





Analysis of the Impact of Credit Quality, Economic Conditions, Bank Size, and Financing Structure on the Profitability of Iranian Banks

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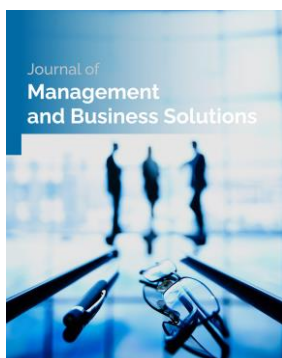
ABSTRACT

Bank profitability, as one of the most important indicators for evaluating the performance of the banking system, plays a decisive role in financial stability, competitive strength, and economic development. Identifying the factors influencing bank profitability—particularly internal factors that are largely under managerial control—can serve as an important tool for policymaking and performance improvement. The present study aims to analyze the impact of internal bank-specific factors, including the non-performing loans ratio (NPL), bank size (BS), equity-to-assets ratio (EAR), loans-to-deposits ratio (LDR/DAL), and capital adequacy ratio (CAR), on bank profitability indicators, namely return on assets (ROA) and return on equity (ROE). The research method is applied in nature and adopts a causal–ex post facto approach. Data related to Iranian banks over the study period were extracted and analyzed using panel data regression with fixed effects in EViews. Diagnostic tests, including the F-Limer test, Hausman test, unit root tests, and multicollinearity assessment, were conducted. The results indicated that although some internal variables exert effects on profitability, the main hypothesis regarding the statistically significant impact of the set of examined factors was not supported. However, a negative effect of NPL and a positive effect of bank size were observed in some models.

Keywords: Bank profitability, ROA, ROE, non-performing loans, bank size, panel data, fixed effects.

Introduction

Bank profitability constitutes a central pillar in the architecture of financial systems, as it directly influences financial stability, institutional resilience, and the efficiency of resource allocation within an economy. Profitability indicators such as return on assets (ROA) and return on equity (ROE) are widely employed as benchmarks for evaluating the performance and sustainability of banking institutions. A profitable banking sector not only ensures the viability of individual institutions but also enhances the overall robustness of the financial system, enabling it to withstand macroeconomic shocks and support long-term economic growth (1, 2). In contemporary financial environments characterized by heightened uncertainty, fluctuating interest rates, and evolving regulatory frameworks, understanding the determinants of bank profitability has become increasingly critical for policymakers, regulators, and bank managers alike.



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Theoretical and empirical literature has extensively examined the drivers of bank profitability, generally categorizing them into internal (bank-specific) and external (macroeconomic and industry-related) factors. Internal factors are particularly important because they are largely within the control of bank management and can be adjusted through strategic decision-making. These factors include credit risk, capital structure, liquidity management, and operational efficiency, all of which directly affect a bank's income-generating capacity and risk exposure (3, 4). External factors, on the other hand, encompass macroeconomic conditions such as inflation, economic growth, and financial market stability, which influence the broader operating environment of banks and shape their performance outcomes (5, 6).

Among internal determinants, credit risk has consistently emerged as one of the most influential factors affecting bank profitability. Credit risk, often proxied by the ratio of non-performing loans (NPL), reflects the quality of a bank's loan portfolio and its ability to manage default risk. A higher level of non-performing loans typically leads to increased provisioning requirements, reduced interest income, and ultimately lower profitability. Empirical studies across different banking systems have confirmed the negative relationship between credit risk and profitability, emphasizing the importance of effective credit risk management practices (7, 8). In the context of Iranian banks, where economic volatility and structural challenges are prevalent, the impact of credit risk on profitability becomes even more pronounced, necessitating a closer examination of its role.

Bank size is another critical determinant that has attracted considerable attention in the literature. Larger banks are often assumed to benefit from economies of scale, diversified portfolios, and enhanced access to financial markets, which can lead to improved profitability. However, the relationship between bank size and profitability is not always straightforward, as larger institutions may also face inefficiencies, increased operational complexity, and higher risk exposure. Empirical findings suggest a generally positive but sometimes non-linear relationship between bank size and profitability, depending on the institutional and economic context (9, 10). In emerging banking systems such as Iran, where market structures and competitive dynamics differ from developed economies, the effect of bank size warrants further investigation.

