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(RESEARCH ARTICLE)

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Diagnostic value of salivary tumor markers in breast, lung and ovarian cancer

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Abstract

Background: Breast and ovarian cancers, the most common cancers in women are expected to rise in the next decade. Ovarian cancer is a "silent killer" because of its heterogeneity and asymptomatic early stage. It is currently the fifth most common cause of cancer-related deaths in women, making it the most deadly gynecological malignancy.

Objective: To determine the diagnostic value of salivary tumor markers in breast, Lung and Ovarian cancer

Methods: A cross-sectional study was conducted at General Hospital Lahore, Pakistan, which was performed between September 2023 to July 2024, The total number of patients in our study were 120. The number of female patients in our study were 120. For all patients, we did diagnostic tests, blood test and Biopsies. We also took the stages of cancer for breast, lung and ovary. We took the symptoms and causes for all patients. We excluded children and pregnant women in our study. Data was tabulated and analyzed by SPSS version 27.

Result: In a current study total 120 patients were enrolled. The minimum age of patients were 47 years and the maximum age of the patients were 63 years. The mean age were 54.15±5.354 years. The minimum BMI (Kg/m2) of patients were 31 years and the maximum BMI of the patients were 39 years. The mean BMI were 34.60±2.468 (Kg/m2).

The frequency of breast cancer in situ were 3 patients and nill patients were 75 and its percentage were 62%. The breast cancer stage I were present in 12 patients , stage II were 24 patients and Stage III were 6 Patients. P-value were less than 0.04.

The frequency of nil patients number in lung cancer were 90 and its percentage were 75%. The frequency of stage I lung cancer were 6 , stage II were 12, stage III were 6 and stage IV were 6 and its percentage were 5%. P-value were <0.02.

The frequency of metastasis PM1 in the lung were 5 and in the ovary were 2. Over all P-Value in our study were < 0.05.

Conclusion: Saliva would be an excellent diagnostic tool to help cancer patients live longer and with better quality of life. Saliva-omics prove to be a good diagnostic tool for ovarian cancer at early stage. In our study Metastasis PM1 were more in lung as compared to breast and ovary

Keywords: CA-125 (cancer antigen 125); Human epididymis protein 4 (HE4); Carcinoembryonic antigen (CEA); Saliva; α-fetoprotein (AFP)

1. Introduction

Saliva is an important bodily fluid, and interest in it as a diagnostic tool has increased in recent years [1-2]. Its primary benefit is that saliva can be collected frequently and non-invasively without causing the same level of discomfort as

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blood samples [3]. Because saliva has greater transport stability than blood [8], it is already routinely employed in genetic testing [4]. Various chemicals and biomarkers found in saliva can be employed as indicators of health and disease, particularly in the diagnosis of cancer [5,6]. Saliva has been found to include a number of cancer biomarkers, including elevated levels of c-erbB-2 in breast cancer patients' samples when compared to those of patients with benign conditions and healthy controls, and elevated levels of CA125 in ovarian and oral cancer [7]. CEA, or carcinoembryonic antigen, and CA15-3, or carbohydrate antigen [8], α-fetoprotein (AFP), and human epididymis protein 4 (HE4) in saliva were also determined. Several studies have shown that salivary CA15-3 levels are useful in early breast cancer diagnosis and follow-up [9]. Numerous studies integrate the measurement of multiple salivary biomarkers, such as c-erbB-2, CA125, and CEA. Numerous issues related to the practical application of this technique in clinical laboratory practice remain unresolved, despite the fact that tumor markers in saliva have been the subject of numerous research. First, the concentration of tumor markers in the blood and saliva can vary greatly; for instance, the level of CA15-3 in the saliva is up to ten times lower than that in the serum [10]. This means that distinct standards for the pathology and norm for saliva for every tumor marker must be established. Second, even under ideal circumstances, the data on the concentration of tumor markers in saliva collected by various authors varied greatly from one another, which frequently makes it impossible to compare the findings with one another [11]. In this study, the levels of tumor markers for ovarian, breast, and lung cancer as well as benign diseases of the corresponding organs and the control group were measured in saliva. The results were compared with data from the literature. Using the same equipment and reagents from the same manufacturer, we compared the levels of salivary tumor markers for different cancer types in the same experiment. The study's objective was to assess salivary tumor markers' potential diagnostic utility [12]. The elevated value of CA125, a hallmark of serous ovarian cancer, suggests that the disease involves the serous membranes. It is crucial to keep an eye on its concentration while assessing how well surgery and chemotherapy work. Salivary CA125 level information is generally lacking in the literature that has been published to date [13]. Human epididymal protein 4 (HE4), a biomarker that is overexpressed in ovarian cancer, is one of the several biomarkers that have been identified to improve the specificity of ovarian cancer detection [14]. It is well known that the nasopharynx, salivary gland excretory ducts, and oral cavity epithelium all exhibit significant levels of HE4 expression [15]. Although HE4's physiological function in the oral cavity is unclear, it is likely required for the epithelium to function normally. However, research suggests that HE4 helps the innate immune system of the respiratory tract and oral cavity [16]. The likelihood of employing HE4 as a saliva marker for diagnosis is diminished or eliminated since it appears that HE4 either does not diffuse into saliva from serum or its level in saliva is less than its own content. However, more investigation and validation are needed for this idea [17].

