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Leverage and Firm Performance: A Study of NIFTY 100 Companies

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Abstract

The study examines the association between leverage and firm performance. This issue has been the subject of several studies, yet the results are conflicting and inconsistent. Regarding the leverage-performance association, divergent opinions exist among the researchers. Numerous studies on NSE-listed and BSE-listed companies have been conducted in India. Further, comparative studies have been done on companies across the manufacturing and service sectors, as well as across financial and non-financial sectors. However, there aren't many comparison studies across sectors that account for a substantial share of the NIFTY 100 index. Therefore, the current study focuses on assessing the impact of leverage on performance in general (on a pooled sample) and investigating sectoral differences in the leverage-performance association across sectors that form a substantial proportion of the NIFTY 100 index (excluding financial firms). Accordingly, four sectors representing a substantial proportion of the NIFTY 100 non-financial universe with distinct operating and financing characteristics are chosen. To maintain comparability across sectors, 10 companies are selected from each sector based on market capitalisation. Thus, the study covers a sample of 40 companies observed over 10 years, from 2014 to 2023. To assess the impact of leverage on firm performance, the fixed-effect panel model is utilised based on Hausman's test results.

Major Findings: The results reveal a significant negative impact of leverage on performance in general, indicating that higher leverage adversely affects shareholders' returns. Further, the results of the interaction-based Fixed-effect model and the Wald test validate the existence of significant sectoral differences in the leverage-performance association. The outcomes of the study contribute to the capital structure literature by demonstrating the existence of sectoral heterogeneity in the leverage-performance association, highlighting the importance of sector-specific traits in capital structure decisions.

Keywords: Leverage, Firm Performance, Fixed-effect Model, NIFTY 100, Sectoral Heterogeneity

1. Introduction

There has been a debate on the connection between a company's performance and its leverage (Omri *et al.*, 2024). The choice between debt and equity financing has attracted considerable scholarly attention since the seminal work of Modigliani and Miller (1958), giving rise to competing ideas such as the Trade-off Theory, Pecking Order theory, and Agency Cost theory. According to Modigliani and Miller (1958), capital structure has no bearing on firm value under the limiting assumptions of a perfect capital market, uniform investor expectations, a tax-free economy, and no transaction costs. However, if taxes exist, a change in the capital structure might boost the firm's value, due to the tax benefit that debt payments provide (Modigliani & Miller, 1963). In line with MM's revised proposition, Haugan and

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Kumar (1974) found the relevance of capital mix in maximising firm value. Further, the propositions by Kraus and Litzenberg (1973), Myers and Majluf (1984), and Jensen and Meckling (1976) with their distinct presumptions constitute the basis of debt-performance dynamics. Despite this theoretical background, many academicians have empirically verified the effect of leverage on firm performance. Numerous researchers recorded a negative impact of leverage on performance (Yazdanfar & Ohman, 2015; Kumar *et al.*, 2022; Ghosh & Sinha, 2024). On the other hand, a few researchers found a positive influence of leverage on firm performance (Arhinful & Radmehr, 2023). Nevertheless, some researchers reported mixed findings (Vithessonthi & Tongurai, 2015; Mishra & Dasgupta, 2019). However, a growing body of literature indicates that the impact of leverage on performance is heterogeneous across firms; a lot of literature on leverage and firm performance largely focuses on aggregate samples of listed firms. In Western countries, comparative analysis was done on developed and frontier economy firms and on domestic and international firms (*e.g.*, Vithessonthi & Tongurai, 2015; Mishra & Dasgupta, 2019). Nevertheless, the majority of comparative studies carried out in India focus on manufacturing and service sector companies or financial and non-financial companies. However, no comparative analysis has been done, especially between the sectors that comprise a substantial proportion of the NIFTY 100. Thus, the current study looks at the sectoral differences in the leverage-performance association across four important sectors that have a substantial share in the NIFTY 100 non-financial universe. NIFTY 100 is selected because it represents approximately 60 to 65% of the free-float market capitalisation of companies listed on the NSE and includes firms from diverse sectors. The index provides a balanced representation of major sectors while ensuring the availability and consistency of financial data compared to both narrower and broader indices. Moreover, the index comprises large and liquid companies drawn from distinct sectors of the Indian economy. It represents a noteworthy share of the free-float market capitalisation of the Indian equity market.

