BALTIC COASTAL ZONE

Vol. 23 pp. 21-32 2019

ISSN 1643-0115

Original research paper

Received: 09/10/2019
Accepted: 26/01/2020

THYROID CANCER RISK ASSESSMENT AMONG THE POPULATION OF POMERANIAN AND WEST POMERANIAN VOIVODESHIP (POLAND)

Olha Kasiyan[1], Halyna Tkachenko[2], Natalia Kurhaluk[2], Svitlana Yurchenko[1], Iwona Jażewicz[3], Olena Dunayevska[4]

[1] Department of Hygiene and Ecology,
Danylo Halytsky Lviv National Medical University,
Pekarska Str. 69, Lviv 79010, Ukraine
[2] Department of Biology, Institute of Biology and Earth Sciences,
Pomeranian University in Słupsk,
ul. Arciszewskiego 22b, 76-200 Słupsk, Poland
e-mail: halyna.tkachenko@apsl.edu.pl
[3] Institute of Social and Economic Geography and Tourism,
Pomeranian University in Słupsk,
ul. Partyzantów 27, 76-200 Słupsk, Poland
e-mail: iwona.jazewicz@apsl.edu.pl
[4] Lviv City Department of the State Institution
"Lviv Regional Laboratory Center of the Ministry of Health of Ukraine",
Krup'yars'ka 27, Lviv 79014, Ukraine

Abstract

The objective of our study was to compare recent secular trends in the morbidity and mortality rates of thyroid cancer among the children and adult populations of West Pomeranian and Pomeranian Voivodeships in 2000 and 2016. The number of thyroid cancer cases and incidence rates were retrieved from the Regional Cancer Registries for the period 2000-2016. The number of deaths and mortality rates was obtained from the cancer mortality database (2000 and 2016 by regions). The increase in the incidence rates among the female population in the Pomeranian Voivodeship was observed (from 11.31 in 2000 to 32.04 per 100,000 persons in 2016). Among the child population, the incidence has increased slightly among girls. The adult mortality rate remained unchanged during the study period and was not recorded among other populations. The highest incidence in West Pomeranian Voivodeship is observed among women in 2016 and stands at 22.46 per 100,000 population. Mortality increased slightly during the study period among the female population. The relative risk of thyroid cancer mortality was increased among the adult population of West Pomeranian Voivodeship. Therefore, both thyroid cancer morbidity and mortality are occurring mainly at the expense of the female population. These trends, combined with

overall high mortality and high 15-year increase of morbidity, raise concerns on the extent to which the situation may be taking place.

Key words: thyroid cancer, morbidity, mortality, relative risk, adults, children

INTRODUCTION

Thyroid cancers are one of the few cancers that are more common in women than men. In Poland, the number of cases of thyroid cancer in 2010 was 2,192, of which about 384 in men and 1,808 in women. The thyroid neoplasms constitute 0.5% of cases in men and 2.6% in women. Over the past two decades, the number of cases has increased significantly. The number of cases of thyroid cancer shows an increase with age up to the seventh decade of life, then decreases. The risk of disease increased for both sexes until the seventh decade of life, after which it decreased. Starting from the 90s of the twentieth century, a sharp increase in the incidence of women is visible and slightly slower in men population. The incidence among both sexes in all age groups duplicates trends observed in the entire population: faster growth in women, especially since the beginning of the 1990s (Wojciechowska and Didkowska 2010, 2016).

Among patients diagnosed with thyroid cancer in 2000-2002, 1-year survival rates were 88.2% in men and 92.6% in women, while among patients diagnosed in the years 2003-2005, the 1-year survival rate was 88.4% in men and women 94.3%. The 5-year survival among patients with thyroid cancers during the first decade of the 21st century improved: for men 76.8% versus 84.6%, while for women 90.7% versus 93.3% (Wojciechowska and Didkowska 2010, 2016).

