

**REPUBLIC OF AZERBAIJAN**

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**ABSTRACT**

of the dissertation for the degree of Doctor of Philosophy

**THE CLINICAL AND EPIDEMIOLOGICAL FEATURES  
OF ORAL CAVITY CANCER AND PHARYNGEAL  
CANCER IN THE REPUBLIC OF AZERBAIJAN**

Specialty: 3224.01- “Oncology”

Field of science: Medicine

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## THE RELEVANCE OF THE TOPIC

Oral cavity cancer is the second most common pharyngeal cancer of the head and neck, following laryngeal cancer. More than 90% of oral cavity cancers are squamous cell carcinomas. Each year, approximately 355000 cases of oral cavity cancer and 93000 cases of malignant tumours are diagnosed, representing 2% and 0,5 % of the morbidity structure of malignant neoplasms.<sup>1,2</sup>

Oral cavity cancer (OCC) is more commonly encountered in men than in women (5.8 and 2.3 per 100,000 people). However, recent studies show that the increasing use of risk factors such as tobacco and alcohol among women is also leading to a rising trend in the incidence of this malignant tumour among them. The average age of occurrence is in the sixth decade of life. However, the presence of a genetic factor and Human Papillomavirus (HPV) can cause this cancer to be observed in young people (up to 45 years old).<sup>3,4</sup>

The incidence of oral cavity cancer is exceptionally high in Asia (64%), Europe (17.4 %) and North America (7.6%). The increase in incidence in Asian countries can be linked to exposure to risk factors such as tobacco products, alcohol and betel chewing. The increase in morbidity rates from oral cavity cancer in Europe since the 1990s is mainly observed due to known risk factors such as alcohol and tobacco.<sup>5,6</sup>

However, despite advancements in modern diagnostic methods

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<sup>1</sup> Sarode, G. Epidemiologic Aspects of Oral Cancer. / G.Sarode, N.Maniyar, S.Sarode // Dis. Mon. -2020. v.66, -p.100988.

<sup>2</sup> Zachary S. Global epidemiologic patterns of oropharyngeal cancer incidence trends/ S.Zachary, L.Michael, S.R. Philip et al // J Natl Cancer Inst., -2023. v.115(12), -p.1544-1554.

<sup>3</sup> Edirisinghe, S. The Risk of Oral Cancer among Different Categories of Exposure to Tobacco Smoking in Sri Lanka. / S.T.Edirisinghe, M.Weerasekera, De Silva DK, et al // Asian Pac J Cancer Prev., -2022. v.23, -p.2929-35.

<sup>4</sup> Takako, I. Human Papillomavirus and Oropharyngeal Cancer / I.Takako, A. Faizan // Dent Clin North Am., -2018. v.62(1), -p.111-120.

<sup>5</sup> Salehiniya, H. Oral cavity and lip cancer in the world: An epidemiological review. / H.Salehiniya, M.Raei // Biomed Res Ther., -2020. v.7, - p.3898-905.

<sup>6</sup> Tenore, G. Tobacco, alcohol and family history of cancer as risk factors of oral squamous cell carcinoma: Case-Control Retrospective Study. / G.Tenore, A.Nuvoli, A.Mohsen, et al // Appl Sci, - 2020. v.10, - p.3896.

and treatment, the five-year survival rate for oral cavity cancer remains low. Survival rates can vary depending on factors such as the anatomical location and stage of the tumour at the time of diagnosis. If the tumour is diagnosed at an early stage, the survival rate is approximately 80-90%, which limits not only the extent of surgical treatment but also the use of adjuvant therapy.<sup>7,8</sup>

Pharyngeal cancer (PC) is a malignant tumour located in the entrance area of the larynx. The symptoms of this malignant tumour appear late due to the anatomical structure of the pharynx, and it is often diagnosed at a late stage. In developed countries, the incidence of pharyngeal cancer (PC) is 2.7, while in developing countries, it is 1.7. HPV causes 30% of PC. The incidence rate is high in developed countries such as Europe, North America, Australia, New Zealand, Japan, and South Korea, with rates exceeding 40% (in developing countries, this rate is much lower (<20%), and in many countries, it remains uncertain).<sup>9</sup>

In recent years, the incidence of Pharyngeal cancer (PC) has been increasing among young people worldwide, with approximately 6% of cases recorded in individuals under the age of 45. In some regions of the world, 20% of pharyngeal cancer (PC) cases are diagnosed before the age of 30, especially in men. In the USA, pharyngeal cancer (PC) is recorded approximately 20 times more frequently among African Americans than white youths. Generally, this malignant tumour is found 4-5 times more frequently in men than in women.<sup>10</sup>

Thus, the high death rate of oral cavity cancer and pharyngeal

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<sup>7</sup> Sinevici, N. Oral cancer: Deregulated molecular events and their use as biomarkers / N.Sinevici, J.O'sullivan // ORAL ONCOLOGY, -2016. v.61, -p.12-18.

<sup>8</sup> Mohammed, S.. Evaluation of a low-cost, portable imaging system for early detection of oral cancer / S.R.Mohammed, N.Ingole, D.Roblyer [et al.]// Head Neck Oncol., - 2010. v.2, -p. 10

<sup>9</sup> Bray, F. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. / F.Bray., J.Ferlay, İ.Soeerjomataram, et al // CA Cancer J Clin., -2018. v.68, -p.394-424.

<sup>10</sup> de Camargo, C. International incidence of oropharyngeal cancer: a population-based study. / de Camargo Cancela M, de Souza DL, Curado MP. // Oral Oncol. - 2012. v.48(6), -p.484-90.

cancer (PC) highlights the global significance of this issue. The study of risk factors leading to the development of these malignant tumors and the timely implementation of preventive measures are of special importance. Given the lethality of the disease, the search for reliable prognostic criteria that determine early diagnosis and treatment strategies is of great importance.

In Azerbaijan, the lack of comprehensive research on the prevalence of oral cavity cancer and pharyngeal cancer highlights the significance of this dissertation work.

**The research aims** to study the patterns of spread and identify the risk factors contributing to the prevalence of oral cavity cancer and pharyngeal cancer in the administrative regions of the Republic of Azerbaijan.

**Objectives of the research:**

1. Identification of the epidemiological features of oral cavity cancer and pharyngeal cancer in different regions of the Republic.