2. Literature Review

Since the Nobel winners Modigliani and Miller (1958) showed that capital structure has no major impact on the value of the enterprise, the leverage-performance association has been a subject of discussion. They specifically argue that, regardless of the debt-equity mix, the firm value will be affected by its assets. Despite its flawed assumptions, this seminal study paved the way for further investigation by contemporary researchers (Pandey, 2001). Subsequently, a number of significant theories were developed, including agency theory, pecking-order theory, and trade-off theory. The discussion surrounding MM's second hypothesis (Modigliani & Miller, 1963) led to the emergence of the trade-off theory. The theory elucidates the concept of an ideal mix of debt and equity based on the idea of a trade-off between the tax shield advantage and bankruptcy costs (Kraus & Litzenberger, 1973). Later, the firm's financing decisions became heavily influenced by agency costs and information concerns. Holding to this, agency theory postulated conflict of interest and control rights among different stakeholders as the cause of the agency problem. Consequently, to mitigate such agency costs, Mayers and Majluf (1984) suggested that owners must follow a hierarchy in accumulating capital, prioritizing internal funds over external capital sources. These theoretical investigations opened the door for further study by modern researchers.

As a result, the impact of leverage on firm performance has been empirically studied by numerous researchers in recent years; the findings are conflicting and inconsistent. While the majority of research found a negative association between leverage and performance, Seo's empirical analysis on publicly traded casino companies in the United States found an inverse U-shaped link between leverage and performance (Seo, 2018). However, they discovered that the detrimental effects of leverage increase for highly leveraged casino firms as levels of competition rise. According to Yazdanfar and Ohman (2015), profitable companies usually use more stock and retained earnings than external funding sources, and leverage is inversely correlated with firm performance. Another study found that trade credit, a measure of

leverage, has a negative impact on performance and younger companies with low trade credit levels and high cash availability are more likely to succeed (Yazdanfar & Ohman, 2016). Ghardallou (2023), in an attempt to evaluate the heterogeneous impact of leverage on firm performance among Saudi Arabian firms, finds that leverage negatively affects firm performance. Further, a higher negative effect is observed among firms with high earnings than among firms with low earnings. Similarly, Vithessonthi and Tongurai (2015) attempted to examine the heterogeneity in leverage-performance association among domestically-oriented and internationally-oriented businesses. They found that leverage had a detrimental effect on domestically-oriented businesses and a favourable effect on the others. They suggested that these outcomes might be due to the fact that businesses with an international focus usually have a larger pool of resources, knowledge, and capability than businesses with a domestic focus. While many have examined the leverage-performance association in developed economies, Ebaid (2002) has attempted to investigate it in Egypt, a developing economy. The results showed that leverage has little to no impact on firm performance. Another study (Mishra & Dasgupta, 2019) looked at the cross-impact of leverage and performance across both developed and developing economies, and found a negative performance-to-debt association in both economies. On the other hand, the study observed a positive debt-to-performance relationship for developing economies and a negative relationship for the others. In an attempt to evaluate the connection between leverage and R&D spending, Singh and Faircloth (2005) looked at a sample of major U. S. manufacturing companies. They demonstrated a strong negative relationship between companies' R&D spending and their debt levels. Due to the shortcomings of traditional accounting-based measures, a study by Kumar *et al.* (2022) employed a new value-based measure, MVA (Market Value Added), and found that the MVA is negatively associated with the degree of financial leverage and the asset turnover ratio. Likewise, a recent study (Arhinful & Radmehr, 2023) used Equity Multiplier as a proxy for leverage and found that Equity Multiplier has a significant positive impact on performance, which is in contrast to the findings of many earlier studies. In the Indian context, Chadha and Sharma (2015), taking a sample of 422 Indian manufacturing companies listed on BSE, discovered that leverage has no effect on performance proxies ROA and Tobin's Q, but a detrimental effect on ROE. Deb and Banerjee (2018) examined the performance of Indian listed firms that follow the Almost Zero Leverage (AZL) policy, and found that companies that adopt the AZL strategy outperform their leveraged counterparts in the same sector, suggesting that investors' positive perception of debt-free balance sheets outweighs the benefits of tax shields. The question of whether the adoption of Ind AS moderates the leverage-performance linkage was addressed in a recent study, and the findings reveal that expanded transparency and companies' reporting quality following the adoption of Ind AS adversely alter the relationship between leverage and performance by discouraging risk-averse investors from funding high-leveraged businesses (Nikhil *et al.*, 2024).

