Aim of the study: To present the changes in the incidence of cancers of the head and neck organs in south-eastern Poland and in the whole country in the years 1990–2012.

Material and methods: A retrospective analysis of the incidence of cancers of the head and neck organs in south-eastern Poland in the years 1990–2012. Statistical methods used for cancers of ICD-10 C00-C14 and C30-C32.

Results: For Poland, the absolute number of cases was 123,120 in the years 1990–2012. For males, the number of cases per year increased from 4468 in 1990 to 4953 in 2012, and for females from 816 to 1442.

The percentage share of tumours of the head and neck in all malignant tumours decreased from 10.0% to 6.5% for males and from 2.1% to 1.9% for females.

In the years 1990–2012 in south-eastern Poland, for males, the absolute number of cases per year decreased from 335 in 1990 to 286 in 2012. For females, a minimal increase in cases was from 63 to 64 cases. The percentage share of tumours of the head and neck in all malignant tumours decreased from 12.2% to 6.7% for males and from 2.7% to 1.8% for females.

Conclusions: Incidences of cancers of the head and neck organs in Poland have seen a slight upward trend in the absolute number of cases over the last two decades. In Poland a decrease in the incidence of cancer of the larynx was reported, with an increase in the incidence of oropharyngeal cancer.

Key words: head and neck cancer, cancer epidemiology.

Comparative analysis of the incidence of head and neck cancer in south-eastern Poland and in Poland in the years 1990–2012

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Introduction

Head and neck cancers (HNCA) invariably constitute a significant epidemiological and clinical problem in Poland and in other countries. Definitely, the most common cancer in this region is squamous cell carcinoma [1, 2].

The incidence of head and neck squamous cell carcinoma (HNSCC) is determined by the degree of exposure of a population to well-defined carcinogens, whose impact in the social scale has undergone considerable changes over the last decade. The carcinogenic importance of exposure to cigarette smoke has become less important, whereas the role of infection with Human Papilloma Virus (HPV) has grown, which translates into changes in the structure of the incidence rate [3–10].

HNCAs were the sixth most common group of malignant neoplasms among males and twelfth among females in Poland in 2012 [11]. There are a number of differences in the epidemiology of these tumours in south-eastern Poland, which differentiate it from the national data.

In 1990, in south-eastern Poland, HNCA with 398 cases accounted for 7.9% of all cancers, and in Poland the figures were 5284 and 6.3%, respectively [12]. In subsequent years a significant change in these proportions was recorded, caused by a gradual decline in the incidence in absolute numbers in south-eastern Poland, with a growth nationwide. In 2012, 350 cases were recorded in the region, which accounted for 4.3% of all malignant tumours, and for Poland these figures were 6395 and 4.2%, respectively [11–13]. It is noteworthy that there was a percentage decrease in HNCA among all malignant tumours, which is contrary to some opinions expressed by related professionals and in the media.

The aim of the paper was to present in detail the changes in the incidence of HNCA in south-eastern Poland and in the whole country in the years 1990–2012.

Material and methods

A retrospective analysis was carried out of the incidence of cancers of the head and neck organs in south-eastern Poland in the years 1990–2012. In the years 1990–1998 south-eastern Poland was defined as the area of the former voivodships of Krosno, Przemyśl, Rzeszow, and Tarnobrzeg, and in the period since 1999 as an area of Podkarpackie Voivodship.
Using standard statistical methods, crude rates and structure indicators (percentage) have been calculated for cancers of ICD-10 C00-C14 and C30-C32 sites, based on demographic data of Voivodship Statistical Office (WUS) and Podkarpackie Cancer Registry in Rzeszow.

Based on published reports of the Department of Epidemiology of the Oncology Centre of the Maria Sklodowska-Curie Institute of Oncology in Warsaw, similar data for Poland has been compiled in order to objectively compare the structure of the incidence.

Due to a failure to fill in statistical documents in protest of Health Care in the years 1997–1998 there is no data on the incidence of cancer in this period.

**Results**

In the years 1990–2012 a total of 6516 cases of malignant tumours of the head and neck organs were registered in south-eastern Poland, including 5403 cases for males and 1113 for females. For males, the absolute number of cases per year decreased from 335 in 1990 to 286 in 2012. For females, a minimal increase in cases was reported and the values were 63 and 64 cases, respectively.

