Oncology
and Radiotherapy©
19(9) 2025 : 001-0010 • RESEARCH ARTICLE

Towards an artificial intelligent study of the upper aero-digestive tract cancer

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ABSTRACT

The use of artificial intelligence (AI) in epidemiological studies of the upper aerodigestive tract can help analyze large amounts of data quickly and accurately. In this article, epidemiological studies were carried out on the number of patients who received oral care before treatment, age and gender, type of tumor, treatment and TNM classification (number of T, M, N). We will carry out an epidemiological study of the UADT using the linear regression test to analyze the risk factors for upper respiratory tract diseases. In this context, the variables studied will be related to the number of patients who received oral care before treatment, age and gender, type of tumor, treatment and TNM classification (number of T, M, N. We will carry out a study using artificial intelligence on the possibility of implementing an intelligent model for the UADT. The variables Family history, Medical history, Weight, Passive, Weaned, Profession, Non-smoker, Smoking, Socio-economic level, Alcoholism, Surgical history, Number of packs/ year, Gender, Place of residence, Age, Cigarettes, significantly influences the Oral condition.. However, they don't influence the surgical treatment. We have conducted epidemiological studies on the number of patients who received oral care before treatment, considering their age and gender, tumor type, treatment, and TNM classification (number of T, M, N). Additionally, we attempted to explore the use of artificial intelligence to implement an intelligent model for studying the epidemiology of UADT (Upper Aerodigestive Tract) cancers.

Keywords: Epidemiology; Tumor; Statistical Analysis

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Word count: 3268 **Tables:** 12 **Figures:** 03 **References:** 13

Received: 16 Aug, 2025, Manuscript No. OAR-25-170009;

Editor assigned: 20 Aug, 2025, PreQC No. OAR-25-170009 (PQ);

Reviewed: 8 Sep, 2025, QC No. OAR-25-170009;

Revised: 22 Sep, 2025, Manuscript No. OAR-25-170009 (R);

Published: 30 Sep, 2025

INTRODUCTION

The upper aero digestive tract, refer to the anatomical structures located in the upper part of the respiratory system and the digestive system. These structures include the mouth, nose, throat (pharynx), larynx, epiglottis, and esophagus. They are called the upper aero digestive tract (UADT) because they are involved in breathing, swallowing, and digesting food.

When we breathe, air enters through the nose or mouth, passes through the pharynx, larynx and trachea, to reach the lungs. When we eat, food passes through the mouth, pharynx, and esophagus and reaches the stomach for digestion [1-4].

The epiglottis is a small leaf-like structure that closes over the larynx during swallowing to prevent food from entering the airways. However, under certain conditions, such as during a aspiration, food can pass through the airways and cause health problems [5].

The UADT are made up of several different anatomical structures, each of which can be the site of a tumor. The types of tumors that can develop in the head and neck vary depending on the specific location of the tumor in the UADT [6].

Head and neck tumors can have varying symptoms depending on their location and type. Common symptoms include pain when swallowing, hoarseness, cough, wheezing, weight loss, throat or chest pain, etc. It is important to consult a doctor if you have persistent or worrisome symptoms. Early diagnosis can greatly improve the chances of treatment and recovery [5], [6].

In this article, we will carry out epidemiological studies on the number of patients who received oral care before the treatment, the age and gender, the type of the tumor, the treatment as well as the TNM classification (number of T, M, N). In addition, we will try to study using artificial intelligence the possibility of implementing an intelligent model for the study epidemiology of the UADT.

EPIDEMIOLOGICAL DATA

Overall distribution

- Head and neck cancer: Head and neck cancer are for about 3% of cancer in general [Figure 1].
- Cancer of the oral cavity**:** (BARNES et al., 2005; STEWART and KLEIHUES, 2005)