2. Study of the morbidity and mortality rates of oral cavity cancer and pharyngeal cancer in Baku.

3. Identification of significant risk factors in the development of oral cavity cancer and pharyngeal cancer.

4. Development of practical recommendations for the early prevention and diagnosis of oral cavity cancer and pharyngeal cancer.

**Materials and methods:**

In the research work, the morbidity and mortality rates of oral cavity cancer and pharyngeal cancer, depending on gender and age, have been analysed in different administrative regions of the Republic of Azerbaijan during the years 2019-2023. When analyzing the quantitative indicators of morbidity, the incidence rate, age-standardized rate, injury and aggressiveness indicators, as well as the 5-year survival rate, were calculated. The calculation of statistics was performed according to the recommendations of the WHO, the method for defining epidemiological parameters, as well as in accordance with the rules of medical statistics. Smoking and alcohol consumption have been identified as the main risk factors for the development of oral cavity cancer. To identify these factors, the odds ratio (OR) was calculated with a 95% confidence interval (CI).

### **Key provisions presented for defence:**

1. In different regions of the Republic, epidemiological features should be considered as the basis for implementing early prevention measures for oral cavity cancer and pharyngeal cancer.

2. In regions where a high level of morbidity has been identified, the aspects of oral cavity cancer and pharyngeal cancer morbidity should be considered based on gender and age.

3. In the development of oral cavity cancer, factors such as long-term smoking and alcohol consumption are considered critically significant.

### **Scientific innovations of the research.**

The results of the research reflect the morbidity and mortality rates of oral cavity cancer and pharyngeal cancer in different administrative regions of the Republic of Azerbaijan, and additionally, the regions with the highest and lowest incidence rates have been identified. The epidemiological features of oral cavity cancer and pharyngeal cancer have been identified based on gender and age. Long-term smoking and alcohol consumption have been identified as significant factors in the risk of developing oral cavity cancer.

### **Practical importance of the research.**

The conducted research plays a key role in developing essential measures for the early prevention and diagnosis of oral cavity cancer and pharyngeal cancer in administrative regions with high incidence rates. Additionally, it will provide an opportunity to detect these malignant tumours promptly, ensuring effective treatment.

### **Approbation of the dissertation:**

The primary dissertation materials were presented and discussed at international scientific practical conferences (online) “Новое в хирургии” (Minsk 2019), at the 11th Congress of CIS and Eurasian Oncologists and Radiologists (Kazan 2020), at the II International Karabakh Congress of Applied Sciences 2021, and at the Azerbaijan Oncologists Society meeting (Baku 2023)

The results of the dissertation were reported and discussed at the interdepartmental meeting of National Center of Oncology of the Ministry of Health of the Republic of Azerbaijan (13 December 2024, Protocol N2), at the scientific seminar of the FD 1.02 Dissertation

Council operating under NCO of the Ministry of Health of the Republic of Azerbaijan (12 June 2025, protocol N1).

The most important theoretical and practical provisions of the dissertation have been reflected in 13 scientific works. In total, 7 articles and 6 theses have been published. Scientific works on the dissertation topic have been printed both internationally (2 articles, 3 theses) and in Azerbaijan (5 articles, 3 theses).

**The name of the institution where the dissertation was carried out.**

The dissertation was carried out at the National Oncology Center of the Ministry of Health of the Republic of Azerbaijan.

**The structure and volume of the dissertation:**

The dissertation materials are explained in a 136-page computer text ( 214.874 characters), including introduction (9.794 characters), literature review (63.162 characters), in the chapter “Materials and methods” (17.072 characters), personal research in three chapters (81.747 characters), conclusion (37.495 characters), results and practical recommendations (2.625 characters). The list of references covers 192 sources (39.599 characters). The dissertation is illustrated with 26 tables and 6 figures.

## **MATERIALS AND METHODS OF THE RESEARCH**

In the research, the morbidity rate of oral cavity cancer and pharyngeal cancer during 2019-2023 was determined. To study the morbidity and mortality rates of oral cavity cancer and pharyngeal cancer in the Republic, a retrospective and prospective analysis of the medical records of patients treated with these diagnoses was conducted at the National Oncology Center. Additionally, to address the assigned tasks, the materials from Report Form N 7 “Report on Malignant Tumour “confirmed by the State Statistical Committee of the Republic of Azerbaijan, the Republic Hygiene and Epidemiology Center and the in-district oncology dispensaries were collected and analysed. The calculations were assessed according to the following indicators.

- incidence rate (per 100.00 population);
- proportion rate (in %);
- age-standardised incidence rate (per 100.000 population);

- Mortality rate (per 1000 population);
- case fatality rate (in %);
- prevalence rate (per 100.000population);
- Aggressiveness (accuracy) index
- The five-year survival rate (in %).

The indicators listed above were calculated using the methods suggested by the World Health Organization.

The age -strandardized incidence rate of OC (oral cavity cancer) and PC (pharyngeal cancer) was determined using the direct standardization method and consisted of three stages:

1. Calculation of the incidence rate per 100,000 population,
2. Calculation of average standard population,
3. Calculation of age-standardized incidence rates.

For solving the posed problem, the territory of the Republic is divided into 11 administrative regions.

In our research, smoking and alcohol use are identified as the main risk factors for the development of oral cavity cancer. For this purpose, the case-control research method was used. The case group consisted of 100 patients diagnosed with oral cavity cancer who received surgical treatment and radiotherapy at the National Oncology Center from 2018 to 2022. The control group consisted of 150 patients who visited the outpatient department of the National Oncology Center and did not have a diagnosis of malignant tumours. Women with the diagnosis of oral cavity cancer were not included in either the research or the control group because, in Azerbaijan, women do not commonly drink alcohol or smoke, which would interfere with an objective evaluation.

To evaluate the risk factors, the odds ratio (OR) was calculated along with the 95 % confidence intervals (CI). The collected data was organized into tables and analyzed using SPSS software, version 16.

