|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||

Available online on http://www.ijmbs.info

International Journal of Medical and Biomedical Studies; 2025; 9(6); 10-20

Original Research Article

Assessing the Relationship of Coping Styles in Subjects with T2DM and Glycemic Status

Krishna Sai Surya Kolipakula[1], Gadugoyyala Guna Sri Phani Ajay[2], Udipi Badikillaya Vijayalakshmi[3], Amulya Kolipakula[4], Sanka Venkatrama Krishna Arya[5], Gangisetty Lakshmi Narayana[6], Ganapathi Swamy Chintada[7]

[1]MBBS Intern, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India
[2]MBBS Student, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India
[3]Professor & Head, Department of Biochemistry, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India
[4]MBBS, Siddhartha Medical College, Vijayawada, Andhra Pradesh, India
[5]MBBS intern, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India
[6] MBBS Intern, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India
[7]Professor in Biostatistics, Department of Community Medicine, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India

Received: 14-09-2025 / Revised: 04-10-2025 / Accepted: 26-11-2025
DOI: https://doi.org/10.32553/ijmbs.v9i6.3153
Corresponding author: Gadugoyyala Guna Sri Phani Ajay
Conflict of interest: No conflict of interest

Abstract:

Background: Type 2 diabetes mellitus (T2DM) is a long-standing metabolic condition that contributes substantially to illness burden and chronic complications. Maintaining adequate glucose regulation continues to be difficult for many individuals despite improvements in therapeutic options. Alongside medical and biological determinants, psychological factors such as coping responses may shape diabetes self-care behaviors and long-term metabolic outcomes. Existing literature examining the link between coping patterns and glycemic status has produced mixed findings, with limited data available from Indian populations.

Materials and Methods: This investigation employed a hospital-based observational design and included 120 adult individuals diagnosed with T2DM who were receiving care at a tertiary-level health facility. Relevant demographic and clinical information was obtained using a standardized data collection format. Coping behaviors were evaluated using a validated coping assessment tool and grouped into active, emotion-oriented, and avoidant coping categories. Long-term glucose regulation was assessed using recent glycated hemoglobin (HbA1c) measurements. Statistical evaluation involved summary measures and correlation testing to explore relationships among coping patterns, HbA1c values, body mass index (BMI), and disease duration.

Results: Overall glycemic regulation in the study population was suboptimal, as reflected by elevated average HbA1c levels. Strategies aimed at emotional regulation were most frequently adopted, followed by active problem-oriented approaches and avoidance coping-based behaviors. No statistically meaningful direct association was identified between HbA1c values and any coping category. In contrast, strong associations were observed among the different

coping strategies themselves. HbA1c demonstrated significant positive relationships with both body mass index and length of time since diabetes diagnosis.

Conclusion: Coping styles did not demonstrate a direct association with glycemic control in this study. Clinical factors such as BMI and duration of diabetes were stronger determinants of HbA1c. The findings suggest that coping strategies may influence glycemic outcomes indirectly through behavioral pathways. Integrating psychosocial assessment with routine diabetes care may support comprehensive disease management.

Keywords: Type 2 diabetes mellitus, Coping styles, Glycemic control, HbA1c, Psychosocial factors, BMI

Introduction

Type 2 diabetes mellitus (T2DM) is a long-standing metabolic condition marked by chronic elevation of blood glucose levels due to impaired insulin action and, in many cases, reduced insulin secretion. It represents a growing public health concern worldwide, with a particularly steep rise in prevalence observed in low- and middle-income countries. In India, the burden of T2DM has expanded rapidly over recent decades, driven by urbanization, sedentary lifestyles, dietary changes, and increasing life expectancy. The disease is associated with substantial morbidity and mortality, largely attributable to its long-term microvascular and macrovascular complications affecting the eyes, kidneys, nerves, cardiovascular system, and cerebrovascular circulation [1].

Optimal management of T2DM relies on sustained regulation of blood glucose levels to reduce the risk of complications. Long-term glycemic status is commonly assessed using glycated hemoglobin (HbA1c), which reflects average blood glucose concentrations over the preceding two to three months and serves as a standard marker for evaluating metabolic control. Despite the availability of effective pharmacological agents and evidence-based treatment guidelines, a considerable proportion of individuals with T2DM fail to achieve recommended glycemic targets. This highlights the complex and multifactorial nature of diabetes management, where biological factors interact with behavioral, psychological, and social influences [2].

