Albumin-to-Fibrinogen Ratio as a Prognostic Biomarker in Acute Myeloid Leukemia

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Abstract

Background: Acute myeloid leukemia (AML) is a heterogeneous hematologic malignancy characterized by clonal proliferation of myeloid precursor cells in the bone marrow and peripheral blood. Despite advances in molecular diagnostics and risk-adapted therapies, prognosis remains poor for many patients, and accurate prognostic biomarkers are essential for improving risk stratification and guiding treatment decisions. Increasing evidence suggests that systemic inflammation and nutritional status play an important role in cancer progression and patient outcomes. The albumin-to-fibrinogen ratio (AFR), a composite biomarker derived from serum albumin and plasma fibrinogen levels, reflects both nutritional condition and systemic inflammatory response. Albumin is widely recognized as a marker of nutritional status and physiological reserve, while fibrinogen is an acute-phase reactant involved in inflammation, coagulation, and tumor progression. The integration of these two parameters into a single ratio may provide a more comprehensive indicator of the host's inflammatory and metabolic state in malignancy.

Objective: This study aims to evaluate the prognostic significance of the albumin-to-fibrinogen ratio in patients with acute myeloid leukemia and to explore its potential role as a simple and accessible biomarker for predicting clinical outcomes. Recent studies have demonstrated that lower AFR values are associated with increased systemic inflammation, impaired nutritional status, and unfavorable prognosis in several malignancies. In the context of AML, an elevated inflammatory state and altered coagulation pathways may contribute to disease progression, treatment resistance, and poorer survival outcomes. AFR may therefore serve as an integrated biomarker reflecting the complex interaction between inflammation, coagulation activity, and nutritional status in leukemia patients. Compared with many molecular or cytogenetic markers, AFR is inexpensive, easily obtainable from routine laboratory tests, and readily applicable in clinical practice. Incorporating AFR into prognostic evaluation may improve the ability to identify high-risk patients and support individualized therapeutic strategies.

Conclusion: The albumin-to-fibrinogen ratio represents a promising prognostic biomarker in acute myeloid leukemia. Its association with systemic inflammation and nutritional status highlights its potential value in risk stratification and outcome prediction. Further prospective studies are warranted to validate its clinical utility and to determine its role alongside established prognostic factors in AML management.

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Keywords: *Albumin-to-fibrinogen ratio; Acute myeloid leukemia; Prognostic biomarker*

Introduction

Acute myeloid leukemia (AML) is a clonal hematologic malignancy characterized by uncontrolled proliferation and accumulation of immature myeloid precursor cells in the bone marrow, peripheral blood, and occasionally in extramedullary tissues. It represents one of the most common forms of acute leukemia in adults and is associated with significant morbidity and mortality worldwide. The disease is highly heterogeneous in terms of genetic abnormalities, clinical presentation, treatment response, and survival outcomes. Despite advances in molecular diagnostics and targeted therapies, the prognosis of many AML patients remains poor, particularly among older individuals and those with adverse cytogenetic or molecular features. Consequently, identifying reliable prognostic biomarkers remains a critical aspect of AML management and research. [1]

Prognostic stratification in AML traditionally relies on several clinical and biological parameters, including patient age, performance status, cytogenetic abnormalities, and molecular mutations such as FLT3, NPM1, and CEBPA. These factors are integrated into widely used risk classification systems that guide therapeutic decisions and predict treatment outcomes. However, these prognostic tools do not fully capture the complexity of AML biology or the host-related factors that may influence disease progression and survival. Increasing attention has therefore been directed toward identifying additional biomarkers that reflect systemic physiological processes such as inflammation, coagulation, and nutritional status. [2]

Systemic inflammation has emerged as an important contributor to cancer development and progression. In hematologic malignancies, inflammatory pathways can influence leukemic cell proliferation, survival, and resistance to therapy. Proinflammatory cytokines and acute-phase reactants may alter the bone marrow microenvironment, promoting leukemic cell growth and impairing normal hematopoiesis. Furthermore, chronic inflammation may affect immune surveillance and contribute to disease progression. As a result, several inflammation-based biomarkers have been investigated as potential prognostic indicators in malignancies, including leukemias. [3]