In 2010, in Poland, the incidence of thyroid cancer in both sexes was lower than the average for European Union countries (data from 2009). Thyroid tumors account for 0.1% of cancer mortality among men and 0.5% among women. The number of mortality due to thyroid cancers in 2010 was 261, i.e. 74 among men and 187 among women. Most mortality cases from thyroid cancers occur after the age of 50. The risk of thyroid cancer mortality increases with age from the sixth decade of life to a maximum in the eighth-ninth decade of life (around $3/10^5$ in men and around $8/10^5$ in women). Mortality from thyroid cancer in both age groups and sexes is decreasing (1965-2010). In 2010, thyroid cancer mortality in Poland was lower among men and higher in women than the average for European Union countries (data from 2009) (Wojciechowska and Didkowska 2010, 2016).

The variation within Europe in the survival rates of patients with thyroid cancer is similar to that found for many other cancers, with certain countries characterized by higher than average (or lower than average) survival rates for most cancer types. This means that prognostic factors specific to thyroid cancer do not necessarily explain the observed differences in country-specific survival rates (Teppo and Hakulinen 1998). The most likely cause of the rise in the incidence of thyroid cancer is increasing detection due to incidental findings through advanced imaging and the systematic diagnostic exploration of small thyroid nodules (Jegerlehner et al. 2017).

Our aim was, therefore, to compare recent secular trends in the morbidity and mortality rates of thyroid cancer among the children and adult populations of West Pom-

eranian and Pomeranian Voivodeships in 2000 and 2016. Our hypothesis was that an increase in the incidence of thyroid tumors would provide indirect evidence for the increase in the relative risk rates.

MATERIALS AND METHODS

In order to study both the morbidity and mortality of thyroid cancer among different population groups in the Pomeranian and West Pomeranian Voivodeship regions in 2000 and 2016, a database of the Cancer Registry of the Republic of Poland for 2000-2016 was analyzed (Wojciechowska and Didkowska 2010, 2016). The population was considered according to the Statistical Information Center (stat.gov.pl).
The relative risk (RR) calculations at confidence intervals (CI) and the statistical significance (p) was performed using the WHO-recommended Epi Info program (Woodward 2005), using absolute disease values.
Mathematical processing of the obtained results was performed using the standard statistical package STATISTICA 8.0 software (StatSoft, Cracow, Poland).

RESULTS AND DISCUSSION

The intensive rates of thyroid cancer morbidity and mortality among different age groups of the Pomeranian and West Pomeranian Voivodeship regions in 2000 and 2016 were analyzed. The increase in the incidence rates among the female population was observed (from 11.31 per 100,000 persons in 2000 to 32.04 per 100,000 persons in 2016). Among the child population of the voivodship, the incidence has increased slightly among girls. The adult mortality rate remained unchanged during the study period and was not recorded among other populations (Table 1).

Table 1

Morbidity and mortality rates of thyroid cancer among the population of Pomeranian Voivodeship in 2000 and 2016

Groups	The incidence, per 100,000 persons	Mortality, per 100,000 persons	The resident population amount
2000			
Adults			
Males	3.38	0.49	859,609
Females	11.31	0.33	929,364
Children (0-18 years old)			
Boys	0.84	0.0	250,112
Girls	1.62	0.0	236,409
2016			
Adults			
Males	5.60	0.09	884,456
Females	32.04	0.33	955,571
Children (0-18 years old)			
Boys	0.0	0.0	243,473
Girls	1.92	0.0	232,111

An analysis of the dynamics of the incidence and mortality rates of thyroid cancer among different age groups of the population in the West Pomeranian Voivodeship is presented in Table 2. The analysis showed an increase in the incidence and mortality rates among the male and female population during the years 2000-2016. The highest incidence in West Pomeranian Voivodeship is observed among women in 2016 and stands at 22.46 per 100,000 population. Mortality increased slightly during the study period among the female population of West Pomeranian Voivodeship.

Table 2

Morbidity and mortality rates of thyroid cancer among the population of West Pomeranian Voivodeship in 2000 and 2016

Groups	The incidence, per 100,000 persons	Mortality, per 100,000 persons	The resident population amount
2000			
Adults			
Males	2.52	0.87	665,283
Females	8.87	0.11	717,280
Children (0-18 years old)			
Boys	0.0	0.0	174,899
Girls	0.42	0.0	166,279
2016			
Adults			
Males	4.36	0.68	670,737
Females	22.46	0.77	725,297
Children (0-18 years old)			
Boys	0.0	0.0	160,026
Girls	0.0	0.0	152,114

The relative risk of thyroid cancer mortality and morbidity in 2016 compared to 2000 have been calculated among different age groups of the Pomeranian and West Pomeranian Voivodeship regions and presented in Tables 3 and 4 and Figure 1.

