



Original Article

The Relationship between Defense Mechanisms and Suicidal Ideation in Women: The Mediating Role of Psychological Pain and Difficulties in Emotion Regulation

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Abstract

Background: Suicidal ideation persists as a pressing public health concern, especially in women. Dysfunctional defense mechanisms and their complex interplay with emotional and cognitive processes warrant further scholarly investigation.

Objectives: This study investigates the mediating roles of psychological pain and difficulties in emotion regulation in the relationship between defense mechanisms and suicidal ideation in women.

Methods: This descriptive-correlational study used structural equation modeling to examine direct and indirect pathways in women with suicidal ideation from Karaj counseling centers (2024). A convenience sample of 350 participants (mean age = 32.0 years, SD = 7.8) completed the Defense Style Questionnaire-40 (immature/dysfunctional subscale), Beck Scale for Suicide Ideation, Mental Pain Scale, and Difficulties in Emotion Regulation Scale. Data analysis used SPSS-27 and AMOS-27. The study received ethics approval, included informed consent, and high-risk participants (BSSI ≥ 17) were referred to crisis services.

Results: Findings indicated a significant direct effect of dysfunctional defense mechanisms on suicidal ideation ($\beta=0.22$, $p<0.001$). Psychological pain ($\beta=0.15$, 95% CI [0.10, 0.20], $p<0.001$) and difficulties in emotion regulation ($\beta=0.10$, 95% CI [0.05, 0.15], $p<0.001$) partially mediated this relationship, with the direct effect remaining significant, confirmed through 5,000 bootstrap resamples. The model exhibited strong fit (CFI=0.92, TLI=0.91, RMSEA=0.06), underscoring the mediators' salience in suicidal ideation.

Conclusion: This study highlights the need for multidimensional interventions targeting dysfunctional defenses, psychological pain, and emotion regulation to prevent and treat suicidal ideation in women.

Implications for Nursing and Midwifery Preventive Care

- Empowers nurses to identify dysfunctional defenses, psychological pain, and emotional dysregulation for early suicide risk detection in women.
- Supports coping and resilience training for high-risk women in clinical settings.
- Promotes education and timely referral to reduce suicidal ideation.



Introduction

Suicidal ideation, defined as thoughts of engaging in suicide-related behavior, is a significant public health issue with profound individual and societal consequences [1]. While a wide array of factors contribute to its development, including biological, social, and psychological variables, women consistently demonstrate a higher prevalence of suicidal ideation compared to men, despite men having a higher rate of completed suicide [2]. This gender paradox highlights the necessity of in-depth research to understand the unique psychological processes that contribute to the manifestation of suicidal thoughts in women. Women who seek psychological and counseling services often present with a complex constellation of symptoms, including profound emotional distress, interpersonal difficulties, and a history of trauma, which can exacerbate suicidal thoughts [3, 4]. These women, who are the focus of this study, represent a particularly vulnerable population whose needs may be inadequately addressed by one-dimensional interventions. Therefore, a comprehensive understanding of the psychological mechanisms at play is crucial for developing effective preventive and therapeutic strategies tailored to this group.

Defense mechanisms are unconscious psychological strategies used to cope with anxiety and maintain a sense of psychological equilibrium [5]. Rooted in psychodynamic theory, these mechanisms can be broadly categorized as mature, neurotic, and immature (or dysfunctional). Mature defenses, such as altruism, humor, and sublimation, are generally associated with adaptive coping and psychological well-being. Conversely, immature or dysfunctional defenses, including projection, passive aggression, and splitting, are linked to maladaptive behaviors, personality disorders, and various forms of psychopathology [6]. A growing body of research suggests a strong correlation between the use of dysfunctional defense mechanisms and suicidal ideation [7, 8]. For example, individuals who heavily rely on denial or dissociation may be less likely to acknowledge and process their pain, leading to an accumulation of distress that can ultimately manifest as suicidal thoughts [9]. The unconscious and

habitual nature of these defenses makes them powerful, yet often unrecognized, contributors to an individual's psychological state, and a deeper understanding of their role is essential for effective clinical intervention.

