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# Association Between LENT Score and Survival in Patients with Malignant Pleural Effusion at Dr. Mohammad Hoesin General Hospital, Palembang

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**Abstract**

The presence of a malignant pleural effusion (MPE) indicates advanced stage of malignancy, which severely compromises in a poor prognosis. LENT score has been developed as a prognostic tool for MPE, yet its association with survival has not been thoroughly evaluated in Indonesia. This study aims to examine the association between LENT score and 3-month survival in patients with MPE at Dr. Mohammad Hoesin General Hospital, Palembang. This prospective cohort study included 35 patients with MPE. Survival analysis using Kaplan-Meier curves. In this study cohort, the most frequent primary malignancy observed was lung cancer (62,8%). Kaplan-Meier analysis showed a median survival of 22 days for the high-risk LENT scores and 85 days for the moderate-risk group ($p < 0,001$). LENT score is significantly associated with three-month mortality in EPG patients. LENT score remains a robust tool for risk stratification in MPE management.

**Keywords:** LENT Score, Malignant Pleural Effusion, Pleural Effusion, Mortality, Prognosis

## 1. Introduction

Malignant Pleural Effusion (MPE) is a common and debilitating complication of advanced-stage cancer, signifying metastatic disease and a poor prognosis.[1] Occurring in approximately 15% of all cancer patients, MPE is defined by the accumulation of cancerous fluid in the space surrounding the lungs, leading to distressing symptoms such as severe shortness of breath, cough, and chest pain. These symptoms profoundly impair patients' quality of life and frequently require palliative interventions.[2,3] Globally, lung and breast cancers are the most common malignancies leading to MPE.[4,5] Despite advances in oncology, the median survival for patients following an MPE diagnosis remains grim, typically ranging from just three to twelve months, underscoring the urgent need for accurate prognostic tools to guide clinical care.[6]

The primary challenge in managing MPE lies in its heterogeneous prognosis. The wide survival range of months is often too broad to effectively guide individualized treatment decisions or facilitate meaningful conversations with patients and their families about end-of-life care.[4] While several prognostic factors have been studied, many require complex or expensive testing. To address this, the LENT score—an accessible tool based on four readily available parameters: pleural fluid Lactate dehydrogenase, Eastern Cooperative Oncology Group (ECOG) performance status, serum Neutrophil-to-lymphocyte ratio, and Tumor type—was developed.[7] Previous international studies have validated the LENT score, demonstrating its ability to stratify

patients into distinct risk groups.[8,9] However, a significant scientific gap remains, as its predictive accuracy has not been thoroughly evaluated in diverse populations, particularly in Indonesia.

## 2. Method

This research uses an analytic observational study design with a prospective cohort approach. The aim is to analyze the association between the LENT prognostic score and 3-month survival in patients diagnosed with malignant pleural effusion (MPE). The population in this study is patients with diagnosis of MPE treated at Dr. Mohammad Hoesin General Hospital in Palembang, Indonesia. The diagnosis of malignant pleural effusion (MPE) was confirmed by the attending physician based on the fulfillment of one or more of the following criteria: (1) the presence of malignant cells in pleural fluid cytology or pleural tissue histopathology; (2) the presence of a pleural effusion in a patient with a confirmed history of primary malignancy (either intrathoracic or extrathoracic); or (3) an effusion that was hemorrhagic, massive, progressive, recurrent, and unresponsive to anti-infective therapy.

The research sample is selected using the method of consecutive sampling, where all eligible patients presenting during the study period were recruited. Inclusion criteria were: 1) adults aged ≥18 years, 2) a confirmed MPE diagnosis, and 3) availability of complete data for LENT score calculation. Exclusion criteria were the presence of non-malignant effusions or failure to complete the three-month follow-up period. A total of 35 participants were included in this study.

Data was collected through a review of patient medical records and follow-up contact with patients or their families to confirm survival status. The collected variables included demographic data, primary cancer type, ECOG Performance Status, and laboratory values such as pleural fluid LDH, and neutrophil-to-lymphocyte ratio (NLR). The main prognostic variable, LENT score, was calculated for each participant based on these collected data points. The data collection procedure was conducted at Dr. Mohammad Hoesin General Hospital within a timeframe of three months, from September to November 2024. Survival status was actively monitored for 90 days from the initial diagnosis.

The sample size was calculated based on the three-month survival outcome. For the survival analysis, a minimum of 35 subjects was required to achieve a statistical power of 95% with a type I error (α) of 5%. This study successfully recruited 37 patients, and after 2 patients were excluded due to being lost-to-follow-up, a total of 35 subjects were analyzed, thereby meeting the targeted statistical power.

