



Original Article

A Pilot Study of Serum Adenosine Deaminase Levels in Benign and Malignant Breast Lumps at a Tertiary Care Hospital

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ABSTRACT

Objectives: The primary objective of the study is to measure the serum ADA levels in benign and malignant breast lumps. The secondary objective is to compare the serum ADA levels in benign and Malignant breast lumps, and to assess the use of serum ADA levels as a potential biochemical indicator for the diagnosis of breast carcinoma.

Materials and Methods: This is a descriptive observational study which is being conducted at Rajarajeswari Medical College and Hospital for 3 months. The patients presenting with breast lumps were subjected to a clinical examination of both breasts and axillae, which were then confirmed by radiological investigations such as mammograms or sonomammograms for a final diagnosis. Blood samples were drawn for the measurement of serum ADA activity, which was measured at 37°C according to the method of Giusti and Galanti, based on the Berthelot reaction. The statistical analysis was done using descriptive and inferential statistics. Yaman's formula was used to calculate the sample size of 50 patients.

Results: Out of the 50 cases included in this study, 60% of the patients have malignant breast lumps and 40% of the patients have benign breast lumps. Out of the malignant cases (breast imaging-reporting and data system stage 4 and above), 11.1% are found to have abnormally high serum ADA levels (>24 U/L), while 0% of the benign cases have abnormal serum ADA values (<24 U/L).

Conclusion: According to the findings in this study, serum ADA values are similar in range for benign and malignant breast lumps. Only 11.1% of the malignant cases show a rise in serum ADA levels, which is not adequate for the diagnosis of breast carcinoma. Hence, contrary to previous studies, serum ADA levels are not a specific indicator for the diagnosis of breast carcinoma. Limitations in this study may include a small sample size and the inclusion of pre-operative cases. A larger sample size may substantiate the result with respect to the use of serum ADA levels as an indicator of breast carcinoma.

Keywords: Serum adenosine deaminase, Breast carcinoma, Breast lumps

INTRODUCTION

Breast lumps are one of the most frequent problems encountered by women worldwide. Over 25% of women are affected by breast disease in their lifetime.^[1] They are mostly seen in women of reproductive age and can be either benign or malignant.

Breast cancer is ranked as the number one cancer among Indian females, with an age-adjusted rate as high as 25.8/100,000 women and a mortality of 12.7/100,000 women.^[2] Benign breast disease is more common, affecting between 25% and 50% of adult women.^[3]

Although benign breast lumps are common, a thorough approach is needed in all cases to rule out malignancy.^[1] Hence, early recognition of malignancy plays an important role in improving survival and recovery. Biochemical markers as diagnostic tools have gained popularity in recent years.

The adenosine deaminase (ADA) enzyme is involved in the conversion of adenosine to inosine, which eventually forms uric acid. Adenosine is an important signalling molecule that has major anti-inflammatory actions in tumorous conditions.^[4] Increased ADA activity could lead to the scavenging of an important molecule, i.e., adenosine.

Serum ADA levels are usually increased in ovarian, breast, colorectal, and head-and-neck cancers as well as in inflammatory diseases such as tuberculosis, rheumatoid arthritis, systemic lupus erythematosus, Crohn's disease and ulcerative colitis.^[4] The use of ADA as a serological tumour marker in rapidly growing malignancies has increased with time.

Need for study

The discovery of breast lesions in women is often a cause of fear due to the increased incidence of malignancies associated with a high mortality rate. While the majority of breast lumps are benign, early diagnosis is essential to rule out breast cancer.

Apart from physical and radiological examination, biochemical markers are increasingly used in the detection of malignancies. Serum ADA levels are found to be raised in various inflammatory and malignant conditions. Previous studies have shown a direct correlation between breast malignancies and increased levels of serum ADA.

However, the levels of ADA in benign breast diseases have rarely been assessed. Moreover, the difference in serum ADA levels between benign and malignant breast lumps needs to be found for an accurate diagnosis. Hence, this study aims to fulfil the above criteria.

Objectives

Primary objective

The primary objective of the study is to measure the serum ADA levels in benign and malignant breast lumps.

Secondary objective

The secondary objective of the study is as follows:

- To compare the serum ADA levels in benign and malignant breast lumps
- To assess the use of serum ADA levels as a potential biochemical indicator for the diagnosis of breast carcinoma.

MATERIALS AND METHODS

This is a descriptive observational study which is being conducted at a tertiary care hospital for a period of 3 months. The study comprises 50 patients.