Table 3

The relative risk rates of thyroid cancer morbidity among the population of Pomeranian and West Pomeranian Voivodeship in 2016 compared to 2000

Groups	The relative risk	CI	χ^2	p
Pomeranian Voivodeship				
Males	1.68	1.07-2.64	5.29	0.0214
Females	2.77	2.22-3.45	89.73	<0.0001
Boys	0.00	0.00-4.16	1.95	0.1629
Girls	1.02	0.29-3.52	0.08	0.9768
West Pomeranian Voivodeship				
Males	1.82	1.02-3.23	4.29	0.0383
Females	2.49	1.88-3.29	43.25	<0.0001
Boys	0.00	0.00	0.00	-
Girls	0.00	0.00-18.91	0.91	0.3388

CI – confidence interval; χ^2 – Cochran-Mantel-Haenszel chi-squared test (χ^2); p – statistical significance

The highest relative risk (RR) rate of thyroid cancer morbidity from 2000 to 2016 was noted among the female population of the Pomeranian Voivodeship (RR = 2.77, $p < 0.0001$). A high RR of thyroid cancer morbidity was also found among women of West Pomeranian Voivodeship (RR = 2.49, $p < 0.0001$) (Table 3).
Among men of both voivodships, there was also an increase in RR of the thyroid cancer morbidity during the study period (in Pomeranian Voivodeship: RR = 1.68, p = 0.0214, in West Pomeranian Voivodeship: RR = 1.82, at p = 0.0383) (Table 3).
In Pomeranian Voivodeship, the morbidity of thyroid cancer among girls remains unchanged (RR = 1.02, at p = 0.9768). In the other groups of the children population, the risk of thyroid cancer morbidity is not observed (Table 3).

Table 4

The relative risk rates of thyroid cancer mortality among the population of Pomeranian and West Pomeranian Voivodeship in 2016 compared to 2000

Groups	The relative risk	CI	χ^2	p
Pomeranian Voivodeship				
Males	0.19	0.02-1.66	2.78	0.0953
Females	0.97	0.31-3.02	0.00	0.9616
Boys	0.00	0.00-4.16	1.95	0.1629
Girls	0.00	0.00	0.00	-
West Pomeranian Voivodeship				
Males	1.19	0.36-3.90	0.08	0.7734
Females	4.94	1.08-22.57	5.24	0.022
Boys	0.00	0.00	0.00	-
Girls	0.00	0.00	0.00	-

CI – confidence interval; χ^2 – Cochran-Mantel-Haenszel chi-squared test (χ^2); p – statistically significance

In the West Pomeranian Voivodeship, there was an increase in the risk of thyroid cancer mortality among the female population (RR = 4.94, at p = 0.022) and a slight increase among the male population (RR = 1.19, at p = 0.7734) from 2000 to 2016 (Table 4). Among the other population groups studied, the risk of thyroid cancer mortality has decreased or not detected in recent years (Fig. 1).

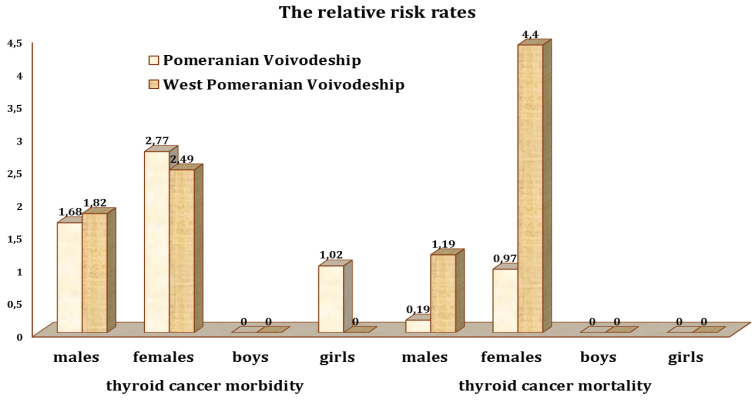

Fig. 1. The relative risk rates of thyroid cancer morbidity and thyroid cancer mortality among the population of Pomeranian and West Pomeranian Voivodeship in 2016 compared to 2000

