

Developing Model of Spiritual Intelligence, Coping Mechanisms, Other Factors on Self-Management in Type 2 Diabetes Mellitus Patients: A Cross-Sectional Analysis in Indonesia

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder with increasing global prevalence, including in Indonesia, where it poses a significant public health challenge. Effective self-management is crucial to prevent complications, yet adherence remains challenging due to psychological, cultural, and socioeconomic factors. Spiritual intelligence and coping mechanisms are emerging as essential determinants in self-care behaviours for chronic disease management. This study examined the relationship between spiritual intelligence, coping strategies, and self-management behaviours among patients with T2DM in Kediri, Indonesia.

Methods: A cross-sectional study was conducted among T2DM outpatients from three health centres in Kediri, Indonesia, using multi-stage random sampling. A total of 325 participants were selected. Data were collected via structured interviews using validated instruments to assess spiritual intelligence (SISRI-24), coping strategies (Brief-COPE), meaning-based coping (MCCS), and diabetes self-management (AADE). Descriptive statistics and Structural Equation Modeling were used for data analysis.

Results: Spiritual intelligence significantly improved self-management in type 2 diabetes patients ($p = 0.015$; $\beta = 0.165$). Coping efforts ($p = 0.033$; $\beta = 0.145$), meaning-based coping ($p = 0.016$; $\beta = 0.129$), and social support ($p = 0.004$; $\beta = 0.174$) also showed significant positive effects. The final model highlighted spiritual intelligence as a key factor enhancing coping and self-management, though some appraisal pathways were non-significant.

Conclusion: Spiritual intelligence, coping strategies, and social support significantly enhance self-management in type 2 diabetes patients. Integrating these psychosocial factors into diabetes care may improve patient outcomes and promote more effective disease management.

Keywords: Coping Strategies, Self-Management, Spiritual Intelligence, Type 2 Diabetes Mellitus

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Introduction

Diabetes mellitus type 2 (T2DM) is a chronic metabolic disorder characterized by insulin resistance and impaired insulin secretion, leading to hyperglycemia and various complications [1]. The global prevalence of T2DM has been increasing significantly, with an estimated 537 million adults affected worldwide, projected to rise to 783 million by 2045 (kutip idf) In Indonesia, diabetes is a significant public health concern, ranking among the top causes of morbidity and mortality [2]. Effective self-management is essential in preventing

complications and improving the quality of life for individuals with T2DM [3].

Self-management in diabetes includes medication adherence, dietary control, physical activity, blood glucose monitoring, and problem-solving skills [4]. However, adherence to these behaviours remains challenging, particularly in developing countries where cultural, psychological, and socioeconomic factors influence health behaviour. Among the psychological factors, spiritual intelligence has been identified as a potential determinant of health behaviours, influencing how individuals cope with chronic

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diseases [5]. Spiritual intelligence encompasses finding meaning in life experiences, maintaining inner peace, and integrating spirituality into daily activities, which may positively affect self-care behaviours in T2DM patients [6].

Several studies have suggested that spiritual intelligence plays a significant role in chronic disease management. For instance, previous research found that individuals with higher spiritual intelligence tend to have better self-care behaviours, enhanced psychological resilience, and greater adherence to medical recommendations [7]. Moreover, problem- and emotion-focused coping mechanisms are critical in determining how patients manage their diabetes [8]. Effective coping strategies can help individuals handle stress, make informed decisions, and sustain long-term self-care behaviours [9]. However, there is limited research on how spiritual intelligence and coping mechanisms influence diabetes self-management, particularly in the Indonesian population.

Given the increasing burden of diabetes and the challenges in achieving optimal self-management, exploring factors beyond traditional medical interventions that may enhance self-care behaviours is crucial. This study analyses the relationship between spiritual intelligence, coping mechanisms, and self-management behaviours among T2DM patients in Kediri, Indonesia. By understanding these relationships, healthcare professionals can develop more comprehensive interventions integrating psychological and spiritual aspects into diabetes management programs.

Methods

Study Design and Setting

This study employed an observational design with a cross-sectional approach to assess the relationship between spiritual intelligence, cognitive appraisal, coping mechanisms, and diabetes self-management among Type 2 Diabetes Mellitus (T2DM) patients. The study was conducted across three Community Health Centers in Kediri, Indonesia: Balowerti, Ngletih, and Sukorame.

Population and Sampling

The study population comprised all T2DM outpatients residing in Kediri. A multi-stage random sampling technique was utilized to ensure a representative sample from the selected healthcare centres. The sample size was determined using an estimation formula with a minimum requirement of 325 participants.

