Health Belief Model Predictors of Behavioral Intention to Use Emergency Healthcare Services among Diabetic Patients: A Cross-Sectional Study

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Abstract: Background: Emergency healthcare services are critical for diabetic patients experiencing acute complications; however, timely utilization remains inconsistent. In Saudi Arabia, limited evidence exists regarding the cognitive factors influencing emergency care-seeking intentions. Aim: To examine Health Belief Model (HBM) predictors of behavioral intention to use emergency healthcare services among diabetic patients in the Jazan region. Methods: A cross-sectional survey of 250 diabetic patients was conducted using validated Arabic questionnaires assessing six HBM constructs. Hierarchical binary logistic regression evaluated HBM constructs (Model 1) and additional demographic/clinical variables (Model 2). Results: Most participants (64.4%) demonstrated low intention to use emergency services. HBM constructs significantly predicted behavioral intention (χ^2=16.916, p=0.010). Significant predictors were Cues to Action (OR=1.174), Perceived Susceptibility (OR=1.149), Self-Efficacy (OR=1.126), and Perceived Barriers (OR=0.880). Adding demographic variables did not significantly improve model fit (p=0.475). Conclusion: Health beliefs, rather than demographic characteristics, primarily determine emergency service utilization intentions among diabetic patients. Interventions should target symptom recognition, perceived vulnerability, self-efficacy, and access barriers to enhance timely emergency care-seeking.

Keywords: Health Belief Model, Diabetes Mellitus, Emergency Healthcare Services, Behavioral Intention, Saudi Arabia, Care-Seeking Behavior.

1. INTRODUCTION

Emergency healthcare services constitute a critical lifeline for diabetic patients experiencing acute complications, yet appropriate and timely utilization of these services remains inconsistent worldwide [1,2]. Diabetes mellitus, affecting over 537 million adults globally, frequently precipitates life-threatening emergencies including severe hypoglycemia, diabetic ketoacidosis, and hyperglycemic hyperosmolar state, which demand immediate medical intervention to prevent mortality and irreversible complications [3,4]. Despite the availability of emergency medical services in most healthcare systems, substantial barriers—including limited awareness, fear of healthcare costs, geographic accessibility challenges, and inadequate recognition of emergency symptoms—contribute to delayed or foregone emergency care among diabetic populations [5,6]. This pattern of underutilization or delayed presentation is particularly concerning given that timely emergency intervention can reduce mortality rates by up to 70% in diabetic emergencies [7,8]. In Saudi Arabia, where diabetes prevalence reaches 18.3% among adults and emergency department visits for diabetes-related complications account for approximately 15% of all emergency presentations, understanding the factors influencing diabetic patients' intentions to seek emergency care has become a public health imperative [9,10]. The consequences of delayed emergency care seeking extend beyond individual patient outcomes, encompassing increased healthcare costs, prolonged hospitalizations, and preventable morbidity and mortality [11].

The Health Belief Model (HBM) provides a theoretical foundation for understanding diabetic patients' intentions to utilize emergency healthcare services [12]. This framework posits that health-related behaviors are influenced by individual perceptions and beliefs about disease susceptibility and severity [13]. In the context of diabetes emergency care, Perceived susceptibility represents patients' beliefs about their risk of experiencing diabetic emergencies, while Perceived severity reflects their understanding of potential complications' seriousness [14]. The model suggests that Perceived benefits of seeking emergency care must outweigh Perceived barriers, including cost, accessibility, and fear of judgment, to motivate appropriate healthcare utilization [15]. Self-efficacy, added by Rosenstock *et al*. (1988), represents patients' confidence in recognizing emergencies requiring professional intervention [16]. Cues to action, such as symptom severity and social support, serve as triggers for emergency service utilization [17]. This study hypothesizes that these HBM constructs collectively predict behavioral intention to use emergency healthcare services among diabetic patients, with self-efficacy and Perceived barriers serving as primary determinants.

Despite the growing prevalence of diabetes in Saudi Arabia, limited empirical evidence exists regarding patients' behavioral intentions to utilize emergency healthcare services during diabetic crises [18].

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Previous studies have predominantly focused on diabetes management and prevention strategies, neglecting the critical decision-making processes that influence emergency care-seeking behaviors [19]. Furthermore, the application of the HBM to understand emergency service utilization patterns among diabetic patients [20-23] remains underexplored in the Saudi context, where cultural and healthcare accessibility factors may uniquely influence health-seeking behaviors. This study represents the first comprehensive application of the HBM to examine emergency healthcare service utilization intentions among diabetic patients in the KSA, uniquely integrating all six HBM constructs (Perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy) to predict behavioral intentions and provide culturally-relevant insights. Prior Saudi HBM studies have largely focused on preventive behaviors (e.g., medication adherence, glycemic control, screening), with limited application to emergency healthcare utilization and without integrating all six constructs. Furthermore, no study has specifically examined this issue in the Jazan region. Accordingly, this study provides the first comprehensive regional application of the HBM to emergency service utilization among diabetic patients in the KSA, incorporating all six constructs within a unified predictive framework. The research objectives are: (1) to assess the relationship between HBM constructs and behavioral intentions to use emergency healthcare services among diabetic patients, (2) to identify significant predictors of emergency service utilization intentions, and (3) to provide evidence-based recommendations for improving emergency healthcare accessibility and diabetes education programs in the KSA.