Our study demonstrates a large rise in the incidence of thyroid cancer, the Pomeranian and West Pomeranian Voivodeship regions in 2016 compared to 2000 with a concomitant 7-fold increase in the rate of thyroid cancer mortality among women and a slight decrease among men of West Pomeranian Voivodeship. On the other hand, a significant decrease in thyroid cancer mortality among men in Pomeranian Voivodeship was observed. These findings suggest that a substantial and growing part of the detected thyroid cancers are diagnosed and treated. The slight decrease in thyroid cancer-specific mortality over time may reflect improved treatment strategies, thanks to e.g. to refined surgical techniques with a lower complication rate and better post-surgical care (Jegerlehner et al. 2017).

Our results are consistent with several studies showing a rapidly increasing thyroid cancer incidence without a substantial change or a slight decrease in mortality in various countries, as well as in different regions of Poland. For example, Teppo and Hakulinen (1998) have analyzed the survival of patients with thyroid cancer using population-based EUROCARE II data from 1978-1989 (trends in survival) and 1985-1989 (cross-sectional comparisons between areas). The data consisted of 7,504 patients and covered 37 cancer registration areas in 17 European countries. In 90% of the patients, the diagnosis was histologically confirmed. The prognosis of patients with thyroid cancer was relatively favorable. The overall 5-year relative survival rate was 72% for men and 80% for women. Substantial variation in this 5-year rate was observed between countries ranging from 59 to 83% in men and from 72 to 84% in women. Higher than average survival rates were observed in Finland, Iceland, The Netherlands, and Sweden. Countries with lower than average rates were Denmark, England, Estonia, Slovakia, Slovenia and Poland (women). Elderly patients had lower survival rates than the younger ones. Time trends in survival (which could be analyzed only in selected countries with sufficient numbers of cases) were irregular but generally showed slight increases compared with rates in 1978-1980 (Teppo and Hakulinen 1998).

Bosetti and co-workers (2013) have provided an up-to-date picture of patterns and trends in mortality from major cancers in Europe by analyzing cancer mortality data from the World Health Organization for 25 cancer sites and 34 European countries (plus the European Union, EU) in 2005-2009. After a peak in the late 1980s, cancer mortality in Europe has declined by ~10% in both sexes up to the early 2000s. Cancer mortality in the EU steadily declined since the late 1980s, with reductions of 1.6% per year in 2002-2009 in men and 1% per year in 1993-2009 in women. In western Europe, rates steadily declined over the last two decades for stomach and colorectal cancer, Hodgkin lymphoma, and leukemias in both sexes, breast and (cervix) uterine cancer in women, and testicular cancer in men. In central/eastern Europe, mortality from major cancer sites has been increasing up to the late 1990s/early 2000s. In most Europe, rates have been increasing for lung cancer in women and for pancreatic cancer and soft tissue sarcomas in both sexes, while they have started to decline over recent years for multiple myeloma. In 2005-2009, there was still an over 2-fold difference between the highest male cancer mortality in Hungary (235.2/100,000) and the lowest one in Sweden (112.9/100,000), and a 1.7-fold one in women (from 124.4 in Denmark to 71.0/100,000 in Spain).