### **Results and discussions of the research**

In our research, we analyzed the five-year trend( 2019-2023) in the incidence of oral cavity cancer and pharyngeal cancer in the Republic of Azerbaijan. Over this period, there was a slight increase in the incidence of oral cavity cancer. The incidence rate among men

rose from 1,4<sup>0</sup>/<sub>0000</sub> to 1,9<sup>0</sup>/<sub>0000</sub>, while among women, it increased from 1,0<sup>0</sup>/<sub>0000</sub> to 1,2<sup>0</sup>/<sub>0000</sub>. The prevalence of this cancer was 1,8 times higher in men than in women, and the proportion rate among men was between 1,2% and 1,4% whereas among women, it varied between 0,6%-0,8%. While analysing the prevalence rate, it was observed that this rate showed a slight rise in both men and women. This rate increased among men from 6,0<sup>0</sup>/<sub>0000</sub> in 2019 to 6,8<sup>0</sup>/<sub>0000</sub> in 2023, while among women, it ranged between 3,9<sup>0</sup>/<sub>0000</sub> -4,4<sup>0</sup>/<sub>0000</sub> (Table 1).

**Table 1**

**The incidence dynamics of oral cavity cancer during 2019-2023  
in Azerbaijan among men and women**

Years	Proportion rate (%)		Incidence rate (per 100.000 population)		Prevalence rate (per 100.000 population)	
	male	female	male	female	male	female
2019	1,2 %	0,8%	1,4 <sup>0</sup> / <sub>0000</sub>	1,0 <sup>0</sup> / <sub>0000</sub>	6,0 <sup>0</sup> / <sub>0000</sub>	4,0 <sup>0</sup> / <sub>0000</sub>
2020	1,4 %	0,6%	1,6 <sup>0</sup> / <sub>0000</sub>	0,7 <sup>0</sup> / <sub>0000</sub>	6,4 <sup>0</sup> / <sub>0000</sub>	3,9 <sup>0</sup> / <sub>0000</sub>
2021	1,3%	0,7%	1,8 <sup>0</sup> / <sub>0000</sub>	1,1 <sup>0</sup> / <sub>0000</sub>	6,7 <sup>0</sup> / <sub>0000</sub>	4,1 <sup>0</sup> / <sub>0000</sub>
2022	1,2%	0,7%	1,8 <sup>0</sup> / <sub>0000</sub>	1,1 <sup>0</sup> / <sub>0000</sub>	6,8 <sup>0</sup> / <sub>0000</sub>	4,3 <sup>0</sup> / <sub>0000</sub>
2023	1,3%	0,8%	1,9 <sup>0</sup> / <sub>0000</sub>	1,2 <sup>0</sup> / <sub>0000</sub>	6,8 <sup>0</sup> / <sub>0000</sub>	4,4 <sup>0</sup> / <sub>0000</sub>

To assess the general characteristics of disease incidence across different age groups in the population age-standardized incidence rates were calculated. In our research work, regardless of age, the standardized incidence rate of oral cavity cancer (OCC) was higher among men compared to women. Specifically, over 5 years this rate varied between 1,4<sup>0</sup>/<sub>0000</sub> and 1,7<sup>0</sup>/<sub>0000</sub> among men, and between 0,9<sup>0</sup>/<sub>0000</sub> and 1,7<sup>0</sup>/<sub>0000</sub> among women. For both sexes, the peak incidence of OCC was observed in the 50-59 age group, with rates of 0,4<sup>0</sup>/<sub>0000</sub> - 0,6<sup>0</sup>/<sub>0000</sub> in men and 0,3<sup>0</sup>/<sub>0000</sub> in women.

In the 5-year trend of pharyngeal cancer (PC) incidence, a slight increase was observed among men (respectively 1,1<sup>0</sup>/<sub>0000</sub> to 1,3<sup>0</sup>/<sub>0000</sub>), while a slight decrease was noted among women (from 0,7<sup>0</sup>/<sub>0000</sub> to 0,4<sup>0</sup>/<sub>0000</sub>). Regarding the prevalence rate of the illness, a slight decrease

was recorded in men (from 6,9<sup>0</sup>/<sub>0000</sub> to 6,7<sup>0</sup>/<sub>0000</sub>), while a slight increase was observed in women (from 4,0<sup>0</sup>/<sub>0000</sub> to 4,2<sup>0</sup>/<sub>0000</sub>) (Table 2).

**Table 2**

**The Trends of Pharyngeal Cancer Incidence Among Men and Women in the Republic of Azerbaijan in 2019–2023**

Years	Proportion Rate (%)		Incidence rate (per 100.000 population)		Prevalence rate (per 100.000 population)	
	Man	Woman	Man	Woman	Man	Woman
2019	0,9	0,4	1,1	0,5	6,9	4,0
2020	1,1	0,6	1,2	0,7	6,4	3,9
2021	0,9	0,4	1,2	0,5	6,9	4,1
2022	0,8	0,4	1,0	0,6	6,8	4,3
2023	1,0	0,3	1,3	0,4	6,7	4,2

The analysis of the age-standardized incidence rate of pharyngeal cancer during these years shows that the peak incidence among men occurred in the 50-59 and 60-69 age groups, and among women, it was in the 50-59 age group. In men aged 50-59, this rate ranged between 0,2-0,4, whereas in women, it ranged between 0.1-0.2.

According to the results of our research, we can conclude that during the years 2019-2023, a slight steady increase was observed in the incidence of both localized cancers and the peak incidence rate in both sexes was mainly observed in the 50-59 age group.

The analysis of the incidence rates of all oral cavity cancer and pharyngeal cancer patients in different regions showed that this rate for oral cavity cancer was higher in men, particularly in the Absheron and Sheki Zagatala administrative regions (2,5<sup>0</sup>/<sub>0000</sub> and 2,9<sup>0</sup>/<sub>0000</sub>), in women, it was highest in the Quba Xachmaz region (2,2<sup>0</sup>/<sub>0000</sub>). The lowest incidence rates were recorded in the Lenkeran-Astara and Mountain Shirvan regions (0,8<sup>0</sup>/<sub>0000</sub> and 0,6<sup>0</sup>/<sub>0000</sub>). The incidence rate of PC, the highest in both men and women, was recorded in the Lenkeran-Astara region, 1.9<sup>0</sup>/<sub>0000</sub> and 1.3<sup>0</sup>/<sub>0000</sub> (Table 3).

