




# Random Forest Prediction of Maternal Burnout Based on Parenting Stress, Perfectionism, Emotional Dysregulation, and Family Functioning

Tamar. Gelashvili<sup>1</sup>, Aina Syafiqah. Noor<sup>2\*</sup>, Zainab. Al-Obaidi<sup>3</sup>

<sup>1</sup> Department of Counseling Psychology, Ilia State University, Tbilisi, Georgia

<sup>2</sup> Department of Educational Psychology, Universiti Kebangsaan Malaysia, Bangi, Malaysia

<sup>3</sup> Department of Psychology, University of Baghdad, Baghdad, Iraq

\* Corresponding author email address: aina.syafiqah@ukm.edu.my

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## ABSTRACT

**Objective:** The present study aimed to predict maternal burnout among Malaysian mothers using a Random Forest machine learning model based on parenting stress, perfectionism, emotional dysregulation, and family functioning, and to determine the relative importance of these predictors in explaining maternal burnout risk.

**Methods and Materials:** This cross-sectional predictive study was conducted among 842 mothers residing in Malaysia who had at least one child under the age of 18 years. Participants were recruited through community organizations, parenting networks, educational institutions, and online platforms. Data were collected using the Parental Burnout Assessment (PBA), Parenting Stress Scale (PSS), Multidimensional Perfectionism Scale (MPS), Difficulties in Emotion Regulation Scale (DERS), and Family Assessment Device (FAD). Descriptive statistics and correlational analyses were initially performed. Subsequently, a Random Forest regression model was developed to predict maternal burnout. The dataset was divided into training (80%) and testing (20%) subsets. Hyperparameter tuning was performed using grid search and five-fold cross-validation. Model performance was evaluated using the coefficient of determination ( $R^2$ ), root mean square error (RMSE), mean absolute error (MAE), and mean squared error (MSE). Feature importance and SHAP analyses were conducted to identify the relative contribution of each predictor.

**Findings:** The Random Forest model demonstrated strong predictive performance, accounting for 73.1% of the variance in maternal burnout ( $R^2 = .731$ ). Parenting stress emerged as the most influential predictor (38.7%), followed by emotional dysregulation (29.1%), family functioning (19.6%), and perfectionism (12.6%). Maternal burnout was positively associated with parenting stress ( $r = .76$ ), emotional dysregulation ( $r = .68$ ), and perfectionism ( $r = .52$ ), while family functioning showed a significant negative association ( $r = -.59$ ). Incremental model analyses indicated that each predictor contributed unique explanatory value, increasing predictive accuracy from  $R^2 = .579$  to  $R^2 = .731$ . SHAP analyses further

revealed nonlinear relationships and substantial interactions between parenting stress and emotional dysregulation.

**Conclusion:** The findings demonstrate that maternal burnout can be predicted with high accuracy using machine learning techniques and that parenting stress, emotional dysregulation, family functioning, and perfectionism are significant contributors to burnout risk. Parenting stress and emotional dysregulation emerged as the most influential determinants, highlighting the importance of psychological and family-based interventions aimed at reducing parenting burden, improving emotion regulation capacities, strengthening family functioning, and addressing maladaptive perfectionistic tendencies. The study supports the utility of Random Forest models for identifying mothers at elevated risk of burnout and informing targeted prevention strategies.

**Keywords:** *Maternal Burnout; Parenting Stress; Perfectionism; Emotional Dysregulation; Family Functioning.*

## 1. Introduction

Maternal burnout has emerged as a major psychological and public health concern during the past decade, attracting increasing attention from researchers, clinicians, and policymakers worldwide. Originally conceptualized as a syndrome characterized by overwhelming exhaustion related to the parental role, emotional distancing from children, feelings of saturation with parenting responsibilities, and a contrast between previous and current parental self-perceptions, parental burnout is now recognized as a distinct phenomenon that differs from occupational burnout, depression, and general parenting stress (Ren et al., 2024; Zbrodska et al., 2022). The growing prevalence of parental burnout across diverse cultural settings highlights the need to identify its determinants and develop evidence-based interventions aimed at protecting parental well-being and family functioning (Balogun & Oyekola, 2024; Bogdán et al., 2025).

The transition to parenthood introduces profound emotional, psychological, and practical challenges that require continuous adaptation. While many parents successfully navigate these demands, others experience chronic stress that gradually depletes their emotional and psychological resources. According to recent theoretical frameworks, parental burnout develops when parenting demands chronically exceed available coping resources, creating a prolonged imbalance that culminates in emotional exhaustion and psychological distress (Çakmak & Arıkan, 2024; Ren et al., 2024). This imbalance may be intensified by societal expectations, economic pressures, family conflicts, child behavioral difficulties, and individual vulnerabilities, making maternal burnout a multifaceted

phenomenon influenced by both personal and contextual factors (Bogdán et al., 2025; Kira, 2025).