2. METHODS

2.1. Study Design and Setting

This cross-sectional study was conducted in the Jazan region, Saudi Arabia, from [specify dates]. The study employed a quantitative survey design to examine the relationship between HBM constructs and behavioral intention to use emergency healthcare services among diabetic patients. The research adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies [24].

2.2. Participants and Eligibility Criteria

The study population comprised adult diabetic patients (Type 1 or Type 2) aged 18 years and above residing in the Jazan region. Inclusion criteria were: (1) confirmed diagnosis of diabetes mellitus, (2) age ≥18 years, (3) ability to read and understand Arabic, and (4) willingness to provide informed consent. Exclusion criteria included cognitive impairment preventing informed consent and incomplete questionnaire responses. Participants were recruited through convenience sampling from diabetes clinics, primary healthcare centers, and community health programs in the Jazan region.

2.3. Sample Size Determination

Sample size was calculated for binary logistic regression analysis using the rule of events per variable (EPV) [24]. With six HBM predictor variables and an anticipated 50% prevalence of high behavioral intention, a minimum of 120 participants was required to achieve 10 events per predictor variable [25]. To account for potential incomplete responses and enhance statistical power, the target sample size was set at 250 participants, providing approximately 20 events per variable and ensuring adequate power (>0.80) for detecting medium effect sizes (odds ratio ≥2.0) at $\alpha = 0.05$.

2.4. Data Collection Instrument

A structured self-administered questionnaire was developed comprising two main sections. Section A collected demographic and clinical information including age, gender, diabetes type, duration of diagnosis, education level, monthly income, previous emergency healthcare use, and distance to the nearest emergency facility. Section B assessed HBM constructs and behavioral intention using seven constructs, each measured with three items on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The HBM constructs included Perceived Susceptibility (vulnerability to diabetic emergencies), Perceived Severity (seriousness of diabetic complications), Perceived Benefits (advantages of seeking emergency care), Perceived Barriers (obstacles to accessing emergency services), Cues to Action (triggers prompting emergency care seeking), and Self-Efficacy (confidence in recognizing emergency situations). The Health Belief Model questionnaire items were adapted from validated instruments used in previous diabetes studies [26-30] and modified to specifically address emergency healthcare service utilization among diabetic patients. The dependent variable, Behavioral Intention to use emergency healthcare services, was measured using three items assessing participants' intentions to seek emergency care during diabetic crises. Construct scores ranged from 3 to 15, calculated as the sum of three items per construct.

2.5. Questionnaire Translation and Content Validity

The questionnaire was originally developed in English and translated into Arabic using forward-backward translation methodology. Two independent bilingual experts performed the forward translation, and two different experts conducted the back-translation to ensure conceptual equivalence. Discrepancies were resolved through consensus meetings. Content validity was established through expert review by five specialists in public health, endocrinology, and health psychology, who assessed the relevance, clarity, and comprehensiveness of items. The Content Validity Index (CVI) exceeded 0.80 [31] for all items. A pilot study with 30 diabetic patients (not included in the final sample) was conducted to assess questionnaire comprehension and completion time, resulting in minor wording modifications.

2.6. Data Collection Procedure

Data collection was conducted from 01 May 2025 to 30 September 2025, spanning five months following ethical approval. Trained research assistants approached potential participants at diabetes clinics and healthcare centers, explained the study purpose and procedures, and obtained written informed consent. Participants completed the questionnaire independently in a quiet, private setting, with research assistants available to clarify questions without influencing responses. Questionnaire completion time averaged 10-15 minutes. All questionnaires were reviewed for completeness immediately upon submission, and participants were asked to complete any missing items. Data confidentiality was maintained through anonymous coding, and completed questionnaires were stored securely.

2.7. Variables and Operational Definitions

The dependent variable, Behavioral Intention, was operationalized as participants' stated intentions to utilize emergency healthcare services during diabetic emergencies, measured on a summated scale (range: 3-15) and subsequently dichotomized at the median into low intention (≤5) and high intention (>5) for logistic regression analysis. Independent variables comprised six HBM constructs (Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, Cues to Action, and Self-Efficacy), each measured continuously (range: 3-15) [2,23,26,32,33]. Demographic and clinical covariates included age (continuous), gender (categorical: male/female), diabetes type (categorical: Type 1/Type 2/not sure), duration of diabetes (continuous years), education level (ordinal: five categories), monthly income (ordinal: four categories in Saudi Arabian Riyal; SAR), previous emergency use (binary: yes/no), and distance to facility (ordinal: four categories in kilometers).

2.8. Statistical Analysis

Data were analyzed using [specify software, e.g., IBM SPSS Statistics version 26. Descriptive statistics included frequencies and percentages for categorical variables, and means with standard deviations for continuous variables. To evaluate demographic invariance in health beliefs, independent samples t-tests, one-way analysis of variance, and Pearson correlations tested differences in HBM construct scores across demographic strata, with alpha level set at 0.05. Discriminant validity assessment examined inter-construct correlation matrices, with Fornell and Larcker's (1981) criterion of maximum shared variance below 10% ($r^2 < 0.10$) establishing adequate construct distinctiveness and validating absence of problematic multicollinearity in predictive modeling. Pearson correlation coefficients were calculated to examine bivariate relationships among HBM constructs and behavioral intention. Hierarchical binary logistic regression was performed in two steps: Model 1 included only HBM constructs as predictors, and Model 2 added demographic and clinical variables. The chi-square difference test assessed whether demographic variables significantly improved model fit beyond HBM constructs alone. Model fit was evaluated using the -2 Log Likelihood, Nagelkerke R^2, and chi-square statistics. Classification accuracy, sensitivity, specificity, and area under the receiver operating characteristic (ROC) curve were calculated to assess predictive performance [34]. Odds ratios (OR) with 95% confidence intervals were reported for significant predictors [35]. Statistical significance was set at $p < 0.05$ (two-tailed). Missing data were minimal (<5%) and handled through listwise deletion.