**Table 3**

**The incidence rate of OCC and PC in different regions of the Republic of Azerbaijan (per 100,000 population)**

Region	Oral cavity cancer		Pharyngeal cancer	
	male	female	male	female
Baku	1,9	1,3	1,2	0,3
Absheron	2,5	1,0	1,0	1,4
Aran	1,1	0,7	0,7	0,8
Mountain Şirvan	0,6		0,6	
Ganja Qazakh	1,5	1,2	0,5	0,3
Quba- Khachmaz	1,4	2,2	1,1	0,4
Lenkeran-Astara	0,8	1,7	1,9	1,3
Nakhchivan	2,6			
Shaki Zaqatala	2,9	0,6	1,6	0,3

While calculating the prevalence rate of OCC and PC in different regions of the Republic, it was found that during the research, this rate was the highest among men in the Mountain Shirvan region (19,3<sup>0</sup>/<sub>0000</sub>), among women in Absheron (10,7 <sup>0</sup>/<sub>0000</sub>) administrative regions. The lowest prevalence rate for both men and women was recorded in Nakhchivan at 4,8 <sup>0</sup>/<sub>0000</sub> and 1,7 <sup>0</sup>/<sub>0000</sub>. (Table 4).

**Table 4**

**The prevalence rate of OCC and PC in different regions of the Republic of Azerbaijan (per 100,000 population)**

Region		
	male	female
Baku	14,2	8,6
Absheron	12,6	10,7
Aran	10,2	7,2
Mountain Shirvan	19,3	6,3
Ganja -Qazakh	11,7	9,6
Quba - Khachmaz	12,42	9,38
Lenkeran Astara	11,0	6,0
Nakhchivan	4,8	1,7
Shaki- Zaqatala	10,8	5,8

It is known that analyzing the mortality rate of malignant tumours may involve certain mistakes. However, from an epidemiological perspective, the mortality rate is considered a valuable source of information about trends in population health. The lethality rate, in turn, is regarded as a measure of disease severity.

While analyzing the mortality rate, the highest OCC and PC mortality rates were recorded among men in the Lankaran-Astara region and women in Nakhchivan region. (0,06<sup>0</sup>/<sub>00</sub> and 0,2<sup>0</sup>/<sub>00</sub>). The lowest mortality rates were recorded among men in the Ganja - Qazakh and Aran administrative regions (both 0,01<sup>0</sup>/<sub>00</sub>), among women in the Aran and Mountain Shirvan regions (both 0,006<sup>0</sup>/<sub>00</sub>) (Table 5).

**Table 5**

**Mortality rate of OCC and PC in different regions of the Republic of Azerbaijan (per 10.000 population)**

Region	Mortality rate (per 10.000 population)	
	male	female
Baku	0.02	0,01
Absheron	0.03	0,01
Aran	0.01	0,006
Mountain Shirvan	0.02	0,006
Ganja - Qazakh	0.01	0,01
Quba Khachmaz	0.03	0,01
Lankaran Astara	0,6	
Nakhchivan	0,09	0,2
Sheki - Zagatala	0,1	0,13

The research determined that there is a significant difference in case fatality rates across different regions. The highest case fatality rate among men was recorded in the Mountain Shirvan and Absheron regions (both 75%), and the lowest was observed in Baku and Nakhchivan economic regions (19,4% and 16,7%). Among women, the highest case fatality rate was recorded in the Sheki-Zagatala (66%), and the lowest was in the Absheron economic region (14,3%).

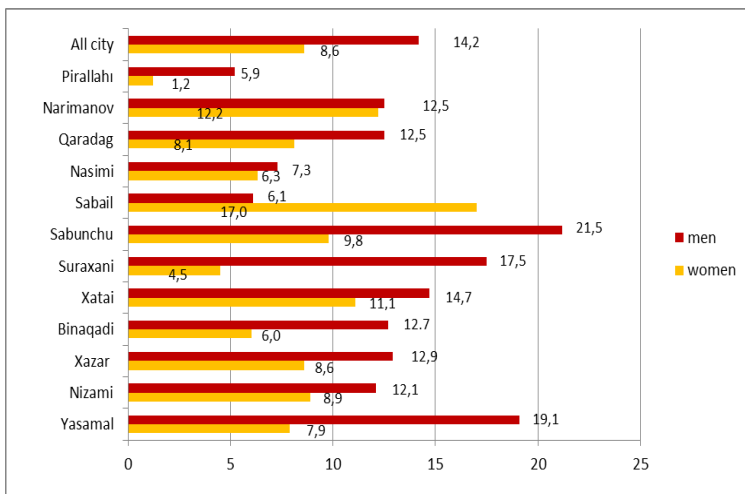
The analysis of the five-year survival rate determined that the highest rates were recorded in Baku and Absheron economic regions (14,7% and 45,1%), and the lowest rate was observed in the Aran economic region at -26,5%.

During the study, the epidemiological characteristics of OCC and PC were also examined in the administrative-territorial districts included in the republic's economic regions.

Baku consist of 12 administrative-territorial districts (Binegedi, Qaradag, Khazar, Sabail, Sabunchu, Surakhani, Narimanov, Nasimi, Nizami, Pirallahi, Khatia, Yasamal). In the studied region, the incidence rate of OCC among men was the highest in Pirallahi ( $9,6^0/0000$ ), Surakhani ( $4,6^0/0000$ ), and Khatai ( $3,9^0/0000$ ) districts, while the lowest rate was recorded in the Nasimi district ( $0,9^0/0000$ ). Among women, the highest incidence rate was observed in the Sabail district  $-3,8^0/0000$ ; while the lowest incidence rate was in the Binegedi district,  $0,7^0/0000$ . Overall, in the city, the incidence rate of oral cavity cancer was  $1,3^0/0000$  among women, but among men it was  $1,9^0/0000$ .

In the studied region, the incidence rate of PC varied between men and women. Among men, the highest incidence rate of pharyngeal cancer was recorded in the Qaradag district  $-6,3^0/0000$ , and the lowest rate was in Nasimi district  $-0,9^0/0000$ . Among women, the highest incidence rate of pharyngeal cancer was in Nasimi district ( $1,8^0/0000$ ). Overall, in Baku, the incidence rate of pharyngeal cancer was  $0,3^0/0000$  among women and among men was  $1,2^0/0000$ .

The prevalence rates of oral cavity cancer (OCC) and pharyngeal cancer (PC) among men and women in Baku city were determined. According to Diagram 3.1, the highest prevalence rate among men was recorded in the Sabunchu district ( $21,2^0/0000$ ), and the lowest rate was observed in the Sabail and Pirallahi districts ( $6,1^0/0000$  and  $5,9^0/0000$ ). An analysis of the overall prevalence of OCC and PC among women showed that the highest was in the Sabail district ( $17,0 /0000$ ), and the lowest was recorded in the Pirallahi district at  $1,2^0/0000$ . In Baku, the prevalence rates of OCC and PC were  $14,2^0/0000$  among men and  $8,6^0/0000$  among women.