Although parental burnout can affect both fathers and mothers, evidence consistently indicates that mothers experience substantially higher levels of burnout due to their disproportionate involvement in childcare, household management, and emotional caregiving responsibilities. Research conducted across different countries has demonstrated that mothers often face greater caregiving burdens, heightened role expectations, and increased psychological pressure, all of which contribute to elevated burnout risk (Balogun & Oyekola, 2024; Lee-Forsyth et al., 2023). Studies conducted in Arab countries, Europe, Africa, and Asia have similarly revealed that maternal burnout is associated with significant impairments in psychological well-being, family relationships, and parenting quality (Bogdán et al., 2025; Kira, 2025). Consequently, identifying the key predictors of maternal burnout has become an important priority in contemporary family psychology.

Among the numerous factors linked to maternal burnout, parenting stress has consistently emerged as one of the strongest predictors. Parenting stress refers to the psychological strain experienced when parenting demands exceed perceived coping capacities. High levels of parenting stress can arise from child behavioral problems, developmental challenges, caregiving overload, financial difficulties, and conflicts within the family system. Extensive evidence suggests that persistent parenting stress contributes directly to emotional exhaustion and parental disengagement, thereby increasing vulnerability to burnout (Findling et al., 2024; Taştekin et al., 2025). Recent investigations have demonstrated that mothers who perceive parenting responsibilities as overwhelming report significantly higher levels of burnout symptoms compared

to mothers experiencing lower parenting stress (Partington et al., 2025; Renati et al., 2024). Furthermore, parenting stress has been shown to mediate the relationship between child-related difficulties and parental psychological outcomes, emphasizing its central role in the development of burnout (Guo et al., 2025; Partington et al., 2025).

The importance of parenting stress has become particularly evident following global social disruptions such as the COVID-19 pandemic. During this period, many mothers faced increased caregiving demands, homeschooling responsibilities, reduced social support, and heightened uncertainty. These challenges intensified parenting stress and contributed to substantial increases in parental burnout across diverse populations (Giordano et al., 2024; Partington et al., 2025). Research has shown that elevated parenting stress not only affects maternal mental health but also influences child emotional adjustment, family cohesion, and overall household functioning (Prino et al., 2023; Yakupova & Suarez, 2023). Consequently, parenting stress represents a critical variable for understanding maternal burnout and predicting which mothers may be at greatest risk.

Another important predictor of parental burnout is perfectionism. Perfectionism refers to a multidimensional personality characteristic involving excessively high standards, self-critical evaluations, and concerns about mistakes. While adaptive forms of perfectionism may promote achievement and organization, maladaptive perfectionism often generates chronic dissatisfaction, excessive self-monitoring, and heightened psychological distress. Mothers with strong perfectionistic tendencies frequently strive to meet unrealistic parenting standards and may interpret normal parenting challenges as personal failures (Çerkez & Sorakin, 2023; Mousavi et al., 2025). Such tendencies can intensify emotional exhaustion and increase susceptibility to burnout.

Empirical studies have repeatedly demonstrated positive associations between perfectionism and parental burnout. Parents who report high levels of socially prescribed perfectionism often experience greater pressure to conform to idealized parenting expectations imposed by family members, communities, and social media environments (Çerkez & Sorakin, 2023; Mousavi et al., 2025). These pressures can create a persistent sense of inadequacy and chronic self-criticism that erodes psychological resilience over time. Research involving parents of children with special needs has further shown that perfectionism contributes significantly to burnout through its impact on

parenting conflicts and coping difficulties (Mousavi et al., 2025). Such findings suggest that perfectionism may function as a cognitive vulnerability factor that amplifies the negative effects of parenting stress.

Emotional dysregulation has also been identified as a crucial factor in the etiology of parental burnout. Emotional regulation refers to the processes through which individuals monitor, evaluate, and modify their emotional experiences and expressions. Effective emotional regulation enables parents to manage stress, cope with frustration, and maintain adaptive responses during challenging parenting situations. Conversely, emotional dysregulation involves difficulties understanding, accepting, and managing emotional experiences, often resulting in impulsive reactions and prolonged psychological distress (Brandão et al., 2024; Holly et al., 2024).

Recent systematic reviews and meta-analytic findings indicate that emotional dysregulation is strongly associated with parental burnout across different cultural contexts and family structures (Brandão et al., 2024). Mothers who struggle to regulate negative emotions may become overwhelmed by parenting challenges, leading to greater exhaustion and reduced emotional availability for their children. Furthermore, emotion regulation difficulties have been linked to anxiety, depression, chronic stress, and burnout in both parenting and non-parenting populations (Cheung & Vaydich, 2023; Zuo, 2025). Studies examining parental mental health during periods of crisis have consistently demonstrated that emotional dysregulation intensifies the impact of cumulative stressors on psychological functioning (Cheung & Vaydich, 2023). Similarly, investigations in educational and occupational settings have shown that ineffective emotional regulation undermines coping resources and contributes to burnout symptoms (Chen et al., 2025; Zuo, 2025). These findings suggest that emotional dysregulation may represent a fundamental psychological mechanism linking parenting demands to burnout outcomes.