In terms of incidence, cancers of the oral cavity are among the

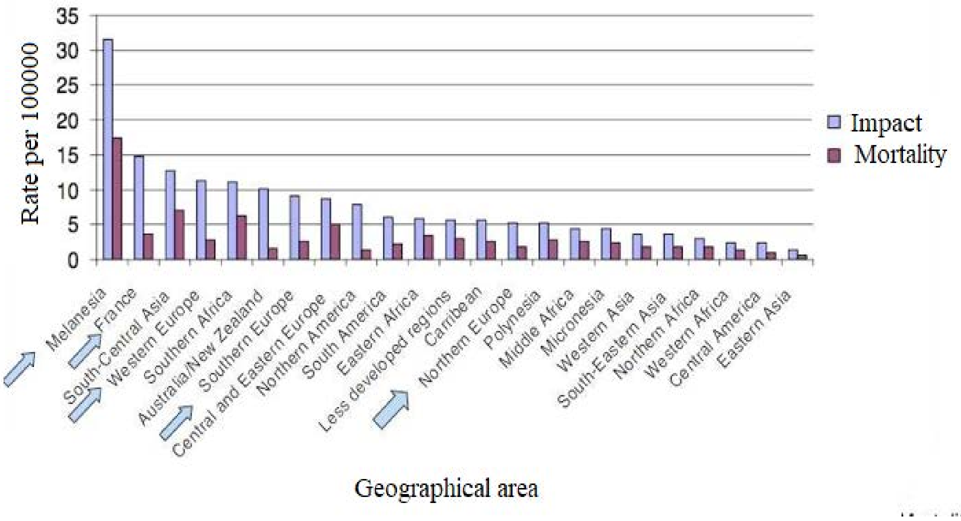

Figure 1: Cancers of the UADT in men: incidence standardized for 100,000 (world standard) in some developed countries (GLOBOCAN, 2002).

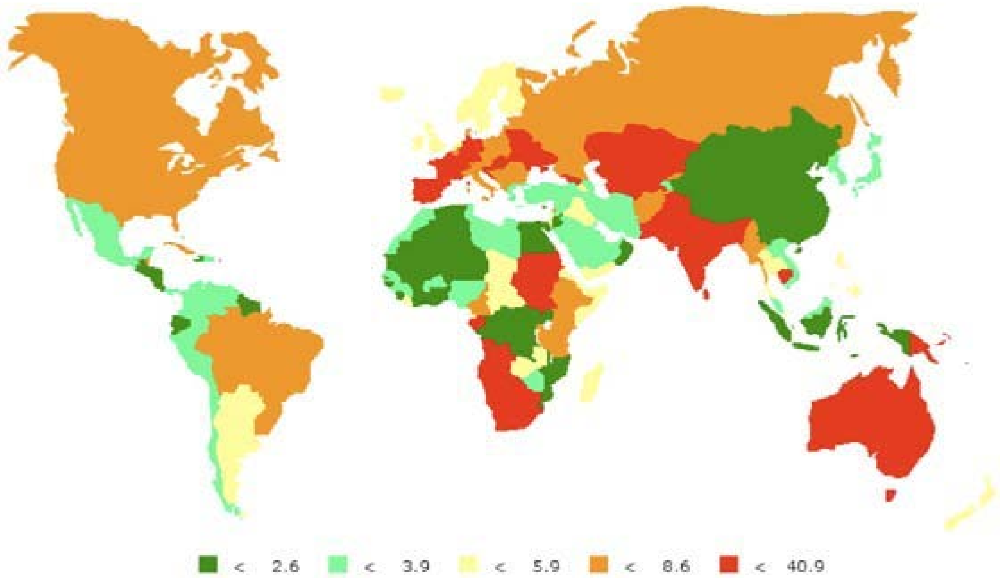

Figure 2: Global incidence of oral cavity cancer. Standardized incidence on age/100,000 inhabitants (GLOBOCAN 2002, International Agency for Research in Cancer IAC).

most common cancers worldwide. The number of individuals worldwide with oral cancer was nearly 700,000 in the year 2000. Around the world, there are nearly 170,000 new cases of cancer affecting the oral cavity every year. These are the cause of nearly 120,000 deaths per year (127,459 deaths worldwide in 2002). Cancers of the oral cavity represent 10% of all cancers. In 2002, worldwide, there were no less than 274,289 new cases of cancer of the oral cavity. Among men, it occupies the place of 8th most common cancer and the 11th cause of cancer death. Among women, he occupies the place of 14th most common cancer and the 14th cause of cancer death.