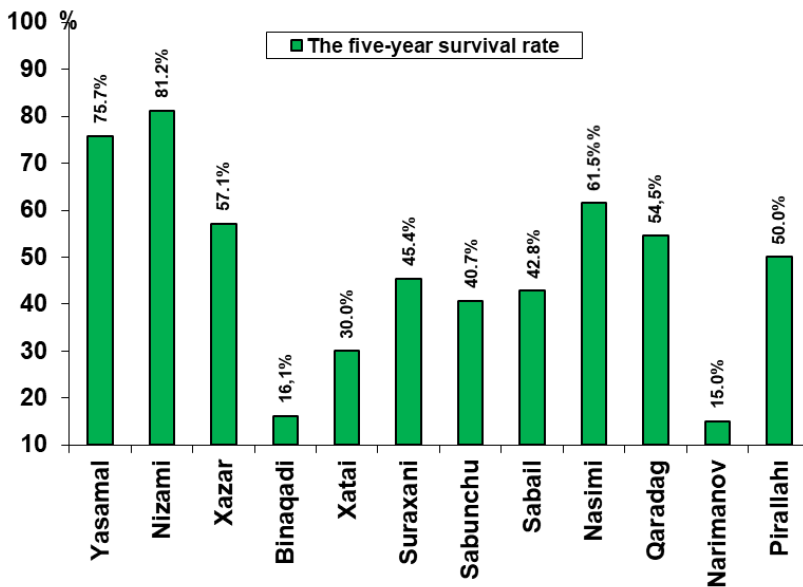
**Picture 1. Overall prevalence rates of OCC and PC among men and women in Baku**

The analysis of the overall mortality rate showed that the lowest rate among men was recorded in the Sabunchu district ( $0,009^{0/00}$ ), and among women in the Surakhani district ( $0,009^{0/00}$ ). The highest rates among men were observed in the Sabail and Surakhani districts ( $0,04^{0/00}$  and  $0,04^{0/00}$ ), and among women were in the Sabail district ( $0,06^{0/00}$ ). Overall, in Baku city, this rate among men was  $0,02^{0/00}$ , and among women was  $0,01^{0/00}$ .

To determine the severity level of the illness, the case fatality rate for OCC and PC was calculated in the studied region. Across Baku, this rate among men was 19,4 %, and 15,8% among women.

An analysis was conducted on the five-year survival rate for both types of cancer across Baku. Overall, the five-year survival rate in the city was 45,1%. In the Nizami, Yasamal, Nesimi, Khazar, Qaradag and Pirallahi districts, this rate was 50,0% or higher (see picture 2).

To determine the activity level of screening programs (the accuracy index of registration), "aggressiveness" indicators were calculated. Among men, the highest aggressiveness indicator was recorded in the Bineqedi district 4,0, and the lowest was in the Garadagh district (0,2). Among women, this indicator was the highest in Binaqadi (3,3), the lowest in Nasimi district (1,1).



**Picture 2. The five-year survival rates of OCC and PC in different districts of Baku.**

While calculating the age-standardized incidence rate of OCC in Baku, it was found that among women, the peak incidence occurred in the 60- 69 and 70 + age groups. The age-standardized incidence rates in these groups were  $0,4^0/0000$  and  $04^0/0000$ . Regardless of age, the overall age-standardized incidence rate for women was  $1,3^0/0000$ . Among men, the highest incidence rate of OCC was observed in the 50-59 age group, where the age-standardized incidence rate was  $0,7^0/0000$ . The overall age-standardized incidence rate for men, regardless of age, was  $1,9^0/0000$ .

While calculating the age-standardized incidence rate of PC in Baku, it was determined that there were no recorded cases among men and women under the age of 40. Starting from the age of 40, the incidence rate began to rise. Among men, the peak standardized incidence rate was observed in the 40-49 and 50-59 age groups, and it reached  $0,4^0/0000$  in both age groups.

The Aran economic region is one of the largest regions in the Republic. In this region, OCC has the lowest proportion in the overall

structure of malignant tumours. The proportion rate across the region was 1,0% for men and 0,6% for women. While calculating the incidence rate of OCC, the highest rates among men and women were recorded in the Beylegan district ( $9,6^{0/0000}$ ) and Hacıqabul district ( $5,2^{0/0000}$ ), while the lowest rates were observed in Salyan ( $1,4^{0/0000}$ ) and Sabirabad ( $1,1^{0/0000}$ ). The total regional incidence rate among men was  $1,1^{0/0000}$ , and among women was  $0,7^{0/0000}$ .

In the Aran economic region, PC accounts for an even smaller proportion of malignant tumours than oral cavity cancer. The proportion rate of PC was 0,6 % among men and 0,7% among women across the region. While calculating the incidence rate of PC, the highest rate among men was recorded in Salyan,  $2,9^{0/0000}$ , and the lowest was in Sabirabad,  $1,1^{0/0000}$ . Among women, the highest incidence rate was observed in the Imishli district ( $3,1^{0/0000}$ ), and the lowest in the Salyan district ( $1,4^{0/0000}$ ). Across the entire region overall incidence rate of PC was  $0,7^{0/0000}$  among men and among women was  $0,8^{0/0000}$ .

In the Aran economic region, the calculation of the prevalence rate for both localizations revealed that the highest rates among men were recorded  $22,9^{0/0000}$  -  $20,3^{0/0000}$  in the Zerdab and Neftchala districts, and among women was in the Beyleqan district ( $20,6^{0/0000}$ ). Notable gender disparities were identified in some districts. Among men, this rate was  $20,3^{0/0000}$  in Zerdab,  $3,4^{0/0000}$  was among women (6 times less). Overall, across the region, this rate was  $10,2^{0/0000}$  and  $7,2^{0/0000}$  higher among men than among women.

In the studied region, across both localizations, the analysis of the five-year survival rate revealed that it was relatively low, standing at 26,5%.

In the Aran economic region, analysis of the age-standardized incidence rate across both localizations revealed that the highest incidence among both men and among women occurred in the 50-59 and 60-69 age groups. Unlike other regions, cases were also recorded in the 0–18 and 18-29 age groups, indicating a broader age distribution of incidence in this region.