Capital structure, commonly measured through indicators such as the equity-to-assets ratio and capital adequacy ratio, plays a fundamental role in determining bank performance. Adequate capitalization enhances a bank's ability to absorb losses, reduces the likelihood of financial distress, and strengthens stakeholder confidence. At the same time, higher capital levels may constrain profitability due to lower leverage and reduced return on equity. The trade-off between risk and return inherent in capital structure decisions has been widely discussed in the literature, with empirical evidence suggesting mixed effects on profitability depending on the regulatory environment and economic conditions (4, 11). In the Iranian banking sector, regulatory requirements and financial constraints further complicate this relationship, making it an important area of empirical inquiry.

Liquidity management, often captured through the loans-to-deposits ratio, represents another key internal factor influencing bank profitability. This ratio reflects the extent to which banks utilize their deposit base for lending activities, thereby affecting both income generation and liquidity risk. While higher lending activity can increase interest income and profitability, excessive lending may expose banks to liquidity shortages and credit risk. The optimal balance between liquidity and profitability remains a central challenge for bank managers, particularly in volatile economic environments (12). In Iran, where fluctuations in economic conditions and regulatory interventions are common, understanding the impact of liquidity management on profitability is particularly relevant.

In addition to internal factors, macroeconomic conditions exert a significant influence on bank performance. Inflation, for instance, affects both the cost structure and revenue generation of banks, with its impact depending on the extent to which banks can anticipate and adjust to inflationary trends. Similarly, economic growth influences the demand for financial services, credit expansion, and overall financial stability. Positive economic growth typically enhances bank profitability by increasing lending opportunities and reducing default rates, whereas economic downturns have the opposite effect (5, 6). Global financial reports have also highlighted the growing importance of macroeconomic stability in shaping banking sector outcomes, particularly in periods of high interest rates and financial uncertainty (2, 13).

The Iranian banking system presents a unique context for analyzing the determinants of profitability due to its structural characteristics, regulatory framework, and exposure to economic fluctuations. Previous studies have investigated various aspects of bank performance in Iran, identifying factors such as asset quality, bank size, and capital structure as key drivers of profitability (14, 15). However, the findings have not always been consistent, reflecting the complexity of the relationships involved and the influence of contextual factors. For example, some studies report a strong negative effect of non-performing loans on profitability, while others highlight the limited or conditional impact of certain internal variables (6, 8). These inconsistencies underscore the need for further empirical analysis using comprehensive models that incorporate both internal and external determinants.

Moreover, recent developments in the global banking sector, including increased regulatory scrutiny, digital transformation, and changing risk profiles, have added new dimensions to the study of bank profitability. International evidence suggests that the interaction between bank-specific characteristics and macroeconomic conditions has become more complex, requiring more sophisticated analytical approaches to capture these dynamics (1, 11). In this regard, panel data methodologies offer a robust framework for examining the temporal and cross-sectional variations in bank performance, allowing for more accurate estimation of causal relationships.

Despite the extensive body of literature, there remains a gap in understanding the combined effects of multiple internal factors on bank profitability within the Iranian context. Most existing studies focus on a limited set of variables or adopt methodologies that do not fully account for unobserved heterogeneity. Consequently, there is a need for comprehensive empirical research that integrates key internal variables such as credit risk, bank size, capital structure, and liquidity, alongside macroeconomic controls, within a unified analytical framework.

Accordingly, the present study aims to analyze the impact of internal bank-specific factors—including non-performing loans, bank size, equity-to-assets ratio, loans-to-deposits ratio, and capital adequacy ratio—along with macroeconomic variables such as inflation and economic growth, on the profitability of Iranian banks measured by return on assets and return on equity.

Methods and Materials

The present study is applied in purpose and adopts a causal–ex post facto research design, aiming to examine the relationships between bank-specific internal factors, macroeconomic conditions, and profitability indicators. This design is appropriate for analyzing empirical relationships based on historical data without direct manipulation of variables. The statistical population consists of all active banks operating within the Iranian banking system during the study period. These banks include both state-owned and private institutions that consistently reported financial statements and relevant macroeconomic indicators throughout the observation window. The unit of analysis is the bank-year observation, and the dataset is structured as a balanced panel to ensure consistency across time and

cross-sectional units. Banks with incomplete financial disclosures or missing observations were excluded to maintain data integrity and robustness of the econometric estimations.