Successful diabetes care extends beyond medical treatment and places significant emphasis on patient-driven self-care practices. Daily adherence to prescribed medications, appropriate dietary habits, regular physical activity, routine glucose monitoring, and lifestyle modification form the foundation of effective disease control. However, the continuous demands of self-management can impose a substantial psychological burden. Living with a chronic condition such as T2DM often involves persistent stress, emotional strain, frustration, and concerns related to disease progression and long-term outcomes, all of which may interfere with consistent self-care behaviors [3].

In recent years, increasing attention has been directed toward the role of psychological factors in diabetes outcomes. Emotional states, stress levels, and coping behaviors have been shown to influence health-related decision-making and metabolic regulation. Coping strategies refer to the cognitive and behavioral efforts individuals use to manage internal and external challenges perceived as stressful or overwhelming. In chronic illnesses like T2DM, coping plays a crucial role in how individuals adjust to diagnosis, adhere to ongoing treatment demands, and respond to disease-related stressors [4].

Coping approaches are broadly classified into problem-oriented, emotion-oriented, and avoidance coping-based strategies. Active problem-oriented coping focuses on addressing challenges directly through planning, information-seeking, and problem-solving. Emotion-oriented coping aims to regulate emotional distress through methods such as acceptance, emotional expression, or seeking reassurance. Avoidant coping involves avoidance or withdrawal from stressors and may provide short-term relief but is often associated with unfavorable long-term outcomes. Individuals with T2DM frequently employ a combination of these strategies, influenced by personal characteristics, disease severity, social support, and life context [5].

The relationship between coping strategies and glycaemic control remains complex and not fully understood. Several studies have suggested that adaptive coping styles, particularly problem-focused coping, are associated with better self-management behaviours and improved glycaemic outcomes. In contrast, maladaptive or avoidant coping has been linked to poor adherence, unhealthy lifestyle choices, and suboptimal metabolic control. However, findings across studies have been inconsistent, with some investigations failing to demonstrate a direct association between coping patterns and HbA1c levels. These inconsistencies suggest that coping may influence glycaemic control indirectly through behavioural and psychological pathways rather than exerting a direct biochemical effect [6].

In addition to coping strategies, clinical and demographic factors such as duration of diabetes, body mass index (BMI), age, and treatment modality are well-established determinants of glycaemic control. Longer disease duration and higher BMI have consistently been associated with poorer metabolic outcomes, reflecting progressive beta-cell dysfunction and increased insulin resistance. The interaction between these clinical factors and psychological variables further complicates the relationship between coping and glycaemic control, emphasizing the need for comprehensive assessment models that integrate both medical and psychosocial dimensions [7].

In the Indian context, psychosocial aspects of diabetes care remain relatively underexplored, despite the high disease burden. Cultural beliefs, family dynamics, socioeconomic constraints, and limited access to mental health resources may significantly influence coping behaviours and self-management practices. Many patients rely heavily on family support, while others may experience stigma or emotional distress related to chronic illness. Understanding coping styles within this sociocultural framework is essential for developing patient-centred interventions that are both effective and culturally appropriate [8].

Given the inconsistent evidence regarding the direct relationship between coping strategies and glycaemic control, particularly in Indian populations, further research is warranted. Examining coping patterns alongside clinical indicators such as HbA1c, BMI, and disease duration may provide valuable insights into how psychological responses interact with metabolic outcomes. Such understanding can help inform holistic diabetes management approaches that integrate psychological support with standard medical care.

The present study was therefore undertaken to assess coping styles among adults with type 2 diabetes mellitus and to examine their relationship with glycaemic control as measured by HbA1c. By exploring the distribution of coping strategies and their association with metabolic and clinical variables in a tertiary care setting, this study aims to contribute to the growing body of evidence emphasizing the importance of psychosocial factors in diabetes management. Ultimately, identifying coping patterns associated with better or

poorer outcomes may aid clinicians in tailoring interventions that enhance self-management, improve quality of life, and optimize long-term glycaemic control.

Methods

Study Design and Setting

The present investigation employed an observational cross-sectional design conducted at a tertiary-level teaching hospital in Andhra Pradesh. Both outpatient and inpatient services were utilized for participant recruitment. The study was carried out over a specified duration following clearance from the institutional ethics authority. Ethical principles governing human research were strictly followed, and written informed consent was obtained from all participants prior to inclusion.