Eligibility Criteria

Participants were eligible if they met the following conditions: diagnosed with T2DM, aged between 30 and 70 years, had previously sought treatment at a healthcare facility, were able to communicate effectively, and were willing to provide informed consent for study participation.

Data Collection

Data were collected through structured interviews utilizing validated questionnaires to ensure reliability and validity. The instruments used included Spiritual Intelligence, Assessed using the Spiritual Intelligence Self-Report Inventory (SISRI-24); Coping Strategies, Evaluated using the Brief-COPE Questionnaire; Meaning-Based Coping, Assessed with the Meaning-Centered Coping Scale (MCCS); and Diabetes Self-Management, Measured using the American Association of Diabetes Educators (AADE) Questionnaire.

Data Analysis

Descriptive statistics were conducted to summarize demographic characteristics and study variables using SPSS version 16.0. Structural Equation Modeling (SEM) was employed for multivariate analysis to examine the relationships among study variables.

Ethical Considerations

This study was approved by the Ethics Committee of the Faculty of Nursing, Universitas Airlangga. Ethical clearance was granted under approval number 3107-KEPK. All participants provided informed consent before data collection, ensuring adherence to ethical principles of anonymity, confidentiality, and voluntary participation.

Results

Characteristic of Patients

Table 1 describes the sociodemographic and clinical characteristics of the patients with type 2 diabetes mellitus included in this study. Most participants were elderly females diagnosed within the past 1–5 years. Although only 30% reported diabetes-related complications, over half exhibited poor glycemic control (≥ 200 mg/dL). A large proportion demonstrated moderate levels of knowledge and stress, while relatively few showed high levels of either. Interestingly, only a minority had a family history of diabetes or possessed high diabetes-related knowledge.

Hypothesis Testing Results

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As shown in Table 2, structural equation modelling confirmed several significant relationships among spiritual intelligence, cognitive appraisal, coping strategies, and self-management. Spiritual intelligence was positively associated with adaptive coping mechanisms and self-management, primarily through its influence on secondary appraisal and meaning-based coping. Both primary and secondary appraisal processes were linked to greater coping effort, supporting self-management. Meaning-based coping also served as a mediator, strengthening the pathway from appraisal to self-regulatory behaviour. Other external factors contributed to several key paths, reinforcing the robustness of the model.

Final Inner Model Construct

The final structural model in Figure 1 shows that, The SEM analysis revealed that spiritual intelligence significantly positively affected primary appraisal, secondary appraisal, coping effort, and meaning-based coping. Both primary and secondary appraisal contributed to coping effort and meaning-based coping while coping effort significantly influenced diabetes self-management. Notably, meaning-based coping did not directly predict diabetes self-management. Instead, primary appraisal demonstrated a more prominent direct effect. Social support and dispositional coping positively affected meaning-based coping, though not self-management directly. One indicator, motivational relevance (X2.3), was excluded due to estimation issues.

Discussion

This study developed and tested a conceptual self-management model in individuals with type 2 diabetes, grounded in the transactional theory of stress and coping and incorporating spiritual intelligence, cognitive appraisal, and coping strategies. The results revealed several statistically significant pathways that underscore the multifaceted role of spiritual intelligence in influencing health behavior and disease self-management.

Spiritual intelligence directly affected secondary appraisal, coping effort, meaning-based coping, and self-management, supporting its relevance in chronic disease adaptation. This finding aligns with research by Gulbahar et al. (2023) who found that higher levels of spiritual wellbeing were significantly associated with better self-care activities among patients with type 2 diabetes [10]. Similarly, Rafiei et al. (2023) demonstrated that

spiritual intelligence positively correlated with diabetes self-management, highlighting its role in helping individuals internalize illness-related stress and engage in more reflective, goal-oriented coping strategies [11]. These results are consistent with Lazarus and Folkman's transactional model of stress and coping, which emphasizes that an individual's interpretation of stress (appraisal) and available coping resources determine behavioral and psychological outcomes [12,13] Our study supports this model, revealing that primary and secondary appraisals influence coping efforts and predicting self-management.

