Epidemiology of Malignant Cervical, Corpus Uteri and Ovarian Tumours – Current Data and Epidemiological Trends

Epidemiologie der bösartigen Tumoren der inneren weiblichen Genitalorgane – aktuelle Zahlen und epidemiologische Trends

Authors A. Waldmann[1], N. Eisemann[2], A. Katalinic[1,2]

Affiliations
[1] Institut für Sozialmedizin und Epidemiologie, Lübeck
[2] Institut für Krebsepidemiologie e. V., Lübeck

Key words
- ovarian cancer
- cervical cancer
- endometrial cancer
- epidemiology

Schlüsselwörter
- Ovarmalignom
- Zervixkarzinom
- Endometriumkarzinom
- Epidemiologie

Abstract

Cervical, uterine and ovarian cancers are the most common malignancies of the female genital tract. Using current data from population-based cancer registries in Germany, we present the recent figures for the incidence, prevalence, associated mortality and survival for these cancers. In 2009, a total of 23 800 women were newly diagnosed with one of the three gynaecological cancers (cervical cancer: 20.3%, endometrial cancer: 48.5%, ovarian cancer: 31.2%). This figure equals approximately one third of the number of women newly diagnosed with breast cancer in the same year. The relative 5-year survival for carcinomas of the corpus uteri is 79% and is higher that those for cervical cancer (68%) and ovarian cancer (40%). Ovarian cancer in particular is often diagnosed at a later stage and has a high risk of recurrence. Due to the favourable prognosis for endometrial tumours and the unfavourable prognosis for ovarian malignancies, the incidence of various gynaecological tumours is ranked differently compared to the 5-year prevalence of these same tumours. Currently, the 5-year prevalence in Germany for patients with cervical, endometrial or ovarian cancer is estimated to be around 80 000 women. Slightly more than half of these women were diagnosed with cancer of the corpus uteri. Around 25% of women have ovarian and 21% have cervical cancer.

Zusammenfassung

Die Karzinome des Uterus und der Ovarien machen den größten Anteil der bösartigen Tumoren der inneren weiblichen Genitalorgane aus. Anhand aktueller Daten aus den epidemiologischen Krebsregistern werden Kennzahlen zur Inzidenz, Prävalenz, Mortalität und zum Überleben dieser Krebserkrankungen präsentiert. Insgesamt erkrankten im Jahr 2009 rund 23 800 Frauen neu an den 3 Krebsarten (Cervix uteri: 20,3%, Corpus uteri: 48,5%, Ovar: 31,2%). Dies entspricht etwa einem Drittel der Brustkrebsneuerkrankungsfälle im selben Jahr. Das relative 5-Jahres-Überleben bei Krebs des Corpus uteri liegt mit 79% höher als bei Krebs des Cervix uteri (68%) und bei Krebs der Ovarien (40%). Insbesondere letztgenannte werden häufig in einem späten Stadium diagnostiziert und sind mit einem hohen Rezidivrisiko verbunden. Bedingt durch die gute Prognose der Malignome des Gebärmutterkörpers und die schlechte Prognose von Ovarialmalignomen ist bei der 5-Jahres-Prävalenz das Verhältnis der Tumoren im Vergleich zur Inzidenz leicht verschoben. Aktuell wird die 5-Jahres-Prävalenz für Patientinnen mit vorbestehendem Malignom der Zervix, des Korpus bzw. der Ovarien in Deutschland auf 80 000 Frauen geschätzt. Ewas mehr als die Hälfte dieser Frauen wurden mit einem Malignom des Corpus uteri diagnostiziert. Rund 25% der Frauen haben ein vorbestehendes Ovarialmalignom und 21% ein vorbestehendes Malignom der Cervix uteri.

received 28.11.2012
revised 21.1.2013
accepted 24.1.2013

Bibliography
DOI http://dx.doi.org/10.1055/s-0032-1328266
Geburtsh Frauenheilk 2013; 73: 123–129 © Georg Thieme Verlag KG Stuttgart · New York · ISSN 0016-5751

Correspondence
Dr. Annika Waldmann
Institute of Social Medicine and Epidemiology
Ratzeburger Allee 160 (Haus 50)
23562 Lübeck
annika.waldmann@uksh.de

Introduction

In addition to breast cancer, gynaecological malignancies also include cervical, endometrial and ovarian cancers. Cancer of the corpus uteri is the most common malignancy of the female genital tract, followed by ovarian and cervical cancer.