Psychological pain, often described as an unbearable and intolerable suffering of the mind, is a central and pervasive component of the suicidal experience [10]. It is a subjective phenomenon that can arise from feelings of shame, guilt, rejection, or a sense of entrapment, and it is a key variable in prominent theories of suicide, such as Shneidman's psychache theory and the interpersonal theory of suicide [11]. Psychache, a term coined by Edwin Shneidman, refers to the acute mental and emotional pain that a person feels when they perceive their psychological needs as being unfulfilled [12]. This form of pain is distinct from physical pain and is so distressing that individuals may view death as the only viable escape [13]. Research has consistently demonstrated a direct and robust link between heightened levels of psychological pain and an increased risk of suicidal ideation and behavior [10]. The capacity to manage and mitigate this pain is therefore a critical protective factor against suicide. However, the mechanisms through which psychological pain becomes a direct pathway to suicidal thoughts, particularly in relation to other psychological constructs, require further empirical investigation. Emotion regulation refers to the ability to influence which emotions one has, when one has them, and how one experiences and expresses these emotions [14]. Deficits in this area are considered a transdiagnostic factor in various mental health disorders, including depression, anxiety, and personality disorders [15]. People who experience difficulties in emotion regulation often struggle with an inability to tolerate distress, a lack of emotional clarity, and a limited repertoire of effective emotional management strategies [16]. This inability to modulate intense emotional states can lead to impulsive behaviors and a heightened vulnerability to suicidal ideation. For women, who are often socialized to suppress emotions or prioritize the emotional needs of others, these difficulties can be particularly pronounced [17]. When confronted with overwhelming psychological

pain, an inability to effectively regulate emotions can lead to a sense of being trapped and out of control, making suicidal thoughts seem like a plausible solution to an otherwise unbearable situation [18]. Thus, a better understanding of the link between emotion regulation difficulties and suicidal ideation is vital for developing effective interventions.

While previous research has individually examined the relationships between defense mechanisms, psychological pain, and emotion regulation with suicidal ideation, few studies have integrated these constructs into a single, comprehensive model to explore their intricate interplay. This study addresses this gap by proposing a structural model that tests the mediating role of psychological pain and difficulties in emotion regulation in the relationship between defense mechanisms and suicidal ideation in women. The findings will provide a more nuanced understanding of the psychological pathways leading to suicidal thoughts, moving beyond a simple correlational analysis. The primary purpose of this research is to contribute to a deeper academic understanding of suicidal ideation in women and to provide a robust, evidence-based framework for clinical and preventive interventions. By identifying the specific mechanisms at play, this study aims to inform mental health professionals and policymakers on how to develop more targeted and effective strategies to reduce suicidal risk within this vulnerable population.

Objectives

The primary aim of this study was to examine the mediating role of psychological pain and difficulties in emotion regulation in the relationship between dysfunctional defense mechanisms and suicidal ideation among women, thereby providing an evidence-based framework for effective clinical and preventive interventions.

Methods

Study Design

This cross-sectional, descriptive-correlational study employed structural equation modeling (SEM) to examine associations among defense mechanisms,

psychological pain, difficulties in emotion regulation, and suicidal ideation in women.