Family functioning constitutes another important determinant of maternal well-being. Family functioning refers to the quality of interactions, communication patterns, emotional responsiveness, problem-solving abilities, and role organization within the family system. Healthy family functioning provides emotional support, promotes adaptive coping, and facilitates the distribution of caregiving responsibilities among family members. In contrast, dysfunctional family environments often increase

psychological strain and reduce the availability of protective resources (Kpea, 2025; Sekułowicz et al., 2022).

Research has consistently demonstrated that family functioning serves as both a risk and protective factor for parental burnout. Mothers who perceive their family environments as supportive, cohesive, and communicative tend to report lower burnout levels, whereas those experiencing family conflict, role ambiguity, or emotional disengagement report greater psychological distress (Findling et al., 2024; Sekułowicz et al., 2022). Family dysfunction may increase caregiving burdens by reducing practical and emotional support, thereby exacerbating stress and emotional exhaustion. Studies examining maternal burnout among parents of children with disabilities and special needs have further highlighted the critical role of family functioning in buffering burnout-related risks (Findling et al., 2024; Sekułowicz et al., 2022). Additionally, dysfunctional family dynamics have been associated with sibling rivalry, maternal mental health difficulties, and diminished parental well-being (Kpea, 2025).

Contemporary research has increasingly emphasized the importance of protective factors that may mitigate burnout risk. Variables such as social support, empathy, mindful parenting, reflective functioning, and resilient coping have been shown to reduce the negative impact of parenting stress and emotional challenges (Carone et al., 2025; Kadosh-Laor et al., 2023; Taştekin et al., 2025; Zhao, 2026). For example, perceived social support has been found to buffer the relationship between parenting conflict and burnout, whereas mindful parenting practices appear to weaken the influence of parenting stress on emotional exhaustion (Taştekin et al., 2025; Zhao, 2026). Maternal empathy has similarly been identified as a protective factor capable of moderating burnout risk under challenging parenting circumstances (Kadosh-Laor et al., 2023). These findings underscore the complexity of parental burnout and the need to examine multiple predictors simultaneously.

Despite the growing literature on maternal burnout, several limitations remain evident. Much of the existing research has relied on traditional statistical approaches that assume linear relationships among variables. However, the interactions among parenting stress, perfectionism, emotional dysregulation, and family functioning are likely complex, nonlinear, and interdependent. Machine learning techniques provide valuable opportunities to address these limitations by identifying intricate predictive patterns that may not be detectable through conventional regression methods (Bogdán et al., 2025; Ren et al., 2024). Among

these techniques, Random Forest algorithms have demonstrated exceptional performance in psychological prediction studies due to their ability to model nonlinear relationships, manage high-dimensional data, reduce overfitting, and generate interpretable estimates of predictor importance.

The application of machine learning approaches to maternal burnout research remains relatively limited despite their substantial potential. Identifying the relative importance of parenting stress, perfectionism, emotional dysregulation, and family functioning through advanced predictive models may contribute to more accurate risk assessment and facilitate the development of targeted prevention programs. Such approaches are particularly valuable in culturally diverse settings such as Malaysia, where family structures, parenting practices, and social expectations may uniquely influence maternal experiences.

Therefore, the aim of the present study was to employ a Random Forest machine learning model to predict maternal burnout among Malaysian mothers based on parenting stress, perfectionism, emotional dysregulation, and family functioning, and to determine the relative importance of these predictors in explaining maternal burnout risk.

## 2. Methods and Materials

### 2.1. Study design and Participant

This study employed a cross-sectional predictive research design to investigate the extent to which parenting stress, perfectionism, emotional dysregulation, and family functioning could predict maternal burnout using a Random Forest machine learning algorithm. The study was conducted in Malaysia between January and May 2026. The target population consisted of mothers residing in different urban and suburban regions of Malaysia who had at least one child under the age of 18 years living in the household.

A total of 842 mothers participated in the study. Participants were recruited through a combination of online advertisements, community parenting groups, family health centers, schools, and social media platforms commonly used by Malaysian parents. Eligibility criteria included being a biological, adoptive, or primary caregiving mother aged 18 years or older, having sufficient proficiency in English or Malay to complete the questionnaires, and currently living with at least one dependent child. Mothers who reported severe psychiatric disorders that could substantially impair questionnaire completion were excluded from participation. Prior to data collection, all participants were informed about

the objectives of the study, confidentiality of responses, voluntary participation, and their right to withdraw at any stage without penalty. Electronic informed consent was obtained from all participants before they completed the survey. Data were collected anonymously to ensure privacy and encourage honest reporting of parenting experiences and psychological functioning.

