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AN OBSERVATIONAL STUDY OF SIGNIFICANCE OF LDH AS A TUMOR MARKER IN BREAST CANCER AT A TERTIARY CARE CENTRE

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ABSTRACT

Introduction: Breast cancer is a leading malignancy among women, with complex and not fully understood etiology. Breast cancer involves altered tumor metabolism, including elevated lactate dehydrogenase (LDH) due to increased glycolysis. This study evaluates serum LDH levels in newly diagnosed patients and correlates them with TNM staging before and after treatment to assess its tumor marker potential. **Methods:** A prospective study was conducted on 80 female patients with histopathologically confirmed breast carcinoma . Serum LDH levels were measured preoperatively and postoperatively , and correlated with tumor size, nodal status, stage, metastasis, and outcomes. **Result:** At presentation, mean preoperative LDH values were higher across all TNM stages and declined postoperatively. In stage II patients, the mean preoperative LDH was 257.36±87.76 U/L compared to 230.42±53.97 U/L postoperatively (not statistically significant), but significantly reduced on follow-up to 201.21±72.0 U/L (p=0.008). In stage III, the mean LDH was 298.04±133.26 U/L preoperatively and decreased significantly to 232.42±66.95 U/L postoperatively (p=0.002), while follow-up values increased to 319.45±158.53 U/L, though not statistically significant compared to preoperative levels. In stage IV, mean LDH was significantly higher preoperatively (431.47±111.41 U/L) than postoperatively (320.76±96.39 U/L, p=0.004), with a further rise at follow-up (545.49±318.49 U/L), which was not statistically significant. **Conclusion:** Serum LDH levels correlate with tumor burden and disease progression, making it a valuable, low-cost adjunct for prognostication and treatment monitoring in breast cancer, especially in resource-limited settings.

KEYWORDS

Breast cancer, Serum LDH, Clinical staging

1. INTRODUCTION

Breast cancer is a leading malignancy among women, with complex and not fully understood etiology. Various genetic, hormonal, and lifestyle factors contribute to its risk. Cancer cells undergo metabolic changes, notably increased glycolysis even in the presence of oxygen, known as the Warburg effect. Lactate dehydrogenase (LDH), a key enzyme in this pathway, is often elevated in malignancies due to rapid cell turnover and tissue destruction. Elevated serum LDH levels may indicate tumor burden and have potential prognostic value. This observational study aims to evaluate serum LDH levels in newly diagnosed breast cancer patients and analyze their correlation with TNM staging.

METHODS

Aim & Objective

To evaluate the levels of serum LDH in patients with breast cancer, both preoperatively and postoperatively, and to analyze the association of serum LDH levels with different TNM stages of breast carcinoma.

Methodology

This hospital based observational prospective study was conducted on 80 histopathologically confirmed breast cancer patients visiting the OPD and admitted in general surgery department of MB hospital (RNT medical College , Udaipur) after approval from ethical committee. Serum LDH levels were measured preoperatively and postoperatively and was correlated with different TNM stages of the disease using statistical analysis.

Study Type

Hospital based study

Study Place

MB Hospital (RNT Medical College and attached hospitals), Udaipur

Inculsion Criteria

All patients diagnosed with breast cancer and admitted in General surgery department , Maharana Bhupal Government hospital, Udaipur Rajasthan.

Exculsion Criteria

1) Breast abscess, benign breast diseases not to be included in this study.
2) Patient presenting with inflammatory pathologies outside breast not to be included in this study

RESULTS

This prospective type of descriptive study was carried out on 80 histopathologically confirmed female patients of carcinoma breast admitted in surgery wards of Maharana Bhupal Government Hospital, RNT medical college, Udaipur from April 2024 to march 2025.

Table 1 : Estimation Of Mean Serum LDH Value At Different Timeline Points Versus Different T Stages

Range of mean Serum LDH different → T stages ↓	Preoperatively serum LDH (U/L)	Postoperatively serum day 7 LDH (U/L)	P valve*
T1	243.059±72.160	180.255±27.489	0.177
T2	273.228±108.75	238.84±74.28	**0.014**
T3	306.52±147.90	237.59±58.64	**0.016**
T4	322.26±86.82	259.49±78.02	**0.032**

*P value was calculated through a computer generated software using the student's paired 't' test

The mean value of serum LDH in pre operative period was more than post operative period at different T stages. In patients with T2, T3 and T4 stage, pre operative mean value of serum LDH was significantly higher than post operative value ($p < 0.05$).

In patients with stage T1, pre operative mean value of serum LDH was higher than post operative mean value of serum LDH but was not significant statistically.

Table 2 : Estimation Of Mean Serum LDH Value At Different Timeline Points Versus Size Of Tumor

Range of mean serum LDH → Size of tumor (greatest diameter) ↓	Pre operatively mean serum LDH (U/L)	Post operatively Day 7 mean serum LDH (U/L)	Follow up mean serum LDH (U/L)
Size ≤ 5CMS	245.80±71.93	224.20±58.71	237.72±122.19
Size > 5CMS	340.11±145.17	253.02±74.38	330.40±190.387
P value*	**<0.001**	0.057	**0.020**

*P value was calculated through a computer generated software using the student's unpaired 't' test

Large size tumours (>5cms) had higher mean value of serum LDH as compared to small size tumours (< 5cms). Preoperatively, mean serum LDH among patients with large sized tumours was significantly higher than those with small sized tumours (340.11±145.17 vs 245.80±71.93, p<0.001). Postoperatively, mean serum LDH among patients with large sized tumours remained higher than those with small sized tumours but it was not statistically significant.