In Germany, these malignancies account respectively for 5.1% (fourth most common malignancy in women), 3.5% (sixth most common) and 2.2% (twelfth most common) of all newly diagnosed cancers in women. As most cervical and endometrial cancers, particularly oestrogen-dependent endometrial tumours, are diagnosed at an early

stage, these cancers have a favourable prognosis. Ovarian cancer however is usually diagnosed at a later stage and, in addition, has a high risk of recurrence. Ovarian cancer therefore has an unfavourable prognosis [1,21,23].

Infection with human papillomavirus (HPV) is now considered a prerequisite for the development of cervical cancer [2]. HPV DNA has been detected in around 90% of cervical cancers. HPV has numerous phenotypes and they exhibit different pathogenicities in humans. HPV can be differentiated into high-risk types (16, 18, 31, 45) and low-risk types. The majority of cervical cancers are caused by high-risk HPV types [3]. HPV type 16 was detected in around 50–60% of patients with cervical cancer and HPV type 18 was found in around 10–20% of women with cervical cancer. As HPV vaccines against these particular types have been available since 2006, vaccination can reduce the risk of contracting HPV. Since the spring of 2007, the German Standing Committee on Vaccinations (STIKO) has recommended vaccinating girls between the ages of 12 and 17 years against HPV [4]. If HPV infection is present, then the presence of the following co-factors will increase the risk of developing cervical cancer: taking oral contraceptives for five years or more, smoking, carrying a large number of pregnancies to term (5 or more live births) as well as previous exposure to other sexually transmitted diseases such as chlamydia or herpes simplex virus type 2. Moreover women with an existing HPV infection have a higher risk for HPV infection and the development of cervical cancer [5,6].

Cancer of the corpus uteri is commonly divided into 2 types: oestrogen-dependent (type I) and non oestrogen-dependent (type II). Oestrogen intake increases the risk for oestrogen-dependent endometrial cancer, but this type of cancer is commonly diagnosed at an early stage and has a more favourable prognosis than type II [7]. Women with early onset of menarche, late onset of menopause and no children are at a higher risk. Tamoxifen intake or long-term oestrogen intake without concurrent administration of gestagen can also increase the risk of developing disease. Obesity leads to increased endogenous oestrogen production and represents, in addition to diabetes mellitus and hypertension, a further risk factor [8]. Women with breast cancer are at increased risk of developing cancer of the uterine corpus [9]. Physical activity, taking oral contraceptives, several pregnancies and a soy-rich diet reduce the risk. A lower risk has also been noted in women who smoke [10].

Around 10% of ovarian cancers are caused by genetic mutations (BRCA1, BRCA2 mutation, MLH1, MSH2, TP53) [4]. As ovulation inhibitors have a protective effect, hormonal prevention can play an important role in women with mutations. The risk of developing cancer can be reduced by up to 50% if women at risk take oral contraceptives for many years (i.e., at least 10 years). However, the impact of hormone therapy on the risk of developing ovarian cancer is still controversially discussed. Current data appear to indicate an increased risk for women receiving hormone therapy. Women with breast cancer or polycystic ovarian syndrome also have a higher risk of additionally developing ovarian cancer [4, 11].

It is safe to assume that the observed trends over time for the incidence of obesity, hypertension and diabetes mellitus and hormone intake – whether used to inhibit ovulation or for hormone therapy – combined with changed sexual and smoking behaviour in women will have an impact on the epidemiology of cancers of the female genital tract. Important epidemiologic and clinical data on cervical cancer, cancer of the corpus uteri and ovarian cancer are therefore presented below.

Incidence and Mortality in Germany

In 2008 almost 24000 women in Germany were diagnosed with cervical cancer, cancer of the corpus uteri or ovarian cancer. This corresponds to a raw annual incidence rate of approx. 57.1 per 100000 women. If morbidity rates are based on the European standard population, then 38.9 of 100000 women were diagnosed with cancer of the female genital tract. Cancer of the corpus uteri was the most common of the 3 tumour types with just under 48%, while cervical cancer had an incidence of 20% and ovarian malignancies accounted for the remaining 31% [12]. The average patient age at the time of cervical cancer diagnosis was 52 years, making these patients 17 years younger on average than patients with ovarian cancer or cancer of the corpus uteri (**Table 1**).