The collected data were analyzed using several methods, including descriptive statistics, bivariate tests (Chi-square or Fisher's exact test), survival analysis (Kaplan-Meier curves with the log-rank test). The analysis was conducted with the help of SPSS version 27.0 software to ensure accuracy. For quantitative research, a significance level of $p < 0,05$ was determined.

The primary estimand of this study was 90-day Overall Survival (OS), defined as a time-to-event analysis. The time origin ($T_o$) for survival calculation was the date of the initial diagnosis of malignant pleural effusion (MPE). The primary endpoint was all-cause mortality within the 90-day monitoring period. Patients who were still alive at the end of the 90-day study period were censored on the last date of the follow-up period. Patients who were lost to follow-up were excluded from the analysis.

This study has received approval from Ethics Committee of Dr. Mohammad Hoesin General Hospital, Palembang with the permit number DP.04.03/D.XVIII.06.08/ETIK/188/ 2024. All participants were given informed consent before participating in the research, and the data collected is guaranteed to be confidential in accordance with the principles of health research ethics.

## 3. Result

The study cohort consisted of 35 subjects diagnosed with malignant pleural effusion (MPE). The demographic and clinical characteristics of the research subjects are summarized in Table 1.

**Table 1. Characteristics of Research Subjects, N=35**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age (years) | < 60 | 23 | 65.7% |
| | > 60 | 12 | 34.3% |
| Sex | Male | 24 | 68.6% |
| | Female | 11 | 31.4% |
| Primary Cancer Site | Lung | 22 | 62.9% |
| | Breast | 4 | 11.4% |
| | Mediastinum | 2 | 5.7% |
| | Cervix | 2 | 5.7% |
| | Ovary | 1 | 2.9% |
| | Hematologic | 1 | 2.9% |
| | Others | 3 | 8.6% |
| Color of Pleural Fluid | Yellow | 12 | 34.3% |
| | Reddish | 23 | 65.7% |
| Chemotherapy | Yes | 16 | 45.7% |
| | No | 19 | 54.3% |
| Radiotherapy | Yes | 4 | 28.6% |
| | No | 31 | 88.6% |
| LENT score group | Low risk | 0 | 0% |
| | Moderate risk | 24 | 68.6% |
| | High risk | 11 | 31.4% |
| Pleural fluid LDH | <1500 | 29 | 82.9% |
| | >1500 | 6 | 17.1% |
| ECOG | 1 | 10 | 28.6% |
| | 2 | 15 | 42.9% |
| | 3 | 10 | 28.6% |
| | 4 | 0 | 0% |
| NLR | <9 | 22 | 62.9% |
| | >9 | 13 | 37.1% |
| Comorbidity | Hypertension | 4 | 11.4% |
| | Diabetes Mellitus | 0 | 0% |

**Table 2. Kaplan-Meier Survival Analysis Results, NA=35**

| Variable | Category | Median Survival (days) | CI (95%) | Overall Survival (days) | CI 95% | p-value |
|---|---|---|---|---|---|---|
| LENT Score | Moderate Risk | 85 | 74,71-95,28 | 53 | 31,75-74,25 | 0,001 |
| | High Risk | 22 | 6,89-37,10 | | | |

Patients aged <60 years dominated the subject of study, accounting for 65.7% of the total and the majority were male (68.6%). The predominant primary malignancy was lung cancer (62.9%), followed by breast cancer (11.4%), mediastinal tumors (5.7%), and cervical cancer (5.7%), ovary cancer (2.9%), hematologic cancer (2.9%) and others.

Regarding the characteristics of the pleural effusion, a majority of the fluid samples were reddish in appearance (65.7%). Analysis of individual prognostic markers showed that most patients had pleural fluid LDH levels below 1500 U/L (82.9%). Neutrophil-to-Lymphocyte Ratio (NLR) of less than 9 (62.9%) was found. In relation to treatment history, a total of 54.3% did not undergo chemotherapy, and 88.6% did not undergo radiotherapy. Regarding functional status, a plurality of patients (42.9%) had an ECOG PS of 2. Based on LENT scoring, no patient was categorized as low risk, 68.6% of patients as moderate risk, and 31.4% as high risk. There were 11.4% of patients with comorbid hypertension, while there were no patients with comorbid of diabetes mellitus.

To evaluate the primary hypothesis of this study, a Kaplan-Meier survival analysis was performed. The objective was to determine the association between the LENT score risk categories (Moderate Risk vs. High Risk) and the overall survival duration of the patients in our cohort. The results of this analysis, presented in Table 2, demonstrate a profound and clinically meaningful difference in survival outcomes between the two groups.

Survival analysis was performed to evaluate the effect of LENT scores on mortality outcomes. According to the Kaplan-Meier analysis, a significant difference in survival was observed between the risk groups. Kaplan-Meier curves were used to visualize differences in survival probabilities across risk groups based on LENT scores, accompanied by log-rank tests to assess statistical significance. Patients in the high-risk LENT category demonstrated a markedly shorter median survival of 22 days, in contrast to the 85 days seen in the moderate-risk cohort ($p < 0,001$). The Kaplan-Meier graph (Figure 1) shows a sharp decline in the survival curve in the high-risk group.

