

# Contribution of Demographic and Environmental Factors in Oral Cancer Incidence in Basrah City: Retrospective Study (2005-2025)

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## Abstract

**Background:** Basrah city is one of the most affected areas by oral cancer, with increasing concern due to the rising number of reported cases. Cases are spread across different locations, communities, and regions within Basrah, suggesting multiple potential contributing factors. **Methods:** A total of 411 oral cancer cases were recorded in Basrah city (Iraq/Basrah), including data on age, sex, address, year of diagnosis, histopathological diagnosis, and the affected site. Data were collected from 2005 to 2025. Cases of malignancies in the oral and facial regions with usual residence outside Basrah were excluded. Data were gathered from records at the Histopathological Research Facility of Al-Sadder Teaching Hospital, Al-Basrah General Hospital, the College of Dentistry in Basrah, and several private clinics. This study emphasizes the importance of understanding the geographical and demographic patterns of oral cancer in Basrah and highlights the need for targeted public health strategies and prevention measures. **Results:** Analysis of 411 oral malignant cases from 2005 to 2025 showed that 51.6% were males and 48.4% were females. The highest incidence was in 2011 (10.2%), followed by 2009 (8.5%) and 2010 (8.0%). Squamous Cell Carcinoma (SCC) was the most common, making up 84.4% of cases. Other diagnoses included Non-Hodgkin's Lymphoma (3.2%), Basal Cell Carcinoma (2.4%), Verrucous Carcinoma (2.4%), and Adenoid Cystic Carcinoma (1.7%). The tongue was the most frequently affected site (47.0%), followed by the lower jaw (16.8%), lower lip (6.8%), and cheek (6.8%). Patient ages ranged from 4 to 92 years, with a mean age of 53.39 years and a median age of 55 years.

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The highest number of cases was in Al-Zubair (25%), followed by Al-Madina and Al-Basrah Alqadima (12.5% each), and then Al-Karma and Abu Al-Khasib (10% each). Conclusions: Basrah is one of the most affected regions by cancer, with oral cancer representing a major concern due to the increasing number of cases. Contributing factors include environmental, behavioral, genetic, and socio-economic aspects such as lifestyle, age, sex, genetic predispositions, pollution, and the city's historical context, all of which significantly influence the incidence of oral cancer.

## **Introduction**

The term oral cancer describes a range of malignancies that may arise in and around the oral cavity, Oral Squamous cell carcinomas (OSCC) account for more than 90% of these lesions; however, depending on the location, etiology, and prognosis, even these can be classified into distinct entities, Oral cancer specifically squamous carcinomas of the mouth, should be considered a distinct disease from oropharyngeal carcinomas [1].

The floor of the mouth and the ventral surface of the tongue are the places where OSCC most frequently occurs, accounting for over 50% of cases, the retromolar regions, gingiva, buccal mucosa, posterior tongue, soft palate, and hard palate come next to these locations, the etiology of squamous cell carcinoma of the lip differs from that of OSCC, and it exhibits geographic diversity in distribution that is significantly correlated with prolonged exposure to UV radiation [2].

### **Risk factors can be described as below:**

**1-Genetic:** Certain genetic variations linked to DNA repair pathways, the metabolism of alcohol, and nicotine metabolism have all been linked to an increased risk of oral cancer [3].

**2-Tobacco:** Tobacco Use is still the single most significant preventable risk factor for oral cancer, smoked tobacco releases a complex mixture of thousands of chemicals, of which the International Agency for Research on Cancer has identified more than 60 known chemical carcinogens and an additional 16 chemicals in unburned tobacco Smoking has a variety of detrimental impacts on oral health, including oral cancer, smokers are three times more likely to get it than non-smokers [4]. About 21.8% of Iraqi teenagers are smokers [5].

**3-Alcohol:** Many patients who receive a diagnosis of oral cancer are heavy drinkers, and alcohol use remains high in countries with increasing oral cancer rates [6].