In the same year, 9545 patients died from one of these three tumour types (raw rate: 22.8 pro 100000 women). The age-standardised mortality rate was 13.2 per 100000 (European standard population) [12,13]. 17% of these deaths (based on absolute numbers) were due to cervical cancer, 25% were due to cancer of the corpus uteri, and 58% of deaths were attributable to ovarian cancer. Ovarian cancer has the most unfavourable ratio of deaths compared to newly diagnosed cases with 1.4 new diagnoses for every one death. For cervical cancer, the ratio is 3.1 new diagnoses to 1 death, and 4.7 new cases are diagnosed with cancer of the corpus uteri for every death [24].

Incidence and Mortality Trends

Since the 1970s, the incidence and mortality of cervical cancer has dropped significantly in many countries (most of them developed countries) all over the world. In the Scandinavian countries, for example, the incidence dropped from around 17 per 100000 (1970; ASR [world]) to 8 per 100000 women (2000). In the same period, mortality dropped from around 6 per 100000 to about 2 per 100000 women [14]. Since the year 2000, in many countries the incidence and mortality rates for cervical cancer stabilised at around one quarter to one third of the rates recorded for the 1970s [14,15].

The (recent) incidence and mortality trends in Germany are shown in **Fig. 1**. In the period from 2003 to 2009, the age-standardised incidence rate (European standard population) for both cervical cancer and cancer of the corpus uteri hovered around a constant figure of 9.6 new diagnoses per 100000 women and 17.9 new diagnoses per 100000 women, respectively. Mortality rates for the period from 1998 to 2009 dropped continually. In 2009 the age-standardised mortality rate for cervical cancer was 2.6 per 100000; for cancer of the corpus uteri it was 2.9 per 100000. For both cancer entities this represents a drop of 30% from the mortality rates recorded 11 years earlier. The decreased mortality among patients with cervical cancer is primarily associated with systematic and opportunistic screening programmes such as routine Papanicolau tests (Pap test) [16] which can be used to detect cytological changes. Moreover, with the help of HPV vaccinations and the removal of precancerous lesions discovered at screening, certain invasive tumours can be almost entirely prevented [4]. After Germany introduced annual screening using conventional cytological smear in 1971, the incidence of this tumour decreased by about two thirds [17].

The picture for ovarian malignancies is very different. A significant decrease of 20% in the cancer's incidence, from 14.3 to 11.5

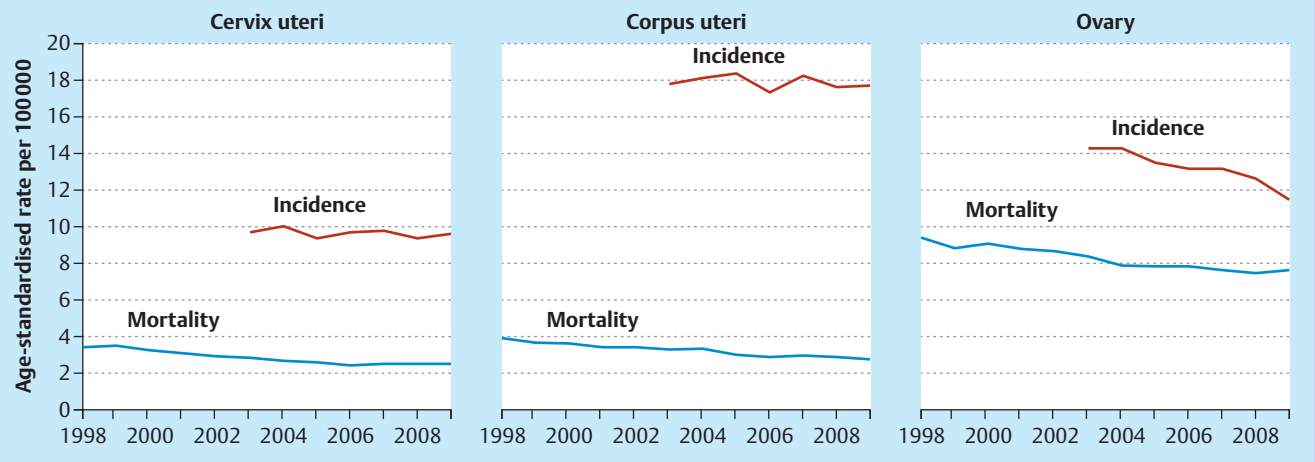

Fig. 1 Age-standardised incidence and mortality rates in Germany over time (European standard; sources: the Association of Population-based Cancer Registries in Germany and the Federal Statistical Office of Germany [12, 13]).

Table 1 Overview of the most important epidemiological figures for Germany 2008/2009, Data obtained from the German Centre for Cancer Registry Data (ZfKD), the Association of Population-based Cancer Registries in Germany e. V. (GEKID) and the Federal Statistical Office of Germany.