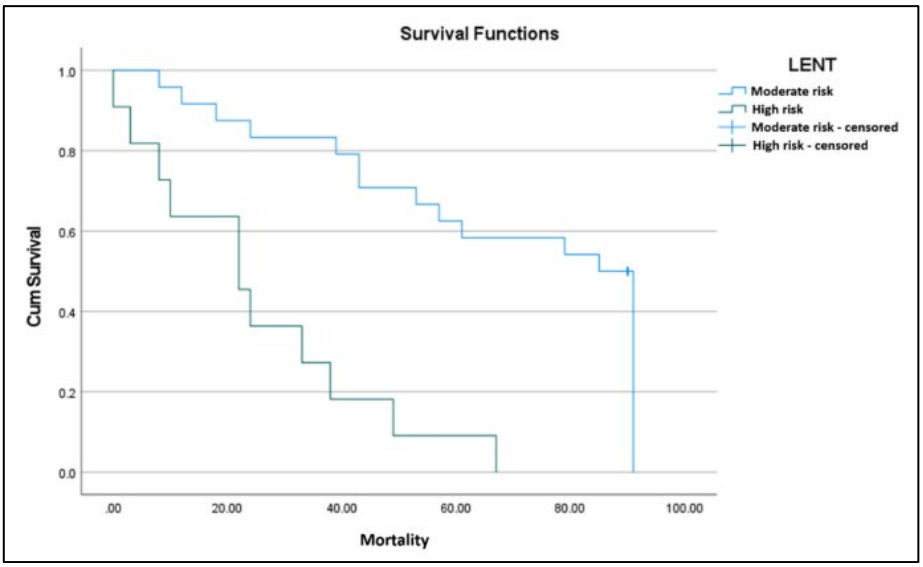


**Figure 1. Kaplan-Meier Survival Curves by LENT Score**

## 4. Discussion

Malignant pleural effusion (MPE) is the accumulation of fluid between the lungs and the chest wall as a result of the presence of cancer cells in the pleura.[2,3,10] The presence of EPG indicates systemic spread of cancer and has been classified as stage M1a, according to the American Joint Committee on Cancer TNM staging system.[11] Given the heterogeneity of EPG patient groups, there are challenges in predicting prognosis and survival. As techniques for managing pleural effusion evolve and advances are made in oncology therapy, the need for an effective prognosis stratification system has increased.[12–15]

The demographic profile of the cohort reveals a distinct trend towards a younger population for this condition, with nearly two-thirds of the patients (65,7%) being under the age of 60. Furthermore, male patients constituted a substantial majority of the sample at 68,6%, indicating a higher prevalence in males within this study group. From an oncological perspective, the data clearly identifies lung cancer as the overwhelmingly predominant primary malignancy, responsible for the malignant pleural effusion in 62,9% of the cases. Other cancer types represented much smaller proportions of the cohort; breast cancer was the second most common site, though it only accounted for 11,4% of patients. A variety of other malignancies were also observed, including tumors of the mediastinum, cervix, ovary, and hematologic cancers, highlighting the diverse etiological origins of MPE. Similar findings by Zamboni et al. and Jeba et al., who also reported lung adenocarcinoma as the most common underlying malignancy in MPE patients.[6,12,16–18] Observation in this study showed that majority of patients had not received prior chemotherapy (54,3%) or radiotherapy (88,6%) contrasts. Other cohorts study have stated a significant portion of patients present with MPE after failing one or more lines of systemic therapy.[15,19]

This study demonstrates that the LENT score is associated with three-month mortality in patients with malignant pleural effusion (MPE). The findings answer the research question and align with the initial hypothesis that a higher LENT score is associated with poorer survival. The analysis revealed that patients who were stratified into the Moderate Risk category based on their LENT score had a median survival of 85 days. This group represents individuals with a more favorable short-term prognosis. In stark and dramatic contrast, patients classified into the High Risk category experienced a significantly shorter survival duration. Their median survival was only 22 days, which is nearly four times shorter than that of the moderate-risk group. This substantial difference of 63 days in median survival highlights the severe prognosis faced by patients with a high LENT score. The divergence in the survival curves between the moderate-risk and high-risk groups was statistically highly significant, as confirmed by the log-rank test ($p < 0,001$). This p-value indicates that the observed difference in survival is extremely unlikely to be due to random chance. This result lends further support to the findings of Clive et al., who first introduced and validated the LENT score, showing it to outperform ECOG PS alone in predicting survival at multiple time points. This study demonstrates that the LENT score is a robust and independent predictor of three-month mortality in patients with malignant pleural effusion (MPE). The findings directly answer the research question and align with the initial hypothesis that a higher LENT score is associated with poorer survival. The