**A combination of tobacco smoking and alcohol drinking** is a strong intensifying risk factor for PMD's epithelial dysplasia and subsequent malignant transformation [7].

**4-Viruses:** Research on the role of oncogenic viruses in human cancer is just getting started. Viruses can hijack the host's biological machinery, alter its DNA and chromosomes, and induce the cells to proliferate. In recent years, HPV 5 and Herpes simplex virus (HSV) have been identified as the causes of OC [8].

Oral cancer is a serious and growing problem in many countries. According to epidemiological research, there are regional variations in the incidence and fatality [9]. Over 4,000 new cases of head and neck cancer, including lip cancer, are identified in Australia every year, oral cavity cancers account for more than 600 of these cases, oral cancer ranks tenth in women's cancers and sixth in men in emerging nations, more than 400,000 new instances of oral cancer are reported worldwide each year, with two thirds of those occurrences occurring in Asian nations like Bangladesh, India, Pakistan, Indonesia, and Sri Lanka [10]. Oral cancer is the most frequent cancer in these high-risk nations, making up more than 25% of all new cases of cancer annually [11].

The International Agency for Research on Cancer reports that the top three nations with the highest rates of oral cancer in 2018 were some in Asia and the Pacific [12]. Regarding the survival rates, patients with OSCC <4 cm survived longer than those with tumors 4 cm or larger, with survival rates of 54.6% and 31.1% for tumors <4 cm and 4 cm or larger, respectively [13]. The Medicaid cohort's OC/OPC annual mortality rates declined between 2012 and 2014, whereas the commercial insurance cohort's rates rose during that same period. The mortality rate was 0.95% for commercial enrollees and 2.03% for Medicaid enrollees in 2012, by 2014 the difference between the two groups had somewhat decreased, with the mortality rates for commercial enrollees and Medicaid enrollees being 1.07% and 1.92%, respectively, beginning in 2016 the Medicaid enrollee mortality rate leveled off over the following four years, rising from 1.89% in 2016 to 1.86% in 2019 [14].

Since the mouth is easily accessible for self- or clinical examination, early diagnosis significantly increases survival rates; on the other hand, a considerable proportion of OSCCs are diagnosed too late due to a combination of factors such as inadequate patient awareness, asymptomatic clinical states, incorrect investigation, and/or delays in patients seeking therapy [15].

Early identification and timely treatment offer the best hope to the patient with mouth cancer, providing the best chance of a cure. As patient knowledge regarding the danger of oral cancer improves, the demand for “screening” is projected to increase [16]. This study is designed to assess the prevalence and distribution of oral cancer in Basrah city, analyze the demographic characteristics (age, gender, location) of the affected population in Iraq, and identify potential risk factors associated with its occurrence.

## **Materials and Methods**

A total of 411 cases were recorded from Basrah city (Iraq/Basrah). The data represent information for each case, including age, sex, address, year of diagnosis, histopathological diagnosis, and the location affected by cancer. The data were collected over a period from 2005 to 2025. The cases were compiled from records available at the Histopathological Research Facility of Al-Sadder Teaching Hospital, Al-Basrah General Hospital, the College of Dentistry in Basrah, and several private clinics.

Sites of malignant oral and facial growths included: tongue, lower jaw, lower lip, cheek, upper jaw, floor of the mouth, palate, buccal mucosa, upper lip, and gingiva, were also mentioned. Cases of malignancies in the oral and facial regions whose usual residence was in governorates other than Basrah were excluded. Data analysis and statistical processing were performed using SPSS version 30.

## **Results**

A total of 411 cases of oral malignant diseases were analyzed for the period from 2005 to 2025. Of these, 51.6% were males and 48.4% were females (Fig. 1). The highest incidence was observed in 2011 (10.2%), followed by 2009 (8.5%) and 2010 (8.0%) (Fig. 2).