The incidence rate (IR), trend and histotype of the differentiated thyroid cancer in the selected areas of iodine deficiency in Poland was analyzed by Szybiński and co-workers (2003). The study was carried out in three areas: Cracow (Carpathian endemic goiter area with 1.99 million mixed rural and urban population), Gliwice (Upper Silesia – moderate iodine deficiency area mostly industrial with 4.89 million inhabitants) and Olsztyn (slight iodine deficiency area, mainly rural with 0.77 million inhabitants). Between 1990 and 2001, in the study area 2,691 newly diagnosed cases of malignant neoplasms of the thyroid gland were registered. In over 80% of patients, it was differentiated thyroid cancer: mainly in women over 40 years, with F/M ratio 5.8. The highest percentage of papillary cancer 72.9% was observed in Olsztyn and the lowest (50.0%) in Cracow and Nowy Sącz districts. In this period of the time incidence rate of differentiated thyroid cancer in women increased in Cracow, Gliwice, and Olsztyn from 1.51 to 9.34 in 1998, from 1.27 to 5.74 in 1999 and from 2.52 to 11.35 in 2001 respectively. In the youngest (0-20 years) age group no significant increase in IR was observed. Between 1998 and 2001 the dynamics of increase of the thyroid cancer incidence markedly diminished. In conclusion, it was hypothesized that an increase in IR of differentiated thyroid cancer in the study area was caused mainly by the suspension of iodine prophylaxis in 1980 and was diminished by the introduction of an obligatory model of iodine prophylaxis in 1996/1997. It was modified in terms of histotype and dynamics of increase by exposure to ionizing radiation. A very specific group at risk on the population level were women aged 20-40 years in the reproductive age exposed to iodine deficiency after suspension of iodine prophylaxis in 1980 and to radiation after the Chernobyl accident in 1986 (Szybiński et al. 2003).

The estimating of the incidence of thyroid cancer and the determination of its histopathological type in the Olsztyn region (the north of Poland), an iodine deficiency area with moderate endemic goiter prevalence, was carried out by Bandurska-Stankiewicz and co-workers (2001). The incidence rate was calculated as the number of newly diagnosed cases in the calendar year per 100,000 inhabitants dependent on sex and age. The results were statistically evaluated. 242 newly diagnosed cases of thyroid cancer were registered including 8 young patients (up to 18 years of age) and 234 adults. The increase in the number of cancer cases was observed year by year. The predominant type of thyroid cancer was papillary carcinoma (66.8%). Follicular carcinoma constituted 17% of cases. A statistically significant increase in incidence rate was observed in women – from 2.8/100,000 to 11.1/100,000 (Bandurska-Stankiewicz et al. 2001).

Szybiński and co-workers (2001) have analyzed the epidemiological situation of thyroid cancer in the Cracow region from 1986 to 1999 and to review regional thyroid cancer registers in Poland (including 43.7% of the Polish population) in 1999. The standardized register was based upon assumptions: 100% of histopathological verification according to ICD-10, the register ascertainment in at least 80%, the demographic area not smaller than 100,000 inhabitants, the incidence rate (IR) calculated as the newly diagnosed cases number per 100,000 inhabitants in a calendar year. Since 1990 a statistically significant rise in the thyroid cancer incidence affecting mainly women >40 years of age has been observed. From 1998-1999 the cancer morbidity was reduced. Since 1995 in the Cracow area, the follicular carcinoma in-

cidence has decreased significantly, which has been associated with effective iodine prophylaxis. The highest incidence values have been observed in Cracow and Olsztyn, showing a territorial relationship with the highest thyroid irradiation doses after the Chernobyl accident. The mean IR value has been 3.86 (1.48 men, 6.08 women), which corresponds to about 1,500 newly diagnosed cases in Poland in 1999. The follicular to papillary carcinoma ratio has been 5.32. The major etiological factors have been iodine deficiency and ionizing radiation (Szybiński et al. 2001).

The correlation between the incidence rate (IR) of thyroid cancer and the severity of iodine deficiency, as well as the influence of iodine prophylaxis on IR, was also investigated by Huszno and co-workers (2001). The suspension of iodine prophylaxis in 1980 resulted in a goiter prevalence increase in schoolchildren (up to 60%) and elevated TSH levels in neonates observed in the early 1990s. In 1990 rise in thyroid cancer IR was observed. IR of papillary and follicular carcinoma in 1995 were 1.6 and 1.5 respectively. The papillary to follicular ratio was about 1.0. Such a high prevalence of follicular cancer was specific for iodine-deficient regions. In 1997, after the introduction of a mandatory model of iodine prophylaxis in Poland, an increase in papillary thyroid cancer IR was observed, reaching in 1998 6.23 per 100,000 inhabitants. Papillary to follicular cancer ratio rose to 2.48. In 1999 no further increase in thyroid cancer IR was observed. An increase in papillary cancer incidence between 1990 and 1999 may be related to the overlapping of iodine deficiency and other cancer risk factors i.e. radiation after the Chernobyl accident (Huszno et al. 2001).