2.9. Ethical Considerations

Ethical approval (reference Number: REC-44/06/463) was obtained from The Standing Committee for Scientific Research, Jazan University (HAPO-10-Z-001). The study adhered to the principles of the Declaration of Helsinki and Saudi Arabian research ethics guidelines. All participants provided written informed consent after receiving detailed information about the study purpose, procedures, voluntary participation, right to withdraw, and data confidentiality measures. No personally identifiable information was collected, and all data were anonymized using unique identification codes. Participants received no monetary compensation, and there were no risks associated with study participation. Study findings will be disseminated through peer-reviewed publications and presentations at relevant conferences, with potential recommendations for healthcare policy and diabetes education programs in the Jazan region.

3. RESULTS

3.1. Demographic and Clinical Characteristics

The study included 250 diabetic patients from the Jazan region, with a mean age of 51.4 years (SD = 11.2, range: 25-80 years). The sample comprised 125 males (50.0%) and 125 females (50.0%). The majority of participants had Type 2 diabetes (n = 199, 79.6%), followed by Type 1 diabetes (n = 38, 15.2%), while 13 participants (5.2%) were unsure of their diabetes type. The mean duration of diabetes diagnosis was 5.7 years (SD = 3.3, range: 1-18 years). Regarding educational attainment, 70 participants (28.0%) held bachelor's degrees, 59 (23.6%) completed secondary education, 57 (22.8%) held diplomas, 45 (18.0%) had primary education or less, and 19 (7.6%) possessed postgraduate qualifications. Monthly income distribution showed that 83 participants (33.2%) earned 5,000-10,000 SAR, 76 (30.4%) earned less than 5,000 SAR, 60 (24.0%) earned 10,001-15,000 SAR, and 31 (12.4%) earned more than 15,000 SAR.

Regarding healthcare access, 150 participants (60.0%) reported no previous emergency healthcare use for diabetes-related emergencies, while 100 (40.0%) had previously utilized emergency services. Distance to the nearest emergency healthcare facility varied, with 96 participants (38.4%) located 5-10 km away, 62 (24.8%) within 5 km, 70 (28.0%) located 11-20 km away, and 22 (8.8%) more than 20 km from the nearest facility.

3.2. Hypothesis Testing: HBM Constructs by Demographic Characteristics

Hypothesis testing examined differences in Health Belief Model construct scores across demographic and clinical characteristics using independent samples t-tests, one-way analysis of variance, and Pearson correlation analyses (Table **1**). Summated HBM scores demonstrated remarkable invariance across demographic strata. No significant differences emerged between males and females ($t[248] = 0.341$, $p = 0.733$), across diabetes types ($F[2, 247] = 0.127$, $p = 0.881$), educational levels ($F[4, 245] = 1.024$, $p = 0.396$), income categories ($F[3, 246] = 0.651$, $p = 0.583$), or distance to healthcare facilities ($F[3, 246] = 0.442$, $p = 0.723$). Pearson correlations revealed negligible associations between HBM scores and age ($r = -0.026$, $p = 0.691$) or diabetes duration ($r = -0.042$, $p = 0.512$). Previous emergency service utilization similarly yielded non-significant differences ($t[248] = 0.853$, $p = 0.395$). These findings corroborate hierarchical logistic regression results, confirming that cognitive-perceptual health beliefs operate independently of sociodemographic positioning, thereby supporting universal rather than demographically-targeted intervention strategies.

3.3. Descriptive Statistics for HBM Constructs

Descriptive statistics for the HBM constructs and behavioral intention are presented in Table **2**. All constructs were measured on scales ranging from 3 to 15, representing the sum of three Likert-scale items (1-5) per construct. Among the HBM constructs, Cues to Action demonstrated the highest mean score (M = 12.14, SD = 2.23), indicating that participants strongly recognized symptoms and triggers that would prompt them to seek emergency healthcare services. Perceived Severity also showed a high mean score (M = 11.96, SD = 2.20), suggesting that participants acknowledged the serious consequences of diabetic emergencies. Perceived Benefits yielded a mean of 11.56 (SD = 2.47), reflecting participants' positive perceptions of the value of seeking emergency care during diabetic crises. Perceived Susceptibility recorded a mean score of 10.61 (SD = 2.44), indicating moderate awareness of personal vulnerability to diabetes-related emergencies. Self-Efficacy showed a mean of 10.93 (SD = 2.44), suggesting reasonable confidence among participants in their ability to recognize when emergency medical attention is needed. Perceived Barriers demonstrated the lowest mean score among the HBM constructs (M = 9.82, SD = 2.55), indicating that participants Perceived moderate obstacles to accessing emergency healthcare services, including cost, distance, and psychological barriers. The dependent variable, Behavioral Intention to use emergency healthcare services, was measured on a scale of 3 to 15 and showed a mean score of 11.17 (SD = 1.61). This relatively low mean, combined with the restricted observed range (3-11 compared to the theoretical range of 3-15), suggests considerable variability in participants' intentions to utilize emergency services during diabetic emergencies, with a substantial proportion reporting low to moderate intention levels. The standard deviations across all constructs ranged from 1.61 to 2.55, indicating adequate variability in responses and absence of ceiling or floor effects for the HBM predictor variables.