Study Population and Sample Size

The study included adult individuals diagnosed with Type 2 diabetes mellitus. A total of 120 participants were enrolled based on predetermined eligibility criteria. Patients attending diabetes care services during the study period were screened consecutively and recruited after confirming their willingness to participate and providing informed consent.

Eligibility Criteria

Participants aged 18 years and older with a confirmed diagnosis of Type 2 diabetes mellitus were considered eligible. To ensure stable disease characteristics, only individuals with a minimum diabetes duration of six months were included. Exclusion criteria comprised the presence of severe psychiatric disorders, cognitive limitations, acute medical conditions, or other chronic illnesses that could interfere with psychological assessment. Pregnant individuals and those diagnosed with Type 1 diabetes mellitus were not included in the study.

Data Collection Process

Following enrollment, data were collected through face-to-face interviews using a structured data collection form. Information related to demographic characteristics such as age, sex, educational background, and duration of diabetes was recorded. Anthropometric measurements, including height and weight, were obtained using standardized procedures, and body mass index was calculated accordingly. Relevant clinical details, including treatment history and the presence of diabetes-related complications, were also documented.

Evaluation of Coping Strategies

Coping behaviors were evaluated using the Brief COPE (Coping Orientation to Problems Experienced)assessment tool, adapted to suit the local language and cultural context [5]. The instrument measures multiple dimensions of coping, which were categorized into active problem-oriented coping, emotion-oriented coping, and avoidant coping strategies. Participants were provided with clear instructions on completing the questionnaire, and assistance was offered when necessary to ensure accurate understanding. Scores for each coping category were computed according to standardized scoring procedures.

Assessment of Glycemic Control

Glycemic control was assessed using glycated hemoglobin (HbA1c) values. The most recent HbA1c report within the preceding three months was recorded for each participant. HbA1c values were used as an indicator of long-term glycemic status and categorized according to standard clinical thresholds.

Statistical Analysis

All collected data were compiled into a digital database and subjected to statistical evaluation using suitable analytical software. Numerical variables were summarized using measures of central tendency and dispersion, whereas categorical variables were reported as

counts and proportions. Relationships between coping patterns and glycemic status were examined using correlation techniques. Additional analyses were performed to explore associations between glycated hemoglobin levels and relevant clinical parameters, including body mass index and duration of diabetes. Statistical significance was determined using a predefined threshold, with probability values below 0.05 considered indicative of meaningful associations.

Ethical Considerations

Participant privacy and data confidentiality were maintained throughout the research process. Enrollment in the study was entirely voluntary, and all participants were informed about the nature and purpose of the study prior to participation. Individuals were assured of their right to discontinue involvement at any stage without any impact on their ongoing medical care.

Results

A total of 120 adults with a confirmed diagnosis of Type 2 diabetes mellitus were enrolled in the study. Complete data were obtained from all participants, and no exclusions were required due to missing or incomplete information. The findings are presented under sections describing demographic and clinical profiles, coping strategy patterns, and their relationships with glycemic indicators.

Demographic and Clinical Characteristics

The study population comprised predominantly middle-aged individuals, with a mean age of 49.58 ± 10.38 years. The average duration since diabetes diagnosis was 8.47 ± 4.98 years, indicating that many participants had been living with the condition for an extended period. Overall metabolic control was suboptimal, with a mean HbA1c level of 9.77 ± 1.89%. Participants also demonstrated elevated body mass indices, with a mean BMI of 28.07 ± 5.21 kg/m², reflecting a high prevalence of overweight and obesity.

Comparative analysis between male and female participants did not reveal statistically significant differences in age, duration of diabetes, HbA1c values, or body mass index. Although male participants exhibited marginally higher average scores for problem-oriented and emotion-oriented coping approaches, these variations did not reach statistical significance. Overall, the demographic and clinical characteristics were broadly similar across gender groups. Detailed descriptive statistics of the study variables are summarized in Table 1.

