

# Cross-Sectional Study Of Salivary Ph Variation In Patients Undergoing Antineoplastic Therapy

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## **Abstract**

### **Objective**

To study the variation of salivary PH in patients undergoing antineoplastic treatment.

### **Methods**

This is a cross-sectional study conducted during the period from January to March 2020 in the medical oncology department of the Blida cancer centre. We included patients treated with antineoplastic therapy (chemotherapy; targeted therapy; hormone therapy). Patients undergoing radiotherapy in the ENT sphere, patients with asialia, and those who refused to participate in our study were excluded.

Salivary PH was measured with an electronic PH meter from unstimulated saliva of patients undergoing antineoplastic drugs. Clinical data were collected from the interview, oral clinical examination and the patient's medical record. These data were then transcribed on a prepared form. Data analysis was performed using SPSS version 20 software.

### **Result**

In total we included 222 patients undergoing antineoplastic treatment. The male sex was predominant with 53.2%. The sex ratio was 1.1. The average age was 57.46 years. The most represented age group was [62-72 years]. The mean PH of our sample was 6.88. The neutral salivary PH was estimated in 36% of the population, while 27% of the population had an alkaline salivary PH and the remaining 36% had an acidic PH. The variation in salivary PH in our sample did not seem to depend statically on the antineoplastic molecules taken by the patients ( $p=0.4$ ).

### **Conclusion**

Within the limits of this study, the variation of salivary pH does not seem to depend on the antineoplastic molecules taken by the patients.

**Key words:** Salivary PH, Cancer, antineoplastic treatment, PH meter, CAC Blida.

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## **I. Introduction**

Saliva is a functional defence agent that acts as a barrier against irritants(1). Its PH varies according to the secretory gland, stimulation, flow rate and buffering elements. The optimal pH is 7, it varies between 6 and 8 depending on certain conditions such as : age, hygiene, diet and medication(2).

Any change in certain salivary parameters, particularly the pH, is the cause of deterioration in oral health with an increased incidence of periodontal disease and dental caries.

It is precisely the case of patients with solid tumors treated by antineoplastic therapy, followed in the medical oncology department of the anti-cancer center of Blida during the period from January to March 2020, that we estimate to study the variations of salivary PH.

## **II. Methods**

This is a cross-sectional study conducted during the period from January to March 2020 in the medical oncology department of the Blida cancer center. We included patients treated with antineoplastic therapy (chemotherapy; targeted therapy; hormone therapy). Patients undergoing radiotherapy in the ENT sphere, patients with asialia and those who refused to participate in our study were excluded.

Saliva samples were collected on the day of the introduction of the antineoplastic treatments. Saliva was collected in the morning, away from meals, mouthwash and one hour after brushing the teeth.

Oral examinations and saliva sampling were performed in the medical oncology department of the Blida cancer centre (Algeria). The patients were seated in their chemotherapy chairs and the oral examination was performed under the light of an LED torch.

Unstimulated saliva was obtained by the active spit technique in a sterile container. Using an electronic PH meter, salivary PH was measured by dipping the meter into the saliva container until a reading was obtained on the display. The PH meter was cleaned with distilled water and dried with compresses for further use.

Clinical data were collected from the interview, the oral clinical examination and the patient's medical record. These data were then transcribed onto a previously prepared form.

The variables studied were: Age, gender, tumour type, medical and surgical history, antineoplastic molecules, oral lesions, tobacco consumption and oral hygiene.

### III. Data analysis :

Results were expressed as the mean value accompanied by its standard deviation for quantitative variables ; qualitative variables were expressed as percentages.

Statistical tests (Pearson's chi-square test for categorical variables and Student's t-test for quantitative variables) were used to compare the characteristics of PH. The data were analysed using SPSS software (20th version). The significance level was set at 0.05.

### IV. Results

In total we included 222 patients undergoing antineoplastic treatment. The predominant sex was male with 53.2%. The sex ratio was 1.1. The mean age was 57.46 years.

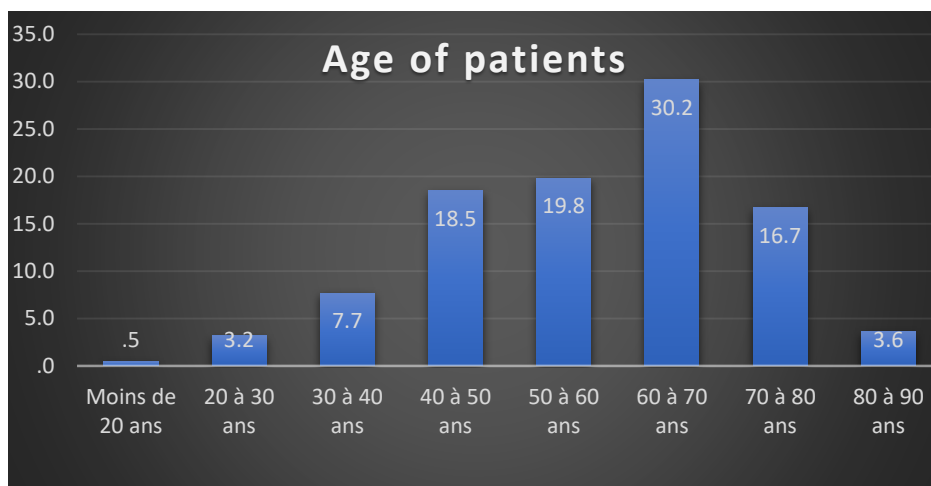


Figure 1 : Age distribution

The most common age range was [60-70 years] (Fig. 1).