2. Materials and methods

A cross-sectional study was conducted at General Hospital Lahore, Pakistan, which was performed between September 2023 to July 2024, The total number of patients in our study were 120. The number of female patients in our study were 120. For all patients, we did diagnostic tests, blood test and Biopsies. We also took the stages of cancer for breast, lung and ovary. We took symptoms and causes for all patients. We excluded children and pregnant women in our study. Data was tabulated and analyzed by SPSS version 27.

3. Results

Table 1 Mean age, BMI, CA-125 and HE4 (Pg/ml) of all the enrolled patients (*120*)**)**

Variables	Minimum	Maximum	Mean±SD
Age (Years)	47	63	54.15±5.354
BMI (Kg/m2)	31	39	34.60±2.468
CA-125 (u/ml)	34	41	37.75±2.174
HE4 (Pg/ml)	539	702	616.25±47.095

In a current study total 120 patients were enrolled. The minimum age of patients were 47 years and the maximum age of the patients were 63 years. The mean age were 54.15±5.354 years. The minimum BMI (Kg/m2) of patients were 31 years and the maximum BMI of the patients were 39 years. The mean BMI were 34.60±2.468 (Kg/m2).

The minimum CA-125 (u/ml) of patients were 34 years and the maximum CA-125 (u/ml) of the patients were 41 (u/ml). The mean CA-125 (u/ml) were 37.75±2.174 (u/ml).The minimum HE4 of patients were 539 (Pg/ml) and the maximum HE4 of the patients were 702 (Pg/ml). The mean HE4 were 616.25±47.095 (Pg/ml)