Variations between Countries

Variations between countries are very large Incidence rates vary from more than 50 per 100,000 in Hungary to 8.5 per 100,000 in Japan. Until the end of the 20th century, France was the country with the highest incidence rate in the world among men but Hungary now has a higher rate. Very high rates are also observed in India, Pakistan, while the lowest rates are observed in West Africa [Figure 2]. Nasopharyngeal cancer has a particular geographical distribution. It is rare in North America, Western Europe and Japan, where the incidence is less than 1/100,000. It represents less than 2% of carcinomas of the UADT in France. It is observed especially in southern China, particularly in the Canton region, where incidence rates can reach 50/100,000. Intermediate rates are observed in Southeast Asia and North Africa. Arctic Inuit populations also have high incidence rates [7-9].

MATERIAL AND METHODS

We will carry out an epidemiological study of the UADT using the linear regression test to analyze the risk factors for upper respiratory tract diseases. Linear regression is a commonly used statistical method to examine the relationship between an independent variable and a continuous dependent variable. In this context, the variables studied will be related to the number of patients who received oral care before treatment, age and gender, type of tumor, treatment and TNM classification (number of T, M, N). Linear regression analysis would determine if a linear relationship exists between the independent variable and the dependent variable. The results of the analysis could also provide information about the strength of the relationship, the direction of the relationship, and the accuracy of predictions. The use of linear regression analysis can be a useful method for studying risk factors for upper respiratory tract disease. However, it is important to consider the limitations of this method and to use an appropriate analysis depending on the characteristics of the data. As mentioned previously, we will carry out a study using artificial intelligence on the possibility of implementing an intelligent model for the UADT. But first, we will focus on the classic statistical study using SPSS software. It is statistical software widely used in research to analyze and interpret data. The use of SPSS can facilitate the statistical analysis of complex data and allow a deeper understanding of the relationships between variables. Before performing statistical analysis using SPSS, it is4. Important to classify variables according to their type and code them correctly to allow for accurate analysis. The main steps for the classification and coding of variables are as follows:

- Classification of variables: Variables can be classified into two main types: qualitative variables and quantitative variables. Qualitative variables, also called categorical, are variables that have separate categories, such as gender or marital status. Quantitative variables, also called numeric, are variables that have a numeric value, such as age or salary.

- Coding of qualitative variables: To code qualitative variables, each category must be assigned a number. For example, for the variable "sex", "1" could be assigned to men and "2" to women. It is important to ensure that the assigned numbers have no real meaning and that the numbers do not follow each other, as this can distort the statistical analysis.

- Coding of quantitative variables: Quantitative variables do not require coding because they are already numeric. However, it is important to ensure that the values are correct and that there are no missing values.

- Data checking: Once the variables have been classified and coded, it is important to check the data for errors and missing values. Errors should be corrected and missing values can be replaced with an appropriate value, such as the mean of the variable.

- By following these steps, variables can be classified and coded correctly, allowing for accurate statistical analysis in SPSS.

- We are therefore going to carry out epidemiological studies on the following cases:

- Epidemiological study on the age and gender of patients;

- Epidemiological study on the number of patients who received oral care before treatment

- Epidemiological study on tumor type

- Epidemiological study on the treatment (surgery, radiation therapy, concomitant radio-chemotherapy);

- Epidemiological study on the TNM classification (number of T, M, N).

RESULTS AND DISCUSSION

Epidemiological Study on the Number of Patients Who Received Oral Care before Treatment

According to the [Table1], the variables Family history, Medical history, Weight, Passive, Weaned, Profession, Non-smoker, Smoking, Socio-economic level, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes, Active significantly influences the Oral condition(sig= 0.005).

According to the [Table 2], the variables of, Weight, Weaned, Smoking, Alcoholism, Surgical history, Age, have significant effect on the Oral condition at the level of 10%.

Epidemiological Study on the Treatment

Surgical Treatment

According to the [Table 3], the variables Family history, Medical history, Weight, Passive, Weaned, Profession, Non-smoker, Smoking, Socio-economic level, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes, Active significantly don't influence the Surgical treatment(sig= 0.106). According to the [Table 4], the variables of Family history, Medical history, Alcoholism, Gender, Age. have a significant effect on the Surgical treatment at the level of 10%.