Serum albumin is widely recognized as an indicator of nutritional status and systemic health. Hypoalbuminemia is frequently observed in patients with malignancies and has been associated with poor clinical outcomes in a variety of cancers. Reduced albumin levels may reflect malnutrition, systemic inflammation, or hepatic dysfunction, all of which can adversely affect patient prognosis. In addition to its role as a nutritional marker, albumin also possesses antioxidant and anti-inflammatory properties that contribute to maintaining physiological homeostasis. Therefore, decreased serum albumin levels may indicate both impaired nutritional reserves and an increased inflammatory burden in cancer patients. [4]

Fibrinogen, on the other hand, is an acute-phase glycoprotein produced by the liver and plays a central role in the coagulation cascade. Beyond its function in hemostasis, fibrinogen has been increasingly recognized as a key mediator of inflammation and tumor biology. Elevated fibrinogen levels have been reported in various malignancies and are often associated with tumor progression, angiogenesis, and metastasis. In hematologic malignancies such as AML, fibrinogen may reflect the activation of inflammatory and coagulation pathways that accompany disease progression. Increased fibrinogen concentrations may therefore serve as an indicator of both systemic inflammation and tumor-associated prothrombotic states. [5]

The albumin-to-fibrinogen ratio (AFR) is a composite biomarker that integrates information from both albumin and fibrinogen levels, thereby reflecting the balance between nutritional status and systemic inflammation. A lower AFR value typically indicates decreased albumin and/or elevated fibrinogen levels, suggesting a state of increased inflammatory activity and reduced physiological reserve. Recent studies have demonstrated that AFR is associated with prognosis in several solid tumors, including gastric, colorectal, and lung cancers. Because AFR combines two readily available laboratory

parameters, it represents a simple, cost-effective, and clinically accessible biomarker for assessing disease severity and predicting patient outcomes. [6]

In the context of acute myeloid leukemia, systemic inflammation and coagulation abnormalities are common features of the disease and may influence treatment response and survival. Leukemic blasts and the tumor microenvironment can produce inflammatory mediators that contribute to disease progression, while abnormalities in coagulation pathways may further complicate the clinical course. These biological processes suggest that inflammation-based biomarkers such as AFR could provide additional prognostic information beyond traditional genetic and cytogenetic markers. However, the role of AFR in AML prognosis has not been fully elucidated, and available data remain relatively limited. [7]

Therefore, investigating the prognostic significance of the albumin-to-fibrinogen ratio in AML may provide valuable insights into the relationship between systemic inflammation, nutritional status, and leukemia progression. Understanding this association could help improve risk stratification and potentially assist clinicians in identifying patients with poorer prognosis who may benefit from more aggressive or individualized therapeutic strategies. This study aims to evaluate the prognostic value of AFR in patients with acute myeloid leukemia and to explore its potential role as a practical biomarker for predicting clinical outcomes. [8]

Pathophysiological Basis of the Albumin-to-Fibrinogen Ratio in Acute Myeloid Leukemia

The albumin-to-fibrinogen ratio (AFR) has emerged as a promising biomarker reflecting the interaction between systemic inflammation, nutritional status, and coagulation activity. In malignant diseases, including hematologic cancers, these biological processes are closely interconnected and can significantly influence disease progression and patient outcomes. In acute myeloid leukemia (AML), the proliferation of leukemic blasts and the associated inflammatory microenvironment can alter metabolic pathways, immune responses, and hemostatic mechanisms. Consequently, biomarkers that integrate indicators of inflammation and nutritional condition, such as AFR, may provide valuable prognostic information beyond traditional genetic or cytogenetic markers. [9]