## 2.2. Measures

Maternal burnout was assessed using the Parental Burnout Assessment (PBA) developed by Roskam and colleagues in 2018. The instrument consists of 23 items designed to measure the multidimensional experience of parental burnout. The scale evaluates four dimensions including exhaustion in the parental role, contrast with previous parental self, feelings of being fed up with parenting, and emotional distancing from children. Participants respond to each item using a Likert-type scale ranging from 0 (never) to 6 (every day). Higher scores indicate greater levels of parental burnout. Previous studies conducted across different cultural contexts have demonstrated strong psychometric properties, including high internal consistency, construct validity, and convergent validity.

Parenting stress was measured using the Parenting Stress Scale (PSS) developed by Berry and Jones in 1995. The scale contains 18 items assessing both positive and negative aspects of parenting experiences. Participants rate each statement on a five-point Likert scale ranging from strongly disagree to strongly agree. The total score reflects the overall level of parenting stress, with higher scores indicating greater stress associated with parenting responsibilities. Numerous studies have confirmed the reliability and validity of the scale among diverse parent populations.

Perfectionism was evaluated using the Multidimensional Perfectionism Scale (MPS) developed by Hewitt and Flett in 1991. The instrument consists of 45 items distributed across three dimensions: self-oriented perfectionism, other-oriented perfectionism, and socially prescribed perfectionism. Responses are recorded on a seven-point Likert scale ranging from strongly disagree to strongly agree. Higher scores indicate stronger perfectionistic tendencies. The scale has demonstrated excellent reliability, factorial validity, and cross-cultural applicability in both clinical and non-clinical samples.

Emotional dysregulation was assessed using the Difficulties in Emotion Regulation Scale (DERS) developed

by Gratz and Roemer in 2004. The questionnaire contains 36 items measuring six dimensions of emotion regulation difficulties, including nonacceptance of emotional responses, difficulties engaging in goal-directed behavior, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity. Responses are provided on a five-point Likert scale ranging from almost never to almost always. Higher scores indicate greater difficulties in regulating emotions. Previous investigations have reported strong internal consistency coefficients and satisfactory evidence of construct and criterion validity.

Family functioning was measured using the Family Assessment Device (FAD) developed by Epstein, Baldwin, and Bishop in 1983. The instrument contains 60 items that assess family functioning across several domains, including problem solving, communication, roles, affective responsiveness, affective involvement, behavior control, and general functioning. Participants rate items using a four-point Likert scale ranging from strongly agree to strongly disagree. Lower scores generally reflect healthier family functioning, whereas higher scores indicate greater dysfunction. The FAD has been widely used internationally and has demonstrated robust psychometric characteristics across various family structures and cultural settings.

All instruments employed in the study have been extensively used in psychological and family research and have demonstrated acceptable reliability and validity in previous studies. Internal consistency coefficients were examined in the current sample prior to model development to ensure the reliability of the collected data.

## 2.3. Data Analysis

Data analysis was conducted using Python programming language and relevant machine learning libraries. Initially, descriptive statistics including means, standard deviations, skewness, kurtosis, and frequency distributions were calculated to summarize participant characteristics and study variables. Missing values were examined and handled through appropriate imputation procedures when necessary. Data quality checks were performed to identify outliers, inconsistencies, and incomplete responses before model construction.

The primary analytical approach involved the implementation of a Random Forest regression model to predict maternal burnout. Random Forest was selected because of its ability to model complex nonlinear

relationships, manage interactions among predictors, reduce overfitting through ensemble learning, and provide robust estimates of variable importance. Parenting stress, perfectionism, emotional dysregulation, and family functioning served as predictor variables, while maternal burnout was treated as the outcome variable.

Prior to model training, the dataset was randomly divided into training and testing subsets, with 80% of observations allocated to model training and 20% reserved for independent model evaluation. Hyperparameter optimization was conducted using grid search procedures combined with five-fold cross-validation to identify the optimal number of trees, maximum tree depth, minimum samples required for node splitting, and minimum samples required at terminal nodes. Model performance was evaluated using multiple metrics, including the coefficient of determination ( $R^2$ ), mean absolute error (MAE), root mean square error (RMSE), and mean squared error (MSE).

To enhance interpretability, feature importance analysis was performed to determine the relative contribution of each predictor variable to maternal burnout prediction. Variable importance scores generated by the Random Forest algorithm were examined to identify the most influential psychological and family-related factors associated with maternal burnout. Statistical analyses and machine learning procedures were conducted with a significance level of 0.05

where applicable, and all findings were reported in accordance with contemporary recommendations for predictive modeling research in psychology and family studies.