	Cervix uteri		Corpus uteri		Ovary	
Incidence	**ZfKD 2008**	**GEKID 2009**	**ZfKD 2008**	**GEKID 2009**	**ZfKD 2008**	**GEKID 2009**
Mean age at diagnosis						
▸ invasive	52		69		69	
▸ in situ		35*		not specified		not specified
Incidence						
▸ invasive						
▸ number of cases	4880	4845	11280	11561	7790	7428
▸ raw rate, per100000	11.6	11.6	26.9	27.6	18.6	17.7
▸ ASR [E], per 100000	9.5	9.6	17.2	17.8	12.2	11.5
▸ in situ						
▸ number of cases	14400–19200		not specified		not specified	
5-year survival						
▸ absolute	65%		70%		37%	
▸ relative	68%		79%		40%	
5-year prevalence	17000		42700		20300	
▸ raw rate, per 100000	40.6		102.0		48.5	
Mortality	**Federal Statistical Office of Germany 2009**		**Federal Statistical Office of Germany 2009**		**Federal Statistical Office of Germany 2009**	
Mean age at death	66		76		73	
Mortality						
▸ number of cases	1596		2420		5529	
▸ raw rate, per 100000	3.8		5.8		13.2	
▸ ASR [E], per 100000	2.6		3.0		7.6	

ASR [E] = Age-standardised rate, European standard

Data sources unless otherwise stated: ZfKD [1], GEKID [12], German Federal Statistical Office [13]

* Source: the Population-based Cancer Registry of Schleswig-Holstein, data from October 2012

per 100000 women, was noted between 2003 and 2009. This resulted in a slight decrease of mortality but less so than the mortality decrease recorded for cervical cancer and cancer of the corpus uteri. The age-standardised mortality rate in 2009 was 7.7 per 100000 women and thus 18% lower than in 1998.

Tumour Stages

Patients with malignant cervical tumours or cancer of the corpus uteri are predominantly diagnosed at a very early stage of disease: every second woman with cervical cancer and three of five women with cancer of the corpus uteri are in stage T1 at the time of diagnosis (47 and 60%, respectively), meaning that the tumour is limited to the cervix or the corpus uteri. A further 15 and 8% of cervical cancers and cancers of the corpus uteri are stage T2 at diagnosis, the stage in which the tumour has already spread to im-

