Health Gate
Volume 4 Number 2 April 2026 ISSN 2986-1098
Homepage: https://healthgate.ppnikotablitar.com

DOI : http://dx.doi.org/10.70111/hg4204
Submitted : July, 16 2025
Reviewed : January, 16 2026
Accepted : April, 16 2026

Diabetes Melitus Emergency Prevention Behavior: Hyperglycaemia With Health Belief Model

Arina Ainul Fadlilah[1], Tri Cahyo Sepdianto[2], Dewi Rachmawati,[3*]
[1,2,3]Diploma three nursing study program Keperawatan Blitar, Poltekkes Kemenkes Malang
Corresponding author: dewi_rachmawati@poltekkes-malang.ac.id

ABSTRACT

Diabetes melitus emergencies are drastic changes in blood sugar levels that result in a decrease in consciousness if no prevention is taken. The Health Belief Model is a health behaviour theory to understand individual health behaviour including six basic components (Perceived Vulnerability, Perceived Severity, Perceived Benefits, Perceived Barriers, Cues to Action, self-efficacy. This study was conducted to determine the prevention behaviour of diabetes melitus emergencies: hyperglycemia with the Health Belief Model approach. This research uses descriptive method. The sample size was 30 DM patients who were taken with purposive sampling technique. Data collection using a questionnaire of preventive behaviour of diabetes melitus emergencies: belief-based hyperglycaemia as many as 19 questions. Data analysis technique using univariate analysis. A total of 46.7% of DM patients have a vulnerable risk of hyperglycaemia, 40% of DM patients have a severe risk of hyperglycaemia, 50% of DM patients have a beneficial risk of hyperglycaemia, 36.7% of DM patients have a risk of obstacles, 50% of DM patients have a capable risk of hyperglycaemia, 50% of DM patients have a risk of hyperglycaemia encouragement all tend to prevent hyperglycaemia. Diabetes melitus emergency prevention behaviour: hyperglycaemia tends to prevent hyperglycaemia because they are aware of the importance of controlling blood sugar levels, afraid of the dangers of diabetes complications, feel the benefits of treatment and a healthy lifestyle, motivated to behave healthily, supported by counseling and family support, high motivation in preventing hyperglycaemia.

Keywords: Preventive Behaviour, Diabetes Melitus Emergency, Health Belief Model.

Background

Diabetes melitus emergencies are medical conditions that require immediate treatment due to drastic changes in blood sugar levels that can be life-threatening (1)(3). Included in diabetes melitus emergencies are hypoglycaemia (decreased blood sugar levels), and hyperglycaemia crises (diabetic ketoacidosis and hyperosmolar hyperglycaemia syndrome (2)(4).

According to the world health organisation, Indonesia ranks fourth with the largest number of diabetics in the world. With a prevalence of 8.6% of the total population, it is estimated that in 1995 there were 4.5 million people with diabetes and by 2025 it is estimated to increase to 12.4 million people with diabetes (5)(7). One of the diabetes melitus emergency conditions with a high prevalence in the adult group is hyperglycaemia at 56.8%. In 2014, 207,000 emergency department visits with a diagnosis of hyperglycaemia crisis were reported (8)(10).

Hyperglycaemic crisis occurs when there is an absolute or relative deficiency of insulin. In the absence of adequate insulin, glucose cannot enter insulin-dependent tissues such as muscle and adipose cells because insulin is required to activate GLUT-4