3.4. Distribution of Behavioral Intention to Use Emergency Healthcare Services

The distribution shows that approximately two-thirds (64.4%) of diabetic patients in the study demonstrated low intention to use emergency healthcare services, while only about one-third (35.6%) reported high intention. This finding (Figure **1**) highlights a concerning gap in emergency care-seeking behavior that warrants targeted intervention strategies.

Table 1: Demographic and Clinical Characteristics of Study Participants with Health Belief Model Construct Scores

Characteristic	n	Percentage (%)	HBM Score Mean ± SD	Test Statistic	p-value
Age (years)					
Mean ± SD (Range)	51.4 ± 11.2	(25-80)	67.02 ± 6.00	r = -0.026	0.691
Gender					
Male	125	50.0	66.38 ± 5.77	t = -1.715	0.088
Female	125	50.0	67.67 ± 6.17		
Diabetes Type					
Type 1	38	15.2	66.61 ± 4.91	F = 0.121	0.886
Type 2	199	79.6	67.12 ± 6.24		
Not sure	13	5.2	66.85 ± 5.43		
Duration of Diabetes (years)					
Mean ± SD (Range)	5.7 ± 3.3	(1-18)	67.02 ± 6.00	r = -0.057	0.369
Education Level					
Primary or less	45	18.0	67.69 ± 5.31	F = 0.379	0.824
Secondary	59	23.6	66.53 ± 6.56		
Diploma	57	22.8	66.95 ± 5.94		
Bachelor	70	28.0	67.31 ± 6.33		
Postgraduate	19	7.6	66.16 ± 4.82		
Monthly Income (SAR)					
Less than 5000	76	30.4	67.36 ± 5.51	F = 0.772	0.511
5000-10000	83	33.2	67.04 ± 6.20		
10001-15000	60	24.0	66.12 ± 6.27		
More than 15000	31	12.4	67.94 ± 6.12		
Previous Emergency Healthcare Use					
Yes	100	40.0	66.80 ± 5.84	t = -0.481	0.631
No	150	60.0	67.17 ± 6.12		
Distance to Healthcare Facility					
Less than 5 km	62	24.8	67.18 ± 6.19	F = 1.681	0.172
5-10 km	96	38.4	66.45 ± 5.76		
11-20 km	70	28.0	66.87 ± 6.17		
More than 20 km	22	8.8	69.59 ± 5.59		
Total Sample	250	100.0	67.02 ± 6.00		

Note: SAR = Saudi Arabian Riyal. SD = Standard Deviation.

Table 2: Descriptive Statistics for HBM Constructs and Behavioral Intention

Construct	Variable	Mean	SD	Possible Range
Perceived Susceptibility	PS_Score	10.61	2.44	3-15
Perceived Severity	PSV_Score	11.96	2.20	3-15
Perceived Benefits	PB_Score	11.56	2.47	3-15
Perceived Barriers	PBR_Score	9.82	2.55	3-15
Cues to Action	CA_Score	12.14	2.23	3-15
Self-Efficacy	SE_Score	10.93	2.44	3-15
Behavioral Intention (DV)	BI_Score	11.17	1.61	

Note: N = 250. All constructs measured on summated scales (sum of three 5-point Likert items). DV = Dependent Variable. SD = Standard Deviation.

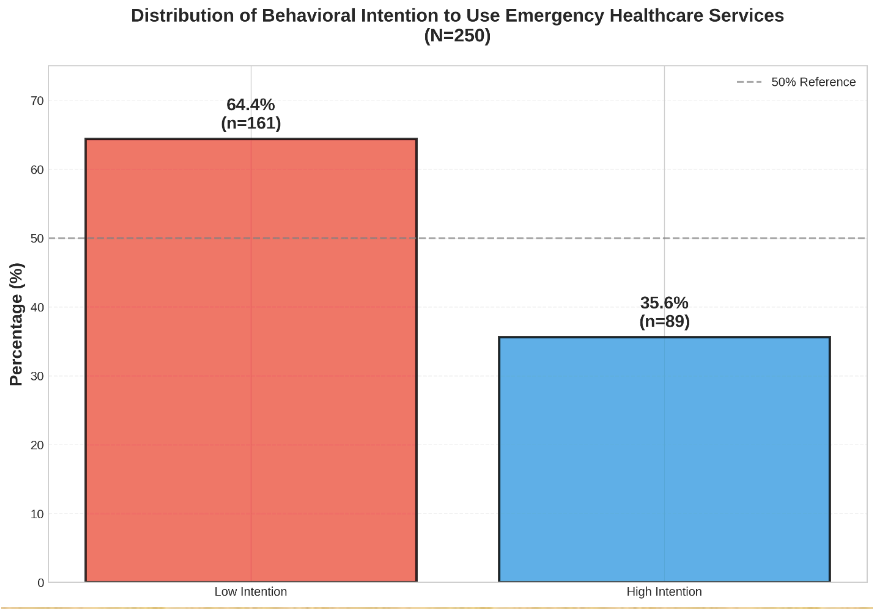

Figure 1: Distribution of Behavioral Intention to Use Emergency Healthcare Services Among Diabetic Patients (N=250). The majority of participants (64.4%, n=161) demonstrated low intention, while 35.6% (n=89) reported high intention to utilize emergency services during diabetic emergencies.