Participants

The statistical population consisted of all women with suicidal ideation who referred to psychology and counseling centers in the city of Karaj, Iran, during the year 2024. Suicidal ideation was operationally defined and confirmed via referral from clinical psychologists or psychiatrists at these centers, supplemented by a Beck Scale for Suicide Ideation (BSSI) score of ≥ 5 (indicating at least mild ideation). A total of 450 women were approached for participation; of these, 350 met the inclusion criteria and provided consent (response rate = 78%; 100 refused due to time constraints or discomfort). Participants were included if they were female, over 18 years of age, and had confirmed suicidal ideation as defined above. Exclusion criteria included a history of psychosis, bipolar disorder, or any other severe mental illness that could interfere with the accurate completion of the questionnaires. To manage acute suicide risk, an ethical imperative, participants scoring ≥ 17 on the BSSI (moderate to severe ideation) were immediately referred to crisis intervention services, with on-site clinical supervision available throughout data collection. All participants provided informed consent before their involvement. Ethical considerations, including the protection of participants' confidentiality and anonymity, were strictly adhered to, and the study was approved by the institutional ethics committee of Islamic Azad University.

Sampling Methods

A convenience sampling method, which is a non-probability approach in which participants are selected based on their accessibility and availability at the time of recruitment, was utilized. This sampling was conducted across five psychology and counseling centers in Karaj to enhance representativeness within the accessible population.

Data Collection

Data were collected over a period of six months from the selected psychology and counseling centers.

After receiving approval from the center directors, the researchers approached potential participants who met the inclusion criteria. Following an explanation of the study's purpose and procedures, participants who agreed to take part signed a written informed consent form. The participants then completed a packet of self-report questionnaires, which took approximately 30 minutes to finish. A researcher was present to answer any questions and to ensure the proper completion of the forms. All completed questionnaires were coded to protect anonymity and were stored in a secure location accessible only to the research team.

Variables and Measurement Tools

The study's key variables included dysfunctional defense mechanisms (predictor), psychological pain and difficulties in emotion regulation (mediators), and suicidal ideation (outcome). These were assessed using validated self-report instruments as follows.

Beck Scale for Suicidal Ideation (BSSI)

The BSSI is a widely used, 19-item self-report measure designed to quantify the severity and intensity of suicidal ideation within the past week. It assesses the presence and seriousness of suicidal wishes, attitudes, and specific plans. Each item is scored on a 3-point scale (0-2), yielding a total score that can range from 0 to 38. Higher scores indicate a more severe level of suicidal ideation, with scores commonly categorized as minimal (0-4), mild (5-16), or moderate to severe (17 and above) [19]. The Farsi version has demonstrated reliable internal consistency, with a reported Cronbach's alpha of 0.79 in prior research [20]. In the present study, the BSSI showed excellent reliability with a Cronbach's alpha of 0.88.

Mental Pain Scale (MPS)

Psychological pain was assessed using the 44-item Mental Pain Scale [21], a self-report instrument that measures the multifaceted experience of mental suffering. The scale evaluates nine key dimensions of psychological pain, including emotional turmoil, feelings of worthlessness, alienation, and a sense of

immutability. Participants rate each item on a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). A higher total score reflects a greater degree of psychological pain. This measure is considered a crucial tool in suicide research as it directly quantifies the unbearable suffering that often precedes suicidal behavior. In previous Farsi-language studies, the scale's internal consistency was documented with a Cronbach's alpha of 0.78 [22]. For this study, the MPS demonstrated good reliability with an alpha coefficient of 0.85.

Difficulties in Emotion Regulation Scale (DERS)

The DERS is a 36-item self-report questionnaire that assesses a range of emotion regulation deficits. Items are rated on a 5-point Likert scale from 1 (rarely) to 5 (almost always), with higher scores indicating greater difficulties. The scale is comprised of six subscales: 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 [23]. Prior research in Iran has consistently reported high reliability for the DERS, with Cronbach's alpha values typically ranging from 0.84 to 0.93 [24]. The overall internal consistency of the DERS in the current study was also very high, with a Cronbach's alpha of 0.9.