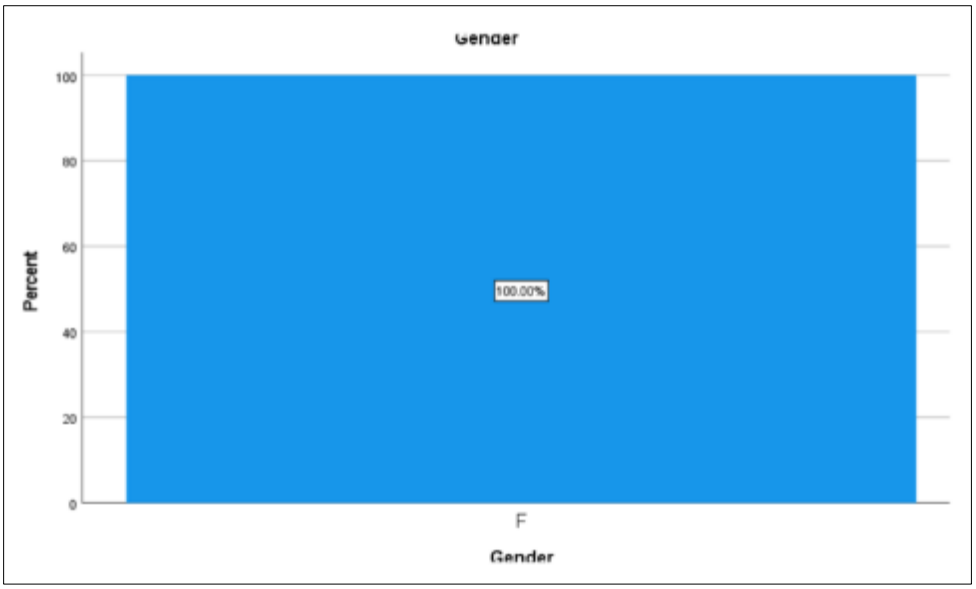

Figure 1 Chart of gender distribution

In Figure 1, we did a gender distribution, we can see the female patient Percentage in the above bar chart.

Table 2 Patient characteristics of enrolled patients (n=120)

Variables	Frequency	Percentage	P-Value
Symptoms			
Chest Pain	12	10.0	
NO	60	50.0	0.03
Pain	18	15.0	
Swelling	30	25.0	
Causes			
NO	84	70.0	
Smoking	24	20.0	0.04
Viral infection	12	10.0	

The current study included a total of 120 patients with salivary tumor markers in breast, Lung and Ovarian cancer whose characteristics are summarized in Table 2. The frequency of chest pain symptom were 12 and its percentage were 10 %. The frequency of no symptoms were 60 patients and its percentage were 50%. The frequency of just pain were 18 and swelling were 30. The P-value were < 0.03.

The frequency of no causes were in 84 patients and its percentage were 70 %. The frequency of smoking were 24 and its percentage were 20%. The frequency of Viral Infection were 12 and its percentage were 10 %.P-value were <0.04.

Table 3 Frequency and percentage of Breast, Lung and Ovarian cancer of all enrolled patients (n=120)

Variables	Frequency	Percentage	P-Value
Breast Cancer			
in situ	3	2.5	
NIL	75	62.5	0.04
Stage I	12	10.0	
Stage II	24	20.0	
Stage III	6	5.0	
Lung Cancer			
NIL	90	75.0	
Stage I	6	5.0	0.02
Stage II	12	10.0	
Stage III	6	5.0	
Stage IV	6	5.0	
Ovarian Cancer			
NIL	69	57.5	
Stage I	18	15.0	
Stage II	6	5.0	0.03
Stage III	24	20.0	
Stage IV	3	2.5	

The frequency of breast cancer in situ were 3 patients and nill patients were 75 and its percentage were 62%. The breast cancer stage I were present in 12 patients , stage II were 24 patients and Stage III were 6 Patients. P-value were less than 0.04.

The frequency of nil patients number in lung cancer were 90 and its percentage were 75%. The frequency of stage I lung cancer were 6, stage II were 12, stage III were 6 and stage IV were 6 and its percentage were 5%. P-value were <0.02.

The frequency of ovarian cancer nil patients number were 69 and its percentage were 0.03. The frequency of ovarian cancer stage I were 18 patients, stage II were 6 patients, stageIII were 24 patients and stage IV were 3 patients. P-Value were < 0.03.

Table 4 Metastasis frequency of enrolled patients (n=120)

Variables	Frequency	Percentage	P-Value
Metastasis			
NIL	6	5.0	
PM0 in Breast	42	35.0	
PM0 in Lung	19	15.8	0.04
PM0 in Ovary	46	38.3	
PM1 in Lung	5	4.2	
PM1 in Ovary	2	1.7	
Total	120	100.0	

The frequency of metastasis nil patients number were 6 and its percentage were 5%. The frequency of metastasis PM0 in breast were 42 and its percentage were 35%.

The frequency of metastasis PM0 in lung were 19 and its percentage were 15%. The frequency of metastasis PM0 in Ovary were 46 and its percentage were 38%.