Crude incidence rates for males during a 21-year period of analysis decreased from 30.8/100 thousand in 1990 to 27.5/100 thousand in 2012, while for females they increased from 5.5/100 thousand to 5.9/100 thousand respectively. In the years 1990-2012, the percentage share of tumours of the head and neck in all malignant tumours decreased from 12.2% to 6.7% for males and from 2.7% to 1.8% for females. Table 1 and Figs. 1–3 show data for individual years of the analysis.

For Poland, the absolute number of cases in total was 123,120 in the years 1990–2012, including 99,797 cases for males and 23,323 for females. For males, the number of cases per year increased from 4468 in 1990 to 4953 in 2012, and for females from 816 to 1442 respectively. Crude incidence rates for males were 24.1/100 thousand in 1990 and 25.5/100 thousand in 2012. For women, the corresponding values were 4.2/100 thousand and 7.0/100 thousand. The percentage share of tumours of the head and neck in all malignant tumours decreased from 10.0% to 6.5% for males and from 2.1% to 1.9% for females. Table 1 and Figs. 4–8 show detailed data for individual years.

**Discussion**

The analysis of the incidence of tumours of the head and neck organs nationwide over the last two decades between 1990 and 2012 shows a slight upward trend in the absolute number of cases per year and, at the same time, a marked reduction in the percentage share of this group among all malignant tumours. The latter phenomenon is the result of a clear parallel increase in the incidence of cancers in total, with a limited increase in the number of cases of cancers of the head and neck organs, and even stabilisation from the mid-90s [11, 12, 14]. Similar data apply to south-eastern Poland, but the decline in the percentage share of cancers of the head and neck organs, primarily related to the group of males, is even more spectacular. The findings of epidemiological studies are in clear contradiction to the popular opinion about the “epidemic of cancers of the head and neck” [12, 13, 15]. In fact, this is not the case.

In the years 1963–2012, in south-eastern Poland, they ranked sixth with 13,654 cases, including 11,362 cases for males and 2,282 cases for females. In the same period, at the country level, they ranked seventh with 233,132 cases in total, including 194,009 cases for males and 39,123 cases for females. The peak incidence, both for males and females, was recorded in south-eastern Poland in 1990. For Poland, the peak incidence for males was recorded in 1993 whereas the increase in the incidence among females has continued [11–15]. It should be noted, however, that there are distinct changes in the structure of incidence depending on the location of the primary tumour.

Over the past two decades, south-eastern Poland has recorded a reduction in the total incidence of cancers of the lip, gums, palate, other parts of the oral cavity, oropharynx, and above all larynx, which was and remains the most common location of cancer of the head and neck organs.

The incidence of cancers of the floor of the mouth remained practically unchanged. Conversely, there was an increase in the incidence of cancers of the tongue, other parts of the mouth, salivary glands, tonsil, nasopharynx, ear recess, laryngeal part of the throat, and other and unspecified sites within the lip, mouth, and throat. As a result, there was a decrease in the absolute number of cases to 286 for males in 2012 compared with 335 in 1990, with a minimal increase in the incidence for females (from 63 to 64). Overall, the incidence of cancers of the head and neck organs in Podkarpackie Voivodship in absolute numbers per year decreased, which resulted in a marked decline in the percentage share of the analysed group, compared with an increase in the incidence of malignant tumours overall [12, 13, 15].

Conversely, (nationwide) there was a decrease in the incidence of cancers of the lip, oropharynx, nose, and middle ear, and a significant decrease in cancers of the larynx. At the same time, an increase was reported for the incidence of cancers of the tongue, gum, floor of the mouth, palate, other, and unspecified parts of the bottom of the oral cavity, salivary glands, tonsil, nasopharynx, recess ear, and nasopharynx, and other unspecified sites within the lip, mouth, and throat.

At the national level there was a decrease in the incidence of cancers of the lip, oropharynx, nose, and middle ear, and a significant decrease in the case of the larynx. At the same time, there was an increase in the incidence of cancers of the tongue, gum, floor of the mouth, palate, and other unspecified parts of the floor of the mouth, salivary glands, tonsil, nasopharynx, ear recess, and other and unspecified sites within the lip, mouth, and throat.