3.5. Correlation Matrix Analysis of HBM Constructs

The correlation matrix revealed generally low to moderate intercorrelations among HBM constructs, indicating adequate discriminant validity and minimal multicollinearity concerns (Figure **2**). The strongest correlation with behavioral intention was observed for Cues to Action ($r = 0.204$, $p < 0.001$), followed by Perceived Susceptibility ($r = 0.137$, $p < 0.05$). These bivariate relationships align with the subsequent logistic regression findings where both constructs emerged as significant predictors. Notably, Perceived Barriers showed a weak negative correlation with behavioral intention ($r = -0.069$, $p > 0.05$), though this relationship did not reach statistical significance at the bivariate level. Among the HBM constructs themselves, intercorrelations ranged from -0.106 to 0.137, with the strongest inter-construct relationship observed between Perceived Severity and Perceived Barriers ($r = 0.137$, $p < 0.05$). The relatively weak correlations among predictor variables (all $r < 0.15$) suggest that each HBM construct captures distinct aspects of health beliefs, supporting the theoretical framework's multidimensional nature and confirming the absence of problematic multicollinearity in predictive modeling.

3.6. Discriminant Validity

Discriminant validity was assessed by examining inter-construct correlations to ensure each HBM construct measured a distinct theoretical dimension. Figure **2** presents the correlation matrix among the six constructs. All correlation coefficients were below 0.15, with maximum shared variance of 1.89% ($r^2 = 0.019$), substantially below the recommended 10% threshold (Fornell & Larcker, 1981). These findings confirm excellent discriminant validity, supporting the multidimensional nature of the HBM and validating the independence of constructs in regression analyses.

3.7. Hierarchical Logistic Regression Analysis

Hierarchical binary logistic regression was performed to evaluate the contribution of demographic and clinical variables beyond HBM constructs in predicting behavioral intention to use emergency healthcare services. Model 1 included six HBM constructs (Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, Cues to Action, and Self-Efficacy) as predictors. Model 2 added eight demographic and clinical variables (age, gender, diabetes type, duration of diabetes, education level, monthly income, previous emergency use, and distance to healthcare facility) to the HBM constructs, yielding a total of 14 predictors.

Both models were statistically significant (Table **3**). Model 1 demonstrated significant overall fit ($\chi^2 = 16.916$, $df = 6$, $p = 0.010$), explaining 9.0% of the variance in behavioral intention (Nagelkerke $R^2 = 0.090$) with 66.4% classification accuracy and ROC AUC of 0.654. Model 2 also showed significant overall fit ($\chi^2 = 24.501$, $df = 14$, $p < 0.001$), explaining 12.8% of variance (Nagelkerke $R^2 = 0.128$) with 66.8% classification accuracy and ROC AUC of 0.684. However, the chi-square difference test revealed that the addition of demographic and clinical variables did not significantly improve model fit beyond the HBM constructs alone (χ^2 difference = 7.585, $df = 8$, $p = 0.475$). Although statistically significant, the model