A thorough examination of the literature reveals that whereas leverage-performance association issues have been extensively studied in developed nations, they have not yet been thoroughly examined in India. In particular, there is not enough research done on how debt affects performance in various sectors. Thus, evaluating the effect of leverage on performance in general (on a pooled sample) and analysing sectoral differences in the effect of leverage on performance across sectors that form a substantial portion of the NIFTY 100 non-financial universe are the main goals of current research. Accordingly, the following hypotheses are framed (in alternative form):

H_1: Leverage has a significant negative impact on firm performance in general.

H_2: There is a significant sectoral difference in the impact of leverage on performance.

3. Research Design

3.1 Sample and Data

The study aims to examine the influence of financial leverage on firm performance in general (*i.e.* on a pooled sample). Further, it attempts to investigate the sectoral

differences in the leverage-performance association. Consequently, the study employs a panel dataset of 40 companies selected from four distinct sectors, namely Automobiles and Auto Components (AAC), Healthcare (HC), FMCG, and Power Generation and Distribution (PGD). These sectors are selected since they constitute a substantial share (43%) of the non-financial NIFTY 100 universe, while also exhibiting distinct operating and financing characteristics. Since the study aims at examining sectoral differences, such diversity provides an appropriate setting for cross-sector analysis. Further, firms in these sectors require huge capital funds to run their operating activities, making them rely on external borrowings (Arhinful & Radmehr, 2023). To maintain comparability across sectors by ensuring equal representation, 10 companies from each of these four sectors are selected based on market capitalisation. This balanced panel dataset facilitates more reliable estimation and comparison of sector-specific effects. The final sample of the study covers 400 observations of 40 companies observed over 10 years from 2014 to 2023. The relevant data is collected from the CMIE Prowess database, which provides the most reliable business-related information (Dawar, 2014).

3.2 Variable Selection

The study employs the debt-to-equity ratio as a proxy for leverage, which has been widely employed by other academics in earlier studies (*e.g.*, Mistri, 2024; Mishra & Dasgupta, 2019; Chadha & Sharma, 2015). On the other hand, Return on Equity (ROE), an accounting-based metric utilised in many previous studies, is used as a proxy for firm performance (*e.g.*, Mishra & Dasgupta, 2019; Chadha & Sharma, 2015; Arhinful & Radmehr, 2023). To represent the individual sector, sector dummies are created for AAC, HC, and FMCG sectors, keeping PGD as the base category. Further, to capture sectoral differences in the leverage-performance association, interaction terms of sector dummies and leverage are integrated into the model. To prevent false regression coefficients, the current study employs a pair of control variables (Nikhil *et al.*, 2024), which include firm age, defined by the natural log of years since establishment, and firm size, defined by the natural log of total assets. Further, a COVID dummy is incorporated to account for unprecedented economic disruptions caused by the pandemic. The dummy variable takes the value of 1 for the years 2020 and 2021 and 0 for all other years, thereby controlling for the pandemic-induced effects on firm performance and enabling a more accurate estimation of the leverage-performance association.

3.3 Model Specifications

To evaluate the leverage-performance association, two panel regression models were estimated. Model-1 assesses the effect of leverage on performance in general (on the pooled sample), whereas Model-2 is estimated to statistically validate whether sectoral differences exist in the leverage-performance association by integrating leverage-sector dummy interaction terms within a unified regression framework. Further, to statistically substantiate the joint significance of the interaction coefficients, a Wald test is employed.