Changes in thyroid cancer histotypes in 1986-2001 and a significant decrease in the incremental rate of differentiated thyroid cancer probably reflect the influence of effective iodine prophylaxis. The significant difference between IR of thyroid cancer incidence in the districts of Cracow and Nowy Sącz may be related to differences in the exposure to radiation after the Chernobyl accident. Huszno and co-workers (2003) have evaluated the correlation between thyroid cancer histotype and incidence rate (IR) and iodine nutrition level in two endemic goiter areas: the districts of Cracow and Nowy Sącz. The suspension of iodine prophylaxis in Poland in 1980 resulted in increased goiter prevalence in schoolchildren and adults and elevated TSH levels in newborns in the early 1990s. Since 1992 a rise in thyroid cancer IR was observed. Thyroid cancer IR in the Cracow population was 2.22 in 1986; 3.62 in 1995 and 6.02 in 2001; in Nowy Sącz: 1.52; 2.59 and 3.88 respectively. In 1986 papillary/follicular cancer ratio in both areas was about 1.0 (the value typical of iodine-deficient areas). After restoring the obligatory iodine prophylaxis in 1997, a significant decrease in elevated TSH concentration in newborns and urinary iodine concentration increase in schoolchildren was observed. A relative rise in the incidence of papillary thyroid cancer and a decrease in follicular cancer, resulting in a rise in papillary/follicular thyroid cancer ratio up to 5.9 in 2001 was also observed. Since 1999 no further thyroid cancer IR increase was noted. A significant increase in differentiated thyroid cancer IR was observed in association with the iodine prophylaxis suspension (Huszno et al. 2003).

One is unable to explain the factors responsible for the observed differences in the incidence rates of papillary and follicular thyroid carcinoma in the Silesia region. For example, Szpak and co-workers (2001) have evaluated the present iodine supply

in the Silesia region and related it to the incidence of the various histotypes of thyroid carcinoma. The incidence of thyroid cancer and its histotypes varies considerably throughout Silesia (data obtained from the Institute of Oncology Cancer Register, Gliwice). The factors responsible for these differences are unknown. Urinary iodine excretion observed in 7-11 year-old-children was used as a parameter of iodine supply and measured in the group of 1,037 school children in sixteen localities, equally dispersed throughout Silesia. Mean incidence rates of papillary and follicular thyroid carcinoma were calculated for regions of Silesia by averaging the rates of the communities in each region. Despite the intensive iodine prophylaxis, the persistent symptoms of iodine deficiency were observed. There were significant differences in children's ioduria among investigated regions. The percentage of low ioduria (lower than 100 μg/l) varied from 35.7% to 87.7%. Szpak and co-workers (2001) observed no correlation between age-adjusted rates for histotypes of thyroid carcinoma and the percentage of urine iodine below 100 μg/l, which served as an estimation of iodine deficiency. The study of Szpak and co-workers (2001) also indicates that Silesia is still an area of moderate iodine deficiency. In the years 1990-2000 within Silesia District 1,067 thyroid cancer cases were diagnosed. From the total, papillary carcinoma established 59.9% (639 cases), and follicular carcinoma – 26.0% (276 cases). The etiologic background is unclear, but the significant impact of environmental iodine supply seems unprobable (Zemła 2001).