Inflammation plays a central role in the pathogenesis and progression of many malignancies, including AML. Leukemic cells and the surrounding bone marrow microenvironment produce a variety of inflammatory cytokines, such as interleukin-6, tumor necrosis factor-α, and other proinflammatory mediators. These cytokines contribute to the expansion of malignant clones, suppression of normal hematopoiesis, and development of systemic inflammatory responses. Persistent inflammatory signaling can also promote leukemic cell survival and resistance to apoptosis, thereby facilitating disease progression and reducing treatment effectiveness. The presence of systemic inflammation has therefore been associated with poorer outcomes in patients with hematologic malignancies. [10]

Serum albumin serves as an important indicator of both nutritional status and systemic inflammatory activity. In patients with cancer, hypoalbuminemia often reflects a combination of reduced nutritional intake, increased metabolic demands, and inflammatory cytokine–mediated suppression of hepatic albumin synthesis. Additionally, inflammation can increase vascular permeability, leading to the redistribution of albumin from the intravascular space to the interstitial compartment. Low albumin levels have been associated with reduced physiological reserve, impaired immune function, and decreased tolerance to intensive chemotherapy. As a result, hypoalbuminemia has been recognized as an adverse prognostic factor in many malignancies, including hematologic cancers. [11]

Fibrinogen is another important biomarker closely linked to inflammation and tumor biology. As an acute-phase protein synthesized by the liver, fibrinogen levels increase in response to inflammatory cytokines, particularly interleukin-6. Beyond its role in coagulation, fibrinogen participates in multiple processes related to tumor progression, including cell adhesion, angiogenesis, and modulation of the immune response. Elevated fibrinogen levels may promote tumor cell proliferation and facilitate interactions between malignant cells and the surrounding stromal environment. In addition, fibrinogen can contribute to the formation of a protective matrix around tumor cells, potentially enhancing their ability to evade immune surveillance. [12]

Coagulation abnormalities are frequently observed in patients with acute leukemia and represent an important aspect of disease pathophysiology. Leukemic blasts can activate coagulation pathways by releasing procoagulant factors, inflammatory mediators, and microparticles that stimulate thrombin generation. These alterations may lead to a hypercoagulable state characterized by increased fibrin formation and impaired fibrinolysis. Although the most dramatic coagulation disturbances are observed in acute promyelocytic leukemia, milder coagulation abnormalities can also occur in other AML subtypes. Elevated fibrinogen levels may therefore reflect both systemic inflammation and activation of the coagulation cascade in leukemia patients. [13]

The albumin-to-fibrinogen ratio combines these two biologically significant parameters into a single composite index that reflects the balance between nutritional condition and inflammatory or procoagulant activity. A low AFR typically indicates decreased albumin levels, elevated fibrinogen concentrations, or both. Such a pattern suggests the presence of an inflammatory and hypercoagulable state accompanied by compromised nutritional reserves. These conditions may create a biological environment that favors tumor progression, impairs immune responses, and reduces the patient's ability to tolerate aggressive treatment regimens. [14]

Another potential explanation for the prognostic value of AFR involves its relationship with the tumor microenvironment. In AML, the bone marrow niche plays a crucial role in supporting leukemic cell survival and resistance to therapy. Inflammatory mediators and coagulation factors may influence interactions between leukemic cells, stromal cells, and endothelial cells within this microenvironment. Elevated fibrinogen levels may enhance leukemic cell adhesion and migration, while decreased albumin levels may reflect systemic metabolic stress and immune dysfunction. Together, these changes may contribute to disease persistence and relapse following treatment. [15]

Therefore, the albumin-to-fibrinogen ratio represents a biologically meaningful marker that integrates multiple aspects of leukemia pathophysiology, including systemic inflammation, nutritional status, and coagulation activation. Because both albumin and fibrinogen are routinely measured laboratory parameters, AFR offers a practical and accessible biomarker that can be easily incorporated into clinical evaluation. Understanding the biological basis of AFR in AML provides a strong rationale for investigating its prognostic value and potential role in improving risk stratification and clinical decision-making in patients with this aggressive hematologic malignancy. [16]