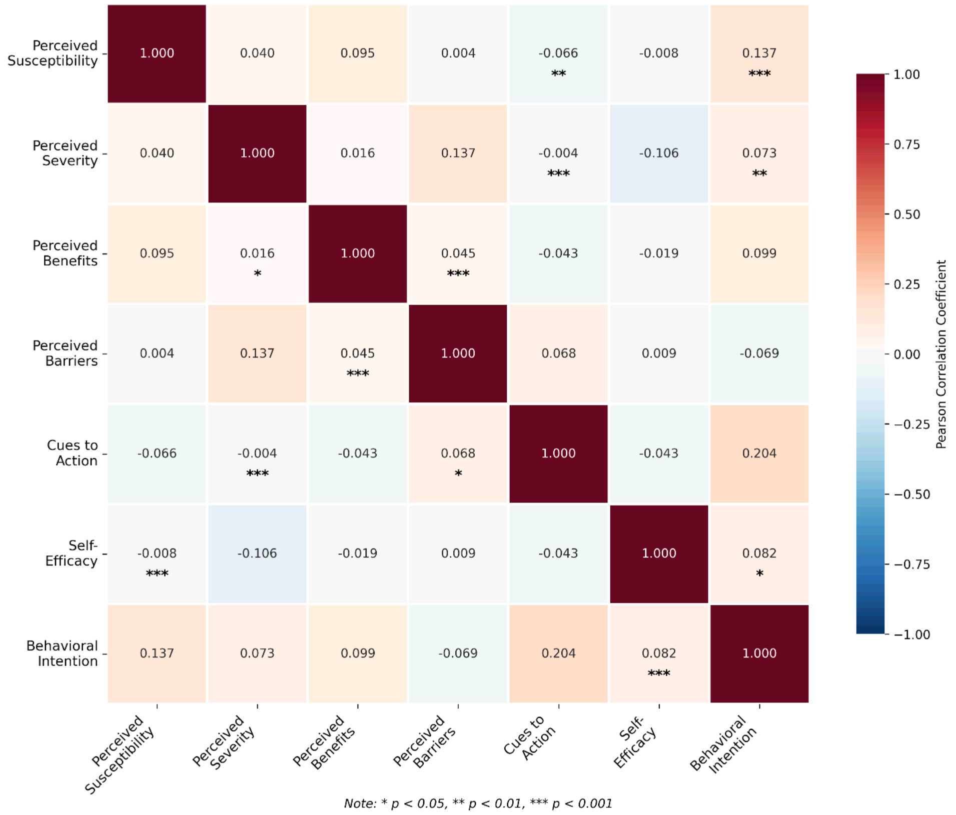

Figure 2: Correlation Matrix of HBM Constructs and Behavioral Intention Among Diabetic Patients (N=250). The heatmap displays Pearson correlation coefficients with color intensity indicating relationship strength and direction. Asterisks denote statistical significance levels: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Cues to Action showed the strongest correlation with behavioral intention ($r = 0.204$, $p < 0.001$).

Table 3: Model Comparison Summary

Statistic	Model 1 (HBM Only)	Model 2 (Full Model)
Number of Predictors	6	14
-2 Log Likelihood	308.625	301.040
Model Chi-square	16.916**	24.501**
Nagelkerke R^2	0.090	0.128
Classification Accuracy	66.4%	66.8%
ROC AUC	0.654	0.684
Model Improvement	—	$\chi^2 = 7.585$, df = 8, $p = 0.475$

Note: ** $p < 0.01$. Model improvement test indicates that adding demographic variables does not significantly improve model fit ($p = 0.475$).

explained a modest proportion of variance in behavioral intention (Nagelkerke $R^2 = 0.090$–0.128), which is consistent with typical explanatory ranges reported in HBM applications.

In the full model (Model 2), four HBM constructs emerged as statistically significant predictors of behavioral intention. Cues to Action demonstrated the strongest relationship ($B = 0.161$, $OR = 1.174$, $p = 0.016$), indicating that each one-unit increase in cues to action scores increased the odds of high intention by 17.4%. Perceived Susceptibility showed a significant positive effect ($B = 0.139$, $OR = 1.149$, $p = 0.022$), whereby higher Perceived susceptibility to diabetic emergencies increased the odds of high intention by 14.9%. Self-Efficacy also positively predicted behavioral intention ($B = 0.119$, $OR = 1.126$, $p = 0.047$), with higher self-efficacy increasing odds by 12.6%. Conversely, Perceived Barriers exhibited a significant negative relationship ($B = -0.128$, $OR = 0.880$, $p = 0.027$), with greater Perceived barriers decreasing the odds of high intention by 12.0%. The remaining HBM constructs—Perceived Severity ($B = 0.030$, $p = 0.648$) and Perceived Benefits ($B = 0.058$, $p = 0.313$)—did not reach statistical significance.

Notably, none of the demographic or clinical variables achieved statistical significance in the full model. Age (B = -0.016, p = 0.227), gender (B = 0.078, p = 0.783), diabetes type (B = -0.149, p = 0.566), duration of diabetes (B = -0.032, p = 0.476), education level (B = -0.086, p = 0.340), monthly income (B = -0.123, p = 0.401), previous emergency use (B = 0.454, p = 0.118), and distance to healthcare facility (B = 0.039, p = 0.799) all failed to demonstrate significant associations with behavioral intention. This finding indicates that health beliefs, rather than sociodemographic or clinical characteristics, primarily determine emergency service utilization intentions among diabetic patients.

Classification analysis of Model 2 revealed an overall accuracy of 66.8%, with high specificity (91.3%) for identifying low intention cases but lower sensitivity (22.5%) for detecting high intention cases. The positive predictive value was 58.8%, while the negative predictive value reached 68.1%. The area under the ROC curve was 0.684, indicating fair discriminative ability of the full model. These findings collectively demonstrate that the HBM provides a robust framework for understanding emergency healthcare service utilization intentions across diverse patient populations, with minimal incremental predictive value gained from demographic stratification (Table **4**).

The ROC curve analysis (Figure **3**) for the full model (Model 2) yielded an AUC of 0.684 (95% CI: 0.626-0.742), indicating fair discriminative ability in predicting behavioral intention to use emergency healthcare services. While the full model showed marginal improvement over the HBM-only model (AUC increase of 0.030), this improvement was not statistically significant (p = 0.475), confirming that demographic variables add minimal predictive value beyond health beliefs. The model demonstrates strong specificity (91.3%) but lower sensitivity (22.5%) at the default threshold of 0.5, suggesting it is more effective at identifying patients with low intention than those with high intention. The addition of demographic and clinical variables did not significantly improve model fit (χ^2 difference = 7.585, p = 0.475), and the AUC improvement was not statistically meaningful.

4. DISCUSSION

This study examined Health Belief Model predictors of behavioral intention to use emergency healthcare services among diabetic patients in Jazan, Saudi Arabia. Results demonstrated that HBM constructs, particularly Cues to Action, Perceived Susceptibility, Self-Efficacy, and Perceived Barriers, significantly predicted emergency care-seeking intentions. Notably, demographic and clinical variables including age, gender, diabetes type, duration of diagnosis, education level, income, previous emergency use, and distance to healthcare facilities did not significantly improve model fit, indicating that health beliefs, rather than demographic characteristics, primarily determine emergency service utilization intentions among diabetic patients.