Defense Style Questionnaire (DSQ-40)

Participants' defense mechanisms were evaluated using the DSQ-40, a 40-item self-report instrument. The questionnaire measures 20 distinct defense mechanisms, which are categorized into three main styles: mature, neurotic, and immature. Mature defense styles (e.g., humor, sublimation) are associated with healthy coping, while neurotic (e.g., reaction formation) and immature styles (e.g., projection, passive aggression) are linked to maladaptive behaviors. Each item is scored on a 9-point Likert scale, and scores are aggregated to reflect the prominence of each style [25]. The Farsi version of the DSQ-40 has been validated in Iran with a reported Cronbach's alpha of 0.76 [26]. In this study, the questionnaire demonstrated good internal

consistency, with a Cronbach's alpha coefficient of 0.79.

Statistical Methods

All collected data were initially entered into SPSS (version 27) for preliminary analysis, including descriptive statistics and assessment of assumptions. Data normality was evaluated using the Shapiro-Wilk test, which indicated multivariate normality ($p > 0.05$ for all variables), supporting the use of maximum likelihood estimation. The main analysis was conducted using the AMOS (version 27) software. Structural equation modeling was utilized to test the proposed research model and to examine the direct and indirect associations of psychological pain and difficulties in emotion regulation in relation to defense mechanisms and suicidal ideation. Indirect effects were assessed via bootstrapping with 5,000 resamples to obtain bias-corrected 95% confidence intervals. Model fit indices, including χ^2/df , CFI, TLI, GFI, AGFI, and RMSEA, were examined to determine the adequacy of the proposed model.

Results

The study sample of 350 women exhibited a diverse range of demographic characteristics. The participants' ages spanned from 18 to 55 years, with

a mean age of 32.0 years (standard deviation [SD] = 7.8). Regarding marital status, the majority of the sample were married (65%, $n=228$), while the remaining participants were either single or divorced (35%, $n=122$). Educational background varied, with a significant proportion holding a university degree (60%, $n=210$) and the rest having a high school diploma (40%, $n=140$). The occupational status of the participants was nearly evenly distributed, with 55% ($n=193$) being employed and 45% ($n=157$) identifying as homemakers.

The descriptive statistics and Pearson correlation coefficients for the study variables are presented in Table 1. The mean scores for suicidal ideation ($M=15.23$, $SD=4.89$), psychological pain ($M=126.87$, $SD=16.23$), difficulties in emotion regulation ($M=89.45$, $SD=15.67$), and defense mechanisms ($M=145.78$, $SD=18.44$) were within the possible ranges for this population. A significant positive correlation was found among all variables, with the strongest relationship observed between psychological pain and suicidal ideation ($r=0.78$, $p < 0.001$). This was followed by a strong correlation between difficulties in emotion regulation and suicidal ideation ($r=0.74$, $p < 0.001$). These findings provide initial support for the interconnections among the variables and lay the groundwork for a more in-depth structural analysis.

Table 1. Descriptive Statistics and Intercorrelations of Study Variables (N=350)

Variable	Mean	SD	Skewness	Kurtosis	1	2	3	4
1. Defense Mechanisms	145.78	18.44	0.08	-0.44	1			
2. Psychological Pain	126.87	16.23	0.31	-0.19	.59**	1		
3. Difficulties in Emotion Regulation	89.45	15.67	0.18	-0.26	.54**	.71**	1	
4. Suicidal Ideation	15.23	4.89	0.42	0.33	.63**	.78**	.74**	1

Note. SD = Standard Deviation; ** $p < .001$.

Before the structural analysis, a confirmatory factor analysis (CFA) was conducted using AMOS (version 27) to evaluate the measurement model, treating each construct as a latent variable indicated by item parcels (three parcels per scale to reduce complexity and ensure parsimony). The CFA model exhibited good fit ($\chi^2/df=2.12$, CFI=0.94,

RMSEA=0.05, GFI=0.92), supporting the discriminant validity of the constructs. Standardized factor loadings ranged from 0.72 to 0.89 (all exceeding the 0.40 threshold). Internal consistency reliabilities were robust, with Cronbach's α values of 0.79 for defense mechanisms, 0.85 for psychological pain, 0.90 for difficulties in emotion regulation, and