Clinical Evidence of the Albumin-to-Fibrinogen Ratio in Malignancies

Inflammation-based biomarkers have gained considerable attention in oncology because they reflect the complex interaction between tumor biology, host immune response, and systemic metabolic status. In recent years, several composite indices derived from routine laboratory parameters have been proposed as prognostic markers in cancer patients. Among these, the albumin-to-fibrinogen ratio (AFR) has emerged as a promising indicator that integrates information related to nutritional condition and inflammatory activity. Because both albumin and fibrinogen are widely available laboratory measurements, AFR offers a simple and cost-effective tool that may help predict disease progression and survival outcomes across a variety of malignancies. [17]

Evidence supporting the prognostic significance of AFR was initially reported in several solid tumors. Studies involving patients with gastric cancer demonstrated that a low preoperative AFR was significantly associated with advanced tumor stage, increased lymph node involvement, and poorer overall survival. Similar findings have been reported in colorectal cancer, where decreased AFR values correlated with more aggressive tumor characteristics and worse clinical outcomes. These observations suggest that AFR may reflect underlying biological processes such as systemic inflammation, malnutrition, and tumor-associated coagulation activity, all of which are known to influence cancer progression. [18]

In addition to gastrointestinal malignancies, the prognostic value of AFR has also been investigated in lung cancer. Clinical studies have shown that patients with non–small cell lung cancer who exhibit lower AFR levels tend to have more advanced disease and shorter survival times compared with patients with higher AFR values. These findings further support the concept that AFR can serve as an integrative biomarker reflecting the balance between inflammatory response and nutritional status in cancer patients.

Because inflammation plays a central role in tumor development and metastasis, biomarkers such as AFR may provide important insights into disease severity and treatment response. [19]

The predictive role of AFR has also been explored in other solid tumors, including hepatocellular carcinoma and pancreatic cancer. In these malignancies, reduced AFR levels have been associated with increased tumor burden, vascular invasion, and decreased survival rates. The consistency of these findings across multiple tumor types suggests that AFR may represent a universal indicator of systemic inflammatory and metabolic disturbances in cancer. Importantly, AFR has demonstrated prognostic value independent of traditional clinical staging systems in several studies, highlighting its potential utility as an additional risk stratification tool. [20]

Although the majority of AFR-related research has focused on solid tumors, emerging evidence suggests that this biomarker may also be relevant in hematologic malignancies. In diseases such as lymphoma and multiple myeloma, systemic inflammation and immune dysregulation are known to influence disease progression and treatment response. Preliminary studies have reported that lower AFR values may be associated with more aggressive disease behavior and reduced survival in these patient populations. These findings provide a rationale for exploring the prognostic significance of AFR in other hematologic cancers, including acute leukemias. [21]

In acute leukemias, inflammatory and coagulation abnormalities are frequently observed during the course of the disease. Leukemic blasts can release cytokines and procoagulant factors that alter the bone marrow microenvironment and contribute to systemic inflammatory responses. These biological changes may affect nutritional status, hepatic protein synthesis, and coagulation pathways, leading to alterations in both albumin and fibrinogen levels. Consequently, AFR may capture important aspects of the host–tumor interaction that are not reflected in conventional prognostic markers used in leukemia. [22]

Despite growing interest in AFR as a prognostic biomarker, studies evaluating its role in acute myeloid leukemia remain relatively limited compared with other malignancies. However, the pathophysiological features of AML, including systemic inflammation, metabolic stress, and coagulation activation, strongly support the potential relevance of AFR in this disease. Because AML patients often present with significant metabolic and inflammatory disturbances, AFR may serve as a useful indicator of disease severity and overall physiological status at diagnosis. [23]

Taken together, the available clinical evidence suggests that the albumin-to-fibrinogen ratio is a promising prognostic marker across a broad spectrum of malignancies. Its ability to reflect both inflammatory activity and nutritional condition makes it particularly valuable in diseases characterized by complex interactions between tumor biology and host response. These observations provide a strong foundation for investigating the prognostic role of AFR in patients with acute myeloid leukemia and evaluating its potential contribution to risk stratification and outcome prediction in this aggressive hematologic malignancy. [24]