Table 4: Full Model Logistic Regression Results

Predictor Variable	B	S.E.	Wald χ^2	p-value	OR
Constant	-3.842	1.890	4.132	0.042*	0.021
HBM CONSTRUCTS:					
Perceived Susceptibility	0.139	0.060	5.289	0.022*	1.149
Perceived Severity	0.030	0.065	0.208	0.648	1.030
Perceived Benefits	0.058	0.057	1.019	0.313	1.060
Perceived Barriers	-0.128	0.058	4.893	0.027*	0.880
Cues to Action	0.161	0.067	5.839	0.016*	1.174
Self-Efficacy	0.119	0.060	3.960	0.047*	1.126
DEMOGRAPHIC VARIABLES:					
Age (years)	-0.016	0.013	1.462	0.227	0.985
Gender (Male)	0.078	0.282	0.076	0.783	1.081
Diabetes Type	-0.149	0.260	0.329	0.566	0.862
Duration (years)	-0.032	0.045	0.508	0.476	0.969
Education Level	-0.086	0.090	0.912	0.340	0.917
Monthly Income	-0.123	0.146	0.706	0.401	0.884
Previous Emergency Use (Yes)	0.454	0.290	2.449	0.118	1.575
Distance to Facility	0.039	0.153	0.065	0.799	1.040

Note: * p < 0.05. Reference categories: Gender = Female, Previous Emergency Use = No.

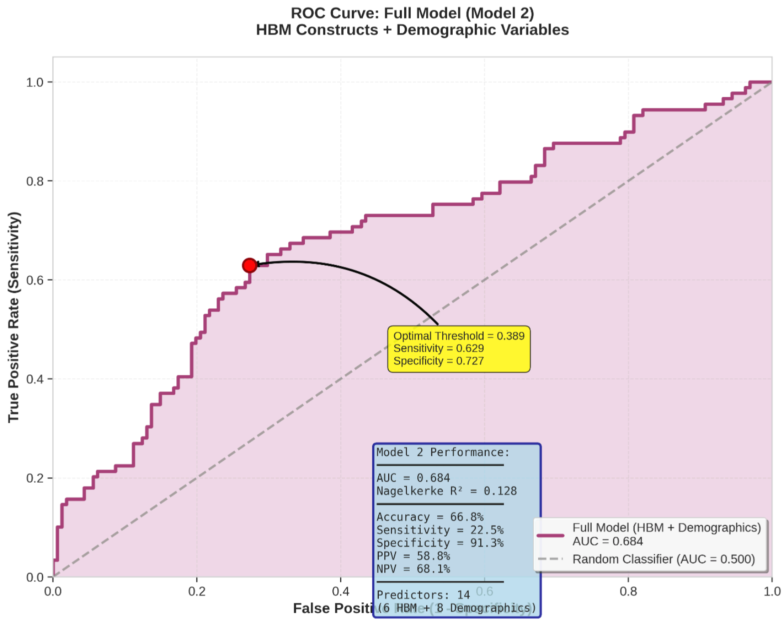

Figure 3: The ROC curve analysis for the full model (Model 2) yielded an AUC of 0.684 (95% CI: 0.626-0.742), indicating fair discriminative ability in predicting behavioral intention to use emergency healthcare services.

The demographic profile reflects typical diabetic populations in Saudi Arabia and the Gulf region. The mean age of 51.4 years aligns with previous studies reporting diabetes prevalence peaks in middle adulthood [36,37]. The predominance of Type 2 diabetes (79.6%) is consistent with global patterns where Type 2 accounts for approximately 90% of cases [37] and mirrors Saudi epidemiological data [38]. The relatively short mean diabetes duration (5.7 years) suggests early disease stages, potentially influencing emergency care awareness.

Educational attainment was relatively high, with 50.8% holding diplomas or university degrees, potentially facilitating better health literacy compared to general Jazan population statistics [32]. However, 63.6% earned below 10,000 SAR monthly, reflecting socioeconomic challenges that may constitute barriers to emergency healthcare access, consistent with Al-Aboudi *et al*. (2016) regarding financial constraints in diabetes care [39]. Notably, 60% had never utilized emergency services for diabetes-related complications, suggesting possible underutilization or effective self-management. Geographic accessibility challenges were evident, with 36.8% residing more than 10 km from emergency facilities, potentially contributing to delayed care access as documented in rural healthcare studies [1,40].

The descriptive findings reveal important patterns in health beliefs and emergency care-seeking intentions among diabetic patients. The highest scores for Cues to Action (M = 12.14) and Perceived Severity (M = 11.96) suggest strong symptom recognition and awareness of diabetic emergency consequences, consistent with Khosravizadeh *et al*. (2021) among Iranian diabetic patients. However, these elevated awareness levels did not translate into high behavioral intentions (M = 11.07), indicating a significant intention-behavior gap documented in health belief research [41,42]. The non-significance of Perceived Severity and Perceived Benefits in the regression model may reflect a ceiling effect, whereby most participants already acknowledged the seriousness and advantages of seeking care, limiting their discriminative predictive value. This finding supports the intention–action gap theory, suggesting that cognitive recognition of risk and benefit does not automatically translate into behavioral commitment without sufficient triggering mechanisms or confidence in execution.