The frequency of metastasis PM1 in lung were 5 and in ovary were 2. The P-Value were < 0.04.

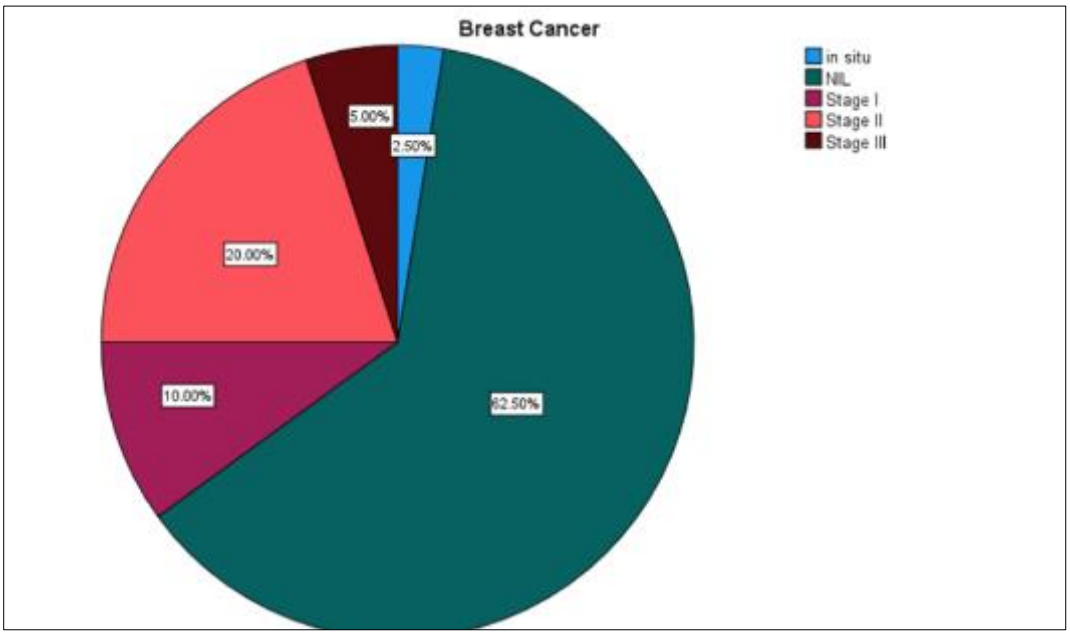

Figure 2 Breast cancer percentage in the above pie chart

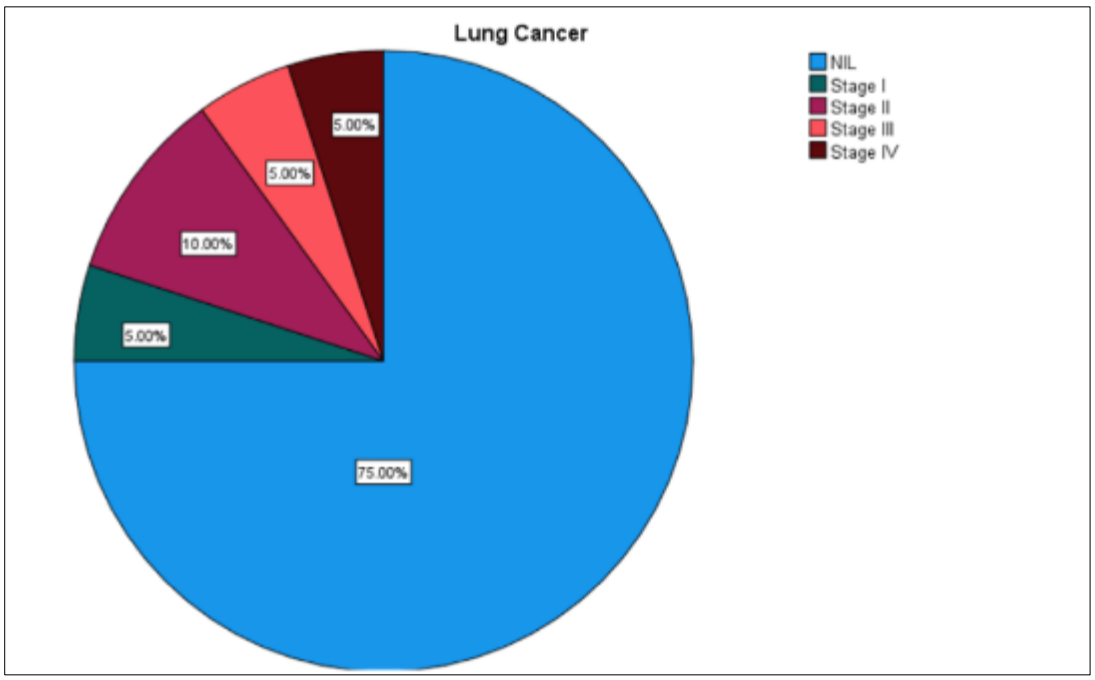

Figure 3 Lung cancer percentage in the above pie chart

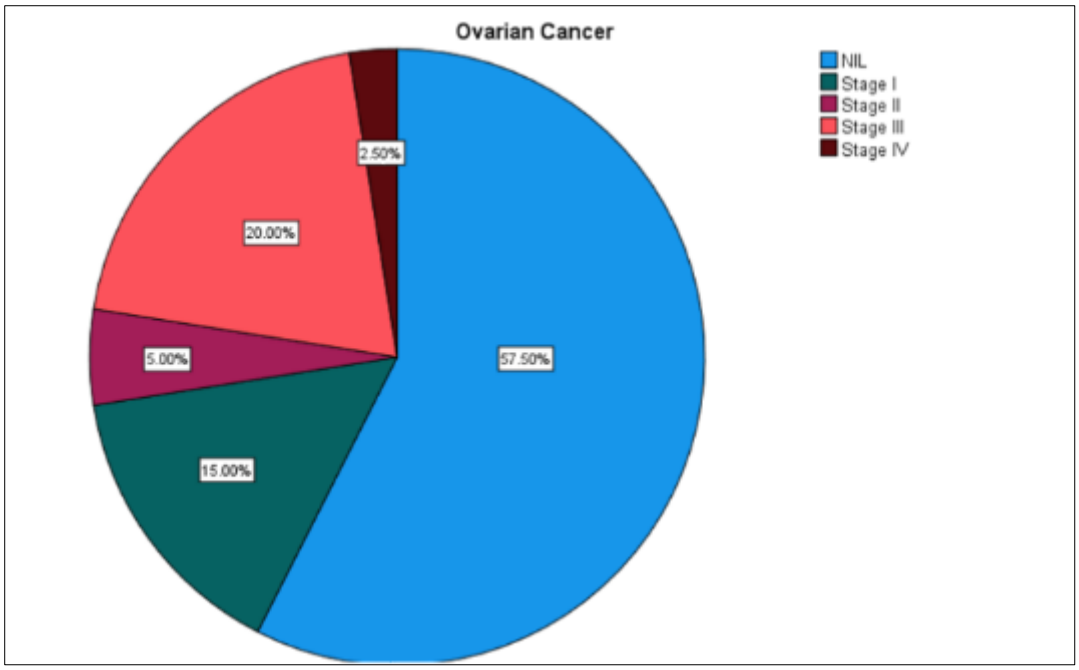

Figure 4 Ovarian cancer percentage in the above pie chart

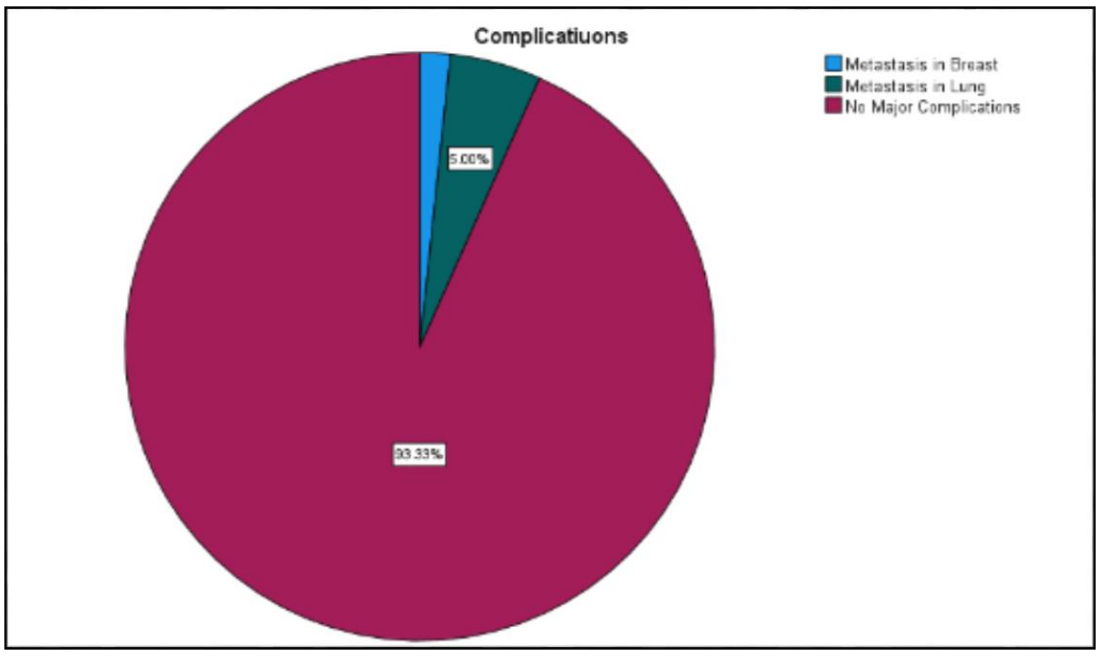

Figure 5 In the above pie chart we can clearly see that 93% of patients were no major complications. 5 % metastasis in lung patients and 1 % in breast patients

4. Discussion

CEA is a glycoprotein located on the cell surface, and widely used in clinical practice as an important routine auxiliary indicator for tumor diagnosis [18]. Although it is known that CEA may also be discovered in healthy people's saliva, the amounts of this compound were determined to be extremely low (0–3 ng/mL) [19]. Other investigators have