Radiotherapy Treatment

According to the [Table 5], the variables Family history, Medical history, Weight, Passive, Weaned, Profession, Non-

Table 1: ANOVA test for Oral condition.

ANOVA[a]						
Model		Sum of Squares	df	MeanSquare	F	sig.
1	Regression	58,59	17	3,447	2,29	.005b
	Residual	1,66,440	111	1,499		
	Total	225.039	128			
To. Dependent Variable: Oral condition						
b. Predictors: (Constant), Family history, Medical history, Weight, Passive, Weaned, Occupation, Non-smoker, Smoking, Socio-economic status, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes , Asset						

Table 2: Coefficient test for Oral condition.

Coefficients [a]						
Model		Unstandardized Coefficients		Standardized Coefficients	you	sig.
		B	Standard. Error	Beta		
1	(Constant)	-0.521	7,184		-0.07	0.942
	Age	-0.034	0.011	-0.338	-3.1	0.003
	Gender	-1.38	1,454	-0.092	-0.95	0.343
	Place of residence	-0.13	0.346	-0.038	-0.38	0.703
	Weight	0.072	0.032	0.228	2,23	0.028
	Socio-economic level	0.19	0.18	0.096	1,06	0.29
	Occupation	-0.006	0.009	-0.059	-0.62	0.536
	Smoking	3,28	1,290	0.218	2,54	0.012
	Asset	-1.04	1,298	-0.119	-0.8	0.424
	Passive	-0.074	1,739	-0.007	-0.04	0.966
	Cigarettes	0.013	1,804	0.001	0.007	0.994
	Not smoked	0.027	0.053	0.046	0.512	0.61
	Number of packages/year	0.011	0.008	0.135	1,37	0.172
	Weaned	0.48	0.241	0.181	201	0.047
	Alcoholism	-0.56	0.253	-0.208	-2.2	0.029
	Medical background	0.008	0.037	0.019	0.206	0.837
	Surgical history	0.089	0.047	0.184	1,89	0.061
	Family history	0.068	0.181	0.033	0.377	0.707
To. Dependent Variable: Oral condition						

Table 3: ANOVA test for: Surgical treatment.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	sig.
1	Regression	2289.03	17	1,34,649	1,50	,106b
	Residual	9937.12	111	89,524		
	Total	12226.2	128			
To. Dependent Variable: Surgical treatment						
b. Predictors: (Constant), Family history, Medical history, Weight, Passive, Weaned, Occupation, Non-smoker, Smoking, Socio-economic status, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes , Asset						

Table 4: Coefficients test for Surgical treatment.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	you	sig.
		B	Standard. Error	Beta		
1	(Constant)	28,69	55,51		0.517	0.606
	Age	0.145	0.085	0.196	1,71	0.09
	Gender	3,69	11,24	0.033	0.328	0.743
	Place of residence	-0.728	2,672	-0.029	-0.27	0.786
	Weight	-0.043	0.251	-0.019	-0.17	0.863
	Socio-economic level	1,290	1,393	0.088	0.926	0.357
	Occupation	-0.058	0.07	-0.081	-0.82	0.413
	Smoking	-8.578	9.968	-0.077	-0.86	0.391
	Asset	-6.251	10,03	-0.097	-0.62	0.534
	Passive	-6.089	13,437	-0.077	-0.45	0.651
	Cigarettes	-3.084	13,93	-0.028	-0.22	0.825
	Not smoked	-0.204	0.41	-0.047	-0.49	0.619
	Number of packages/year	-0.023	0.063	-0.037	-0.36	0.719
	Weaned	0.142	1,860	0.007	0.077	0.939
	Alcoholism	3,338	1,958	,168	1,71	0.091
	Medical background	0.765	0.287	0.255	2,66	0.009
	Surgical history	0.323	0.364	0.091	0.887	0.377
	Family history	2,539	1,400	,166	1,81	0.072
To. Dependent Variable: Surgical treatment						

Table 5: ANOVA test for: Radiation Therapy Treatment.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	sig.
1	Regression	9,332	17	0.549	0.728	.768b
	Residual	83,660	111	0.754		
	Total	92,992	128			
To. Dependent Variable: Radiation Therapy Treatment						
b. Predictors: (Constant), Family history, Medical history, Weight, Passive, Weaned, Occupation, Non-smoker, Smoking, Socio-economic status, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes, Asset.						