The moderate Perceived Barriers score (M = 9.82) suggests ongoing challenges in emergency service accessibility, aligning with Saudi studies reporting financial and geographic obstacles to healthcare utilization [43]. The finding that 64.4% demonstrated low intention to use emergency services mirrors Al-Al-Rasheedi (2014) regarding delayed care-seeking behaviors among Saudi diabetic patients [44]. This substantial proportion with low intention, despite adequate knowledge of severity and symptoms, underscores the complexity of health behavior change beyond mere awareness [45].

The correlation analysis confirmed Cues to Action as the strongest predictor (r = 0.204), consistent with Champion and Skinner (2008) identifying cues as critical triggers for health action. The weak intercorrelations among HBM constructs (r < 0.15) support the model's theoretical distinctiveness, similar to Carpenter's (2010) meta-analysis of HBM applications [33]. The absence of multicollinearity validates using all six constructs simultaneously in regression modeling, as recommended by Glanz *et al*. (2015) for comprehensive health behavior assessment [46].

The hierarchical logistic regression findings provide compelling evidence for the primacy of health beliefs over demographic characteristics in predicting emergency healthcare utilization intentions among diabetic patients. The non-significant improvement from adding demographic variables (χ^2 difference = 7.585, p = 0.475) suggests that cognitive-perceptual factors supersede structural barriers in shaping behavioral intentions, aligning with Carpenter's (2010) meta-analysis demonstrating that HBM psychological constructs consistently outperform demographic variables in predicting health behaviors across diverse populations [33]. The emergence of Cues to Action as the strongest predictor (OR = 1.174) corroborates Champion and Skinner's (2008) theoretical assertions regarding the critical role of triggers in activating health behaviors, paralleling Clair *et al*. (2025) who identified symptom recognition as the primary determinant of emergency department utilization among chronic disease patients [47]. The significant positive effect of Perceived Susceptibility (OR = 1.149) supports Rosenstock's (1974) foundational premise [48] that personal vulnerability perceptions drive preventive behaviors, consistent with Tarkang and Zotor's (2015) systematic review of HBM applications [49].

Conversely, the negative association between Perceived Barriers and intention (OR = 0.880) demonstrates the inhibitory effect of obstacles, echoing Janz and Becker's (1984) identification of barriers as powerful HBM predictors [50]. This finding resonates with Alshammari *et al*. (2018) documenting how cost, distance, and psychological barriers impede diabetes care access in Saudi Arabia [51]. The non-significance of demographic variables, particularly previous emergency use (p = 0.118), challenges assumptions about experience-based learning in healthcare utilization, suggesting that past behaviors do not automatically translate into future intentions without corresponding belief modifications [52]. This finding may indicate that prior emergency encounters alone are insufficient to shape future intention unless accompanied by meaningful cognitive appraisal, positive reinforcement, or belief restructuring. Negative prior experiences, normalization of acute episodes, or reliance on informal coping strategies may attenuate the motivational impact of past service use. The model's fair discriminative ability (AUC = 0.684) is comparable to other HBM studies [53], while high specificity (91.3%) but low sensitivity (22.5%) indicates better identification of low-intention patients, suggesting potential ceiling effects or unmeasured motivational factors influencing high-intention cases.

These findings suggest that interventions to improve emergency healthcare service utilization among diabetic patients should focus primarily on modifying health beliefs rather than targeting specific demographic subgroups. The consistency of HBM construct effects across demographic categories indicates that educational and behavioral interventions emphasizing symptom recognition (cues to action), awareness of vulnerability (Perceived susceptibility), confidence in decision-making (self-efficacy), and reduction of access barriers would be universally beneficial regardless of patient age, gender, education level, or socioeconomic status. The non-significance of "Previous Emergency Use" suggests that past experiences alone do not predict future intentions, further emphasizing the importance of ongoing health education and belief modification programs.

This study has several limitations. Its cross-sectional design precludes causal inference between Health Belief Model constructs and behavioral intention. Convenience sampling from selected healthcare facilities may limit generalizability to all diabetic patients in the Jazan region or Saudi Arabia. Data were collected using self-reported questionnaires, introducing potential recall bias, social desirability bias, and common method bias. The model explained a relatively modest proportion of variance (12.8%), indicating the presence of unmeasured psychological, cultural, or system-level factors influencing emergency care-seeking intentions.

CONCLUSIONS

This cross-sectional study examined Health Belief Model predictors of behavioral intention to use emergency healthcare services among diabetic patients in the Jazan region, Saudi Arabia. The findings indicate that health beliefs—particularly Cues to Action, Perceived Susceptibility, Self-Efficacy, and Perceived Barriers—are the primary determinants of emergency care-seeking intentions, whereas demographic and clinical variables showed no significant predictive value, underscoring the primacy of cognitive-perceptual factors over structural characteristics. Notably, 64.4% of participants demonstrated low intention to utilize emergency services despite adequate awareness of diabetic emergency severity and symptoms, highlighting a significant intention–action gap. These results suggest that educational efforts alone are insufficient and that interventions should focus on strengthening symptom recognition, enhancing perceived vulnerability, building decision-making confidence, and systematically reducing structural and psychological barriers to access. While the study is limited by its cross-sectional design, convenience sampling, reliance on self-reported data, potential common method bias, and modest explained variance (12.8%), it provides actionable evidence for policymakers and healthcare providers to develop belief-centered, scalable strategies aimed at improving emergency care utilization and reducing preventable diabetic morbidity and mortality.

DECLARATIONS

Ethics approval and consent to participate.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIAL

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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AUTHORS' CONTRIBUTIONS

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be responsible for all aspects of the work.

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