West) and thus, probably, reflects a birth cohort phenomenon. Interestingly, an analysis of age-specific incidence rates revealed a preponderance of females in younger age groups (< 50 years) and of males in older ones (> 60 years).

The site distribution of melanomas was similar to that found in the entire FRG and in other melanoma registries of longstanding in Europe and the USA (5,21,22), the predominant site being the trunk in males and the lower extremities in females. The Berlin collective, however, showed a higher proportion of tumours on the head and neck and on the upper extremities, possibly due to the higher percentage of LMM. The histological findings are remarkable with respect to the high proportion of LMM, i.e. 22% of all melanomas in this study. Only about 10% of LMM were reported from a multicenter study in the entire FRG (20).

The histopathologic findings have not been reevaluated in this study and, therefore, the possibility of misclassification and different diagnostic criteria between the various dermatohistologists and pathologists should be considered. The very broad majority

of cases, however, was examined by 3 dermatohistologists and one pathologist, who were familiar with this tumor. We believe therefore, that the reliability of histological reports in this study may be at least as good as in cancer registries, which get reports from many different institutions.

The average mortality rate was 3.0 cases per 100,000 inhabitants and year for men and was only half of that for women at 1.4 cases. Similar differences with a survival advantage for women have been reported from other countries with white populations (23). The mortality rate for male patients decreased between 1980–81 and 1985–86 by about 25%, whereas a 25% increase was observed for females. These data may be better understood if the mortality rates are related to the incidence rates of the same year. The mortality/incidence ratio in women remained constant, thus indicating that the rise of female mortality may be a due to increasing incidence. A decrease of this ratio in males from 0.59 to 0.27 within 5 years indicates a tremendous decrease in the male mortality rate. Despite its dramatic drop, however, male mortality still remained 35% higher than female mortality at the end of the time period examined.

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