0.88 for suicidal ideation. Composite reliability (CR) values were acceptable (defense mechanisms: CR = 0.81; psychological pain: CR=0.87; difficulties in emotion regulation: CR=0.90; suicidal ideation: CR=0.85; all >0.70), and average variance extracted (AVE) exceeded 0.50 for each construct (range: 0.52–0.68), indicating convergent validity. To address potential common method bias, Harman's single-factor test was applied, revealing that a single factor accounted for 42% of the total variance (below the 50% threshold), suggesting no substantial bias. Multicollinearity was assessed via variance inflation factors (VIFs), with all values below 3.0 (range: 1.2–2.8), confirming no issues.

The adequacy of the proposed structural model was evaluated using several key fit indices, as detailed in Table 2. The model demonstrated an excellent fit to the data, confirming the validity of the hypothesized relationships. The chi-square to degrees of freedom ratio (χ^2/df =2.34) was well below the recommended threshold of 3.0, indicating a good model fit. Furthermore, the goodness-of-fit index (GFI=0.93) and the comparative fit index (CFI=0.92) both exceeded the acceptable cutoff of 0.90, suggesting the model's structure accurately represents the observed data. The root mean square error of approximation (RMSEA=0.06) also fell within the acceptable range (<0.08), further reinforcing the model's robust fit. These results collectively support

the theoretical model as a strong representation of the data.

Table 2. Model Fit Indices for the Proposed Structural Equation Model

Fit Index	Observed Value	Acceptable Value
χ^2/df	2.34	< 3.0
GFI	0.93	> 0.90
CFI	0.92	> 0.90
RMSEA	0.06	< 0.08

Note. χ^2/df = Normed Chi-Square; GFI = Goodness-of-Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

The structural equation model results confirmed the hypothesized relationships between the study variables. A significant direct positive relationship was found between dysfunctional defense mechanisms and suicidal ideation (β =0.22, 95% confidence interval [CI]= [0.12, 0.32], p <0.001), indicating that a greater reliance on maladaptive defenses is associated with more severe suicidal thoughts. Additionally, the analysis revealed significant indirect effects, demonstrating that psychological pain (β =0.15, 95% CI= [0.10, 0.20], p <0.001) and difficulties in emotion regulation (β =0.10, 95% CI= [0.05, 0.15], p <0.001) partially mediate this relationship (assessed via bootstrapping with 5,000 resamples to obtain bias-corrected 95% CIs) (Table 3).

Table 3. Comparison of Pain Severity of Intervention and Control Groups Before and After the Intervention

Path	β	95% CI	p
Direct Effects			
Defense mechanisms → Suicidal ideation	0.22	[0.12, 0.32]	< .001
Defense mechanisms → Psychological pain	0.33	[0.24, 0.42]	< .001
Defense mechanisms → Difficulties in emotion regulation	0.27	[0.18, 0.36]	< .001
Psychological pain → Suicidal ideation	0.45	[0.35, 0.55]	< .001
Difficulties in emotion regulation → Suicidal ideation	0.38	[0.28, 0.48]	< .001
Indirect Effects			
Defense mechanisms → Psychological pain → Suicidal ideation	0.15	[0.10, 0.20]	< .001
Defense mechanisms → Difficulties in emotion regulation → Suicidal ideation	0.10	[0.05, 0.15]	< .001

Note. β = standardized beta coefficient; CI = confidence interval.

The total effect of dysfunctional defense mechanisms on suicidal ideation was $\beta=0.47$ (95% CI= [0.35, 0.59], $p < 0.001$), comprising the direct effect and the sum of the two indirect effects. These findings suggest that dysfunctional defenses exert both a direct influence on suicidal ideation and

indirect effects through the experience of psychological pain and difficulties in effectively regulating emotions. The final research model, depicted in Figure 1, provides a visual representation of the relationships among the variables.