Squamous Cell Carcinoma (SCC) was the predominant diagnosis, accounting for 84.4% of all cases. Other notable diagnoses included Non-Hodgkin’s Lymphoma (3.2%), Basal Cell Carcinoma (2.4%), Verrucous Carcinoma (2.4%), and Adenoid Cystic Carcinoma (1.7%) as shown in Fig. 3.

The tongue was the most frequently involved anatomical site, accounting for 193 cases (47.0%), followed by the lower jaw with 69 cases (16.8%), lower lip with 28 cases (6.8%), and the cheek also with 28 cases (6.8%). The male-to-female ratio was approximately 1.07:1, with 51.6% of cases in males and 48.4% in females.

The patients' ages ranged from 4 to 92 years, with a mean age of 53.39 years and a median age of 55 years (Table 1). The standard deviation was 18.07 years. Based on the statistical analysis, the distribution of oral and facial malignancy cases across different districts in Basrah revealed notable geographical variability. The highest proportion of cases was reported in Al-Zubair, accounting for 25% of the total cases. Both Al-Madina and Al-Basra Alqadima accounted for 12.5% each, indicating moderate incidence levels.

Following closely were Al-Karma and Abu Al-Khasib, each contributing 10% of the cases. Several other areas, including Al-Maqil, Hayu Alasdiqa, Dawr Alsiba, Hayu Al-Hussein, Al-Asmai, Al-Nakheela, Manawi l-Jum, and Al-Qibla, each contributed only 2.5% of the total cases. These lower percentages may reflect lower population densities or potential underreporting.

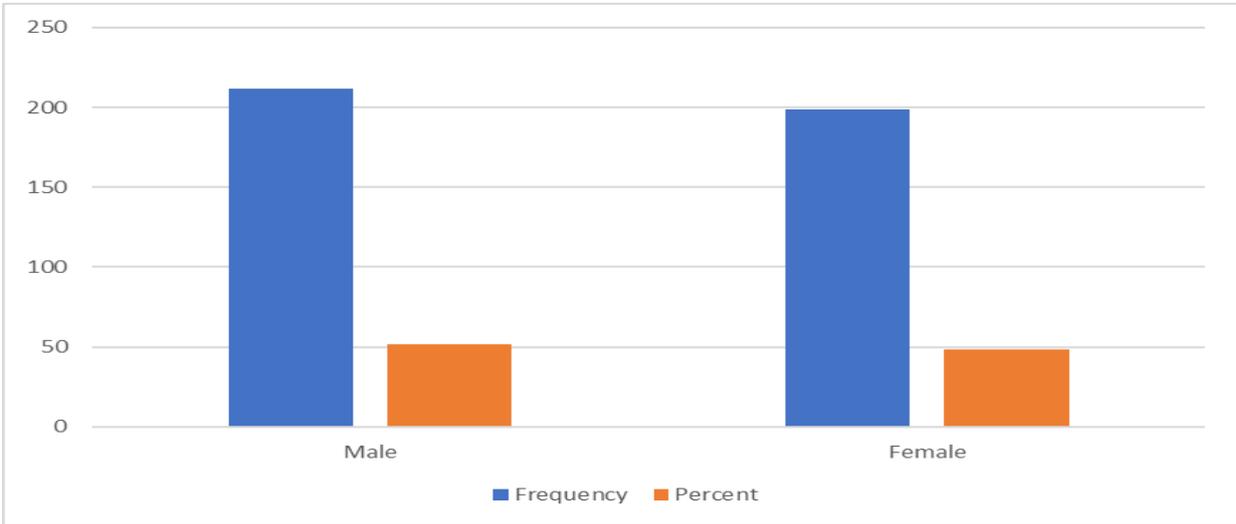


Fig. 1: Gender Distribution of Oral Cancer Cases in Basrah (2005-2025)