Of these patients, 45 women had breast cancer, liver cancer was reported in 33 cases, and lung cancer in 33 patients. However, colon cancer was reported in 31 cases and gastric cancer in 23 cases. The least frequent cancers were those of the sinus and the bile duct. (fig. 2)

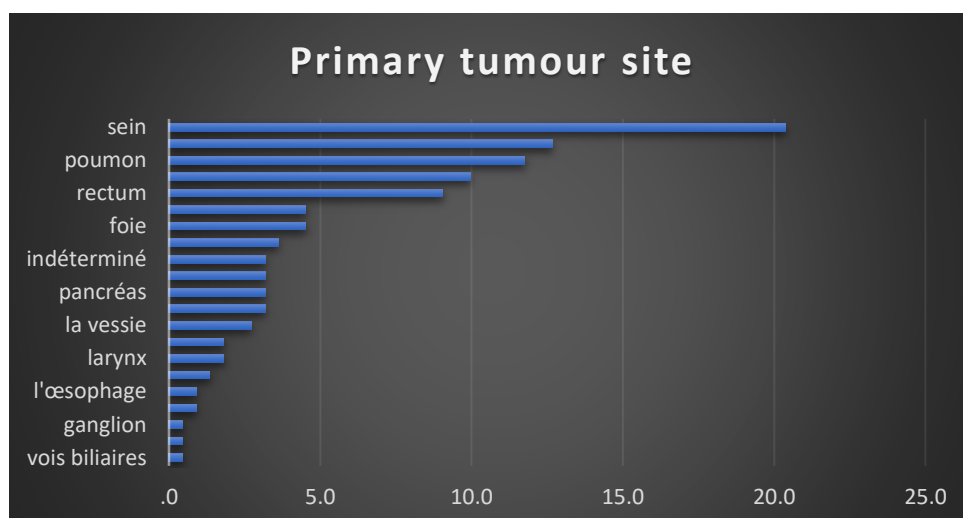
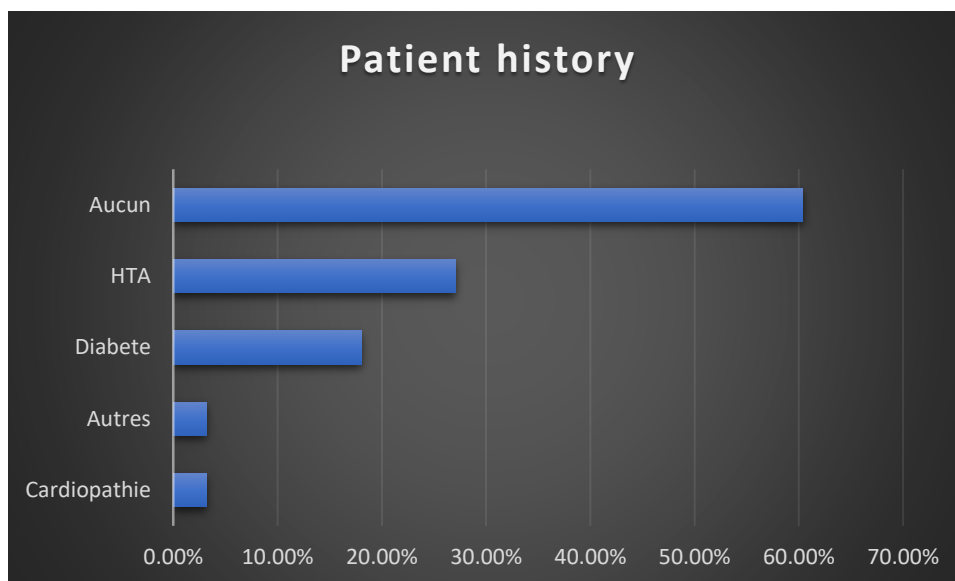