Table 6: Coefficients test for Radiation Therapy Treatment.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	you	sig.
		B	Standard. Error	Beta		
1	(Constant)	2,146	5,094		0.421	0.674
	Age	-0.006	0.008	-0.089	-0.74	0.46
	Gender	1,566	1,031	,162	1,52	,132
	Place of residence	,101	0.245	0.045	0.41	0.682
	Weight	-0.01	0.023	-0.049	-0.43	0.665
	Socio-economic level	-0.032	0.128	-0.025	-0.25	0.801
	Occupation	0.001	0.006	0.024	0.227	0.821
	Smoking	-0.221	0.915	-0.023	-0.24	0.81
	Asset	-0.399	0.92	-0.071	-0.43	0.666
	Passive	-0.016	1,233	-0.002	-0.01	0.99
	Cigarettes	0.358	1,279	0.037	0.28	0.78
	Not smoked	0.029	0.038	0.078	0.781	0.436
	Number of packages/year	0.003	0.006	0.056	0.516	0.607
	Weaned	0.218	0.171	0.127	1,28	0.204
	Alcoholism	0.182	0.18	0.105	1.01	0.314
	Medical background	0.032	0.026	,121	1.21	0.231
	Surgical history	-0.039	0.033	-0.124	-1.2	0.25
	Family history	-0.019	0.128	-0.015	-0.15	0.88
To. Dependent Variable: Radiation Therapy Treatment						

Table 7: ANOVA test for brachytherapy Treatment.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	sig.
1	Regression	0.151	17	0.009	1,176	.296b
	Residual	0.841	111	0.008		
	Total	0.992	128			
To. Dependent Variable: Brachytherapy Treatment						
b. Predictors: (Constant), Family history, Medical history, Weight, Passive, Weaned, Occupation, Non-smoker, Smoking, Socio-economic status, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes , Asset						

smoker, Smoking, Socio-economic level, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes, Active significantly don't influence the Radiotherapy treatment(sig= 0.768). According to the [Table 6], no variable has a significant effect on the Radiotherapy treatment at the level of 10%.

Processing brachytherapy

According to the [Table 7], the variables Family history, Medical history, Weight, Passive, Weaned, Profession, Non-smoker, Smoking, Socio-economic level, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes, Active significantly don't influence the Surgical treatment(sig= 0.296). According to the [Table 8], the variables Age, Place of residence, weight, occupation, alcoholism have a significant effect on the Brachytherapy treatment at the level of 10%.

Treatment Chemotherapy

According to the [Table 9], the variables Family history, Medical history, Weight, Passive, Weaned, Profession, Non-smoker, Smoking, Socio-economic level, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes, Active significantly don't influence the Chemotherapy treatment(sig= 0.522). According to the [Table 10], only the Smoking variable that has a significant effect on the Chemotherapy treatment at the level of 10%.

Table 8: Coefficients test for brachytherapy Treatment.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	you	sig.
		B	Standard. Error	Beta		
1	(Constant)	0.545	0.511		1,1	0.288
	Age	-0.002	0.001	-0.225	-1.9	0.057
	Gender	0.098	0.103	0.098	0.95	0.346
	Place of residence	-0.076	0.025	-0.33	-3.1	0.003
	Weight	0.005	0.002	0.249	2,3	0.025
	Socio-economic level	0.005	0.013	0.037	0.39	0.702
	Occupation	0.001	0.001	0.184	1,8	0.071
	Smoking	-0.027	0.092	-0.027	-0.3	0.769
	Asset	0.056	0.092	0.097	0.61	0.544
	Passive	-0.016	0.124	-0.022	-0.13	0.899
	Cigarettes	-0.049	0.128	-0.049	-0.38	0.703
	Not smoked	0.006	0.004	0.153	1,6	0.115
	Number of packages/year	0	0.001	0.022	0.21	0.838
	Weaned	0.014	0.017	0.079	0.82	0.415
	Alcoholism	0.034	0.018	0.192	1,9	0.059
	Medical background	0.001	0.003	0.053	0.54	0.587
	Surgical history	0.002	0.003	0.055	0.53	0.597
	Family history	0.001	0.013	0.008	0.09	0.928
To. Dependent Variable: Brachytherapy Treatment						