Table 1: Descriptive statistics of demographic, clinical, and coping variables in the study population (n = 120)

Variable	Mean	Standard Deviation
Age (years)	49.58	10.38
Duration of Diabetes (years)	8.47	4.98
HbA1c (%)	9.77	1.89
Body Mass Index (kg/m²)	28.07	5.21
Problem-Focused Coping Score	22.27	4.12
Emotion-Focused Coping Score	31.54	6.40
Avoidant Coping Score	21.78	3.88

Distribution of Coping Styles

Coping strategies were assessed across three domains: problem-focused coping, emotion-focused coping, and avoidant coping. Among these, emotion-focused coping emerged as the most frequently utilized strategy, with a mean score of 31.54 ± 6.40. Problem-focused coping showed a mean score of 22.27 ± 4.12, while avoidant coping had a mean score of 21.78 ± 3.88.

The higher reliance on emotion-focused coping suggests that participants predominantly used strategies aimed at managing emotional distress rather than actively addressing disease-related stressors. Avoidant coping, although lower than emotion-focused coping, was still moderately present, indicating that some participants engaged in denial or avoidance coping when dealing with diabetes-related challenges. The distribution of coping styles highlights the coexistence of multiple coping mechanisms within the same individual.

Association Between Clinical Variables and Glycemic Control

Correlation analysis revealed that duration of diabetes was significantly and positively associated with HbA1c levels ($r = 0.241$, $p = 0.008$), indicating poorer glycemic control with increasing disease duration. BMI also showed a significant positive correlation with HbA1c ($r = 0.259$, $p = 0.004$), suggesting that higher body mass was linked to elevated blood glucose levels.

Age did not demonstrate a significant association with HbA1c, BMI, or any coping style. These findings suggest that metabolic control in this cohort was more strongly influenced by disease duration and body composition than chronological age. The correlations between HbA1c, BMI, duration of diabetes, and coping styles are summarized in Table 2.

Table 2: Correlation between HbA1c, clinical variables, and coping styles in the study population

Variable	HbA1c (r)	p-value
Age (years)	0.139	0.129
Duration of Diabetes (years)	0.241	0.008*
Body Mass Index (kg/m²)	0.259	0.004*
Problem-Focused Coping	0.031	0.738
Emotion-Focused Coping	0.116	0.207
Avoidant Coping	0.074	0.421

Association Between Coping Patterns and Glycemic Status

Analysis did not reveal any meaningful direct relationship between glycated hemoglobin values and the coping domains assessed in the study. Active coping approaches demonstrated only minimal association with HbA1c levels and did not reach statistical significance. Similarly, strategies centered on emotional regulation as well as avoidant coping responses showed no significant linkage with long-term glycemic markers. These observations suggest that coping behaviors alone were not directly reflected in HbA1c values within the study population. It is plausible that coping influences metabolic outcomes indirectly by shaping everyday self-care behaviors, such as treatment compliance, dietary habits, and levels of physical activity, which were not evaluated in the present analysis.

Inter-Associations Among Coping Domains

In contrast to their relationship with glycemic status, strong and statistically significant associations were identified among the coping domains themselves. Active coping strategies were closely related to both emotion-oriented and avoidance coping-based approaches. Likewise, emotion-oriented coping exhibited a robust association with avoidance based coping. This pattern indicates that individuals with Type 2 diabetes mellitus frequently rely on multiple coping responses concurrently rather than adopting a single dominant

strategy. Such overlap highlights the flexible and situational nature of coping behavior in the context of long-term illness.

Relationship Between Coping Patterns and Body Mass Index

Body mass index demonstrated a modest but statistically significant positive association with active coping strategies. This finding suggests that individuals with higher body mass may be more inclined to engage in problem-oriented coping behaviors, potentially due to heightened perception of health-related risks associated with excess weight. No meaningful associations were observed between body mass index and either emotion-oriented or avoidance based coping approaches.

Overall, the study population exhibited inadequate glycemic regulation and a greater tendency toward emotion-oriented coping responses. While coping behaviors did not show a direct association with HbA1c levels, the strong interrelationships among coping domains were evident. Clinical parameters, particularly body mass index and duration of diabetes, showed significant associations with glycemic status, underscoring their dominant influence on metabolic outcomes. The pattern of coping strategies observed among participants is depicted in Figure 1.