The significant influence of secondary appraisal ($\beta = 0.303$, $p < 0.001$) on coping effort indicates that individuals who perceive they have sufficient resources to deal with stressors are more likely to engage in sustained coping efforts. This finding is supported by Duke et al. (2021) who found that cognitive reappraisal enhanced adaptive coping and improved glucose control, particularly in spiritually inclined patients [14]. Similarly, Javanmardifard et al. (2020) demonstrated that spiritual resilience plays a mediating role in helping diabetic patients manage their illness through appraisal and emotional regulation. Of particular note is the significant mediating role of coping strategies—specifically meaning-based coping—in the relationship between spiritual intelligence and self-management [15]. This supports the findings of McCoy (2019), who emphasized that meaning-centered coping interventions improve both emotional wellbeing and treatment adherence in diabetic populations [16]. Invoking spiritual frameworks, patients may reinterpret their condition as an opportunity for personal growth, fostering adaptive coping behavior [17,18].

However, the pathway between spiritual intelligence and primary appraisal was not statistically significant ($p = 0.059$), contrasting with other significant pathways. One possible explanation is that primary appraisal—the immediate evaluation of an event as threatening or harmful—tends to be automatic and emotionally reactive. In contrast, spiritual intelligence involves higher-order cognitive processing, including Meaning-based coping, self-reflection, and transcendental awareness. This suggests that spiritual intelligence may not influence initial threat perception but may be more strongly activated in secondary appraisal and meaning-based coping, where interpretation and values are central. This

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result is supported by Shabani (2023), who found no direct association between spiritual intelligence and stress perception in patients with chronic illnesses but a strong correlation with resilience and post-traumatic growth [19].

Additional pathways involving other factors—presumably demographic and contextual variables—also showed significant associations with coping effort, meaning-based coping, and self-management. These findings emphasize that spiritual intelligence does not operate in isolation but interacts with various individual differences and situational contexts, including sociodemographic characteristics. Age, gender, educational level, and religious orientation may shape how individuals perceive stress, utilize coping mechanisms, and engage in self-care behaviors [20,21]. This multidimensional nature of self-management echoes the findings of Onyishi et al. (2018), who highlighted that both psychosocial and spiritual factors play important roles in diabetes outcomes and are influenced by age, gender, educational background, and religious orientation [22].

This study underscores the crucial role of spiritual intelligence in promoting diabetes self-management, mediated through appraisal and coping mechanisms. Spiritual intelligence significantly influenced primary and secondary appraisal processes, affecting coping efforts. Notably, only coping efforts directly and significantly affected self-management behaviors, such as adherence to diet, exercise, and medication [23,24]. These findings support Lazarus and Folkman's stress-coping theory and align with previous studies showing that patients with strong spiritual values tend to engage more actively in health-promoting behaviors [12,25].

Although meaning-based coping was influenced by spiritual intelligence, social support, and dispositional coping, it did not show a direct effect on self-management. This suggests that its role may be more indirect or long-term, acting as a buffer against stress rather than a direct driver of behavior change. Similar findings by Arslan et al. (2021) suggest that Meaning-based coping enhances psychological resilience, which could support behavioral improvements over time, even if not immediately observable [26]. The exclusion of the motivational relevance indicator (X2.3) indicates potential measurement or cultural interpretation issues, warranting further refinement in future studies. Overall, the results highlight the importance

of integrating spiritual and psychosocial elements into diabetes education programs. Interventions that enhance spiritual reflection, cognitive appraisal, and adaptive coping may offer a more holistic and culturally sensitive approach to improving self-care among patients with type 2 diabetes. In this case, the role of patient discipline factors is important as a basic medium for forming compliance in carrying out self-care [27]. for patients with type 2 diabetes.

These findings underscore the potential value of integrating spiritual intelligence into diabetes education and self-management interventions. Programs that foster reflection, existential awareness, and a sense of personal meaning may strengthen patients' coping strategies and improve behavioral regulation. The observed differential effects on primary and secondary appraisals suggest that spiritual intelligence may significantly influence secondary-level cognitive processing—where reinterpretation and meaning construction occur—rather than during the initial, emotionally reactive phase of stress appraisal. Consequently, future interventions should prioritize strategies that enhance reappraisal and promote more profound Meaning-based coping rather than attempting to modify instinctive threat perceptions.

This study contributes to the growing body of literature advocating for a holistic approach to diabetes management that integrates spiritual, psychological, and behavioral dimensions. By incorporating spiritual intelligence into patient education and tailored therapeutic programs, healthcare providers may enhance patients' adaptive coping mechanisms and support more effective self-management. Future research should employ longitudinal and mixed-method designs to further strengthen this line of inquiry to explore the temporal dynamics of spiritual intelligence and its influence on stress processing. Additionally, investigating culturally diverse populations may provide insight into spiritually integrated self-management models' generalizability and contextual sensitivity.