Table 9: ANOVA test for Chemotherapy treatment.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	sig.
1	Regression	13899.9	17	8,17,641	0.947	.522b
	Residual	95839.3	111	8,63,417		
	Total	109739	128			
To. Dependent Variable: Chemotherapy treatment						
b. Predictors: (Constant), Family history, Medical history, Weight, Passive, Weaned, Occupation, Non-smoker, Smoking, Socio-economic status, Alcoholism, Surgical history, Number of packs/year, Gender, Place of residence, Age, Cigarettes , Asset						

Table 10: Coefficients test for Chemotherapy treatment.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	you	sig.
		B	Standard. Error	Beta		
1	(Constant)	202,3	172,4		1,17	0.243
	Age	-0.196	0.264	-0.088	-0.74	0.46
	Gender	-53.9	34,9	-0.162	-1.5	0.125
	Place of residence	0.514	8,299	0.007	0.062	0.951
	Weight	0.684	0.778	0.098	0.879	0.381
	Socio-economic level	7,072	4,327	,161	1,63	0.105
	Occupation	0.143	0.218	0.067	0.657	0.512
	Smoking	-52.1	30.96	-0.156	-1.7	0.096
	Asset	17,94	31,15	0.093	0.576	0.566
	Passive	-1.58	41,73	-0.007	-0.04	0.97
	Cigarettes	-48.7	43,28	-0.146	-1.1	0.263
	Not smoked	-0.722	1,273	-0.055	-0.57	0.572
	Number of packages/year	-0.037	0.197	-0.02	-0.18	0.852
	Weaned	8,286	5.775	0.14	1,435	0.154
	Alcoholism	-4.31	6,080	-0.073	-0.71	0.479
	Medical background	0.755	0.892	0.084	0.847	0.399
	Surgical history	0.343	1,131	0.032	0.304	0.762
	Family history	6,436	4,347	0.141	1,48	0.142
To. Dependent Variable: Chemotherapy treatment						

Epidemiological Study on Tumor Type

The results relating to the type of the tumor are presented in the [Table 11].

Epidemiological Study on the TNM Classification

TNM classification and tumor staging therefore constitute the best indicator in terms of prognosis. The long-term prognosis also depends on the existence or not of double cancerous locations (tumor of the oral cavity associated with an esophageal or bronchial tumor in particular). The survival of stage I and II cancers is generally superior to that of stage III and IV cancers thanks to better tumor and lymph node control.

The following [Table 12], shows the results obtained using the statistical analysis under SPSS for the TNM classification.

Implementing a Smart Study for the UADT

Artificial intelligence (AI) is a powerful tool for the analysis of massive and complex data, such as epidemiological data. The epidemiological study of the UADT can benefit from the use of AI for the analysis of large amounts of health data and to identify patterns and trends that could be difficult to detect with methods traditional. [10]. AI methods, such as machine learning, can be used to analyze data from electronic medical records; health insurance claims databases, and national health registries. Algorithms can be trained to recognize diagnostic patterns, treatments, and outcomes in this data, in order to identify risk factors, associations, and epidemiological trends related to HSS. For example, AI can help detect associations between air pollution and upper respiratory tract infections, or identify patterns of head and neck cancer prevalence and mortality. AI can also be used

Table 11: Descriptive analysis for the type of the tumor.

	NOT	Minimum	Maximum	Average
Non-keratinizing squamous cell carcinoma: (Epstein virus bar)	1	18	18	18
Keratinizing squamous cell carcinoma	1	176	176	176
Undifferentiated carcinoma of the nasopharyngeal type UCNT	1	49	49	49
Basaloid squamous cell carcinoma	1	16	16	16
Papillary adenocarcinoma	1	5	5	5
Sarcoma	1	7	7	7
Valid N (listwise)	1			

Table 12: Descriptive analysis for the TNM Classification.