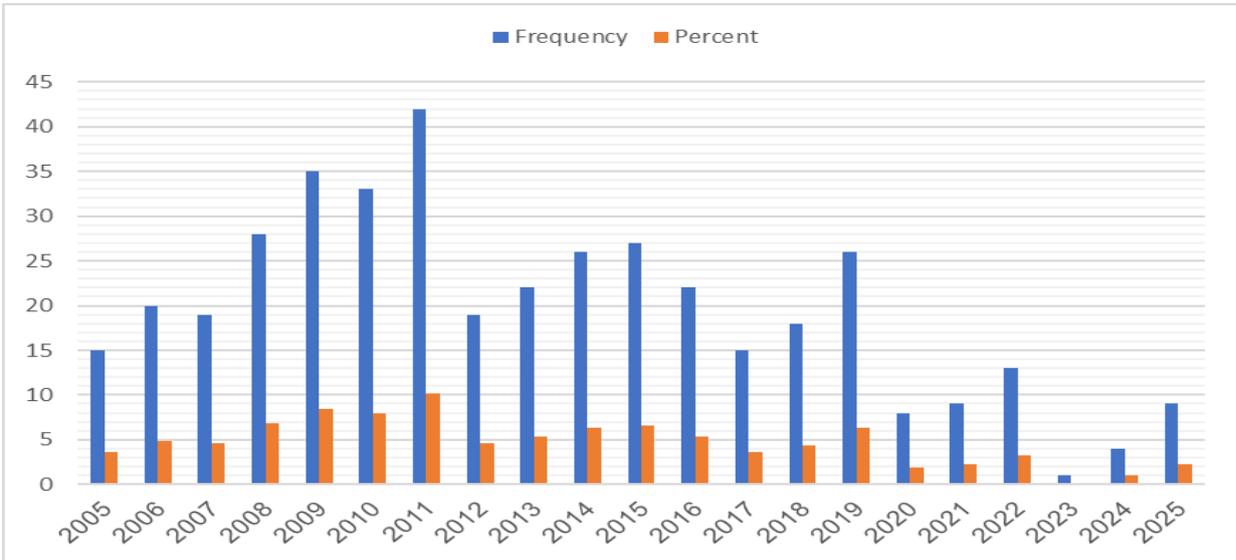


Fig. 2: Distribution of Oral Cancer Cases Across Years in Basrah Governorate (2005-2025)