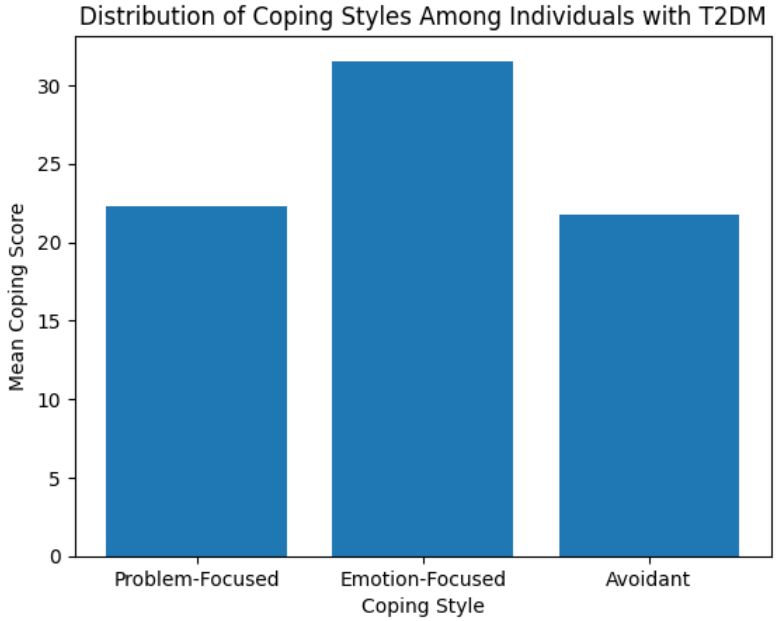

Figure 1: Distribution of coping styles among individuals with Type 2 Diabetes Mellitus

Discussion

The present study examined the relationship between coping styles and glycemic control among individuals with Type 2 Diabetes Mellitus (T2DM) attending a tertiary care hospital. The findings highlight poor overall glycemic control in the study population, a predominance of emotion-focused coping strategies, and the absence of a direct statistical association between coping styles and HbA1c levels. At the same time, strong interrelationships among coping strategies and significant associations of HbA1c with body mass index (BMI) and duration of diabetes were observed. These results underscore the complex and multifactorial nature of diabetes management, where psychological, behavioral, and biological factors interact rather than operate in isolation.

The mean HbA1c value observed in this study indicates suboptimal glycemic control among most participants. This finding is consistent with prior reports showing that a large proportion of

individuals with T2DM fail to achieve recommended glycemic targets despite ongoing treatment [8]. Poor glycemic control in such populations may be attributed to multiple factors, including long disease duration, excess body weight, inconsistent self-care behaviors, and psychosocial stressors. In the present study, both BMI and duration of diabetes were significantly associated with HbA1c levels, reinforcing their well-established role as key determinants of metabolic outcomes.

The significant positive correlation between duration of diabetes and HbA1c reflects the progressive nature of T2DM. With increasing disease duration, pancreatic β-cell function declines and insulin resistance tends to worsen, making glycemic control more difficult over time. Similar associations have been reported in earlier studies, which demonstrate that prolonged exposure to hyperglycemia leads to metabolic deterioration even in patients receiving treatment [9]. This highlights the importance of early and sustained intervention to preserve metabolic control and prevent long-term complications.

The observed association between BMI and HbA1c further emphasizes the role of excess body weight in poor glycemic regulation. Higher BMI is known to exacerbate insulin resistance and impair glucose utilization, thereby contributing to elevated blood glucose levels. The finding aligns with existing evidence linking overweight and obesity to worse glycemic outcomes in individuals with T2DM [10]. Together, these results suggest that clinical factors exert a more direct influence on glycemic status than psychological variables when assessed cross-sectionally. This pattern suggests that individuals in this cohort primarily relied on strategies aimed at managing emotional distress rather than actively addressing disease-related stressors. Similar coping profiles have been reported in other studies involving individuals with chronic illnesses, where emotion-focused coping is often adopted in response to sustained stress and perceived lack of control over disease outcomes [11].

Importantly, no significant direct relationship was found between coping styles and HbA1c levels in the present study. This finding is consistent with several earlier investigations that failed to demonstrate a direct association between coping patterns and biochemical measures of glycemic control [12]. These observations suggest that coping strategies may not exert an immediate or linear effect on metabolic parameters such as HbA1c. Instead, their influence is likely mediated through behavioral pathways, including medication adherence, dietary practices, physical activity, and engagement with healthcare services.