Prognostic Role of the Albumin-to-Fibrinogen Ratio in Acute Myeloid Leukemia

Prognostic assessment plays a fundamental role in the management of patients with acute myeloid leukemia (AML), as it guides therapeutic strategies and helps estimate survival outcomes. Although cytogenetic and molecular markers remain the cornerstone of current risk stratification systems, increasing attention has been directed toward host-related factors that may influence disease progression and treatment response. In this context, inflammation-based biomarkers have emerged as valuable tools for predicting clinical outcomes in various malignancies. The albumin-to-fibrinogen ratio (AFR), which reflects both systemic inflammation and nutritional status, has recently been investigated as a potential prognostic indicator in AML patients. [25]

Several clinical studies have suggested that lower AFR values at the time of diagnosis are associated with poorer prognosis in AML. Patients with decreased AFR often exhibit higher levels of systemic inflammation and metabolic stress, conditions that may promote leukemic cell survival and disease progression. These patients may also present with more aggressive disease characteristics, including higher leukocyte counts, increased tumor burden, and compromised physiological reserves. As a result, a low AFR may serve as an indicator of an unfavorable biological environment that contributes to reduced

survival outcomes. [26]

The association between AFR and overall survival has been a key focus of recent investigations. Studies evaluating AML cohorts have demonstrated that patients with lower AFR levels tend to have shorter overall survival compared with those with higher ratios. This relationship is believed to reflect the combined effects of hypoalbuminemia and elevated fibrinogen levels, both of which are associated with systemic inflammation and disease severity. Hypoalbuminemia may indicate impaired nutritional status and decreased tolerance to intensive chemotherapy, while elevated fibrinogen levels may reflect an inflammatory and procoagulant state that supports tumor progression. Together, these factors may contribute to poorer treatment outcomes in AML patients with low AFR. [27]

In addition to its association with survival, AFR may also be linked to treatment response in AML. Patients with lower AFR values may have reduced ability to tolerate intensive chemotherapy due to compromised nutritional status and systemic inflammation. Furthermore, inflammatory cytokines present in the leukemic microenvironment can promote resistance to apoptosis and reduce the effectiveness of cytotoxic agents. Consequently, patients with low AFR may exhibit lower rates of complete remission following induction therapy compared with those with higher AFR levels. These observations suggest that AFR may provide useful information regarding both disease severity and treatment responsiveness. [28]

Another important aspect of AFR is its potential role in improving risk stratification in AML. Traditional prognostic systems focus primarily on leukemia-specific genetic abnormalities, but they may not fully capture host-related factors that influence patient outcomes. Because AFR reflects systemic inflammatory activity and nutritional condition, it may provide complementary prognostic information that enhances existing risk classification models. Incorporating AFR into prognostic assessment could therefore help identify high-risk patients who might benefit from closer monitoring or alternative therapeutic strategies. [29]

Furthermore, AFR may be associated with other clinical parameters that reflect disease severity in AML. Lower AFR values have been linked to markers of systemic inflammation such as elevated C-reactive protein levels, increased leukocyte counts, and impaired liver function tests. These associations further support the concept that AFR reflects broader physiological disturbances occurring in patients with aggressive disease. By integrating information related to inflammation, coagulation, and nutritional status, AFR may offer a more comprehensive picture of the patient's overall condition at the time of diagnosis. [30]

The prognostic value of AFR may also be related to its ability to reflect interactions between leukemic cells and the bone marrow microenvironment. Inflammatory mediators and coagulation factors can influence the survival, proliferation, and migration of leukemic blasts. Elevated fibrinogen levels may promote cellular adhesion and protect malignant cells from immune-mediated destruction, while reduced albumin levels may indicate systemic metabolic stress and impaired immune function. These biological interactions may contribute to disease persistence and relapse, further explaining the association between low AFR and poorer clinical outcomes in AML patients. [31]