TNM Classification					
		Frequency	percent	Valid Percent	Cumulative Percent
Valid	T1N0M0	1	,4	,4	,4
	T1N1M0	1	,4	,4	,7
	T1N2M0	1	,4	,4	1.1
	T2N0M0	28	10.3	10.3	11.4
	T2N0M1	2	,7	,7	12.2
	T2N1M0	6	2.2	2.2	14.4
	T2N1M1	1	,4	,4	14.8
	T2N2M0	10	3.7	3.7	18.5
	T2N2M1	5	1.8	1.8	20.3
	T2N3M0	2	,7	,7	21
	T3N0M0	39	14.4	14.4	35.4
	T3N0M1	1	,4	,4	35.8
	T3N1M0	27	10	10	45.8
	T3N1M1	3	1.1	1.1	46.9
	T3N2M0	34	12.5	12.5	59.4
	T3N2M1	2	,7	,7	60.1
	T3N3M0	3	1.1	1.1	61.3
	T3N3M1	2	,7	,7	62
	T4N0M0	23	8.5	8.5	70.5
	T4N1M0	11	4.1	4.1	74.5
	T4N1M1	3	1.1	1.1	75.6
	T4N2M	1	,4	,4	76
	T4N2M0	42	15.5	15.5	91.5
	T4N2M1	8	3	3	94.5
	T4N3M0	13	4.8	4.8	99.3
	T4N3M1	2	,7	,7	100
	Total	271	100	100	

to develop models for predicting head and neck disease, using risk factors such as age, gender, smoking, alcoholism, and other medical history. The use of AI for the epidemiological study of head and neck disease can help improve the prevention, diagnosis and treatment of head and neck disease, by identifying modifiable risk factors, high-risk populations and allowing better allocation. Health resources. However, it is important to emphasize that the use of AI in medical research requires ethical precautions and adequate transparency, in order to protect data confidentiality and ensure the accuracy of results [11].

Types Of Artificiel Intelligence Model

There are several types of models based on artificial intelligence. Here is a list of the main types of models:

- Neural networks: they mimic the functioning of the human brain and are often used for image recognition, machine translation, and speech recognition and time series prediction.
- Decision trees: they are used for classification and prediction and are particularly useful when the data is structured and the variables are easily interpreted.
- Genetic algorithms: they are inspired by the theory of evolution and are used to find optimal solutions to complex problems, such as the optimization of resources or the design of electronic circuits.
- Hidden Markov processes: they are used for pattern recognition and speech recognition and are based on probabilistic models.
- Support vector machines: These are used for classification and regression and are particularly useful when the data is nonlinear and the variables are difficult to interpret.
- Bayesian networks: they are used for classification and prediction and are based on probability theory.
- Long-term memory networks: these are used for natural language understanding and are designed to process sequences of data.
- Generative adversary networks: they are used for the synthesis of data, such as images and videos, and are based on two neural networks that oppose each other.

These models are often used in combination to solve more complex problems [12].

Types of Neural Network Models

Neural networks are one of the most popular techniques of artificial intelligence. They are inspired by how the human brain works, where neurons interact to form connections and process information. Artificial neural networks are composed of layers of interconnected neurons that process incoming information. Each neuron performs a simple mathematical operation on the inputs it receives and then passes the result to other neurons in the next layer. As information propagates through the different layers of the network, the relationships between the data are learned by the network.Neural networks are used in many AI applications, such as image recognition, language translation, speech recognition, sequence prediction, and product recommendation. Deep neural networks, which are neural networks with many layers, are particularly good at these tasks. Neural networks are trained from data by adjusting the weights of the connections between neurons based on errors made by the network in predicting known outcomes. The learning process consists of minimizing the prediction error on a set of training data, so that the network can generalize to new data. In summary, neural networks are a powerful AI technique that has enabled significant advances in many fields [13].