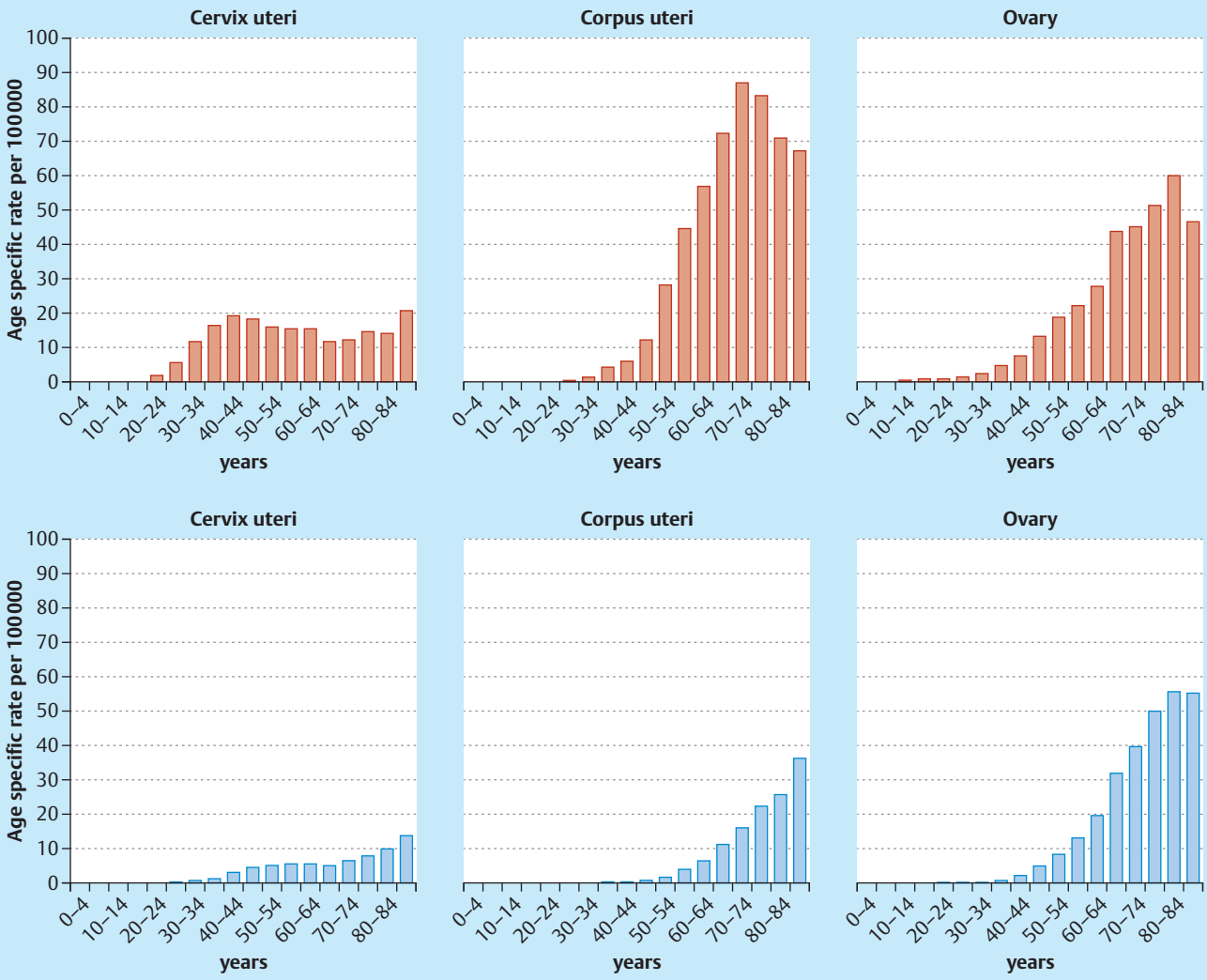

Fig. 2 Age-specific incidence (red) and mortality (blue) per 100 000 women in Germany in 2008 (sources: the Association of Population-based Cancer Registries in Germany and the Federal Statistical Office of Germany [12, 13]).

mediately adjacent regions. Advanced stages, i.e., stage T3 or T4, are only found in 9 and 8% of women, respectively. Only around 7% of death certificates give these cancers as the sole cause of death. However, it should be noted that the tumour stage of every fifth patient with cervical cancer or cancer of the corpus uteri (22% respectively) is unknown, so that the true percentage of early or late stage tumours could be much higher. Similarly, no information is available about the tumour stage of every fifth patient with ovarian cancer (21%). The percentage of these tumours diagnosed at an early stage is much lower compared to patients with uterine cancer (cervix uteri, corpus uteri); only one in four women are diagnosed as stage T1 or T2 (18 and 7%, respectively). Instead, the majority of ovarian cancers diagnosed are stage T3 (37%). Due to this unfavourable distribution at diagnosis and the associated poorer prognosis, the percentage of patients with ovarian cancer given as the cause of death on their death certificate is 17%, significantly higher than for other malignant gynaecological tumours.

Age Groups

In principle, older women have a higher risk of developing cancer of the female genital tact compared to younger women (**Fig. 2**). For cervical tumours the age distribution is bimodal, with most cases occurring in the 5-year age groups "women between 40 and 44 years", "women between 45 and 49 years" and "women aged over 85 years" (> 18 per 100 000). Cancer of the corpus uteri occurs most commonly in women after menopause [7]. The number of new diagnoses also increases for every increase in age group, with most new diagnoses found in the group of women aged between 70 and 74 years and between 75 and 79 years (> 80 per 100 000). The incidence of ovarian cancer increases continually with age. It is most common in the group aged between 80 and 84 years (60 per 100 000).

Histology and Degree of Differentiation

Cervical cancer, cancer of the corpus uteri and ovarian cancer differ with regard to their histology.

Two out of three malignant cervical tumours are classified as basal cell carcinomas (68.7%) and every sixth to seventh tumour is classified as an adenocarcinoma (15.4%). Sarcomas are rare (0.3%). The histology of the remaining tumours is not specified (data obtained from the Population-based Cancer Registry of Schleswig-Holstein, October 2012). Adenocarcinomas are the most common corpus uteri tumours, with two of three tumours classified as adenocarcinoma (62.3%). Sarcomas are rare (2.5%). The range of histologies is broader for ovarian malignancies: every third tumour is a serous carcinoma (32.1%) and every fifth cancer an adenocarcinoma (22.6%). Other less common histologies include endometrioid carcinoma (8.2%), mucinous carcinoma (5.8%), sex cord-stromal tumour (1.4%), clear cell carcinoma (1.0%) and germ cell tumour (0.7%).