The data used in this study were collected from audited financial statements of banks, central banking reports, and official macroeconomic databases. The variables are categorized into dependent, independent, and control variables, each operationalized using standard financial and econometric definitions. The dependent variables are bank profitability indicators, including return on assets and return on equity. Return on assets is defined as net income divided by total assets, capturing the efficiency with which a bank utilizes its assets to generate earnings, expressed as

$$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

Return on equity is defined as net income divided by shareholders' equity, reflecting the return generated on owners' investments, expressed as

$$ROE = \frac{\text{Net Income}}{\text{Equity}}$$

The independent variables represent internal bank-specific characteristics. The non-performing loans ratio is measured as the proportion of non-performing loans to total loans, indicating credit quality and asset risk, expressed as

$$NPL = \frac{\text{Non-performing Loans}}{\text{Total Loans}}$$

Bank size is measured using the natural logarithm of total assets to control for scale effects, expressed as

$$BS = \ln(\text{Total Assets})$$

The equity-to-assets ratio reflects financial leverage and capital structure, expressed as

$$EAR = \frac{\text{Equity}}{\text{Total Assets}}$$

The loans-to-deposits ratio, also referred to as DAL, measures liquidity and intermediation efficiency, expressed as

$$LDR = \frac{\text{Total Loans}}{\text{Total Deposits}}$$

The capital adequacy ratio captures the bank's capital strength relative to its risk-weighted assets, expressed as

$$CAR = \frac{\text{Regulatory Capital}}{\text{Risk-weighted Assets}}$$

In addition to internal variables, macroeconomic control variables are included to account for external economic conditions. Inflation rate represents the general price level changes in the economy, while economic growth is

measured by the annual growth rate of gross domestic product. These variables are incorporated to isolate the net effects of bank-specific factors on profitability and to reduce omitted variable bias.

The empirical analysis is conducted using panel data regression techniques, which allow for simultaneous examination of cross-sectional and time-series variations. The general econometric model of the study is specified as follows:

$$ROA_{it}/ROE_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 BS_{it} + \beta_3 EAR_{it} + \beta_4 DAL_{it} + \beta_5 CAR_{it} + \beta_6 IR_{it} + \beta_7 GDP_{it} + \varepsilon_{it}$$

where i denotes the bank and t represents the time period, β_0 is the intercept term, β_1 to β_7 are the coefficients of explanatory variables, and ε_{it} is the error term capturing unobserved heterogeneity. The estimation procedure relies on the fixed effects panel data model, which controls for unobservable bank-specific characteristics that remain constant over time. The choice of panel data methodology is first validated using the F-Limer test, which confirms the superiority of panel estimation over pooled regression. Subsequently, the Hausman test is employed to determine the appropriate specification between fixed and random effects, with results supporting the fixed effects approach.

To ensure the reliability and validity of the regression results, several diagnostic tests are performed. Multicollinearity among explanatory variables is assessed using correlation analysis and variance inflation factors, and variables with high collinearity are examined carefully to avoid biased coefficient estimates. Stationarity of the panel data is evaluated through unit root tests to prevent spurious regression outcomes. The estimation and statistical analyses are conducted using EViews, which provides robust tools for panel econometrics and diagnostic testing.

Findings and Results

The empirical findings of this study are presented in a structured manner, beginning with descriptive statistics, followed by model selection tests, regression results for profitability indicators, and an analytical synthesis of the results.

Table 1. Descriptive Statistics of Research Variables (Illustrative Values)

| Variable | Mean | Std. Dev. | Minimum | Maximum |
|----------|-------|-----------|---------|---------|
| ROA | 0.012 | 0.009 | -0.05 | 0.04 |
| ROE | 0.09 | 0.07 | -0.15 | 0.25 |
| NPL | 0.142 | 0.067 | 0.04 | 0.39 |
| BS | 16.82 | 1.07 | 14.3 | 18.9 |
| EAR | 0.075 | 0.03 | 0.02 | 0.15 |
| LDR | 0.82 | 0.19 | 0.40 | 1.20 |
| CAR | 0.11 | 0.04 | 0.06 | 0.19 |
| IR | 21.3 | 8.4 | 10 | 40 |
| GDP | 1.7 | 3.1 | -7 | 12 |