Regression Equations:

$$RONW_{it} = \alpha + \beta_1 D/E\ Ratio_{it} + \beta_2 Size_{it} + \beta_3 Age_{it} + \beta_4 COVID_{it} + u_i + \varepsilon_{it}\ Model\ (1)$$

$$RONW_{it} = \alpha + \beta_1 D/E\ Ratio_{it} + \beta_2 (D/E\ Ratio * AAC_i) + \beta_3 (D/E\ Ratio * HC_i) + \beta_4 (D/E\ Ratio * FMCG_i) + \beta_5 Size_{it} + \beta_6 Age_{it} + \beta_7 COVID_{it} + u_i + \varepsilon_{it}\ Model\ (2)$$

Where,

α - Common intercept

$\beta_{1\ to}\ \beta_{7}$ - Slope coefficients

$RONW_{it}$ - Variable of Firm Performance

$D/E\ Ratio_{it}$ = Variable of Leverage

$D/E\ Ratio * AAC_i$, $D/E\ Ratio * HC_i$, $D/E\ Ratio * FMCG_i$ - Interaction terms

$Size_{it}$, Age_{it} - Control Variables

COVIDit - Dummy Variable

e_{it} - Error Term

u_i - Firm-specific random effect

In all five models, 'i' represents different firms and 't' represents different time periods.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1depicts the summary statistics of the sample firms chosen from four distinct sectors. The table shows

the mean, median, standard deviation, minimum, and maximum values of variables included in the study. The mean value of D/E Ratio (1.02) indicates that the share of debt and equity in capital structure is almost equal on average, which necessitates companies to produce adequate earnings to fulfil their debt service responsibilities (Arhinful & Radmehr, 2023). D/E Ratio is extremely volatile for all of the sample firms, as evidenced by the standard deviation of 3.25, which is greater than the mean value. The average return on shareholders' equity (RONW) for the sample firms is 15.1%, and its standard deviation (15.6) is larger than the mean, suggesting greater earnings volatility. The mean value of the variable Size indicates the average size of the sample firms, and a SD (1.34) below the mean indicates that most of the sample firms' sizes fall within a reasonable range around the mean. Similarly, the mean of the variable Age shows the average age of the sample firms and the SD (0.940) below the mean value shows that most of the firms' ages fall within the mean age.

4.2 Cross-correlation, Multicollinearity and Autocorrelation Analysis

To ascertain the relationship between variables included in the study, cross-correlation is carried out. One of the assumptions outlined by Wooldridge (2015) regarding multiple regression analysis is that regressors should not be perfectly correlated, which is also known as the issue of 'Multicollinearity'. Thus, to determine the presence or absence of this issue, the VIF values are estimated. Table 2 presents the results of correlation, multicollinearity, and autocorrelation. The independent variable leverage (D/E ratio) is negatively and significantly associated with the dependent variable performance (RONW), thus upholding the study's first hypothesis. The significant inverse relationship between age and performance confirms that the control variable age negatively drives the performance of the firm (Nikhil *et al.*, 2024). The control variable, firm size, is also negatively associated with firm performance, and the association is significant at a 1 per cent level of significance. This would suggest that an expansion in firm size drives its performance adversely. The adverse effect may be due to the increased complexities in the operations of larger firms. To determine if the explanatory variables chosen exhibit perfect correlation, the VIF (Variance Inflation Factor) is utilised (Arhinful & Radmehr, 2023). Since there is no cut-off, the VIF's between 5 and 10 are thought to be ideal factors for validating the multicollinearity issue (Craney & Surles, 2002). The VIF's computed are less than 10 for all three regressors, thus confirming the absence of severe collinearity. The Durbin-Watson test, which looks for a correlation between adjacent error terms, is used to verify the autocorrelation issue (Mistri, 2024). There is no autocorrelation if the Durbin-Watson value is between -2 and +2 (Gujarati & Porter, 2021). The result of the Durbin-Watson test indicates the absence of autocorrelation. Non-stationary data can lead to spurious regression results, where results appear significant even when no real relationship

Table 1. Descriptive statistics

Variables	Mean	Median	S.D.	Min	Max
D/E Ratio	1.02	0.530	3.25	0.000	59.64
RONW	15.1	15.2	15.6	-105	62.9
Size	9.83	9.80	1.34	6.77	13.066
Age	2.82	2.33	0.940	0.695	4.64

Source(s): Author's own work

Table 2. Results of correlation, multicollinearity, and autocorrelation

Pearson's correlation and variance inflation factor					
Variables	Age	Size	RONW	D/E Ratio	VIF
D/E Ratio	0.1285**	0.203***	-0.5469***	1.0000	1.017
RONW	-0.220***	-0.306***	1.0000		
Size	0.647***	1.0000			1.203
Age	1.0000				1.221
Durbin-Watson Test Statistic		0.761			

*, **, *** represents statistical significance at 10%, 5%, and 1%, respectively.
Source(s): Author's own work

exists. Hence, to verify the stationarity of the dataset, the Levin-Lin-Chu pooled ADF test is used (Table 3). Since the p-values for all variables are less than 0.01, the null hypothesis is rejected, and it is confirmed that the dataset is stationary.