Inclusion criteria include

1. Patients aged 18 years and above
2. Patients presenting with breast lumps.

Exclusion criteria include

1. Patients presenting with inflammation in which serum ADA is raised, i.e., tuberculosis, sarcoidosis, chronic obstructive pulmonary disease, human immunodeficiency virus, chronic heart failure, psoriasis and rheumatoid arthritis
2. Patients presenting with other malignant conditions
3. Patients aged <18 years.

The patients presenting with breast lumps were subjected to a clinical examination of both breasts and axillae, which were then confirmed by radiological investigations such as mammograms or sonomammograms. Malignancy was also confirmed with histopathological or cytological investigations for a final diagnosis.

Blood samples were drawn for the measurement of serum ADA activity, which was measured at 37°C according to the method of Giusti and Galanti based on the Berthelot reaction, i.e., the formation of coloured indophenol complexes from ammonia liberated from adenosine and quantified spectrophotometrically at 625 nm.^[5] The normal range of serum ADA levels is from 0 to 24 U/L.

Statistics

The statistical analysis was done using descriptive and inferential statistics. The sample size of the population was calculated according to Yamane's formula, where 'n' is the sample size, 'N' is the population size and 'e' is the margin of error.

The sample size was calculated to be 50 patients.

RESULTS

Out of the 50 cases included in this study, the patients are classified into benign or malignant breast lumps based on radiological investigations. Malignancy was also confirmed with histopathological or cytological investigations. The percentage of benign and malignant breast lump cases across various levels of serum ADA can be seen in Table 1.

Out of the malignant cases (breast imaging -reporting and data system [BI-RADS] stage 4 and above), 13.3% are found to have abnormally high serum ADA levels (>24U/L) and 86.6% have normal serum ADA levels, i.e., <24U/L. Whereas

Table 1: Percentage of benign and malignant breast lumps cases across various levels of serum ADA in U/L.

Serum ADA values (U/L)	Benign (%)	Malignant (%)
0–9	35	33.3
10–19	50	33.3
20–24	15	20.0
25–39	-	13.3

ADA: Adenosine deaminase

100% of the benign cases (BI-RADS stage 1-3) have normal serum ADA values, i.e., <24U/L.

DISCUSSION

In recent years, serum ADA levels have been used widely for the detection of malignancies, particularly cases of breast carcinoma. Many studies have shown a positive correlation between the values of serum ADA and breast cancer.^[6] In this study, it can be noted that increased serum ADA levels (13.3%) are associated with malignant cases. The low percentage of cases may be attributed to a smaller sample size. It can also be due to non specification of preoperative or postoperative cases, as serum ADA levels are seen to drop in the post-operative period.^[6] In this study, serum ADA levels are in the normal range for benign cases of breast lumps, as seen in normal healthy patients. Hence, while there is a positive correlation between serum ADA levels and malignant breast lumps, there appears to be no correlation between serum ADA levels and benign breast lumps.

LIMITATIONS

The limitations of this study are a small sample size and the inclusion of only pre-operative cases. A larger sample size may substantiate the result with respect to the use of serum ADA levels for the detection of breast carcinoma. Further continuation of the study will be done until a sample size of 100 patients is achieved. This could, in turn, aid in a more accurate conclusion of the use of serum ADA levels as a biochemical indicator for the diagnosis and prognosis of breast carcinoma.

In this study total serum ADA levels were estimated. Further studies could be done by assessment of of isoenzyme ADA1 and ADA2, since few studies have shown an increase in ADA2 levels in malignant breast lumps.^[7]

CONCLUSION

According to the findings in this study, malignant cases were more common in older age groups of 30–70 years, whereas benign cases were seen in a younger age group of 19–55 years.

In this study, serum ADA values are similar in range for benign and malignant breast lumps, with most of the values lying in the normal range, i.e., 0–24 U/L.

Only 13.3% of the malignant cases show a raise in serum ADA levels, which is not sufficient for early detection of breast carcinoma. This result may be attributed to a small sample size of 50 patients and the inclusion of both preoperative and postoperative serum ADA values of patients presenting with breast lumps.

Hence, in this study, contrary to previous studies, serum ADA levels are not a specific indicator for the diagnosis of breast carcinoma.

Ethical approval

The research/study approved by the Institutional Review Board at RAJARAJESWARI MEDICAL COLLEGE AND HOSPITAL, number RRMCH-IEC/211/2023, dated 07.08.23.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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