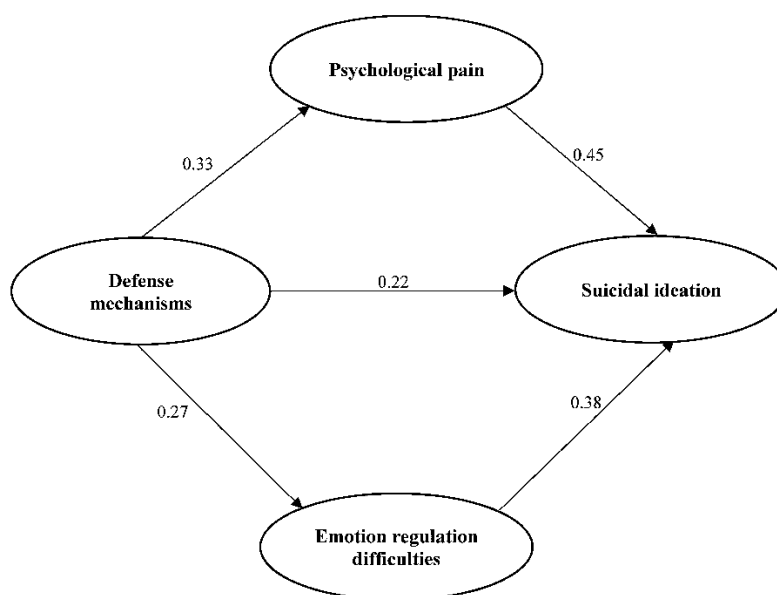


Figure 1. The final structural model of the relationship between defense mechanisms and suicidal ideation in women, mediated by psychological pain and difficulties in emotion regulation

Discussion

This research aimed to model suicidal ideation based on defense mechanisms, psychological pain, and difficulties in emotion regulation in women using structural equation modeling. This study's results indicated that dysfunctional defense mechanisms were directly related to suicidal ideation. This finding suggested that women who consistently resorted to maladaptive coping strategies, such as denial, projection, or acting out, were independently more vulnerable to suicidal thoughts. This aligned with psychoanalytic theories, which hold that dysfunctional defenses prevent the healthy processing of internal conflicts and environmental pressures, leading to an unbearable psychological state [27]. Prior research also confirmed this direct link; for instance, a study by Şahin et al. [8] showed that the use of immature defense mechanisms was

associated with a significant increase in self-destructive behaviors and suicidal thoughts. Clinically, this moderate effect size implies that a one standard deviation increase in dysfunctional defense use is associated with a 0.22 standard deviation increase in suicidal ideation severity, underscoring the need for routine assessment in clinical settings to identify women at heightened risk.

The findings showed a strong relationship between dysfunctional defense mechanisms and psychological pain. This result indicated that avoiding emotional discomfort through maladaptive defenses directly led to the accumulation of severe psychological pain. This was consistent with Shneidman's theory of "psychache," which identified psychological pain as the core of the suicidal experience [13]. The use of defense mechanisms like

suppression or projection prevented constructive self-dialogue and led to a profound sense of suffering, isolation, and emptiness. This pain, which was distinct from physical pain, became a central, intolerable state that the individual desperately sought to escape from.

The results indicated a significant relationship between dysfunctional defense mechanisms and difficulties in emotion regulation. This finding suggested that a reliance on dysfunctional defenses inherently disrupted an individual's ability to effectively manage emotional responses. For example, a person who used "acting out" as a defense mechanism was, by nature, struggling with impulse control, a core component of emotion regulation. This finding was consistent with research that identified difficulties in emotion regulation as a pervasive risk factor in mental disorders, and particularly in suicide [28]. For instance, a study by Amani et al. [17] showed that difficulties in emotion regulation mediated the relationship between personality vulnerabilities and suicidal ideation.