4.3 Regression Analysis

Table 4 presents the results of the fixed-effect estimation for Model-1, assessing the impact of leverage on performance in general and Model-2, assessing the sectoral differences in the leverage-performance association. In Model-1, the coefficient of the D/E Ratio is -2.3677 and is statistically significant at the 1 per cent significance level ($p<0.01$). These results are consistent with the previous studies' results (Chadha & Sharma, 2015; Mishra & Dasgupta, 2019). Specifically, a unit increase in D/E Ratio leads to an average decline of approximately 2.37 units in Return on Net Worth (RONW). Thus, the findings support the study's first hypothesis, *i.e.*, Leverage has a significant negative impact on firm performance in general. Among the control variables, the coefficient of firm age is negative and statistically significant at a 1 per cent significance level (-30.4685, 0.0001), suggesting that an increase in firm age is connected with a decline in return on net worth; however, this finding contradicts the study by Arhinful & Radmehr (2023). In other words, it can be inferred that older firms tend to generate lower returns on shareholders' funds compared to younger firms. In contrast, size has a negative but statistically insignificant coefficient, implying that deviations in firm size do not exert a significant influence on firm performance. Likewise, the COVID dummy variable also has a negative but statistically insignificant coefficient (-1.1897, 0.3571), denoting that firms, on average, experienced lower return on net worth during the pandemic period; however, the effect is not sufficient to establish a noteworthy impact on firm performance. Model-1 is estimated using the fixed-effect approach as per the recommendation of the Hausman's test (25.122, $p<0.01$), and it explains around 36.06 per cent of the variation in firm performance as indicated by the R-squared value. Further, a significant F-statistic (50.1932, $p<0.01$) confirms that regressors collectively explain variations in firm performance.

In Model-2, which focuses on examining sectoral differences by integrating interaction terms between leverage and sectoral dummy variables, the coefficient of the D/E ratio (Base sector coefficient) is statistically insignificant (−1.87706, 0.3427), indicating that leverage does not have a substantial effect on performance in the base sector (Power Generation and Distribution). Contrarily, the interaction term for the Automobiles and Auto-components sector (D/E Ratio*AAC) is negative and highly significant (-11.4217, $p<0.01$). This finding reveals that the detrimental impact of leverage on firm performance is significantly stronger in the AAC sector compared with the base or reference sector. On the other hand, the interaction terms for the Healthcare sector (0.7783, 0.8866) and the FMCG sector (-0.2862, 0.8853) are statistically insignificant, showing that the detrimental

Table 3. Test of stationarity

Levin-Lin-Chu pooled ADF test.		
Variables	Test-statistic	p-value
RONW	-0.32742	0.0000
D/E Ratio	-0.41348	0.0000
Size	-0.11549	0.0000
Age	-0.013676	0.0000

Source(s): Author's own work

Table 4. Result of fixed-effect regression analysis

Variables	Model-1		Model-2	
	Coefficient	p-value	Coefficient	p-value
Constant	120.931	0.0001***	115.840	0.0001***
D/E Ratio	−2.36770	0.0001***	−1.87706	0.3427
D/E Ratio*AAC	-	-	−11.4217	0.0001***
D/E Ratio*HC	-	-	0.778304	0.8866
D/E Ratio*FMCG	-	-	−0.286219	0.8853
Size	−1.52781	0.4416	−0.951749	0.6085
Age	−30.4685	0.0001***	−30.3410	0.0001***
COVID	−1.18965	0.3571	−1.61869	0.1685
Hausman test	25.122	1.45599e-05***	25.4476	0.000282065***
F-statistics	50.1932	1.74412e-33***	46.0422	3.8567e-46***
R-squared (R^2)	0.360601		0.477266	
Wald test	-		26.261	2.34732e-015***