Zonenberg and co-workers (2009) have evaluated the descriptive epidemiological features of incident thyroid cancers diagnosed among the residents of the North-Eastern Region of Poland between 1996 and 2007. The Regional Cancer Surveillance Program was used to collect data on 834 newly diagnosed thyroid cancers registered during a 12-year period. The average annual incidence of all types of thyroid cancer per 100,000 residents rose from 3.9 in 1996 to 8.8 in 2000 and then decreased slightly to 6.8 in 2006 (mean – 5.8 cases per 100,000 inhabitants). Thyroid cancer was more frequently diagnosed in women (81.9%) than in men. The majority of all cases were diagnosed in the age group of 46-55 years. There were 12 newly diagnosed cancers in children under 15 years of age (4 cases among children born after the Chernobyl disaster). The commonest histological type was papillary carcinoma (73.3%). Follicular type accounted for 11.4%, oxyphilic – 6.4%, medullar – 4.0%, anaplastic – 3.1% and other types – for 1.8% of cases. The increased incidence of thyroid cancers observed in a 12-year period is most likely explained by the improvement in diagnostic techniques. Iodine deficiency seems to be a less probable factor in view of the predominance of the papillary type of carcinoma (Zonenberg et al. 2009).

CONCLUSIONS

The detailed analysis of the development of thyroid cancer among the different age groups in the Pomeranian and West Pomeranian Voivodeship showed that there is a tendency for the increase of thyroid cancer risk among adults, especially women and men. The relative risk of thyroid cancer mortality is increased among the adult population of West Pomeranian Voivodeship. Therefore, both thyroid cancer morbidity

and mortality are occurring mainly at the expense of the female population. These trends, combined with overall high mortality and high 15-year increase of morbidity, raise concerns on the extent to which the situation may be taking place. Further research is needed, quantifying the importance of the most likely determinants of these trends as well as the extent and potential effects of diagnosis and treatment in these settings.

REFERENCES

Bandurska-Stankiewicz E., Stankiewicz A., Shaffie D., Wadołowska L., 2001. Zapadalność na raka tarczycy w województwie olsztyńskim w latach 1993-1999. (Thyroid cancer morbidity in the Olsztyn region in 1993-1999). *Wiad. Lek.*, 54 (Suppl 1), 136-142, (in Polish).

Bosetti C., Bertuccio P., Malvezzi M., Levi F., Chatenoud L., Negri E., La Vecchia C., 2013. Cancer mortality in Europe, 2005-2009, and an overview of trends since 1980. *Ann. Oncol.*, 24 (10), 2657-2671.

Huszno B., Szybiński Z., Przybylik-Mazurek E., Stachura J., Trofimiuk M., Buziak-Bereza M., Gołkowski F., Pantoflinski J., 2003. Influence of iodine deficiency and iodine prophylaxis on thyroid cancer histotypes and incidence in endemic goiter area. *J. Endocrinol. Invest.*, 26 (Suppl 2), 71-76.

Huszno B., Szybiński Z., Trofimiuk M., Przybylik-Mazurek E., Buziak-Bereza M., Gołkowski F., Pantofliński J., 2001. Niedobór jodu a rak tarczycy w regionie krakowskim. (Iodine deficiency and thyroid neoplasms in the Cracow region). *Wiad. Lek.*, 54 (Suppl. 1), 163-168, (in Polish).

Jegerlehner S., Bulliard J.L., Aujesky D., Rodondi N., Germann S., Konzelmann I., Chiolero A., NICER Working Group, 2017. Overdiagnosis and overtreatment of thyroid cancer: A population-based temporal trend study. *PLoS One*, 12 (6), e0179387.

Statistical Information Center, stat.gov.pl.

Szpak S., Zeman M., Handkiewicz-Junak D., Kochańska-Dziurowicz A., Kurzeja E., Stanjek A., Bijak A., Bogacz A., Zemła B., 2001. Zróżnicowanie geograficzne podaży jodu na ternie województwa śląskiego w aspekcie ryzyka raka tarczycy. (Geographic differences in iodine supply in the Silesia terrain in relation to thyroid cancer risk). *Wiad. Lek.*, 54 (Suppl 1), 169-175, (in Polish).

Szybiński Z., Huszno B., Rachtan J., Przybylik-Mazurek E., Buziak-Bereza M., Trofimiuk M., 2001. Epidemiologia raka tarczycy w Polsce. (Epidemiology of thyroid cancer in Poland). *Wiad. Lek.*, 54 (Suppl 1), 106-116, (in Polish).