Tumour differentiation indicates how clearly the tumour tissue can be differentiated from adjacent normal tissue. Well differentiated tumours are associated with a better prognosis than poorly differentiated tumours.

Three of four patients with cervical cancer have moderately or poorly differentiated tissue (40.1 and 32.1%, respectively). Only a few patients present with well differentiated tumours (5.6%). Undifferentiated tumours are even rarer (0.7%). Tumour differentiation was not recorded for every fifth tumour (21.5%). The picture is similar for ovarian cancer: around two thirds of patients have moderately or poorly differentiated tumours (26.2 and 37.3%, respectively) compared to patients with well differentiated or undifferentiated tumours (6.1 and 1.1%, respectively). Differentiation tends to be slightly better in tumours of the corpus uteri. Every fourth tumour of the corpus uteri is well differentiated (28.5%). Around two of five tumours are moderately differentiated (38.6%) and only every fifth tumour is poorly differentiated (19.9%). Undifferentiated tumours are rare (0.3%). No differentiation was recorded in 12.8% of tumours, a lower figure than that for the two other cancers of the female genital tract.

Survival

Currently, the overall 5-year survival rate for women with cancer is 57%. Compared to this, the survival rates for women with cervical cancer (65%) or cancer of the corpus uteri (70%) are better while the 5-year survival rate for women with ovarian cancer is significantly lower (37%). However, this absolute 5-year survival rate does not take account of the fact that some of the patients with cancer of the female genital tract also die from other causes. The relative 5-year survival rate which only factors in the percentage of deaths which occur in addition to normal mortality rates is 64% for cancer in general. Compared with this, the rates for women with cervical cancer (86%) and for patients with cancer of the corpus uteri (79%) are much better, while the rates for patients with ovarian cancer (40%) are significantly worse [1].

When the current relative survival rate is compared to the figure for the years 2002/2003, the relative survival rates for cancer of the corpus uteri (82%) and for ovarian cancer (48%) have remained at comparatively stable levels [18]. As the figure for 2002/2003 is based only on data obtained from the Saarland Cancer Registry, the limited variation is probably not due to any systematic long-term trend. However a significant improvement in the relative 5-year survival for cervical cancer from 55 to 86% has been observed. Other calculations have shown a significant increase in relative survival from 62% in 2002 to 67% in 2006 [19]. Suggested reasons for this include improvements in early detection and optimised therapy, among other things through the introduction of gynaecological cancer centres [25].

International Comparison

Below are some international comparisons with regard to the incidence, mortality and prevalence, although the information available for cervical cancer is more detailed than for the two other gynaecological cancer entities.

Cancer of the cervix uteri is the third most common tumour in women world-wide with an estimated number of newly diagnosed cases of 530 000. More than 85% of all cases with cervical cancer occur in developing countries [15], where it is the most common cancer in many areas. The regions where women have the highest risk of developing disease include Eastern and Western Africa (ASR [world] > 30 per 100 000 women), Southern Africa (26.8 pro 100 000), South-Central Asia (24.6 per 100 000), South America and Middle Africa (23.9 and 23.0, respectively, per 100 000). Rates are lowest in Western Asia, North America and Australia/New Zealand (< 6 per 100 000). In Europe, the incidence of cervical cancer varies widely, ranging from 2.1 per 100 000 (Malta) to 23.9 per 100 000 (Romania). Germany is in the lower third of European countries (**Fig. 3**).

With around 290 000 cases, cancer of the corpus uteri is the sixth most common cancer in women [15]. In Germany, cancer of the corpus uteri is the fourth most common cancer in women [1]. The age-standardised incidence rate (world standard) in Europe ranges from 7 (Czech Republic) to 18 (Romania) per 100 000 women. Germany, which has a rate of 12 per 100 000 women, ranks somewhere in the middle [15].

The number of women with incidental ovarian cancer is estimated to be around 225 000 world-wide, making ovarian cancer the seventh most common cancer in women [15]. In Germany, ovarian cancer is the sixth most common cancer in women [1].

In 2008, around 275 000 women died from tumours of the cervix uteri, with 88% of deaths occurring in developing countries (53 000 in Africa, 31 700 in Latin America/the Caribbean and 159 800 in Asia) [15]. There are also clear differences with respect to mortality – both world-wide and Europe-wide. World-wide mortality ranges from 3 (Western Europe) to 25.3 (Eastern Africa) per 100 000 women; mortality in Europe ranges from 0.8 (Iceland) to 11.8 (Romania) per 100 000 (ASR [world]; **Fig. 3**).