Although current evidence suggests that AFR may serve as a valuable prognostic biomarker in AML, further studies are needed to validate its clinical utility. Large prospective studies are required to establish optimal cutoff values, clarify its relationship with established prognostic markers, and determine how it may best be integrated into existing risk stratification systems. Nevertheless, the simplicity and accessibility of AFR make it an attractive candidate biomarker for routine clinical use. By providing additional insights into the inflammatory and metabolic status of AML patients, AFR may contribute to more accurate prognostic evaluation and personalized treatment strategies. [32]

Clinical Implications of the Albumin-to-Fibrinogen Ratio in Acute Myeloid Leukemia

The identification of reliable and easily accessible prognostic biomarkers is essential for improving the management of patients with acute myeloid leukemia (AML). Although current prognostic models primarily rely on cytogenetic and molecular abnormalities, these factors do not fully reflect the host’s systemic condition, which can significantly influence treatment tolerance and clinical outcomes. The albumin-to-fibrinogen ratio (AFR) offers a practical biomarker that integrates information about both

nutritional status and systemic inflammatory activity. Because albumin and fibrinogen are routinely measured laboratory parameters, AFR can be easily calculated without additional cost or specialized testing, making it an attractive tool for clinical application in AML management. [33]

One important clinical application of AFR is its potential role in improving risk stratification at the time of diagnosis. Patients with AML present with considerable heterogeneity in disease severity and response to treatment. While genetic markers provide essential information about leukemia biology, they do not always capture the overall physiological condition of the patient. AFR may complement existing prognostic systems by identifying patients who have a high inflammatory burden or poor nutritional status, both of which are associated with unfavorable outcomes. Incorporating AFR into baseline evaluation may therefore help clinicians better categorize patients into appropriate risk groups and guide treatment decisions. [34]

Another potential application of AFR lies in predicting tolerance to intensive chemotherapy. AML treatment often involves aggressive induction regimens that can produce significant toxicity, particularly in patients with limited physiological reserve. Hypoalbuminemia has been associated with decreased tolerance to chemotherapy and increased treatment-related complications. Similarly, elevated fibrinogen levels may indicate systemic inflammatory activation that could impair recovery from cytotoxic therapy. Patients with low AFR values may therefore represent a subgroup that requires closer monitoring, dose adjustment, or consideration of alternative therapeutic approaches. [35]

AFR may also be useful for monitoring disease progression and treatment response during the course of AML therapy. Changes in systemic inflammatory activity and nutritional status can occur during treatment due to chemotherapy, infection, or disease relapse. Monitoring AFR over time may provide additional information regarding the patient's overall physiological status and response to therapy. For example, improvement in AFR levels during treatment could indicate recovery of nutritional status and reduction of inflammatory activity, whereas persistent or worsening AFR abnormalities might suggest ongoing disease activity or treatment-related complications. [36]

In addition to its prognostic value, AFR may have implications for supportive care strategies in AML patients. Because low AFR reflects both malnutrition and systemic inflammation, identifying patients with decreased AFR may prompt early nutritional assessment and intervention. Nutritional support, infection control, and anti-inflammatory management may help improve the patient's overall condition and potentially enhance treatment tolerance. Addressing these host-related factors may contribute to better outcomes in AML patients, particularly those undergoing intensive chemotherapy or stem cell transplantation. [37]

Furthermore, the use of AFR may facilitate the development of more personalized treatment approaches in AML. As oncology increasingly moves toward individualized medicine, integrating biological, genetic, and host-related factors becomes increasingly important. AFR provides information that complements traditional prognostic markers and may help clinicians identify patients who require more aggressive therapy, closer follow-up, or enhanced supportive care. By incorporating AFR into comprehensive prognostic evaluation, clinicians may improve their ability to tailor treatment strategies according to the specific needs and physiological status of each patient. [38]