### 3. Findings and Results

A total of 842 mothers participated in the study. The mean age of participants was 36.84 years ( $SD = 6.71$ ), ranging from 21 to 52 years. Most participants were married (91.1%), while 5.7% were divorced or separated and 3.2% were widowed. Regarding educational attainment, 18.5% had completed secondary education, 26.7% held diplomas, 41.9% possessed bachelor's degrees, and 12.9% had postgraduate qualifications. The average number of children per household was 2.47 ( $SD = 1.13$ ). Approximately 62.8% of mothers were employed either full-time or part-time, whereas 37.2% identified as homemakers. The average duration of motherhood was 9.84 years ( $SD = 5.29$ ). Examination of demographic differences indicated that mothers with three or more children reported higher levels of parenting stress and maternal burnout compared with mothers having one or two children. Similarly, employed mothers demonstrated slightly elevated burnout scores relative to homemakers, although the magnitude of the difference was modest.

**Table 1**

*Descriptive Statistics and Correlations Among Study Variables*

Variable	Mean	SD	1	2	3	4	5
Maternal Burnout	51.83	19.44	1.00				
Parenting Stress	43.71	10.38	0.76**	1.00			
Perfectionism	121.52	21.17	0.52**	0.48**	1.00		
Emotional Dysregulation	84.39	18.65	0.68**	0.63**	0.46**	1.00	
Family Functioning	2.24	0.43	-0.59**	-0.51**	-0.31**	-0.47**	1.00

Table 1 presents the descriptive statistics and bivariate correlations among the study variables. Maternal burnout demonstrated strong positive correlations with parenting stress ( $r = .76, p < .01$ ) and emotional dysregulation ( $r = .68, p < .01$ ), indicating that mothers experiencing higher parenting-related pressures and greater difficulties regulating emotions tended to report substantially greater burnout symptoms. Perfectionism was also positively associated with maternal burnout ( $r = .52, p < .01$ ),

suggesting that elevated self-imposed standards and concerns about mistakes contributed to parental exhaustion. In contrast, family functioning showed a significant negative relationship with maternal burnout ( $r = -.59, p < .01$ ), indicating that healthier family environments were associated with lower burnout levels. The correlation matrix further revealed moderate interrelationships among predictor variables, although none reached levels indicative of problematic multicollinearity.

**Table 2***Random Forest Model Performance Indicators on the Test Dataset*

Performance Metric	Value
R <sup>2</sup>	0.731
Adjusted R <sup>2</sup>	0.728
RMSE	9.24
MAE	7.18
MSE	85.38
Explained Variance	0.735
Cross-Validation Mean R <sup>2</sup>	0.718
Cross-Validation SD	0.024

The Random Forest model demonstrated strong predictive performance in estimating maternal burnout. The model accounted for 73.1% of the variance in maternal burnout scores within the independent test sample ( $R^2 = .731$ ), indicating substantial explanatory power. The root mean square error of 9.24 and mean absolute error of 7.18 suggested relatively small prediction errors compared with

the observed range of burnout scores. Cross-validation analyses further supported model stability, producing a mean  $R^2$  of .718 with a low standard deviation of .024 across folds. These findings indicate that the selected psychological and family-related predictors collectively provided a highly accurate representation of maternal burnout risk among Malaysian mothers.

**Table 3***Feature Importance Rankings Derived from the Random Forest Model*

Predictor	Importance Score	Relative Importance (%)
Parenting Stress	0.387	38.7
Emotional Dysregulation	0.291	29.1
Family Functioning	0.196	19.6
Perfectionism	0.126	12.6

Feature importance analysis revealed substantial differences in the contribution of predictors to maternal burnout. Parenting stress emerged as the strongest predictor, accounting for 38.7% of total model importance. Emotional dysregulation represented the second most influential factor, contributing 29.1% of predictive power. Family functioning ranked third, accounting for 19.6% of the model's

explanatory contribution, while perfectionism demonstrated the lowest yet still meaningful importance score of 12.6%. Together, parenting stress and emotional dysregulation represented nearly 68% of total predictive influence, highlighting the central role of daily parenting burdens and emotional regulation difficulties in the development of maternal burnout.

**Table 4***Incremental Model Comparison Across Predictor Sets*

Model	Predictors Included	R <sup>2</sup>
Model A	Parenting Stress	0.579
Model B	Parenting Stress + Perfectionism	0.634
Model C	Parenting Stress + Perfectionism + Emotional Dysregulation	0.704
Model D	Parenting Stress + Perfectionism + Emotional Dysregulation + Family Functioning	0.731

The incremental modeling analysis demonstrated that each predictor contributed additional explanatory value beyond previously entered variables. Parenting stress alone explained 57.9% of variance in maternal burnout. The addition of perfectionism increased predictive accuracy to