In the Ganja-Qazakh economic region, the proportion of OCC within the overall structure of malignant tumours was 1,5% among men, and 0,9% among women. The highest incidence rate among men

was observed in the Qazakh district, amounting  $-2,1^{0}/_{0000}$ , and among women the highest rate was recorded in the Samukh district at  $6,9^{0}/_{0000}$ . Across the entire region, the average incidence rate among men was  $1,5^{0}/_{0000}$  only in the Mountainous Shirvan and Lankaran-Astara economic regions. Among women, the overall incidence rate was  $1,2^{0}/_{0000}$ , and this rate was the second highest in the Republic after Baku.

The calculation of the proportion rate of PC in the Ganja-Qazakh economic region revealed that the overall proportion rate was 0,4% among men and 0,2% among women. The overall incidence rate in the region remained low, at  $0,5^{0}/_{0000}$  among men and  $0,3^{0}/_{0000}$  among women. Among men, this rate was relatively higher in the Aghstafa and Qazakh districts, where it reached  $4,6^{0}/_{0000}$  and  $4,1^{0}/_{0000}$ .

The analysis of the overall prevalence rate across both localizations in the Ganja-Qazakh economic region revealed that the highest prevalence rate among men was recorded in Ganja ( $22,1^{0}/_{0000}$ ), and the lowest was in the Tovuz and Goygol districts ( $3,4^{0}/_{0000}$  and  $3,1^{0}/_{0000}$ ). Among women, the highest prevalence rate was noted in Ganja ( $19,3^{0}/_{0000}$ ). Across the entire region, the prevalence rate of oral cavity cancer and pharyngeal cancer was  $11,7^{0}/_{0000}$  among men, while among women was  $9,6^{0}/_{0000}$ .

While studying the mortality rates across the administrative districts of the Ganja-Gazakh economic region, revealed that the overall entire region rate for both genders was equal and was  $0,01^{0}/_{00}$ . In the region, the case fatality rate was higher among women than among men, and it was 50,0% and 30,8%. The analysis of the materials of the five-year survival rate indicated that the overall regional figure was higher than the Aran economic region, Baku city and the Mountainous Shirvan region (41,8%). In both localizations the highest incidence for both men and women was observed in the 50-59 age groups. Across the entire region, the age-standardized incidence rate of oral cavity cancer and oropharyngeal cancer was  $2,0^{0}/_{0000}$  among men and  $1,3^{0}/_{0000}$  among women.

There are five administrative districts (Devechi, Quba, Khachmaz, Qusar and Siyazan) in the Quba-Khachmaz economic region of the Republic. Statistical analysis revealed that the proportion

rate of PC across the region was lower compared to the Lenkeran-Astara and Sheki-Zaqatala economic regions, comprising 0,8% among men, 0,3% among women. The proportion rate of OCC was lower compared to other regions, with a regional rate of 11%. Notably, unlike in other regions, the proportion rate among women was higher than among men. However, this incidence rate across regions was 1,8%, and the highest rate was 4,1%, which was observed in Quba

An analysis of the incidence rate in the Quba-Khachmaz economic region revealed that the incidence of OCC among women was higher than among men. The overall regional rate was 1,4<sup>0</sup>/<sub>0000</sub> for men and 2,2<sup>0</sup>/<sub>0000</sub> for women. In terms of PC, the incidence rate across the region was higher among men (1,1<sup>0</sup>/<sub>0000</sub>), while among women, it was 0,4<sup>0</sup>/<sub>0000</sub>.

When calculating the prevalence rate, it was found that the rate across the region was relatively higher in the Aran and Ganja-Qazakh economic regions (12,42<sup>0</sup>/<sub>0000</sub>). (Table 6)

**Table 6**

**The prevalence rate of OCC and PC among men and women in the Quba-Khachmaz economic region (per 100000 population)**

Region	Prevalence rate( per 100.000 population)	
	male	female
Qusar	18,3 <sup>0</sup> / <sub>0000</sub>	4,1 <sup>0</sup> / <sub>0000</sub>
Khachmaz	15,7 <sup>0</sup> / <sub>0000</sub>	9,0 <sup>0</sup> / <sub>0000</sub>
Quba	14,9 <sup>0</sup> / <sub>0000</sub>	10,7 <sup>0</sup> / <sub>0000</sub>
Shabran	13,2 <sup>0</sup> / <sub>0000</sub>	13,7 <sup>0</sup> / <sub>0000</sub>
Siyazan	-	9,4 <sup>0</sup> / <sub>0000</sub>
Region	12,42 <sup>0</sup> / <sub>0000</sub>	9,38 <sup>0</sup> / <sub>0000</sub>

Statistical analysis showed that in the Quba-Khachmaz region, the five-year survival rate for both localizations was 38,84%. The calculation of standardised indicators for both localisations indicated that these

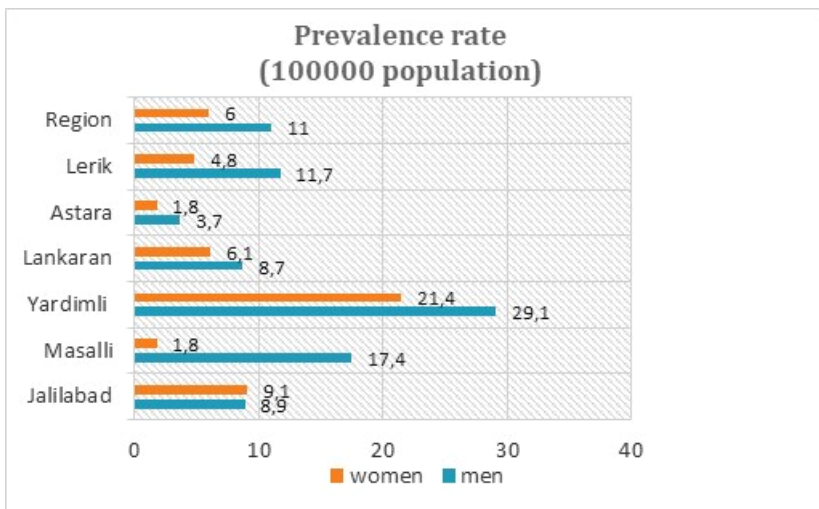
cancers were not observed in individuals under 40 years of age in the studied region. Among women, the highest incidence of oral cavity cancer was recorded in the 70+ age group. Across the entire region, the age-standardised incidence rate of oral cavity cancer and pharyngeal cancer was higher among women  $1,9^0/0000$ , than men  $1,5^0/0000$ .