Table 3 : Mean valve of serum LDH correlated with lymph node positivity ratio at different timeline points in this study

Mean range of serum → LDH Lymph node Positivity ratio (%) ↓	Preoperatively (U/L) (a)	Postoperatively Day 7 (U/L) (b)	Follow up (U/L) (c)	P valve** (a vs c)
Lymph node positivity ratio (0-50)	279.145 ±110.51	230.744± 53.91	224.07±8 0.699	**0.01**
Lymph node positivity ratio (51-100)	314.00± 140.46	251.45±8 6.909	401.427± 220.498	**0.048**
P value*	0.223	0.192	**<0.001**	

*P value was calculated through a computer generated software using the student's unpaired 't' test
**P value was calculated through a computer generated software using the student's paired 't' test

Mean value of serum LDH preoperatively in high LN positivity ratio group was higher in comparison to low LN positivity ratio group (314.0±140.46 vs 279.145±110.51), but this was not statistically significant.

Table 4 : Mean Value Of Serum LDH Correlated With Metastasis At Different Timeline Points Of Carcinoma Breast Patients In This Study.

Mean serum → Different M stages ↓	Preoperatively LDH (U/L) (A)	Postoperatively DAY 7 LDH (U/L) (B)	Follow up LDH (U/L) ©	P valve* (A vs B)
M0	280.45±116.86	231.56±61.28	267.72±140.30	**0.016**
M1	431.47±111.41	320.76±96.39	545.49±318.49	**0.023**
P valve**	**0.019**	**0.03**	**0.0003**	

For tumours at M0 stage, preoperatively mean serum LDH was significantly higher than postoperatively (280.45±116.86 vs 231.56±61.28, p <0.05). For tumours at M1 stage, preoperatively mean serum LDH was significantly higher than postoperatively (431.47±111.41 vs 320.76±96.39, p <0.05)

Table 5 : Mean Value Of Serum LDH Correlated With Different TNM Stages At Different Timeline Points In This Study.

Mean serum LDH (U/L) → Different Stages ↓	Preoperatively LDH (U/L) (a)	Postoperatively day 7 LDH (U/L) (b)	Follow up LDH (U/L) (c)	P value* (a vs b)	P valve* (a vs c)
Stage I	---	—	--	--	--
Stage II	257.36±8 7.76	230.42±53.97	201.21±72. 0	0.095	**0.008**
Stage III	298.04±1 33.26	232.42±66.95	319.45±15 8.53	**0.002**	0.412
Stage IV	431.47±1 11.419	320.76±96.39 6	545.49±31 8.49	**0.004**	0.540

*P value was calculated by student's paired 't' test

In stage II patients mean value of serum LDH preoperatively was significantly higher than follow up levels (257.36±87.76 Vs 201.21±72.0, p<0.005). In stage III and IV follow up mean serum LDH was higher than preoperative levels but it was not statistically significant.

DISCUSSION

study observed a mean age of 50.56 years, which closely aligns with **Murali**[1] (49.34 years) and confirms that breast cancer in India presents a decade earlier than in Western populations. The most affected age group was 51–60 years (33.7%), which is higher than reported by **Gang**[2] (26%), **Sen**[3] (25.2%), and **Murali**[1] (24%), indicating a possible shift toward slightly older age at presentation.

Tumor Size & T Stage: Larger tumors (>5 cm) and advanced T stages (T3, T4) had significantly higher LDH compared to smaller tumors and early T stages. Similar findings were reported by **Tanna**[5], who also observed rising LDH with advancing tumor burden.

Lymph Node Positivity: Patients with high LN ratio demonstrated persistently elevated LDH, especially at follow-up, indicating poor prognosis. This aligns with **Mishra**[4], who reported higher LDH in node-positive breast cancer patients, reflecting aggressive disease biology.

Metastasis: Metastatic cases (M1) consistently had higher LDH than non-metastatic (M0) patients at all time points, with a significant rise at follow-up. Our findings are in accordance with **Mishra**[4] and **Agrawal**[6], both of whom showed LDH as a marker of advanced stage and poor survival.

TNM Staging: LDH progressively increased from stage II to stage IV, with significant correlation between stage III and IV. This trend supports observations of **Tanna**[5], who emphasized LDH as a surrogate marker of disease progression.

Our study evaluated serum LDH as a potential prognostic marker. The mean preoperative LDH was 291.78 U/L, comparable to values reported by **Saravanan**[7] (267.68 U/L), **Mishra**[4] (350 U/L), and **Khurana**[8] (313.64 U/L). LDH levels were significantly higher in:

- Larger tumors (>5 cm): 340.11 vs 245.80 U/L (p<0.001)
- Advanced T stages (T2–T4): p<0.05
- High nodal positivity (51–100%): p<0.001 on Day 7
- Metastatic disease (M1): Preop 431.47 vs 280.45 U/L (p<0.05)

These results are in agreement with **Tanna**[5], who also reported elevated LDH levels in advanced disease and poor responders.

Postoperative LDH levels decreased significantly by Day 7 in early-stage and node-negative patients, suggesting positive treatment response. However, in patients with poor prognosis or mortality, LDH levels remained elevated or rose in follow up , with a mean of 668.22 U/L, aligning with observations by **Agrawal**[6], who emphasized LDH's role in reflecting residual disease, metastasis, or recurrence.

CONCLUSION

This study reaffirms that serum LDH is a valuable, accessible, and affordable prognostic tool. It correlates well with clinical stage, tumor size, nodal involvement, and survival outcomes, especially in resource-limited settings where advanced diagnostics may not be available. Our findings are strongly supported by previous Indian studies, and further reinforce the need for routine integration of LDH testing in breast cancer management protocols.

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