Model Proposed For the Study Epidemiology of the Upper Aero Digestive Tract

The proposed model is of the Feed forward type which is a type of neural network where information flows in a single direction, from input to output. Input data is sent to neurons in the first layer of the network, which perform mathematical operations on that data and pass the results to the next layer, and so on, until the outputs of the network are produced [Figure 3]. In this feed-forward neural network, each neuron in the output layer is connected to all neurons in the previous layer, and each connection is associated with a weight that represents the importance of that connection to the overall output of the network. During training, these weights are adjusted so as to minimize the prediction error on the training data set.

CONCLUSION

In this article, we have presented epidemiological studies on the upper aero digestive tract (UADT) which concern the incidence and prevalence of diseases affecting the anatomical structures of

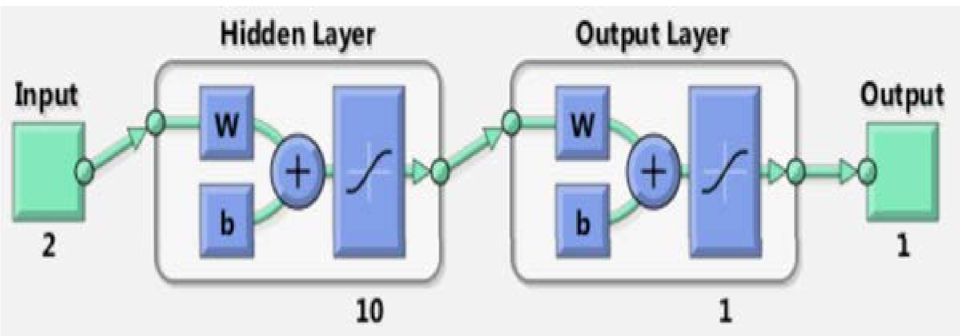

Figure 3: Feed Forward model for the upper aero digestive tract.

the nose, mouth, pharynx and larynx. The main diseases studied in this field include respiratory infections, allergic diseases, cancers of the UADT, chronic inflammatory diseases of the airways and swallowing disorders. Epidemiological studies of the UADT are important because they can help identify the populations most at risk and develop effective prevention and treatment strategies for these diseases. So we have carried out epidemiological studies on the number of patients who received oral care before the treatment, the age and gender, the type of the tumor, the treatment as well as the TNM classification (number of T, M, N). In addition, we tried to study using artificial intelligence the possibility of implementing an intelligent model for the study epidemiology of UADT. On the other hand we tried to achieve epidemiological study using artificial intelligence of UADT Who can be performed using advanced data processing techniques to extract information from large amounts of clinical and epidemiological data. AI can be used to identify risk factors, diagnostic patterns and treatment outcomes in upper GI airway disease. Data can be collected from a variety of sources, such as electronic medical records, public health registries, patient surveys, and health insurance databases. AI can then be used to analyze this data and identify patterns and trends that can help understand the risk factors, causes and outcomes of upper GI airway disease. Additionally, AI can be used to develop predictive models to identify patients at risk of developing upper GI airway disease, as well as to optimize treatments and interventions for patients with these diseases. Ultimately, the use of AI in the epidemiological study of the upper aero digestive tract can provide valuable information to improve the prevention, diagnosis and treatment of these diseases.

ACKNOWLEDGMENTS

In this study, all authors declare no conflict of interest and no financial support of a company or a financial organization.

ETHICAL ISSUES

Approval for the study was granted by the Ethics Committee of the University Hospital of Marrakech under the number 65/2025. Additionally, confidentiality and anonymity were respected during the data collection.

DECLARATION

We confirm that this manuscript has not been published previously, is not under consideration elsewhere, and that all authors have contributed significantly to this work and approved the final version for submission.

AUTHORS' CONTRIBUTIONS

RE contributed to conception, design, data and statistical analysis. HJ and AE contributed to interpretation of data. The draft of manuscript was revised by RE, HJ and AE. All authors read and approved the final manuscript.

SOURCE(S) OF SUPPORT/FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The publication of this article was made possible by the authors' contributions and their affiliation with University Hospital Mohamed VI, Marrakech.

Disclosure of Relationships and Activities

In this study, all authors declare no conflict of interest.

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