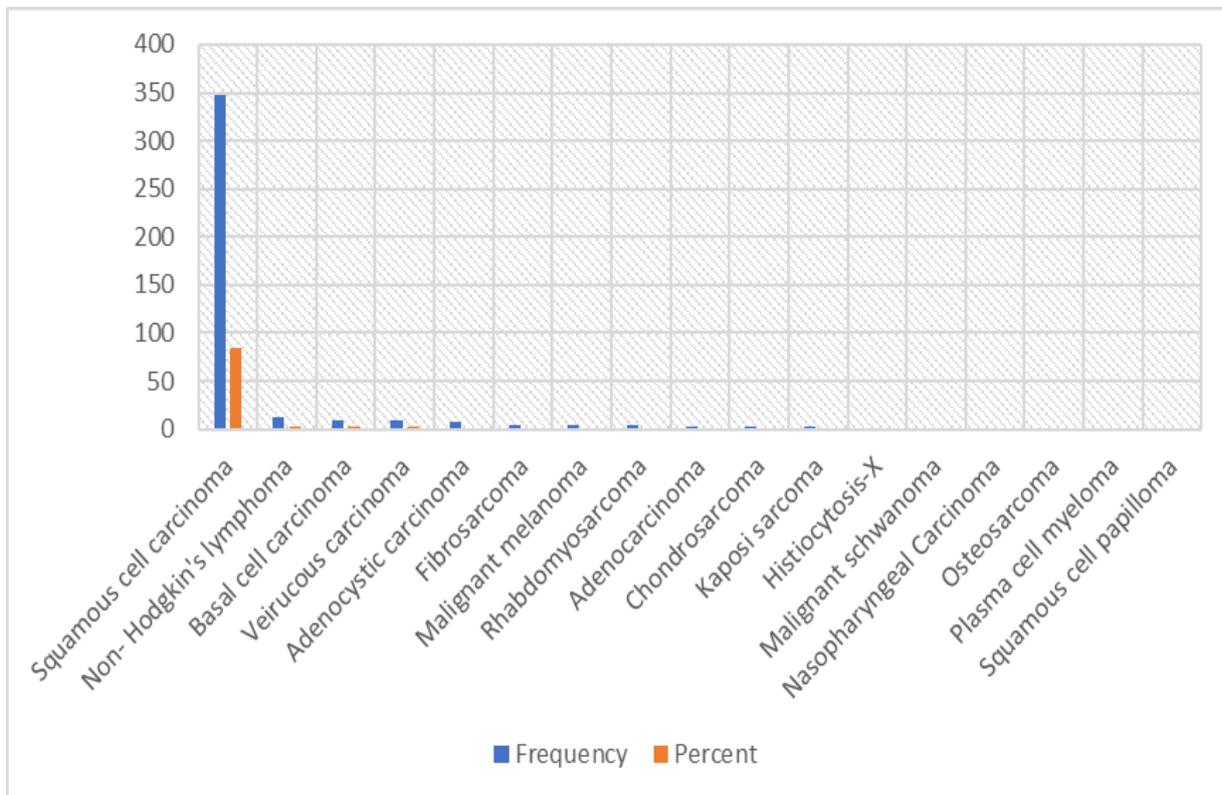


Fig. 3: Distribution and Prevalence of Oral Cancer Types in Basrah (2005-2025)

Table 1: Age Distribution of Oral Cancer Cases in Basrah (2005-2025)