In 2008, around 75 000 women died from cancer of the corpus uteri [15]. The age-standardised mortality rate (world standard) in Europe ranges from around 0.5 (Luxembourg) to 4.5 (Malta) per 100 000 women. Germany is one of the European countries with the lowest mortality rate [15].

The number of deaths due to ovarian malignancies was reported to be 140 000 which is significantly higher than that reported for cancer of the corpus uteri [15] but nevertheless lower than that for cervical cancer.

The raw 5-year prevalence rate for cervical cancer in Europe is between 16.2 (Malta) and 128.2 (Macedonia) per 100 000 women. Eastern Europe has the highest rates. Germany has a raw rate of 40.4 per 100 000, i.e. around 14 745 women were diagnosed with cervical cancer in the last 5 years, which puts Germany in the lower third of European countries [20].

The 5-year prevalence of tumours of the corpus uteri in Europe ranges from 48.7 (Romania) to 147.8 per 100 000 women (Czech Republic, raw rate). The highest rates are recorded in Scandinavia. Germany has a raw rate of 110.3 per 100 000 women, that is,

Fig. 3 Comparison of age-standardised incidence and mortality for cervical cancer (world standard) world-wide and across Europe (source: Globocan 2008 [15]).

around 40 220 women in Germany were diagnosed with cancer of the corpus uteri in the last 5 years. Germany ranks therefore near the middle of all European countries [20].

The 5-year prevalence for ovarian cancer in Europe ranges from 27.8 (Portugal) to 67.9 per 100 000 women (Luxembourg, raw rate). Once again, the highest rates are found in Scandinavia. Germany has a raw rate of 54.2 per 100 000, i.e. 19 779 women were diagnosed with ovarian cancer in the last 5 years, putting Germany in the top third of European countries [20].

Conclusion

The number of women newly diagnosed with ovarian cancer has decreased significantly in the last decade, while the number diagnosed with cancer of the corpus uteri or with cervical cancer has remained fairly stable with few variations. Currently (in 2009), around 24 000 women in Germany are diagnosed every year with an invasive form of one of the tumour entities described above. Overall, cancer of the female genital tract amounts to around 11 % of all new cancer diagnoses in women in Germany. The prognosis for cervical cancer and for cancer of the corpus uteri is good as increasing numbers of tumours are diagnosed at an early stage, while ovarian cancer has a poor prognosis. Around 80 000 women living in Germany today were diagnosed with a cancer of the female genital tract in the last five years [22].

Since 2007 STIKO has recommended vaccinating young girls and women against HPV before they become sexually active to reduce the incidence of cervical cancers and pre-cancerous lesions. Current data indicate that in Germany around one third of girls aged between 12 and 17 years have received the full vaccine of three doses. It remains to be seen whether this percentage could be in-

creased in the long term and whether this will result in reduced mortality later on. Further studies of these developments will be warranted.

Conflict of Interest

None.