Conclusion

This study developed a model illustrating how spiritual intelligence, coping mechanisms, and other psychosocial factors contribute to self-management in type 2 diabetes mellitus patients in Kediri, Indonesia. Spiritual intelligence emerged as a key factor that enhances adaptive coping and strengthens self-management behaviors. The findings support the integration of spiritual and

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psychosocial dimensions into diabetes care programs to improve patient engagement, resilience, and long-term disease management outcomes.

What is already know on this topic

1. Spiritual intelligence and coping strategies are crucial determinants of self-care in managing chronic diseases.
2. Research in Indonesia on their role in Type 2 Diabetes Mellitus self-management remains limited.

What this study adds

1. Shows that spiritual intelligence significantly improves self-management in T2DM patients through coping mechanisms and appraisal processes.
2. Proposes a validated model integrating spiritual and psychosocial factors into diabetes care programs.

Competing interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article

Authors' contributions

KINR : Study conception and design, data collection, data analysis, statistical analysis and drafting of the manuscript.

CUW : Supervision, data interpretation, and critical revision of the manuscript for important intellectual content.

MBQ : Methodology, data interpretation, and manuscript editing.

MAI : Interpretation of results, and final approval of the manuscript.

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Tables and figures

Table 1. Characteristic of Patients

Variable	Frequency (n)	Percentage (%)
Age		
Adult (19-44 years)	19	6.0
Pre-elderly (45-59 years)	122	37.5
Elderly (more than 60 years)	184	56.5
Gender		

Male	66	20.3
Female	259	79.7

Long-time suffering Diabetes Mellitus

Less than 1 year	45	13.8
1-5 year	202	62.2
6-10 year	56	17.2
11-15 year	12	3.7
16-20 year	8	2.5
More than 20 year	2	0.6

Complications of Diabetes Mellitus

Yes	97	30
No	228	70

Family History

Yes	65	20
No	260	80

Blood Glucose Level

Low (less than 100mg/dl)	9	2.8
Normal (100-180 mg/dl)	124	38.2
High (200 mg/dl)	192	59

Knowledge Level

Low	139	42.8
Moderate	177	54.4
High	9	2.8

Stres Level

Low	59	18.2
Moderate	235	72.3
High	31	9.5

Characteristics of patients with type 2 diabetes (n = 325)

Table 2. Hypothesis Testing of the Self-Management Model in Type 2 Diabetes

Pathway	Coefficient	t-Statistic	p-Value
Spiritual intelligence → Primary appraisal	0.132	1.889	0.059
Spiritual intelligence → Secondary appraisal	0.284	5.330	0.000
Spiritual intelligence → Coping effort	0.215	3.637	0.000

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Spiritual intelligence	0.137	2.083	0.037
→ Meaning-based coping			
Spiritual intelligence	0.165	2.434	0.015
→ Self-management			
Primary appraisal	0.167	3.046	0.002
→ Coping effort			
Secondary appraisal	0.303	4.678	0.000
→ Coping effort			
Coping effort	0.145	2.138	0.033
→ Self-management			
Meaning-based coping	0.164	2.969	0.003
→ Coping effort			
Meaning-based coping	0.129	2.419	0.016
→ Self-management			
Other factors	-0.134	1.991	0.047
→ Secondary appraisal			
Other factors	0.152	2.635	0.008
→ Coping effort			
Other factors	0.153	2.565	0.010
→ Meaning-based coping			
Other factors	0.174	2.903	0.004
→ Self-management			

Standardized β , t -values, and p -values shown.
Significance is determined at $p < 0.05$.
Model integrates spiritual intelligence with transactional stress and coping theory.

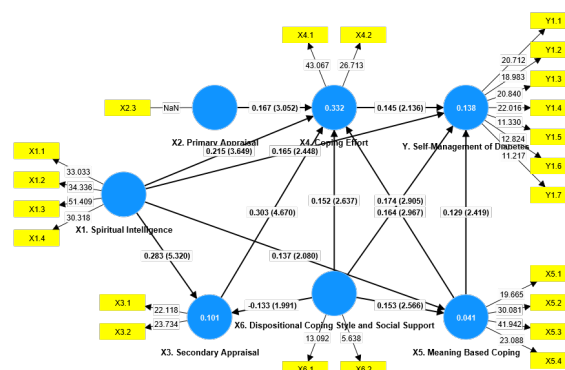


Figure 1. Final Inner Model Construct

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