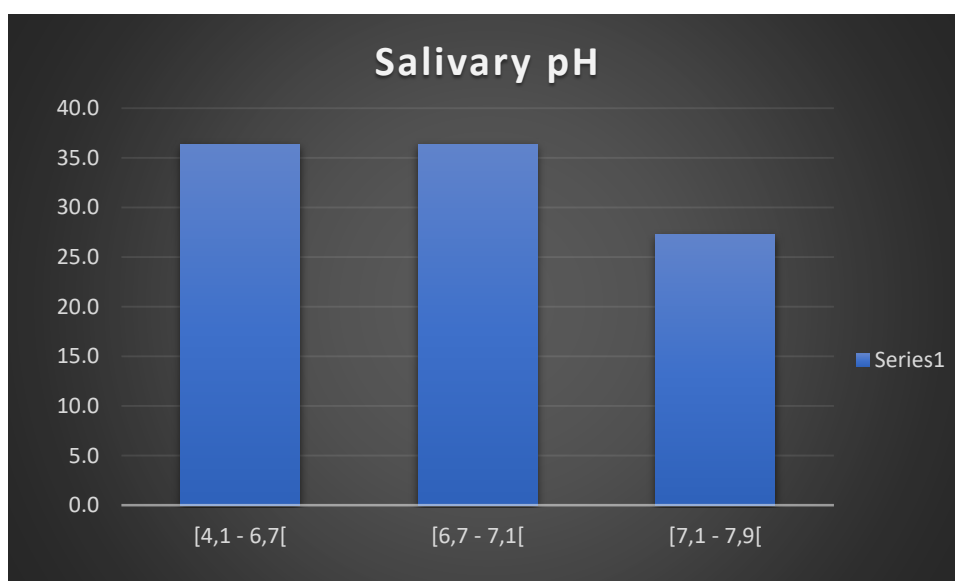
Figure 2 : Distribution by tumour type

The percentage of patients with no medical or surgical history was 60.36%. However, 27.03% had hypertension and 18.02% had diabetes (Fig. 3). 49.4% had poor oral hygiene.



**Figure 3 : Distribution according to medical and surgical history.**

The mean salivary PH of our sample was 6.88. Neutral salivary PH was estimated in 36% of the population, while 27% of the population had alkaline salivary PH and the remaining 36% had acidic PH (fig4). The variation of salivary PH in our sample did not seem to depend on the antineoplastic molecules taken by the patients ( $p=0.4$ ).



**Figure 4 : Distribution of salivary PH variations**

## V. Discussion

In this study, the objective of assessing salivary PH in patients undergoing anti-neoplastic therapy was achieved. Neutral, alkaline and acidic salivary PH values were estimated in these patients.

The close collaboration between the only oncology department of the anti-cancer centre in the wilaya of Blida and the dental surgery department has made it possible not only to recruit cancer patients undergoing antineoplastic treatment, but also to take saliva samples and measure the PH in these patients.

We believe that the variation in salivary PH is not related to antineoplastic molecules. Indeed, saliva should behave in the same way as other body fluids, such as blood and urine, which maintain a stable pH, even under long-term cytotoxic treatment(4,5). Similar results have been reported in the literature by different authors,

according to Costa et al(6) the salivary PH remained around 6.7, even during chemotherapy; furthermore, chemotherapy did not influence the saliva PH, which remained close to neutral ( $p > 0.05$ ).

Any reduction in PH could be attributed to unsatisfactory oral conditions such as poor hygiene or indirectly related to chemotherapy. For example, episodes of vomiting are common during cytotoxic therapy(7).

Although their study was conducted in children, Larsen et al (8). investigated the correlation between patients' salivary PH, taste alterations and oral discomfort. No correlation between salivary PH and taste changes was found in these children undergoing chemotherapy.

On the other hand. Some studies indicate a tendency for saliva to become more acidic in the oral cavity after the start of chemotherapy(9,10); the work of Nemeth et al(11). (11) and Hegde et al(12) reported an acidic PH value in children with acute lymphoblastic leukaemia. This decrease in salivary pH may also be correlated with the decrease in salivary flow in these children, which further reduces salivary buffering capacity, and thus salivary pH.(12)

A decrease in salivary PH ( $PH=6.17 \pm$ ) has also been reported by Kapoor (13) in children with leukaemia under antineoplastic therapy. Salivary gland infiltration by blast cells directly affects gland function by inhibiting salivary cell lines. Consequently, cytotoxic agents result in salivary gland hypoplasia and concomitant salivary disorders.

Antineoplastic therapy does not appear to alter salivary PH. Any change in PH during antineoplastic therapy could be related to local oral conditions or in relation to the haematological malignancies from which the patients suffered.

## **VI. Study limitation**

Our study was interrupted due to the COVID-19 pandemic. Only the acidity aspect of the saliva measured with the PH meter was studied. Biochemical, hormonal and immunological aspects, as well as other parameters, were not estimated in this study. A longer duration would have been desirable in order to complete this study with a microbiological study.

On the other hand, overall our results can serve as a basis for further, more extensive clinical studies.

## **VII. Conclusion**

In the present study, we believe that salivary PH cannot be altered by antineoplastic treatment, any reduction in pH could be attributed to unsatisfactory oral conditions. Nevertheless, it is reasonable to assume that the deterioration in oral health cannot be justified by the acidity of the PH related to antineoplastic treatment, other parameters could explain this variation, which we hope to address in the future.

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