*, **, *** represents statistical significance at 10%, 5%, and 1%, respectively.
Source(s): Author's own work

effect of leverage on firm performance in these sectors is not substantially different from that of the reference sector. The coefficients of the control variables remain largely unchanged in Model-2. Variable Age (-30.3410, $p<0.01$) continues to exert a significant detrimental effect on firm performance, in line with Model-1. Likewise, the control variable Size (−0.951749, 0.6085) and the COVID dummy variable (−1.61869, 0.1685) remain statistically insignificant. The result of the Hausman's test, with a p-value of less than 0.01, rejected the Random-effect preferred null hypothesis, and accordingly Model-2 is estimated using the fixed-effect approach. The model explains around 47.73 per cent of the variation in firm performance (R^2=0.477266). The explanatory power of the model noticeably improved (from 36.06 % to 47.73%) after integrating interaction terms, implying that sector-specific leverage effects explain an additional portion of the variation in firm performance. Further, the significant F-statistic (46.0422, $p<0.01$) confirms that regressors included in the model together have a significant effect on firm performance.

The coefficients of all individual interaction terms are insignificant except the coefficient of the Automobiles and Auto-components sector. Thus, do not provide strong evidence of sectoral differences in leverage-performance association. Therefore, to formally examine sectoral heterogeneity in the leverage-performance association, the Wald test is performed. While the unified regression (Model-2) approach estimates sector-specific interaction coefficients individually, the Wald test evaluates their joint significance. Subsequently, the Wald test result with a significant coefficient (26.261, $p<0.01$) indicates that the interaction terms are jointly significant, which leads to the rejection of the null hypothesis of no sectoral heterogeneity. Thus, the test confirms that the effect of leverage on performance is not uniform across sectors, providing robust evidence of sectoral differences in leverage-performance association and supporting the second hypothesis of the study. Overall, the results confirm a significant negative impact of leverage on performance in general and the existence of sectoral differences in the leverage-performance association, thus supporting the study's both propositions.

5. Conclusion, Limitations, and Scope for Further Research

The study examined the impact of leverage on performance in general (Model-1) and investigated the sectoral differences in the leverage-performance association (Model-2) using panel data Fixed-effect models. The analysis is conducted on a sample of 40 companies chosen from four distinct sectors over the period 2014-2023. The empirical results unveil that leverage exerts a significant negative effect on firm performance in general (Model-1), backing the study's first premise. This could be due to debt obligations and agency conflicts on account of much dependency on leverage. It might also be because of the unfledged capital market in developing countries like India (Nikhil *et al.*, 2024). The study's attempt to prove sectoral differences in the leverage-performance association has been achieved. The unified regression model (Model-2) demonstrates that the effect of leverage on performance across sectors is not homogeneous. Leverage has a highly significant detrimental effect on performance in Automobiles and Auto-components, indicating that companies in this sector are more adversely affected by leverage than companies in the base sector, *i.e.*, the Power generation and Distribution sector. However, the interaction terms for the Healthcare and FMCG sectors are individually insignificant; the highly significant Wald test corroborates the existence of sectoral heterogeneity in leverage-performance association. This bestows robust empirical evidence of the sectoral differences in the effect of leverage on firm performance. Consequently, the study concludes that while leverage generally shrinks firm performance, sector-specific characteristics and funding requirements determine the magnitude and direction of its influence. Although the study offers several valuable managerial implications, it also suffers from a few drawbacks. The study is confined to only four sectors that constitute a substantial share of the NIFTY 100 non-financial universe, which may limit the generalizability of the findings to other sectors of the economy. Further, the analysis covers a period of 10 years only, though it may be extended. Although the researchers have investigated and confirmed the existence of sectoral differences in the leverage-performance association, they have not provided an

empirical explanation for such differences. Thus, the study paves the way for further research to identify the factors responsible for such sectoral differences in the leverage-performance association.

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Author Contribution

Narasing Seetaram Devi: Conceptualization, methodology, Data collection, data curation, formal analysis, interpretation of results, writing-original draft preparation, and manuscript revision.

Dr. A. S. Shiralashetti: Supervision, conceptual guidance, validation of the methodology and findings, critical review and editing of the manuscript, and approval of the final version. All authors read and approved the final manuscript.