References

1 *RKI, GEKID.* Krebs in Deutschland 2007–2008. Häufigkeiten und Trends. 8. überarbeitete Aufl. Saarbrücken: Robert Koch-Institut und die Gesellschaft der epidemiologischen Krebsregister in Deutschland, Hrsg; 2012
2 *Walboomers JM, Jacobs MV, Manos MM et al.* Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. J Pathol 1999; 189: 12–19
3 *Jentschke M, Soergel P, Hillemanns P.* Die Bedeutung der HPV-Genotypisierung für Screening, Therapie und Management der zervikalen Neoplasien. Geburtsh Frauenheilk 2012; 72: 507–512
4 *Ständige Impfkommission am Robert Koch-Institut.* Impfung gegen HPV – Aktuelle Bewertung der STIKO. Epidemiologisches Bulletin 2009; 32: 319–328
5 *Bosch FX, de Sanjose S.* The epidemiology of human papillomavirus infection and cervical cancer. Disease markers 2007; 23: 213–227
6 *Trottier H, Franco EL.* Human papillomavirus and cervical cancer: burden of illness and basis for prevention. Am J Manag Care 2006; 12: S462–S472
7 *Amant F, Moerman P, Neven P et al.* Endometrial cancer. Lancet 2005; 366: 491–505, DOI: 10.1016/s0140-6736(05)67063–8
8 *Hardefeldt PJ, Edirimanne S, Eslick GD.* Diabetes increases the risk of breast cancer: a meta-analysis. Endocr Relat Cancer 2012; 19: 793–803
9 *Mathew A, George PS.* Trends in incidence and mortality rates of squamous cell carcinoma and adenocarcinoma of cervix–worldwide. Asian Pac J Cancer Prev 2009; 10: 645–650
10 *Deutsche Krebsgesellschaft e.V., Deutsche Gesellschaft für Gynäkologie und Geburtshilfe.* Diagnostik und Therapie des Endometriumkarzinoms. Interdisziplinäre Leitline. AWMF-Leitlinien Register 032/034. S2 k. Gültigkeit abgelaufen. Wird z. Zt. geprüft. 2006; last access: 28.11.2012
11 *Deutsche Krebsgesellschaft e.V., Deutsche Gesellschaft für Gynäkologie und Geburtshilfe.* Diagnostik und Therapie maligner Ovarialtumoren. Interdisziplinäre Leitline. AWMF-Leitlinien Register 032/035. S2 k. Gültigkeitsdauer bis 05.2012. Derzeit im Aktualisierungsprozess. 2007; last access: 28.11.2012
12 *Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V. (GEKID).* Atlas der Krebsinzidenz und -mortalität. Elektronische Ressource. 2012. http://www.gekid.de; last access: 28.11.2012
13 *Statistisches Bundesamt, Bonn.* Gesundheitsberichterstattung des Bundes. Elektronische Ressource. 2012. http://www.gbe-bund.de; last access: 28.11.2012
14 *Engholm G, Ferlay J, Christensen N et al.; Association of the Nordic Cancer Registries; Danish Cancer Society.* NORDCAN: cancer incidence, mortality, prevalence and survival in the nordic countries, Version 5.1 (March 2012). http://www.ancr.nu; last access: 28.11.2012
15 *IARC.* Globocan 2008 database. Elektronische Ressource. Lyon; 2008. http://www.dep.iarc.fr/globocan/database.htm; last access: 28.11.2012
16 *Boyl P, Levin B.* World Cancer Report 2008. Lyon: WHO/AIRC; 2009
17 *Ikenberg H.* Kontroversen um die Prävention des Zervixkarzinoms. Gebärmutterhalskrebs: Hat die Zytologie noch eine Chance? Geburtsh Frauenheilk 2012; 72: 691–693
18 *Karim-Kos HE, de Vries E, Soerjomataram I et al.* Recent trends of cancer in Europe: a combined approach of incidence, survival and mortality for 17 cancer sites since the 1990s. Eur J Cancer 2008; 44: 1345–1389
19 *Chen T, Jansen L, Gondos A et al.* Survival of cervical cancer patients in Germany in the early 21st century: a period analysis by age, histology, and stage. Acta Oncol 2012; 51: 915–921
20 *Steliarova-Foucher E, O'Callaghan M, Ferlay J et al.* ECO website: European Cancer Observatory: Cancer Incidence, Mortality, Prevalence and Survival in Europe. Version 1.0 (September 2012). European Network of Cancer Registries, International Agency for Research on Cancer. Elektronische Ressource. http://eco.iarc.fr; last access: 28.11.2012
21 *Brunner C, Müller-Holzner E, Gitsch G et al.* Eine Multicenter Studie über die prognostische Bedeutung des extranodalen Tumorwachstums beim Zervixkarzinom. Geburtsh Frauenheilk 2012; 72 - A39
22 *Mohnike W.* Aktueller Stellenwert der PET-CT-Diagnostik bei Genitalmalignomen. Geburtsh Frauenheilk 2011; 71 - B18
23 *Seck K, Pfab S, Schmalzried H et al.* Welche Faktoren bestimmen die Prognose des Ovarialkarzinoms? Eine Analyse anhand eigener Daten von Primärfällen aus den Jahren 1997–2002. Geburtsh Frauenheilk 2012; 72 - P58
24 *Seebacher V, Grimm C, Polterauer S et al.* Die Bedeutung der Dauer einer adjuvanten Chemotherapie für die Prognose von Patientinnen mit Ovarialkarzinom. Geburtsh Frauenheilk 2012; 72 - A36
25 *Wimberger P, Kuhlmann JD, Schwarzenbach H et al.* Verlust der Heterozygotie proximal zum M6P/IGF2R Lokus in zirkulierender DNA von Ovarialkarzinom-Patientinnen ist prädiktiv für ein verkürztes progressionsfreies Überleben und Gesamtüberleben. Geburtsh Frauenheilk 2011; 71 - O_8

Deutschsprachige Zusatzinformationen online abrufbar unter: www.thieme-connect.de/ejournals/toc/gebfra.