Age	
N	411
Mean	53.39
Median	55
Std. Deviation	18.07
Minimum	4
Maximum	92

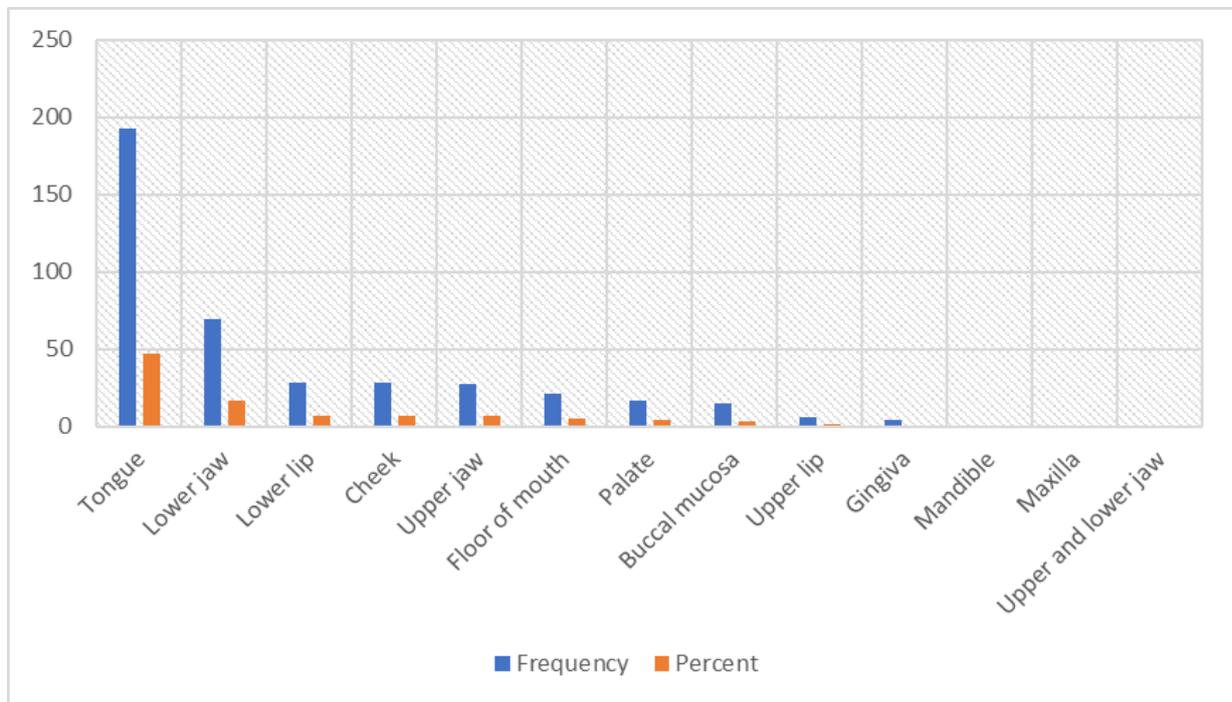


Fig. 4: Distribution of Oral Cancer by Anatomical Site in Basrah (2005-2025).

## Discussion

Since multiple studies consistently show that the prevalence is higher in men than in women, behavioral risk is frequently blamed for this discrepancy, given that men are typically more prone to partake in behaviors like drinking alcohol, smoking cigarettes, and being exposed to carcinogenic substances at work. This result is consistent with earlier research findings [17, 18].

Our study revealed a clear association between increasing age and the incidence of OSCC, with the majority of cases occurring in individuals aged 60 years and above. While OSCC is rare in individuals under 40 years of age, the risk rises substantially in those over 50 and peaks in the sixth and seventh decades of life. This pattern is likely due to cumulative exposure to carcinogens such as tobacco and alcohol, in addition to age-related biological changes. These include diminished DNA repair capacity and a weakened immune system, both of which contribute to the increased susceptibility to oral cancer in older populations [19, 20].

Additionally, Squamous Cell Carcinoma was identified as the most commonly diagnosed histopathological type, representing a high percentage of the cases, approximately 84% of oral cancer cases are SCC. The remaining 16 % include Non-Hodgkin's lymphoma, Basal cell carcinoma, and other rare types. The most important risk factors are smoking (cigarettes, hookah)

and alcohol, which cause 70-80% of squamous cell carcinomas, and exposure of the lips to sunlight [21-23]. This is considered the main risk factor among the population of Basrah. Squamous epithelial cells, which cover the entire oral cavity, including the tongue, floor of the mouth, oral mucosa, gums, and lips, are the source of squamous cell carcinoma. Due to their high turnover rate, these cells are especially vulnerable to the accumulation of mutations when exposed to carcinogens [24].

Immunocompromised individuals, such as those with HIV/AIDS or post-transplant patients, are at higher risk for oral cancers. This may explain the high prevalence of non-Hodgkin's lymphoma in Basra and globally [25].

Adenoid cystic carcinoma (ACC) originates from the ductal and myoepithelial cells of the minor salivary glands. It most frequently occurs on the hard palate, floor of the mouth, and oral mucosa. Although it is relatively uncommon in the oral cavity overall, it represents the most common malignant tumor of the minor salivary glands [26, 27].

Fibrosarcoma, Malignant Melanoma, and Rhabdomyosarcoma ranked 5th, 6th, and 7th, respectively, but were found in small numbers, these cancers are rare in the oral cavity due to their origin from non-epithelial cells like fibroblasts, melanocytes, and muscle tissue, which are present in smaller quantities compared to epithelial cells, additionally, the absence of clear risk factors and their often-asymptomatic nature can delay diagnosis. This results in their low representation in Basra's oral cancer registry compared to more common cancers, such as squamous cell carcinoma [28, 29].

Chondrosarcoma is among the least common forms of cancer to develop in the mouth. It originates from cartilage cells, which are uncommon in the oral cavity and jawbones because these bones—like the mandible and maxilla—have very little cartilage. The appearance of this cancer inside the mouth is unusual because it typically affects the long or pelvic bones [30].