The strong intercorrelations observed among problem-focused, emotion-focused, and avoidant coping styles indicate that individuals with T2DM tend to use multiple coping strategies concurrently. Rather than relying exclusively on a single coping orientation, participants appeared to shift between different strategies depending on situational demands [13]. In the context of T2DM, individuals may engage in problem-solving behaviors when motivated, rely on emotional regulation during periods of distress, and occasionally resort to avoidance when overwhelmed. The absence of a significant association between age and coping styles or glycemic control suggests that coping responses and metabolic outcomes were relatively consistent across age groups in this sample. This contrasts with some studies that have reported age-related differences in coping preferences, but supports others that found coping strategies to be more strongly influenced by psychological and contextual factors than by chronological age alone [14]. Similarly, the lack of significant gender differences in coping styles and HbA1c indicates that male and female participants experienced comparable challenges in diabetes management, despite minor variations in mean coping scores.

An interesting finding of this study was the weak but statistically significant positive correlation between BMI and problem-focused coping. This may indicate that individuals with higher BMI are more aware of their health risks and attempt to engage in active coping behaviors to manage their condition. Previous research has suggested that heightened risk perception may motivate individuals to adopt problem-solving approaches, such as dietary modification and increased physical activity, even if these efforts do not always translate into immediate metabolic improvement [15]. This observation further supports the notion that coping strategies reflect intention and effort, which may not be fully captured by cross-sectional biochemical measures.

Overall, the findings of this study suggest that while coping styles are an important component of the psychological experience of living with T2DM, their relationship with glycemic control is indirect and mediated by behavioral and clinical factors. Strengthening adaptive coping alone may not be sufficient to improve HbA1c unless it is accompanied by effective translation into consistent self-care behaviors. This has important implications for diabetes management programs, which should integrate psychological support with practical skills training and behavioral reinforcement.

Conclusion

This study examined patterns of coping behavior and their relationship with long-term glucose regulation among adults living with Type 2 diabetes mellitus in a tertiary care setting. The analysis demonstrated that a substantial proportion of participants had inadequate metabolic control and elevated body mass indices, underscoring the persistent clinical challenges associated with diabetes management. Measures such as duration of illness and body mass index showed clear associations with glycemic status, reaffirming their importance as key clinical determinants. Assessment of coping behavior revealed that strategies aimed at managing emotional responses were most frequently adopted, alongside active problem-oriented and avoidance coping-based approaches. Rather than relying on a single coping method, individuals appeared to utilize a combination of strategies concurrently. The strong associations observed among different coping domains highlight the flexible and adaptive nature of coping in the context of a chronic, demanding condition such as diabetes. Notably, coping patterns did not demonstrate a direct relationship with glycated hemoglobin levels. This suggests that psychological responses to illness may not immediately translate into changes in biochemical indicators of glycemic control. Instead, coping behaviors are likely to influence metabolic outcomes indirectly by shaping everyday health-related behaviors, including adherence to treatment, dietary choices, physical activity, and engagement with healthcare systems. The findings emphasize the need to view diabetes care through a broader lens that incorporates both medical and psychosocial dimensions. While pharmacological therapy and clinical risk factor management remain central to achieving glycemic targets, attention to emotional well-being and coping responses may enhance overall disease management. Incorporating psychosocial evaluation and supportive interventions into routine diabetes care has the potential to strengthen self-management practices and improve patient-centered outcomes, particularly in resource-constrained settings. In summary, effective management of Type 2 diabetes mellitus requires an integrated approach that addresses clinical parameters alongside psychological adaptation to chronic illness. Further research using longitudinal designs and targeted interventions is warranted to clarify causal relationships and to determine whether modifying coping behaviors can contribute to sustained improvements in metabolic control and overall quality of life.

Acknowledgements

I would like to express my sincere gratitude to all those who contributed, directly or indirectly, to the successful completion of this thesis. I am thankful for the academic environment, guidance, and resources that supported the planning, execution, and completion of this research work. I am especially grateful to the participants who generously gave their time and cooperation during the study. Their willingness to participate and share information was essential for this work. I also acknowledge the support received during data collection, data management, and analysis, which greatly facilitated the smooth conduct of the study. The encouragement and cooperation extended throughout the research period are deeply appreciated. Finally, I would like to thank my family and well-wishers for their constant motivation, patience, and moral support throughout the course of this work.

Declarations

Funding: None

Ethical approval: Not required

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