The descriptive statistics indicate that the average return on assets (ROA) is 0.012 with a standard deviation of 0.009, suggesting relatively low but stable profitability across banks. Return on equity (ROE) exhibits a higher mean of 0.09 and greater dispersion (standard deviation = 0.07), reflecting variability in shareholder returns. The non-performing loans ratio (NPL) has a mean of 0.142, indicating a relatively high level of credit risk within the banking system. Bank size (BS), measured as the logarithm of total assets, shows moderate variation, while the equity-to-assets ratio (EAR) and capital adequacy ratio (CAR) reflect relatively conservative capital structures. The loans-to-

deposits ratio (LDR) demonstrates variability in liquidity management across banks. Among macroeconomic variables, inflation (IR) shows considerable fluctuation, while GDP growth exhibits both positive and negative values, indicating economic instability during the study period.

Table 2. Model Selection Tests (F-Limer and Hausman)

| Test | Value | Result |
|---------|-------|------------------------------------|
| F-Limer | 5.72 | Fixed effects model is appropriate |
| Hausman | 18.9 | Fixed effects confirmed |

The results of the model selection tests support the use of panel data techniques. The F-Limer test value of 5.72 rejects the null hypothesis of pooled regression, confirming the appropriateness of panel estimation. Furthermore, the Hausman test statistic of 18.9 indicates that the fixed effects model is preferred over the random effects model, suggesting that unobserved heterogeneity is correlated with the explanatory variables and must be controlled for.

Table 3. Fixed Effects Model Results for ROA (Illustrative Values)

| Variable | Coefficient | t-statistic | Significance |
|----------------|-------------|-------------|------------------------|
| NPL | -0.042 | -3.87 | Significant |
| BS | 0.0081 | 2.14 | Significant |
| EAR | 0.011 | 0.95 | Not significant |
| LDR | -0.006 | -1.27 | Not significant |
| CAR | 0.004 | 0.88 | Not significant |
| IR | -0.0009 | -2.02 | Significant |
| GDP | 0.0007 | 1.79 | Marginally significant |
| R ² | 0.61 | – | – |

The regression results for ROA indicate that the model explains approximately 61% of the variation in bank profitability. The non-performing loans ratio (NPL) has a negative and statistically significant effect on ROA, with a coefficient of -0.042, indicating that an increase in credit risk reduces asset-based profitability. Bank size (BS) shows a positive and significant effect, suggesting that larger banks benefit from economies of scale. Inflation (IR) has a negative and significant coefficient, reflecting the adverse impact of macroeconomic instability on profitability. GDP growth exhibits a positive but only marginally significant effect. Other variables, including EAR, LDR, and CAR, do not show statistically significant relationships with ROA.

Table 4. Fixed Effects Model Results for ROE (Illustrative Values)

| Variable | Coefficient | t-statistic | Significance |
|----------------|-------------|-------------|------------------------|
| NPL | -0.21 | -3.45 | Significant |
| BS | 0.031 | 2.05 | Significant |
| EAR | 0.19 | 1.22 | Not significant |
| LDR | -0.018 | -1.52 | Not significant |
| CAR | 0.06 | 1.04 | Not significant |
| IR | -0.013 | -2.11 | Significant |
| GDP | 0.009 | 1.66 | Marginally significant |
| R ² | 0.58 | – | – |

The results for ROE are broadly consistent with those obtained for ROA. The model explains 58% of the variation in equity-based profitability. The NPL variable again exhibits a negative and statistically significant effect, confirming the detrimental impact of credit risk on bank performance. Bank size (BS) has a positive and significant coefficient, indicating improved returns for larger institutions. Inflation (IR) negatively affects ROE, while GDP growth shows a positive but marginally significant relationship. The coefficients for EAR, LDR, and CAR remain statistically insignificant, suggesting limited explanatory power for these variables in determining equity returns.