analysis revealed that patients who were stratified into the Moderate Risk category based on their LENT score had a median survival of 85 days. This group represents individuals with a more favorable short-term prognosis. In stark and dramatic contrast, patients classified into the High Risk category experienced a significantly shorter survival duration. Their median survival was only 22 days, which is nearly four times shorter than that of the moderate-risk group. This substantial difference of 63 days in median survival highlights the severe prognosis faced by patients with a high LENT score. The divergence in the survival curves between the moderate-risk and high-risk groups was statistically highly significant, as confirmed by the log-rank test ($p < 0,001$). This p-value indicates that the observed difference in survival is extremely unlikely to be due to random chance. This result lends further support to the findings of Clive et al., who first introduced and validated the LENT score, showing it to outperform ECOG PS alone in predicting survival at multiple time points.[8] Similarly, Zamboni et al. and Ermin et al. reinforced the prognostic utility of ECOG and LENT scores, although Ermin et al. questioned the sufficiency of LENT in short-term mortality prediction, suggesting the need for integrated models like PROMISE. LENT scores strength as a composite marker that effectively integrates a patient's functional status (ECOG), systemic inflammation (NLR), tumor burden (LDH), and underlying cancer biology (tumor type).[20–22]

While our study robustly demonstrates the LENT score's powerful ability to differentiate survival outcomes, it is crucial to place these findings within the broader context of evolving prognostic science. In this regard, the nuanced perspective offered by Ermin et al. is particularly relevant and warrants a deeper discussion. Their research, while also confirming the general utility of the LENT score, critically questioned its sufficiency for predicting very short-term mortality, specifically within a one-month timeframe, when compared to more recently developed integrated models like PROMISE. While our results clearly show that the LENT score was successful in identifying this ultra-poor prognosis group in our Palembang cohort, the work by Ermin et al. suggests that other models might offer even greater precision. The PROMISE score, for instance, incorporates additional variables such as specific cancer histology (non-mesothelioma vs. mesothelioma), which may capture nuances in tumor biology that the LENT score's broader categories do not. Therefore, this potential difference does not diminish the value of the LENT score in our setting; rather, it highlights that the optimal prognostic tool may be tiered or context-dependent, depending on the specific clinical question and the patient population.[20,23]

The ability to accurately identify patients with an expected survival of less than 30 days is paramount when considering the appropriateness of invasive palliative procedures. Interventions such as talc pleurodesis or the insertion of an indwelling pleural catheter (IPC) involve recovery time and potential complications, which may outweigh the benefits for a patient in their final weeks of life. For this specific group, a primary focus on symptom management and comfort care may be the more humane and appropriate pathway.[20,24–26]

The validation of the LENT score within an Indonesian cohort carries significant implications for clinical practice. These findings provide strong evidence for clinicians at Dr. Mohammad Hoesin General Hospital and similar settings to integrate the LENT score into routine MPE management. Its application can directly

improve patient care in two key ways. First, it allows for more accurate and individualized patient counseling regarding prognosis, facilitating shared decision-making and better end-of-life care planning. Second, it provides a crucial evidence-based framework for treatment stratification, helping clinicians decide between more aggressive palliative interventions (e.g., pleurodesis) for patients with a better prognosis and less invasive, comfort-focused measures for those with an expected survival of only a few weeks.[22,24,27,28]

The primary strength of this study is its prospective cohort design, which reduces the risk of bias associated with retrospective data collection and provides a more accurate assessment of prognosis over time. However, the research has several limitations. The main limitation is small sample size (n=35), which may limit statistical power and result in wider confidence intervals for risk estimates. Furthermore, as a single-center study, its findings may not be fully generalizable to other regions or different types of healthcare facilities across Indonesia. Finally, external factors such as variations in palliative care support and treatment adherence were not controlled for and could have influenced survival outcomes.

Based on this study's findings and limitations, future research should focus on validating these results through larger, multi-center prospective studies across diverse Indonesian populations. This would enhance the generalizability of the findings and provide a more precise estimate of the LENT score's predictive power. Additionally, future research could conduct a head-to-head comparison of the LENT score with other prognostic models, such as the PROMISE score, to determine the optimal prognostic tool for MPE patients in a local context. Investigating the integration of novel biomarkers with the existing LENT score could also be a valuable avenue to further refine prognostic accuracy.

## 5. Conclusion

The findings of this study demonstrate the utility of the LENT score as a reliable prognostic tool for patients with malignant pleural effusion treated at Dr. Mohammad Hoesin General Hospital. A high-category LENT score is associated with three-month survival in MPE patients. Large-scale, multicenter studies are needed to validate these findings and refine the prognostic model for various clinical settings.

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