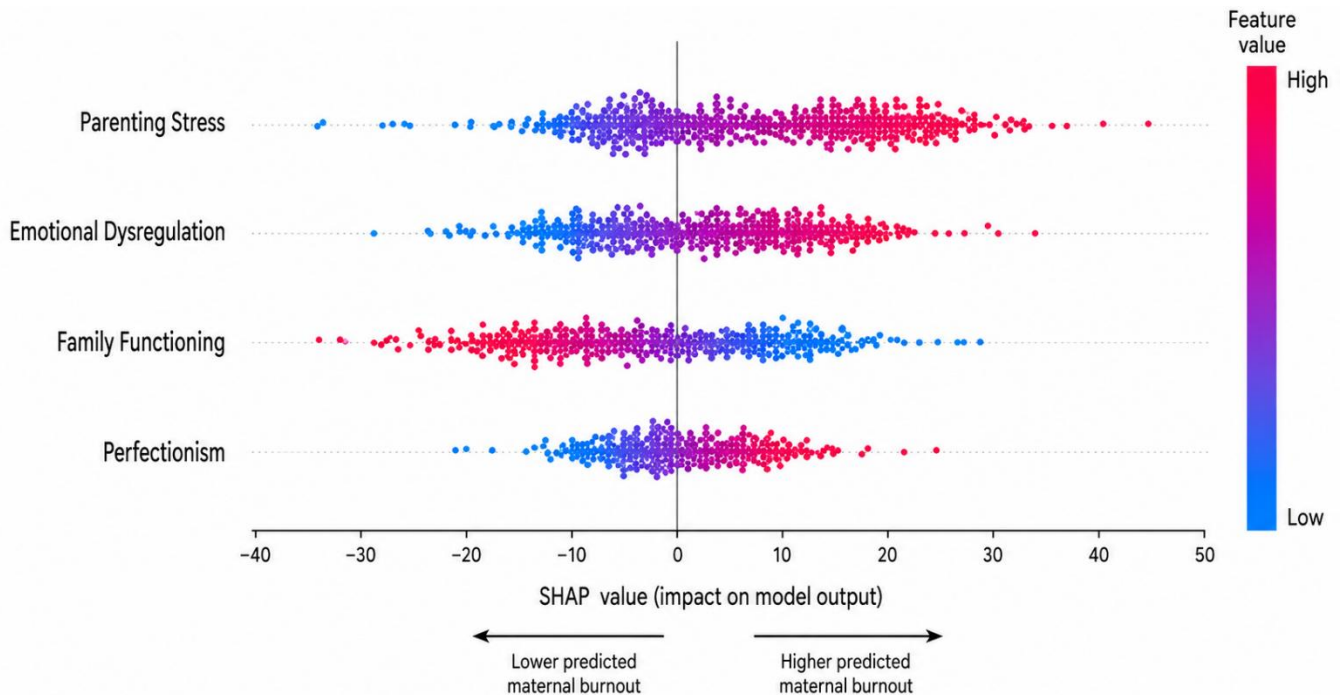
63.4%, representing a notable improvement. Incorporating emotional dysregulation further elevated explained variance to 70.4%, indicating a substantial contribution from emotion regulation processes. Finally, adding family functioning increased overall predictive performance to 73.1%,

confirming that family-level dynamics provide unique information beyond individual psychological characteristics. These findings support a multifactorial understanding of

maternal burnout in which both personal vulnerabilities and family-system variables interact to influence parental well-being.

**Figure 1**

*SHAP Summary Plot Illustrating the Relative Influence of Parenting Stress, Emotional Dysregulation, Family Functioning, and Perfectionism on Maternal Burnout Prediction*



The SHAP-based interpretability analysis provided additional insight into the mechanisms underlying model predictions. Higher levels of parenting stress consistently increased predicted maternal burnout across nearly all observations and demonstrated the greatest overall influence on prediction outcomes. Emotional dysregulation exhibited a similar positive pattern, with elevated difficulties in emotion regulation contributing to increased burnout risk. Family functioning showed a protective effect, such that healthier family environments reduced predicted burnout levels. Perfectionism displayed a more nuanced relationship, with very high levels substantially increasing burnout risk while moderate levels exerted comparatively smaller effects. The SHAP analysis further revealed nonlinear interactions among variables, particularly between parenting stress and emotional dysregulation, suggesting that mothers experiencing simultaneously high stress and poor emotional regulation were disproportionately vulnerable to severe burnout symptoms. Collectively, these findings provide strong evidence that maternal burnout arises from a complex interplay of parenting demands, emotional processes,

perfectionistic tendencies, and family relational dynamics, with parenting stress representing the most influential determinant within the predictive framework.

#### 4. Discussion

The present study aimed to predict maternal burnout among Malaysian mothers using a Random Forest machine learning model based on parenting stress, perfectionism, emotional dysregulation, and family functioning. The findings demonstrated that the proposed model exhibited strong predictive performance, explaining approximately 73% of the variance in maternal burnout. Parenting stress emerged as the most influential predictor, followed by emotional dysregulation, family functioning, and perfectionism. Correlational analyses further indicated that maternal burnout was positively associated with parenting stress, perfectionism, and emotional dysregulation, while family functioning demonstrated a significant negative relationship with burnout. These findings support contemporary theoretical models that conceptualize parental

burnout as the result of an imbalance between parenting demands and available psychological and social resources (Bogdán et al., 2025; Ren et al., 2024).