The strong direct relationship between psychological pain and suicidal ideation was a fundamental finding of this research. This result emphasized the central role of emotional suffering as a direct motivational factor for suicidal thoughts. When psychological pain became unbearable, a person may have viewed suicide not as a destructive act but as a logical response to an illogical degree of suffering [13]. This finding was significant because it showed that reducing psychological pain was a vital step in suicide prevention. A study by Baryshnikov and Isometsä [10] also confirmed that psychological pain mediated the relationship between hopelessness and suicidal ideation, emphasizing its central role. From a clinical perspective, this large effect size highlights the potential for interventions like mindfulness-based pain alleviation techniques to substantially mitigate ideation risk.

The significant direct relationship between difficulties in emotion regulation and suicidal ideation highlighted the crucial role of emotional competence in reducing suicide risk. Individuals who struggled to identify and manage their emotions were defenseless against distress and were more

vulnerable to crises. This inability to control emotions could lead to impulsive and self-destructive behaviors and a sense of hopelessness when faced with negative feelings. This result was supported by a large body of research that had established a clear link between poor emotion regulation and suicidality [17, 28].

The most significant finding of this study was the existence of two powerful mediating pathways. The results showed that dysfunctional defense mechanisms predicted suicidal ideation through two parallel pathways (psychological pain and difficulties in emotion regulation). These findings went beyond simple correlations and suggested a sequential process: an individual's reliance on dysfunctional defenses led to an accumulation of psychological pain and an inability to regulate emotions, which in turn significantly increased the risk of suicidal ideation. The overall model explained 45% of the variance in suicidal ideation, indicating substantial explanatory power with practical relevance for intervention. This model provided clinicians with a powerful tool for identifying specific intervention points along this pathway. In nursing and midwifery practice, these associational pathways support concrete recommendations, such as incorporating brief screening for defense styles and emotion regulation deficits during prenatal or routine check-ups, followed by targeted interventions like dialectical behavior therapy modules for emotion regulation or cognitive restructuring to address psychological pain, thereby enhancing preventive care for at-risk women.

Despite its strengths, this research also had limitations. The use of a convenience sample and a cross-sectional design limited the generalizability of the results and the ability to infer causal relationships. Additionally, reliance on self-report measures may introduce response biases, particularly for unconscious constructs like defense mechanisms, which could be better captured through observer-rated or implicit assessments in future work. The sample's cultural specificity to women in Karaj, Iran, may limit applicability to diverse populations, warranting cross-cultural replications. Given the cross-sectional nature, the observed

mediations represent statistical rather than causal pathways; longitudinal designs are recommended to explore temporal precedence and rule out reverse causation.

Conclusion

The structural model of this research provided a comprehensive and convincing explanation for the psychological pathways leading to suicidal ideation in women. The findings emphasized that therapeutic interventions should not be limited to superficial symptoms but should focus on underlying factors such as dysfunctional defense mechanisms, psychological pain, and difficulty in emotion regulation. While these results highlight promising intervention targets, the cross-sectional design precludes causal inferences, and future longitudinal studies are needed to confirm directional effects. This research provided a valuable guide for designing comprehensive treatment and prevention protocols that could significantly improve the quality of care and outcomes for this vulnerable population.

Ethical Considerations

Ethical Approval for this study was obtained from the Institutional Review Board, and was assigned the reference number IR.IAU.K.REC.1404.068. Informed consent was obtained from all individual participants included in the study, with assurances of confidentiality and the right to withdraw at any time.

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Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contributions

Malehmir Chegini S: Conceptualization, methodology, data collection, formal analysis, writing original draft.

Havasi Soomar N: Supervision, validation, writing, review and editing, project administration.

Gholami Tooran Poshti M: Investigation, resources, visualization, writing, review, and editing. All authors approved the final manuscript.

Artificial Intelligence Utilization for Article Writing

No artificial intelligence tools were utilized in the conceptualization, writing, or revision of this manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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