The economic region of Lankaran in Azerbaijan includes the administrative districts of Astara, Lankaran, Lerik, Yardimli, Masalli, and Jalilabad. The statistical analysis revealed that the proportion rate among men in the region was 0.9%, while among women, it was - 1.2%. In this region, the highest proportion rate among men was in Jalilabad (1.8%), whereas among women it was in Lankaran (2.2%). While analysing the incidence rate, it was determined that the disease rate was higher among women than men, with a total rate of  $1,7^0/0000$  across the entire region. This rate was  $0,8^0/0000$  among men.

In the Lankaran economic region, the overall proportion rate of pharyngeal cancer was higher in men (2,0%) than women (1,5%). Calculating the incidence rate revealed that the rate among men, the rate was higher than among women, and it also exceeded the rates recorded in other regions. Across the entire region, the incidence rate was  $1,9^0/0000$  among men and among women was  $-1,3^0/0000$ ,

In the Lankaran economic region, calculation of the prevalence rate for oral cavity cancer and pharyngeal cancer across both genders showed that this rate did not differ significantly from the rates in other economic regions of the Republic. Across the entire region, the prevalence rate among men was  $11,0^0/0000$ , and among women was  $6,0^0/0000$  (Figure 3).

In the administrative-territorial districts of the Lankaran economic region, analysis of the overall mortality rate revealed that the highest rate among men was  $2,9^0/0000$  in Yardimli, and the lowest was  $0,9^0/0000$  in the Lankaran district. The overall regional mortality rate was 0,6%. The calculation of standardised indicators for both localisations showed that, in the studied region, cases of oral cavity cancer were not observed in individuals under the age of 40-49, and pharyngeal cancer was not observed in individuals under 30-39 years of age. The peak incidence was recorded in the 50-59 and 60-69 age groups.



**Figure 3. The prevalence rate of oral cavity cancer and pharyngeal cancer in different districts of the Lankaran-Astara economic region (per 100,000 population)**

In the Shaki-Zaqatala economic region, the incidence of oral cavity cancer and pharyngeal cancer was higher in men than in women. The highest proportion of oral cavity cancer among men was recorded in the Qakh district (4.9%), while PC was noted in the Zaqatala district (2.9%). The highest incidence rate of OCC among men was observed in the Qakh district (10.8<sup>0</sup>/<sub>000</sub>), whereas among women, it was recorded in the Oguz district (4.6<sup>0</sup>/<sub>000</sub>). Analysis of the incidence rate of PC showed the highest rates among men in the Zaqatala (4.7<sup>0</sup>/<sub>000</sub>) and Qakh districts (3.6<sup>0</sup>/<sub>000</sub>). Across the entire region, the incidence rates of OCC and PC among men were 2.9<sup>0</sup>/<sub>000</sub> and 1.6<sup>0</sup>/<sub>000</sub>, while among women, they were 0.6<sup>0</sup>/<sub>000</sub> and 0.3<sup>0</sup>/<sub>000</sub>.

An analysis of cancer prevalence across both localizations showed that this rate was significantly higher in Balakan among men (32,8<sup>0</sup>/<sub>0000</sub>) compared to other regions. Overall, in the region, the cancer prevalence rate among men was 10,3<sup>0</sup>/<sub>0000</sub>, while among women, it was 5,8<sup>0</sup>/<sub>0000</sub>. The case fatality rate was found to be more than 2,2 times higher among women across the region. Specifically, the case fatality rate was 66,6% for women and 30,8 % for men.

The calculation of the age-standardized incidence rate for oral cavity cancer among men in the Sheki-Zaqatala economic region showed no recorded cases up to the age of 30. Among other age groups, the incidence rate remained consistent. For women, cases began to appear in the 60-69 age group, with the highest incidence observed in the 70+ age group. The incidence of pharyngeal cancer was recorded starting in the 40-49 age group, and among men, the highest incidence rates were observed in this age group and the 50-59 age group. Among women, it was recorded only in the 60-69 age group.

At the final stage of our research, smoking and alcohol consumption were evaluated as risk factors in the development of oral cavity cancer. As mentioned above, 100 men with a histopathologically confirmed diagnosis of oral cavity cancer were included in the study group. Their ages ranged from 35 to 80 years, with a mean age of  $61 \pm 5.5$  years. The control group ( $n=150$ ) included men aged 40 to 82 years, with a mean age of  $63 \pm 3.8$  years. The highest incidence of oral cavity cancer was observed in the 46-55 and 56-65 age groups.

According to the research, we observed that both factors significantly increase the risk of developing oral cavity cancer. Alcohol consumption increases the risk of cancer by 4,3 times (OR=4.3, 95% CI=2.411- 7.666;  $p<0.01$ ). Our research showed that the risk of disease development among current alcohol users was 3.2 times higher compared to former users. Currently, the OR for alcohol users is 7,2 (95% CI=3.741-13.954;  $p<0.05$ ), but for former alcohol users, it was 2,2 (95% EI=1.112-4.474;  $p<0.01$ ) (table 7).

Also, the results of our research showed that the duration of alcohol use also affects the increased risk of oral cavity cancer. Individuals who consumed alcohol for more than 20 years had a significantly higher risk (OR=7,1, 95% CI=3.227-15.670;  $p<0.01$ ) compared to those who consumed alcohol for less than 10 years (OR=2,8, 95% CI= 1.299-5.966;  $p<0.05$ ).

In the research group, a total of 44 patients (44%) consumed only alcohol. Additionally, 22 patients (22%) consumed alcohol, beer and wine, while 11 patients (11%) consumed both beer and alcohol.

**Table 7**

**Alcohol consumption and its association with the development of oral cavity cancer**

Category of alcohol consumption	Case group (abs; %)		Control group (abs; %)		OI (CI 95%)	p
Alcohol users	79	79%	70	46,7%	4.3 (2.411-7.666)	p<0.01
Has used before	24	24%	41	27,3%	2.2 (1.112-4.474)	p<0.01
Currently uses	55	55%	29	19,4%	7.2 (3.741-13.954)	p<0.05
Never or seldom	21	21%	80	53,3%	1	
Duration of alcohol use						
Less than 10 years	19	19%	26	18,6%	2.8 (1.299-5.966)	p<0.05
10-20 years	32	32%	29	20,7%	4.2 (2.097-8.426)	p<0.05
more than 20 years	28	28%	15	10%	7.1 (3.227-15.670)	p<0.01
Never or seldom	21	21%	80	53,3%	1	

The results of our research showed that smoking increases the risk of developing oral cavity cancer by three times. For smokers OR was 3,1:95% CI1.779 - 5.343 (p<0.01). A significant association was observed between the amount of smoking and the risk of developing oral cavity cancer. Smokers who consumed more than two packs of cigarettes per day (OR=5.5, 95% CI=2.662-11.366; p<0.05) had a significantly higher risk of developing oral cavity cancer compared to those who moked less than one pack per day (OR=1.9, 95% CI= 0.919-3.927; p<0.05) and those who smoked 1-2 packs per day (OR=2.8, 95% CI= 1.326-5.702; p<0.05 ) (Table 8).