Sarcoma Kaposi since HIV is the main cause of tumor formation, it is closely linked to immunodeficiency, particularly in HIV patients. The incidence of oral KS cases is negligible in communities with low HIV-positive population proportions, as is the case in the majority of Iraqi cities [31].

The tongue was the most frequently affected site, accounting for 47.0% (193 cases) of all oral cancer cases. This high prevalence is consistent with international findings that identify the tongue as the primary location for oral squamous cell carcinoma, possibly due to its constant

exposure to mechanical trauma, tobacco, alcohol, and its rich vascular supply [32]. The lower jaw (mandible) represented the second most common site, with 17.0% (70 cases). The lower lip, cheek, and upper jaw each accounted for 6.8% (28 cases), and lower lip cancers are strongly linked to prolonged sun exposure and smoking habits, particularly among outdoor workers [33].

In 21 cases, or 5.1%, the floor of the mouth was affected; however, the tongue remains the predominant site of oral cancers, followed by the lower jaw and other anatomical sites. These findings highlight the importance of targeted screening programs and public health education to address modifiable risk factors such as tobacco use, alcohol consumption, and UV exposure [34].

The minimum age recorded in our data was 4 years, with an age range of 4 to 20 years among oral cancer cases. Given the unusually young age of onset, we considered xeroderma pigmentosum as a possible hereditary factor contributing to the development of oral malignancies [34].

Although the oral mucosa excluding the lips is not as intensely exposed to UV radiation as the skin, it is still vulnerable to DNA damage from other environmental factors, the nucleotide excision repair (NER) mechanism, primarily responsible for repairing UV-induced DNA damage, may not only predispose to skin malignancies but also contribute to the development of oral cancers, even in the absence of direct exposure to UV [35].

Basrah is the most damaged and polluted city in Iraq. Numerous researchers who studied this city found that the uranium concentration was 16 parts per million. Furthermore, the findings indicate that DU pollution was widespread in the city people's immune systems were weaker in this city and other nearby cities [36].

Also, several types of contaminants are present in the atmosphere; these pollutants consist of gaseous pollutants, heavy metal pollutants, total suspended particles, and polycyclic aromatic hydrocarbons (PAHs). Each of these categories contributes significantly to the deterioration of air quality, posing serious health risks to the population [37].

Because of the production and extraction of oil, the Basra Governorate is experiencing severe air pollution. Among the most significant health harms are irritation of the eyes, nose, and throat; respiratory and cardiac conditions; immune and neurological system abnormalities; and cancers, the most significant of which is lung cancer [38].

Several epidemic diseases that were previously transmitted through contaminated water have impacted the quality of drinking water across Iraq [39]. The Shatt al-Arab water has become so

salinized that it is no longer suitable for agriculture or animal consumption in the Basra Governorate [40]. Several reasons make Al-Zubair the most affected one; these may contribute to Al-Zubair being one of the most traditional and having a strict level of education and socioeconomic level

The most critical point of focus is the proximity of the area to the oil fields (Fig. 5). The investigation revealed that all groundwater samples collected from the Al-Zubair region were contaminated with petroleum hydrocarbons, with concentrations exceeding the allowable limits. This contamination is attributed to the region's proximity to the oil field reservoirs, where petroleum extraction and refining processes contribute to the release of harmful substances into the groundwater [41]. Al-Madina is the second most frequent place where impacted individuals reside, which also contributes to their socioeconomic status and educational attainment. Additionally, because the area is encircled by the Euphrates, the primary water source, it shares the same ecological risk as Al-Karma and Abu Al-Khasib due to water distribution and the convergence of customs and traditions. The residual locations they are represent sites at (city center) and they represent the least sites affected may contribute to a high level of education, presence of a health center, good oral hygiene, and high socioeconomic status.