measured CEA in the saliva of healthy volunteers; however, normal results ranged widely (11–188 ng/mL) [20–21]. In this investigation, we assessed the CEA in three cohorts of cancer patients and examined the control group in every instance.

Research indicates that 60–70 ng/mL is the typical range for CEA in saliva. We have demonstrated elevated concentrations of CEA in benign illnesses of the lungs, mammary glands, and malignancy, but not in ovarian disorders. This outcome is in line with the notion that ovarian cancer detection via blood CEA levels is likewise not employed. An rise in CEA was observed in the group of patients with lung cancer and breast cancer, including in benign diseases; nevertheless, there is no statistically significant difference between benign and malignant pathologies. Depending on the stage and metastasis in the lymph nodes, we saw an increase in the concentration of CEA. Prior research has demonstrated a favorable correlation between tumor growth and CEA level [19]. Salivary CEA can be utilized as a tool for evaluating OSCC staging and lymph node invasion, as well as an indicator of the severity of the condition. Zheng J. et al.'s study revealed a correlation between salivary CEA levels in patients with OSCC and clinical staging as well as lymph node metastases. Similar to our work, Brooks et al. discovered a substantial rise in salivary CEA concentrations in the breast cancer group when compared to the control group [22].

5. Conclusion

Saliva would be an excellent diagnostic tool to help cancer patients live longer and with better quality of life. Saliva-omics proves to be a good diagnostic tool for ovarian cancer at an early stage. In our study Metastasis PM1 were more in lung as compared to breast and ovary

Compliance with ethical standards

Acknowledgment

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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