Additionally, the analysis examined the relationship between the duration of smoking and the increased risk of developing oral cavity cancer. In terms of oral cavity cancer development, smoking for less than 10 years carries the lowest risk (OR=1.5, 95%CI=0.674-3.339;

p <0.05), and smoking for more than 20 years carries the highest risk (OR=4.1, 95% CI=2.121- 8.133; p<0,05).

**Table 8**

**The Association between the amount of cigarette smoking and the risk of developing oral cavity cancer.**

Amount of cigarettes	Case group (abs; %)	Control group (abs; %)	OR (CI95%)	p
Less than 1 pack per day	19 (19%)	30	1.9 (0.919- 3.927)	p <0.05
1-2 packs per day	22 (22%)	24	2.8 (1.326-5.702)	p <0.05
More than 2 packs per day	33 (33%)	18	5.5 (2.662-11.366)	p <0.05
Never smokers	26 (26%)	78 (52%)	1	
Σ	100 (100%)	150 (100%)		

Overall, the results of our study indicate that smoking and alcohol use are significant risk factors for the development of ABX among men in Azerbaijan. Thus, this risk is 4.3 times higher for alcohol consumers and 3,1 times higher for smokers. The length of alcohol and cigarette use was also found to influence the incidence rate of oral cavity cancer. A significant link was observed between the amount of cigarette consumption and the risk of developing oral cavity cancer. A significantly higher risk of oral cavity cancer was observed among consumers who smoked more than 2 packs of cigarettes per day.

These results have important implications for shaping public health policies, strengthening measures to combat these harmful habits, and educating the population. Future studies may further investigate the molecular mechanisms of these risk factors and the role of other potential risk factors.

## Results

1. In the Republic of Azerbaijan, the five-year dynamics of oral cavity cancer showed no significant improvement in either men ( $1,4 \text{ }^0/0000$ - $1,9 \text{ }^0/0000$ ), or women (from  $1,0 \text{ }^0/0000$  to  $1,2 \text{ }^0/0000$ ). The incidence rate among men was 1,8 times higher than among women. In the dynamics of pharyngeal cancer, a decrease was observed among women from  $-0,7 \text{ }^0/0000$  to  $0,4 \text{ }^0/0000$  [7, 12, 13].
2. The incidence rate of oral cavity cancer among men was higher than among women in different regions of the Republic of Azerbaijan, and the highest rate was recorded in the Absheron ( $2,5 \text{ }^0/0000$ ) and Sheki-Zaqatala ( $2,9 \text{ }^0/0000$ ) economic regions. The incidence rate of pharyngeal cancer was higher among men, and the highest rate was observed in the Lankaran-Astara region ( $1,9 \text{ }^0/0000$ ) [1, 3, 5, 8, 9, 10].
3. In Baku, the highest incidence rate of oral cavity cancer among men was recorded in the Pirallahi district,  $-9,6 \text{ }^0/0000$ , but among women, it was in the Sabail district-  $3,8 \text{ }^0/0000$ . The high incidence rate of pharyngeal cancer among men was recorded in Qaradag district  $6,3 \text{ }^0/0000$ , and among women, it was in the Nasimi district  $1,8 \text{ }^0/0000$  [2].
4. The peak incidence of oral cavity cancer for both genders was in the 50-59 age group ( $0,4 \text{ }^0/0000$  for men,  $0,3 \text{ }^0/0000$  for women), while for pharyngeal cancer the highest incidence was observed in the 50-59 ( $3,4 \text{ }^0/0000$  for men,  $1,5 \text{ }^0/0000$  for women) and 60-69 ( $3,4 \text{ }^0/0000$  for men  $1,4 \text{ }^0/0000$  for women) age groups [12, 13].
5. Regular consumption of alcohol for more than 20 years (OR = 7,1, 95% CI=3.227- 15.670;  $p < 0,05$ ) and smoking (OR=4,2, 95% CI=2.121- 8.133;  $p < 0,05$ ) are considered significant risk factors for the development of oral cavity cancer [11].

## Practical Recommendations

1. It is advisable to identify the order of organisations addressing oral cavity cancer and pharyngeal cancer in the Republic of Azerbaijan, the incidence rate, and the results of mortality rates across all administrative territorial regions. Based on the findings, it is also prudent to prioritise and implement early prevention measures across these regions.

2. The regions with the highest rates of oral cavity cancer and pharyngeal cancer among individuals over 50 years old demand increased attention and specialised oncology care from doctors.
3. Raising public awareness and control about risk factors, such as alcohol consumption and smoking, among the youth in Azerbaijan, while addressing both medical and social aspects of early prevention of oral cavity cancer, can significantly decrease the risk of cancer development.

### **List of published scientific works on the topic of the dissertation**

1. Марданлы, Ф.А. Заболеваемость и смертность от злокачественных новообразований губы, полости рта и глотки в Шеки-Загатальском экономическом регионе / Ф.А.Марданлы, А.Н.Мамедов // *Azərbaycan onkologiya jurnalı*, - 2018, №2, - s. 71-73.
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## List of Abbreviations

OCC – oral cavity cancer

PC – pharyngeal cancer

OR – odds ratio

CI – confidence interval

A handwritten mark or signature in blue ink, consisting of a large, stylized loop followed by a smaller loop and a short horizontal stroke.

The defense will be held on 19 september 2025 in 14<sup>00</sup> at the meeting of the Dissertation Council FD 1.02 of the Supreme Attestation Commission under the President of the Republic of Azerbaijan, operating at the National Center of Oncology of the Ministry of Health of the Republic of Azerbaijan.

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Electronic versions of dissertation and its abstract are available on the [www.aak.gov.az](http://www.aak.gov.az).

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