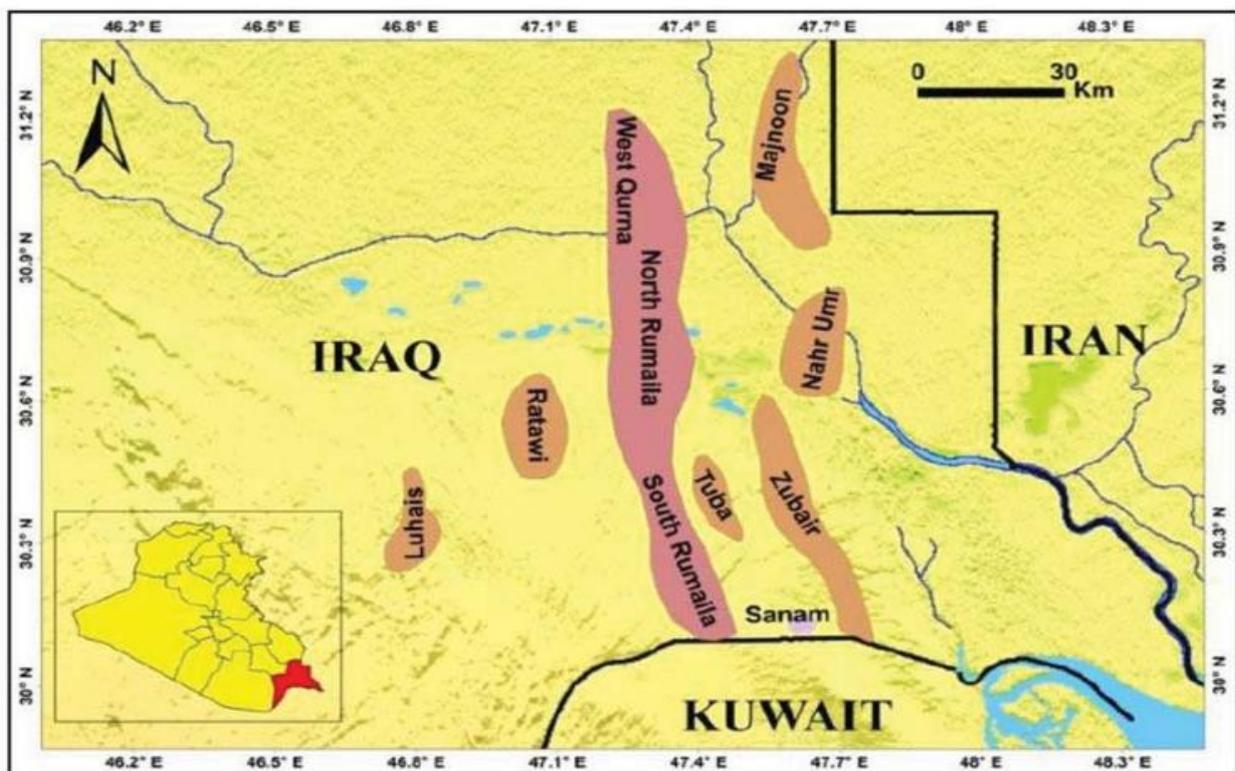


Fig.5: Distribution of Oil Fields in Southern Iraq (Basra Governorate)

## Conclusions

Basrah city is considered one of the most affected regions by cancer cases, with oral cancer being a primary concern due to the increasing number of reported cases. The distribution of these cases across various locations, communities, and geographical areas within Basrah highlights the complex nature of the issue. Several factors contribute to this, including environmental, behavioral, genetic, and socio-economic aspects. These factors encompass lifestyle habits, age, sex, genetic predispositions, pollution, and the city's historical context, all of which play significant cumulative and multifactorial roles in the incidence of oral cancer. It is crucial to raise awareness among government authorities, healthcare organizations, and the general public regarding the importance of regular health monitoring and self-examination for oral cancer. Furthermore, the need for professional consultation and early intervention by specialists should be emphasized. Additionally, the Basrah government must take decisive action to address the environmental issues of water, air, and oil pollution, which are contributing factors to the rising incidence of oral and other types of cancer in the region.

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