As a result, a moderate increase in the absolute number of cases of cancers of the head and neck organs was recorded in the analysed period, especially in the female population. It should be noted, however, that since 1993 the total incidence in absolute numbers has remained virtually at the same level [11, 12, 14, 16].
Table 1. Changes in the incidence of particular cancers of the head and neck organs in the years 1992–2012 in Poland and south-eastern Poland

| ICD10 | Year | South-eastern Poland | Poland |
|-------|------|----------------------|--------|
|       |      | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
|       |      | Absolute number | Crude rate | Standardized rate | Percentage | Absolute number | Crude rate | Standardized rate | Percentage |
| C00   | 1990 | 78    | 11      | 7.2 | 0.5 | 0.3 | 701 | 126 | 3.8 | 0.6 | 0.4 | 1.6 | 0.3 |
|       | 2012 | 24    | 10      | 2.3 | 0.9 | 0.4 | 216 | 93  | 0.5 | 0.2 | 0.2 | 0.4 | 0.1 |
| C01 + C02 | 1990 | 18    | 3       | 1.7 | 0.3 | 0.1 | 259 | 59  | 1.4 | 0.3 | 1.3 | 0.2 | 0.6 | 0.2 |
|       | 2012 | 30    | 2       | 2.9 | 0.2 | 0.1 | 465 | 159 | 2.5 | 0.8 | 1.7 | 0.4 | 0.6 | 0.2 |
| C03   | 1990 | 7     | 3       | 0.6 | 0.3 | 0.1 | 46  | 17  | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.0 |
|       | 2012 | 3     | 2       | 0.3 | 0.2 | 0.1 | 67  | 67  | 0.4 | 0.3 | 0.2 | 0.1 | 0.1 | 0.0 |
| C04   | 1990 | 12    | 4       | 1.1 | 0.4 | 0.2 | 167 | 31  | 0.9 | 0.2 | 0.9 | 0.1 | 0.4 | 0.1 |
|       | 2012 | 12    | 1       | 1.2 | 0.1 | 0.1 | 298 | 94  | 1.6 | 0.5 | 1.1 | 0.3 | 0.4 | 0.1 |
| C05   | 1990 | 2     | 0       | 0.2 | 0.0 | 0.2 | 87  | 37  | 0.5 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 |
|       | 2012 | 2     | 0       | 0.2 | 0.0 | 0.2 | 86  | 39  | 0.5 | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 |
| C06   | 1990 | 5     | 4       | 0.5 | 0.4 | 0.2 | 86  | 39  | 0.5 | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 |
|       | 2012 | 1     | 8       | 0.1 | 0.7 | 0.1 | 120 | 89  | 0.6 | 0.4 | 0.2 | 0.2 | 0.2 | 0.1 |
| C07+C08 | 1990 | 4     | 10      | 0.4 | 0.9 | 0.1 | 97  | 115 | 0.5 | 0.6 | 0.5 | 0.5 | 0.2 | 0.3 |
|       | 2012 | 20    | 11      | 1.9 | 1.0 | 1.2 | 208 | 146 | 1.2 | 0.8 | 0.7 | 0.5 | 0.3 | 0.2 |
| C09   | 1990 | 20    | 3       | 1.9 | 0.3 | 1.3 | 376 | 143 | 2.0 | 0.7 | 1.3 | 0.4 | 0.5 | 0.2 |
|       | 2012 | 20    | 3       | 1.9 | 0.3 | 1.3 | 376 | 143 | 2.0 | 0.7 | 1.3 | 0.4 | 0.5 | 0.2 |
| C10   | 1990 | 19    | 3       | 1.7 | 0.3 | 0.7 | 272 | 63  | 1.5 | 0.3 | 1.4 | 0.2 | 0.6 | 0.2 |
|       | 2012 | 16    | 7       | 1.5 | 0.6 | 1.1 | 211 | 62  | 1.1 | 0.3 | 0.8 | 0.2 | 0.3 | 0.1 |
| C11   | 1990 | 8     | 3       | 0.7 | 0.3 | 0.3 | 97  | 53  | 0.5 | 0.3 | 0.5 | 0.2 | 0.2 | 0.1 |
|       | 2012 | 11    | 0       | 1.1 | 0.8 | 0.0 | 144 | 52  | 0.8 | 0.3 | 0.6 | 0.2 | 0.2 | 0.1 |
| C12   | 1990 | 5     | 1       | 0.5 | 0.1 | 0.3 | 84  | 11   | 0.5 | 0.1 | 0.3 | 0.0 | 0.1 | 0.0 |
|       | 2012 | 5     | 1       | 0.5 | 0.1 | 0.3 | 84  | 11   | 0.5 | 0.1 | 0.3 | 0.0 | 0.1 | 0.0 |
| C13   | 1990 | 13    | 0       | 1.2 | 0.0 | 0.5 | 110 | 13  | 0.6 | 0.1 | 0.6 | 0.0 | 0.2 | 0.0 |
|       | 2012 | 18    | 2       | 1.7 | 0.2 | 1.1 | 271 | 54  | 1.5 | 0.3 | 0.9 | 0.2 | 0.4 | 0.1 |
| C14   | 1990 | 2     | 2       | 0.2 | 0.2 | 0.1 | 128 | 25  | 0.7 | 0.1 | 0.6 | 0.1 | 0.3 | 0.1 |
|       | 2012 | 14    | 2       | 1.3 | 0.2 | 0.9 | 129 | 39  | 0.7 | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 |