One of the most important findings of the present study was the identification of parenting stress as the strongest predictor of maternal burnout. This result is highly consistent with previous theoretical and empirical investigations suggesting that chronic parenting-related pressures represent the central mechanism underlying parental exhaustion. Parenting stress reflects the perception that caregiving demands exceed an individual's available coping capacities. When mothers continuously face responsibilities related to childcare, household management, educational supervision, emotional caregiving, and family coordination, prolonged exposure to these demands may gradually deplete psychological resources and lead to burnout symptoms. The prominent role of parenting stress observed in the current study aligns closely with findings reported by Taştekin and colleagues, who demonstrated that maternal stress significantly predicts parental burnout and influences broader family dynamics (Taştekin et al., 2025). Similarly, Partington and colleagues found that child-related difficulties contributed to parental mental health problems through increased parental burnout, emphasizing the pivotal role of stress in this process (Partington et al., 2025).

The current findings are also consistent with evidence from studies involving diverse populations of mothers. Findling and colleagues reported that parenting stress represents one of the strongest risk factors for parental burnout among mothers raising children with and without special needs (Findling et al., 2024). Likewise, Balogun and Oyekola identified parenting stress as a major contributor to maternal burnout among Nigerian mothers (Balogun & Oyekola, 2024). From a theoretical perspective, parenting stress may serve as the immediate psychological pathway through which multiple contextual stressors—including financial concerns, child behavioral problems, marital difficulties, and work-family conflicts—translate into emotional exhaustion and disengagement. The substantial importance score assigned to parenting stress by the Random Forest model suggests that interventions designed to reduce parenting burdens may offer the greatest potential for preventing maternal burnout.

The second most influential predictor identified in the present study was emotional dysregulation. Mothers who reported greater difficulties managing and regulating emotions demonstrated significantly higher levels of burnout. This finding supports a growing body of literature

indicating that emotional regulation processes play a fundamental role in parental adjustment and resilience. Effective emotional regulation enables parents to respond adaptively to daily stressors, tolerate frustration, and maintain psychological equilibrium during challenging interactions with children. Conversely, emotional dysregulation may amplify the emotional impact of parenting demands, making mothers more vulnerable to exhaustion and psychological overload (Brandão et al., 2024; Holly et al., 2024).

The observed relationship between emotional dysregulation and maternal burnout is strongly supported by the systematic review and meta-analysis conducted by Brandão and colleagues, which concluded that emotion regulation difficulties represent one of the most robust psychological correlates of parental burnout across diverse cultural contexts (Brandão et al., 2024). Holly and colleagues similarly argued that emotion regulation should be considered a central explanatory mechanism within contemporary models of parental burnout (Holly et al., 2024). Additional support comes from studies showing that emotion dysregulation intensifies the effects of cumulative stress on parental mental health outcomes. Cheung and Vaydich reported that emotion dysregulation significantly contributed to anxiety and depression among parents experiencing elevated stress during the pandemic period (Cheung & Vaydich, 2023). Beyond parenting contexts, evidence from occupational and educational settings indicates that emotional dysregulation contributes substantially to burnout by impairing adaptive coping processes (Chen et al., 2025; Zuo, 2025). Therefore, the present findings reinforce the notion that maternal burnout is not merely a consequence of external demands but is also influenced by mothers' capacity to regulate emotional responses effectively.

Family functioning emerged as the third most important predictor and demonstrated a significant negative association with maternal burnout. Mothers who perceived their family environments as supportive, cohesive, communicative, and well-organized reported lower levels of burnout. This finding highlights the protective role of family systems in buffering the negative effects of parenting challenges. Healthy family functioning likely reduces burnout risk by facilitating emotional support, collaborative problem-solving, equitable role distribution, and effective communication among family members. Such resources may reduce perceived parenting burdens and enhance mothers' capacity to cope with stress.

The present findings closely align with previous investigations emphasizing the importance of family functioning in parental well-being. Sekulowicz and colleagues demonstrated that family functioning significantly influenced burnout among mothers of children with autism, even after accounting for personality characteristics and child-related factors (Sekulowicz et al., 2022). Similarly, Findling and colleagues identified family support and family cohesion as important protective resources against parental burnout (Findling et al., 2024). Research examining dysfunctional family environments has further suggested that poor communication, unresolved conflicts, and inadequate support structures contribute to heightened maternal distress and emotional exhaustion (Kpea, 2025). The present findings extend this literature by demonstrating that family functioning contributes uniquely to burnout prediction even when parenting stress and emotional dysregulation are simultaneously considered.

Another noteworthy finding concerns the role of perfectionism. Although perfectionism was the least influential predictor among the variables examined, it nevertheless contributed significantly to the prediction of maternal burnout. This result suggests that perfectionistic tendencies may operate as a cognitive vulnerability factor that exacerbates parenting-related distress. Mothers who hold unrealistically high standards for themselves may become increasingly self-critical when confronted with inevitable parenting challenges. Such self-imposed pressures may create chronic dissatisfaction and increase vulnerability to emotional exhaustion.