Despite these promising applications, several challenges remain before AFR can be widely adopted in routine AML practice. Variability in cutoff values across studies, differences in patient populations, and the influence of comorbid conditions such as liver disease or infection may affect AFR measurements. Therefore, larger prospective studies are needed to validate the optimal thresholds and confirm the independent prognostic value of AFR in diverse AML populations. Standardizing the use of AFR in clinical research will be essential to establish its role in future risk stratification models. [39]

Overall, the albumin-to-fibrinogen ratio represents a simple yet potentially powerful biomarker that reflects the complex interaction between inflammation, coagulation, and nutritional status in patients with acute myeloid leukemia. Its accessibility, cost-effectiveness, and biological relevance make it a promising tool for enhancing prognostic evaluation and guiding clinical decision-making. Continued investigation into AFR may contribute to improved risk assessment and more personalized management strategies for

patients with this aggressive hematologic malignancy. [40]

Conclusion

Acute myeloid leukemia (AML) remains a highly aggressive hematologic malignancy characterized by significant biological and clinical heterogeneity. Despite considerable advances in molecular diagnostics and targeted therapeutic approaches, predicting patient outcomes and optimizing individualized treatment strategies continue to be major challenges in clinical practice. Traditional prognostic systems primarily rely on cytogenetic and molecular abnormalities; however, these models may not fully reflect the influence of host-related factors such as systemic inflammation, nutritional status, and metabolic disturbances. Consequently, identifying additional biomarkers that capture these aspects of disease biology has become an important area of research in AML.

The albumin-to-fibrinogen ratio (AFR) has emerged as a promising biomarker that integrates two biologically significant parameters reflecting the balance between nutritional status and systemic inflammatory activity. Albumin levels provide insight into the patient's nutritional reserve and general physiological condition, while fibrinogen levels reflect inflammatory and coagulation-related processes that are frequently activated in malignant diseases. By combining these two indicators, AFR offers a composite measure that may better represent the overall systemic environment in which leukemia develops and progresses.

Accumulating evidence suggests that lower AFR values are associated with increased inflammatory burden, impaired nutritional status, and poorer clinical outcomes in various malignancies. In the context of AML, systemic inflammation and metabolic stress are common features that may contribute to disease progression, treatment resistance, and reduced survival. AFR therefore has the potential to serve as a practical prognostic biomarker that complements existing genetic and cytogenetic risk stratification systems. Because both albumin and fibrinogen are routinely measured laboratory parameters, AFR can be easily calculated without additional cost or specialized testing, making it particularly suitable for use in routine clinical practice.

Beyond its prognostic value, AFR may also have important clinical implications in the management of AML patients. It may help identify individuals with poor physiological reserve who may be at higher risk of treatment-related complications or reduced tolerance to intensive chemotherapy. Furthermore, AFR may assist clinicians in recognizing patients who may benefit from closer monitoring, enhanced supportive care, or individualized therapeutic strategies. Monitoring AFR during treatment may also provide insight into changes in the patient's inflammatory and nutritional status throughout the disease course.

Despite these promising findings, several limitations must be considered before AFR can be widely implemented as a routine prognostic tool in AML. Variations in study design, patient populations, and cutoff values have resulted in some inconsistency among published reports. In addition, factors unrelated to leukemia, such as liver dysfunction, infection, or comorbid inflammatory conditions, may influence albumin and fibrinogen levels and therefore affect AFR values. Large prospective studies are needed to validate the prognostic significance of AFR, establish standardized cutoff thresholds, and determine how this biomarker can be effectively integrated into existing prognostic models.

In conclusion, the albumin-to-fibrinogen ratio represents a simple, cost-effective, and biologically meaningful biomarker that reflects the interplay between systemic inflammation and nutritional status in patients with acute myeloid leukemia. Its potential role in prognostic evaluation and risk stratification highlights its value as an adjunct to traditional clinical and molecular markers. Continued research in this area may further clarify the clinical utility of AFR and contribute to improved prognostic assessment and

personalized management strategies for patients with AML.

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