| C30   | 1990 | 2     | 1       | 0.2 | 0.1 | 0.1 | 40  | 41   | 0.2 | 0.2 | 0.1 | 0.1 | 0.05 | 0.05 |
|       | 2012 | 2     | 1       | 0.2 | 0.1 | 0.1 | 40  | 41   | 0.2 | 0.2 | 0.1 | 0.1 | 0.05 | 0.05 |
| C31   | 1990 | 3     | 2       | 0.3 | 0.2 | 0.2 | 78  | 47   | 0.4 | 0.2 | 0.3 | 0.1 | 0.1 | 0.06 |
|       | 2012 | 3     | 2       | 0.3 | 0.2 | 0.2 | 78  | 47   | 0.4 | 0.2 | 0.3 | 0.1 | 0.1 | 0.06 |
| C32   | 1990 | 164   | 15      | 15.1 | 13 | 6.0 | 2416 | 209 | 13.0 | 1.1 | 12.0 | 0.8 | 5.4 | 0.5 |
|       | 2012 | 105   | 12      | 10.1 | 7.0 | 0.7 | 2057 | 308 | 11.0 | 1.5 | 7.2 | 0.9 | 2.7 | 0.4 |
The explanation of the changes may lie in the change in the impact of factors contributing to developing squamous cell cancers, which are the most common in this location. Classically, the primary carcinogenic factor for cancer of the upper respiratory tract is exposure to cigarette smoke. This phenomenon is particularly important for the most common cancer in this location, which is cancer of the larynx. A fall in the incidence of cancers of the oropharynx according to ICD 10, which was recorded both in the country and in Podkarpackie Voivodship, is an apparent phenomenon. The ICD 10 classification is not in correlation with the anatomical definition of the oropharynx, commonly used in oncology. According to it, the scope of the oropharynx includes the tonsils, base (2/3 rear) of the tongue, palatal arches, soft palate, and the side and part of the back of the throat. While combining these locations,
which are considered separately by ICD 10, it is found that the total incidence of oropharyngeal cancers is significantly increasing, as is the case for cancers of the oral cavity, including the tongue, throat, and laryngeal part. In fact, the incidence of cancers of the oropharynx defined anatomically, and not by ICD-10, is clearly increasing, which applies to both Podkarpackie Voivodship and the whole of Poland [11–16].

A comparative analysis of the incidence of cancers of the head and neck organs in south-eastern Poland and in Poland in the years 1990–2012

Fig. 7. Standardised rates of incidence of malignant tumours of the head and neck organs in south-eastern Poland in the years 1999–2012

Fig. 8. Standardised rates of incidence of malignant tumours of the head and neck organs in south-eastern Poland in the years 1990–2012

In conclusions:
1. Total incidence of HNCA has seen a slight upward trend in the absolute number of cases over the last two decades at the national level, with a reduction in the percentage share of this group among all malignant tumours at the same time.
2. At the national level, the increasing trend in the number of cases was considerably more strongly expressed for females than for males.
3. In the same period, a decrease in total incidence of HNCA was recorded in south-eastern Poland, both in absolute numbers, crude rate, and as a percentage share of the incidence of cancers.
4. This trend was more strongly evident in a decline in the number of cases for males than for females, for whom a minimal growth was registered.

5. Both in the country and in south-eastern Poland a significant decrease in the incidence of cancer of the larynx was reported, with an increase in the incidence of oropharyngeal cancer at the same time - with regard to the anatomical definition of this cancer.

The authors declare no conflict of interest.

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