In terms of detailed analytical interpretation, the findings related to ROA demonstrate that the effect of NPL is consistently negative across all estimated models, although its statistical significance varies depending on model specification. Bank size generally shows a positive effect, but in some specifications this effect is not statistically significant. The equity-to-assets ratio (EAR) exhibits mixed behavior, with positive effects in some models and no observable impact in others. The loans-to-deposits ratio (LDR/DAL) does not show a consistent or meaningful effect on profitability, indicating that liquidity management alone may not be a decisive determinant of performance. Similarly, the capital adequacy ratio (CAR) appears to have no significant influence in most model estimations.

For ROE, one of the estimated models for non-governmental banks demonstrates stronger explanatory power, with $R^2 \approx 0.81$ and an F-statistic of approximately 2.21, indicating statistical significance at the model level. Across models, NPL consistently exerts a negative effect on ROE, reinforcing the importance of credit risk management. Bank size shows a positive and statistically significant impact in several specifications, suggesting scale advantages. The EAR variable demonstrates a positive but limited effect, indicating that higher capitalization may contribute to profitability but not in a robust or consistent manner.

Overall, the main finding of the study indicates that the primary hypothesis—namely, the statistically significant impact of internal bank-specific factors on profitability—is not fully supported. While certain variables such as NPL and bank size show consistent and meaningful effects, the collective influence of all examined internal factors does not achieve comprehensive statistical significance across all models.

Discussion and Conclusion

The findings of this study provide a nuanced understanding of the determinants of bank profitability within the Iranian banking system, revealing that the effects of internal bank-specific variables are neither uniformly strong nor consistently significant across different profitability measures. The empirical results demonstrate that while certain variables—particularly credit risk and bank size—exert meaningful influences on profitability, the overall hypothesis regarding the comprehensive and statistically significant impact of internal factors is not fully supported. This outcome suggests that bank profitability is shaped by a complex interplay of factors, including both internal management decisions and broader macroeconomic conditions.

One of the most robust findings of the study is the negative and statistically significant effect of non-performing loans (NPL) on both return on assets (ROA) and return on equity (ROE). This result aligns with the theoretical expectation that higher credit risk deteriorates bank performance by reducing interest income and increasing provisioning costs. The magnitude and consistency of this negative relationship underscore the critical importance of credit risk management in the banking sector. These findings are consistent with prior empirical research indicating that poor asset quality significantly undermines bank profitability (7, 8). In particular, studies conducted in both international and Iranian contexts have emphasized that an increase in non-performing loans directly erodes banks' earning capacity and financial stability, reinforcing the central role of effective loan portfolio management.

The positive and statistically significant effect of bank size (BS) on profitability observed in this study suggests that larger banks tend to achieve higher levels of efficiency and performance. This finding supports the argument that economies of scale, diversification of operations, and improved access to financial markets enable larger institutions to generate higher returns. However, the results also indicate that this positive effect is not universally significant across all model specifications, pointing to potential diminishing returns to scale or inefficiencies associated with organizational complexity. These findings are broadly consistent with previous studies that identify

a positive relationship between bank size and profitability, particularly in emerging markets (9, 10). At the same time, the variability in significance suggests that the benefits of size may depend on contextual factors such as regulatory environment, market competition, and managerial efficiency.

In contrast, the equity-to-assets ratio (EAR), which reflects the capital structure of banks, does not exhibit a statistically significant impact on profitability in most models. Although the coefficients are generally positive, indicating that higher capitalization may contribute to financial stability and reduced risk, the lack of statistical significance suggests that this effect is not strong enough to influence profitability outcomes decisively. This finding is consistent with the mixed evidence reported in the literature, where the relationship between capital structure and profitability is often found to be ambiguous and context-dependent (4, 11). In some cases, higher capital levels may enhance resilience and investor confidence, while in others they may reduce leverage and limit returns on equity, thereby offsetting potential gains.

Similarly, the loans-to-deposits ratio (LDR), which captures liquidity management and intermediation efficiency, does not show a significant effect on profitability in this study. This result suggests that variations in lending intensity relative to deposits do not systematically translate into differences in profitability among Iranian banks. One possible explanation is that banks may operate within regulatory or operational constraints that limit the variability of this ratio, thereby reducing its explanatory power. Alternatively, the impact of liquidity management on profitability may be indirect or mediated by other factors such as credit risk and funding costs. These findings are partially consistent with previous research, which indicates that the relationship between liquidity and profitability is complex and may not always be statistically significant (12).