Szybiński Z., Huszno B., Zemla B., Bandurska-Stankiewicz E., Przybylik-Mazurek E., Nowak W., Cichon S., Buziak-Bereza M., Trofimiuk M., Szybiński P., 2003. Incidence of thyroid cancer in the selected areas of iodine deficiency in Poland. *J. Endocrinol. Invest.*, 26 (2 Suppl), 63-70.

Teppo L., Hakulinen T., 1998. Variation in the survival of adult patients with thyroid cancer in Europe. EUROCARE Working Group. *Eur. J. Cancer*, 34 (14 Spec No), 2248-2252.

Wojciechowska U., Didkowska J., 2010. Zachorowania i zgony na nowotwory złośliwe w Polsce. Krajowy Rejestr Nowotworów, Centrum Onkologii – Instytut im. Marii Skłodowskiej-Curie. onkologia.org.pl/raporty/, access on 14/08/2019.

Wojciechowska U., Didkowska J., 2016. Zachorowania i zgony na nowotwory złośliwe w Polsce. Krajowy Rejestr Nowotworów, Centrum Onkologii – Instytut im. Marii Skłodowskiej-Curie. onkologia.org.pl/raporty/, access on 15/08/2019.

Woodward M., 2005. Epidemiology: study design and data analysis. 2nd ed. Boca Raton, FL, Chapman and Hall CRC.

Zemła B., 2001. Występowanie brodawkowatego i pęcherzykowego raka tarczycy u kobiet śląskich. (Occurrence of papillary and follicular thyroid cancer among Silesian women). *Wiad. Lek.*, 54 (Suppl 1), 117-122, (in Polish).

Zonenberg A., Telejko B., Nikolajuk A., Siewko K., Zimnoch L., Dadan J., Kinalska I., Górska M., 2009. The incidence of thyroid cancer in the North-Eastern Region of Poland: a twelve-year follow-up. Endocrine Abstracts, 11th European Congress of Endocrinology, Istanbul, Turkey, 25-29 Apr 2009, *European Society of Endocrinology*, 20, P121, www.endocrine-abstracts.org/ea/0020/ea0020p121.

OCENA RYZYKA ZACHOROWALNOŚCI I UMIERALNOŚCI NA NOWOTWORY TARCZYCY WŚRÓD MIESZKAŃCÓW WOJEWÓDZTW POMORSKIEGO I ZACHODNIOPOMORSKIEGO (POLSKA)

Streszczenie

Celem naszych badań było porównanie najnowszych trendów zachorowalności i umieralności z powodu nowotworów tarczycy wśród dzieci i dorosłych – mieszkańców województw zachodniopomorskiego oraz pomorskiego w 2000 i 2016 r. Liczbę zachorowań na nowotwory tarczycy za lata 2000-2016 uzyskano z Krajowego Rejestru Nowotworów, natomiast liczbę zgonów i wskaźniki umieralności z bazy danych umieralności na raka (2000 i 2016, ocena regionalna). Analiza danych dotyczących woj. pomorskiego wykazała wzrost zachorowalności wśród kobiet (z 11,31 w 2000 r. do 32,04 na 100 000 osób w 2016 r.), a także nieznaczny wzrost zachorowalności w subpopulacji dziecięcej przede wszystkim w grupie dziewcząt, podczas gdy umieralność osób dorosłych utrzymywała się na niezmienionym poziomie. W woj. zachodniopomorskim zaś najwyższą zachorowalność zaobserwowano w 2016 r. i dotyczyła ona kobiet (22,46 na 100 000 osób). Jednocześnie w tym samym roku wzrosła w niewielkim stopniu ich umieralność. Względne ryzyko zgonów z powodu nowotworów tarczycy uległo podwyższeniu w grupie osób dorosłych zamieszkujących województwo zachodniopomorskie. Jak wynika z przeprowadzonych badań zarówno zachorowalność, jak i umieralność z powodu nowotworów tarczycy dotyczy głównie kobiet. Zaprezentowane tendencje, w połączeniu z ogólną wysoką umieralnością i wysokim w okresie 15-letnim wzrostem zachorowalności, budzą obawy co do skali ich dalszego rozwoju w przyszłości.