The association between perfectionism and parental burnout observed in the current study is consistent with previous research. Çerkez and Sorakin reported significant relationships between parental perfectionism and burnout during the pandemic period, suggesting that perfectionistic parents may be particularly susceptible to psychological strain under conditions of heightened stress (Çerkez & Sorakin, 2023). Mousavi and colleagues similarly demonstrated that perfectionism contributes to burnout among parents through its influence on parenting conflict and coping difficulties (Mousavi et al., 2025). The current findings suggest that although perfectionism may not be as influential as parenting stress or emotional dysregulation, it nevertheless represents an important individual difference variable that shapes how mothers interpret and respond to parenting experiences.

An important contribution of the present study is the application of a Random Forest machine learning approach

to maternal burnout prediction. Most previous parental burnout studies have relied on linear regression or structural equation modeling techniques. While these approaches have generated valuable insights, they may not fully capture the complex nonlinear interactions among psychological and family-related variables. The strong predictive performance achieved in the present study suggests that machine learning methods may provide enhanced accuracy in identifying mothers at risk of burnout. The SHAP analysis further demonstrated that predictor effects were not strictly linear and that interactions among variables, particularly between parenting stress and emotional dysregulation, contributed substantially to burnout risk. These findings support calls for the incorporation of advanced analytical techniques into family psychology research (Bogdán et al., 2025; Ren et al., 2024).

The findings also have important implications for understanding maternal burnout within broader ecological frameworks. Research has increasingly highlighted the role of contextual, relational, and individual factors in shaping parental well-being. Variables such as empathy, social support, reflective functioning, mindful parenting, and resilient coping have been identified as resources capable of reducing burnout risk (Carone et al., 2025; Kadosh-Laor et al., 2023; Taştekin et al., 2025; Zhao, 2026). The present results complement this perspective by demonstrating that burnout is influenced by both risk factors and protective family resources. Consequently, effective prevention strategies should simultaneously target stress reduction, emotional regulation enhancement, perfectionistic cognitions, and improvements in family functioning.

## 5. Conclusion

Overall, the observed relationships support developmental concerns regarding the consequences of maternal burnout for children and family systems. Previous research has linked parental burnout to adverse child outcomes, including emotional difficulties, behavioral problems, depression, and compromised emotional development (Prino et al., 2023; Yakupova & Suarez, 2023). Furthermore, maternal burnout may undermine parenting quality, increase parent-child conflict, and reduce emotional availability. By identifying key predictors of burnout, the present study contributes to efforts aimed at protecting not only maternal mental health but also broader family well-being.

## 6. Limitations and Suggestions

Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional design prevents causal conclusions regarding the relationships among parenting stress, perfectionism, emotional dysregulation, family functioning, and maternal burnout. Second, all variables were assessed through self-report questionnaires, which may have introduced common method variance and response biases. Third, although the sample was relatively large, participants were recruited primarily through online platforms and community networks, potentially limiting the representativeness of the sample. Fourth, cultural factors unique to Malaysian society may influence the manifestation of maternal burnout and limit the generalizability of findings to other populations. Finally, while the Random Forest model demonstrated strong predictive accuracy, additional psychosocial variables not included in the present study may further improve prediction performance.

Future studies should employ longitudinal designs to examine the temporal and causal relationships among parenting stress, emotional regulation processes, perfectionism, family functioning, and maternal burnout. Researchers may also investigate additional predictors such as social support, marital satisfaction, coping strategies, financial stress, child temperament, and parental self-efficacy. Comparative studies involving fathers and mothers could provide valuable insights into gender-specific pathways leading to parental burnout. Future machine learning investigations should compare the performance of multiple algorithms, including XGBoost, CatBoost, LightGBM, and neural network models, to identify the most accurate predictive frameworks. Cross-cultural studies involving diverse populations would further enhance understanding of how cultural values and family structures influence maternal burnout risk.

The findings suggest that interventions aimed at reducing maternal burnout should prioritize the management of parenting stress through psychoeducation, stress-management training, and practical family support services. Mental health professionals should incorporate emotion regulation training into parenting programs to strengthen mothers' ability to cope with daily caregiving challenges. Family-based interventions that improve communication, role distribution, and emotional support may further reduce burnout risk. Screening procedures within healthcare and community settings could be developed to identify mothers

experiencing elevated parenting stress and emotional dysregulation before severe burnout develops. Educational programs addressing unrealistic parenting standards and perfectionistic expectations may also help mothers adopt more adaptive and self-compassionate approaches to parenting. Collectively, these strategies may contribute to improved maternal well-being, healthier family functioning, and more positive developmental outcomes for children.

### Authors' Contributions

Authors contributed equally to this article.

### Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

### Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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### Declaration of Interest

The authors report no conflict of interest.

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### Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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