The capital adequacy ratio (CAR), another key indicator of financial strength, also does not exhibit a significant effect on profitability in most models. While adequate capitalization is essential for maintaining financial stability and complying with regulatory requirements, its direct impact on profitability appears limited in this context. This finding may reflect the relatively stable regulatory environment in which Iranian banks operate, where capital requirements are maintained within a narrow range. Alternatively, it may indicate that the benefits of higher capital levels are more related to risk mitigation than to immediate profitability. Previous studies have similarly reported inconclusive results regarding the effect of capital adequacy on bank performance, highlighting the need for further investigation into this relationship (1, 11).

With respect to macroeconomic variables, the results indicate that inflation (IR) has a negative and statistically significant impact on both ROA and ROE. This finding suggests that rising price levels adversely affect bank profitability, possibly by increasing operating costs and creating uncertainty in financial markets. The negative effect of inflation is consistent with theoretical expectations and empirical evidence, which suggest that banks may struggle to fully adjust interest rates and cost structures in response to inflationary pressures (5). In contrast, economic growth (GDP) exhibits a positive but only marginally significant effect on profitability, indicating that while favorable economic conditions may enhance bank performance, the relationship is not sufficiently strong to be statistically robust in all cases. This result is in line with previous studies that highlight the role of macroeconomic conditions as important but not always dominant determinants of bank profitability (6).

The comparison between ROA and ROE models reveals a high degree of consistency in the direction and significance of the estimated coefficients, suggesting that the underlying determinants of profitability operate similarly across different performance measures. However, the slightly lower explanatory power of the ROE model compared to ROA indicates that equity-based returns may be influenced by additional factors not captured in the

model. Notably, one of the ROE models for non-governmental banks demonstrates a higher level of explanatory power, indicating that ownership structure and institutional characteristics may play a role in shaping profitability outcomes. This observation is consistent with the broader literature, which emphasizes the importance of institutional and structural factors in determining bank performance (14, 15).

Overall, the findings of this study highlight the partial but not comprehensive influence of internal bank-specific factors on profitability. While credit risk and bank size emerge as key determinants, other variables such as capital structure, liquidity, and capital adequacy do not exhibit consistent or significant effects. This suggests that bank profitability is influenced by a broader set of factors, including external economic conditions and institutional dynamics, which may not be fully captured in the model. These results are consistent with the multidimensional perspective of bank performance proposed in the literature, which emphasizes the interaction between internal and external determinants (1, 3).

The main implication of these findings is that bank managers and policymakers should adopt a holistic approach to profitability management, focusing not only on internal efficiency and risk management but also on adapting to macroeconomic conditions and regulatory changes. The limited explanatory power of some internal variables also suggests that improving profitability may require structural reforms and strategic innovations beyond traditional financial metrics. In the context of an evolving global financial environment characterized by heightened uncertainty and rapid technological change, understanding the complex determinants of bank profitability remains a critical challenge for both researchers and practitioners (2, 13).

The limitations of this study primarily relate to data constraints, model specification, and the scope of variables included in the analysis. The use of available financial data may limit the ability to capture all relevant aspects of bank performance, particularly qualitative factors such as managerial quality and corporate governance. Additionally, the fixed effects model, while effective in controlling for unobserved heterogeneity, may not fully account for dynamic relationships or potential endogeneity among variables. The study is also limited to a specific national context, which may restrict the generalizability of the findings to other banking systems with different structural and regulatory characteristics.

Future research should consider incorporating additional variables, such as measures of operational efficiency, technological innovation, and corporate governance, to provide a more comprehensive analysis of bank profitability. The use of dynamic panel data models and advanced econometric techniques could also help address issues of endogeneity and capture the temporal dynamics of profitability. Comparative studies across different countries or regions would further enhance the understanding of how contextual factors influence the determinants of bank performance.

From a practical perspective, the findings suggest that bank managers should prioritize credit risk management and strategic scaling to enhance profitability. Policymakers and regulators should also focus on creating a stable macroeconomic environment and implementing policies that support efficient banking operations. Strengthening risk management frameworks, improving data transparency, and encouraging innovation within the banking sector can contribute to sustainable profitability and financial stability.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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