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transporters on the cell membrane. As a result, although blood glucose levels are elevated, cells are unable to utilize glucose for energy production. This cellular "starvation" state stimulates the release of counter-regulatory hormones (glucagon, cortisol, catecholamines, and growth hormone), which further increase hepatic glucose production and promote lipolysis. The breakdown of fat leads to the release of free fatty acids that are converted in the liver into ketone bodies, potentially resulting in diabetic ketoacidosis (DKA). This mechanism underlies hyperglycaemic crises such as DKA and hyperosmolar hyperglycaemic state (HHS) (1)(2). The impact of this condition can cause sufferers to experience impaired organ function, severe dehydration which causes dry mouth, excessive thirst, to cause decreased consciousness and the worst condition is death (11). Therefore, prevention is needed so that the client's condition does not worsen (12). Prevention that can be done is to regulate a diet with balanced energy or in accordance with recommendations, take drugs regularly according to doctor's instructions, follow counselling or education related to diabetes melitus, check blood glucose levels regularly (12)(13). In addition, prevention can be done by motivating oneself to improve health status based on individual beliefs and perceptions. Furthermore, prevention efforts can be carried out by motivating individuals to improve their health status based on their personal beliefs and perceptions. Individual beliefs and perceptions regarding disease control are shaped by their attitudes and behaviors. One approach to identifying disease control is by assessing the patient's perspective, including their understanding and beliefs about the illness, their acceptance of the disease, perceptions of treatment, beliefs regarding signs and symptoms, perceived susceptibility and risks associated with the disease, fears of potential complications, and perceived benefits of treatment, including disease control and prevention of severity (14)(15).

The Health Belief Model is one of the health behaviour theories and psychological models that can be used to understand individual health behaviour in various contexts, including in the context of diabetes. This model includes four main components of perceived threat, namely perceived susceptibility, perceived severity, benefits of health behaviour, perceiver benefits, perceived barriers are factors that may prevent individuals from adopting health behaviour, self-efficacy and cues to action (16). The Health Belief Model (HBM) is an effective approach for improving preventive behaviors and early detection of Diabetes Mellitus. Increased perceived susceptibility and perceived benefits, along with reduced perceived barriers, are key factors in promoting positive health behavior changes among at-risk populations (14)(15).

Methods

The research design used in this study was descriptive, aimed at obtaining an overview of hyperglycemic emergency prevention behavior using the Health Belief Model approach at home. This study obtained ethical clearance from the Health Research Ethics Committee of RSI Aminah Blitar with Number 09/TKEH-RSIAB/EC/II/2024, dated February 1, 2024. The sample was selected using a purposive sampling technique, consisting of 30 patients with diabetes mellitus experiencing hyperglycemia who visited the Emergency Department (ED).

The instrument used in this study was a questionnaire on hyperglycemic emergency prevention behavior in diabetes mellitus based on the Health Belief Model. The questionnaire consisted of seven indicators, among others: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy and inclination

The results of the instrument validity test showed that all questionnaire items were valid, with a Cronbach's alpha value of 0.940, indicating very high reliability. Data analysis

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was conducted using univariate analysis to describe prevention behavior based on the six indicators of the Health Belief Model.

Result

Table 1 Characteristics of respondent

Characteristics of respondent	F	%
Age		
30-34 years	2	6.7
35-39 years	5	16.7
40-44 years	2	6.7
45-49 years	2	6.7
50-54 years	3	10.0
55-59 years	3	10.0
60-64 years	9	30.0
65-69 years	2	6.7
70-74 years	2	6.7
Gender		
Male	9	30
Female	21	70
Employment		
Not Employment	10	33.3
Private employee	4	13.3
Self-employed	9	30.0
Farmer	3	10.0
Housewife	4	13.3
Type of medical expenses		
Independent	1	3.3
Health insurance	29	96.7
Duration of Diabetes		
0-1 years	7	23.3
1-5 years	21	70
6-10 years	2	6.7
Type of medication taken		
Metformin	12	40
Insulin	13	43,3
Glibenclamide	3	10
Glicazide	2	6,7

Based on table 1, it can be interpreted that the age of DM patients is mostly in the range of 60-64 years as much as 30% (9 DM patients) with female gender 70% (21 DM patients) and the type of work of DM patients is mostly not working, namely 33.3% (10 DM patients) while the type of medical expenses used by DM patients is BPJS as much as 96.7% (29 DM patients) and the longest range of diabetes is mostly in the range of 1-5 years

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of diabetes as much as 70% (29 DM patients) and the type of drug consumed by DM patients is insulin as much as 43.3% (13 DM patients).

Table 2 Specific data respondent

Health Belief Model		Has a tendency		No tendency		Total	
		f	%	f	%	f	%
Perceived Vulnerability	Vulnerable	14	46,7	0	0	14	46,7
	Not Vulnerable	1	3,3	15	50	16	53,3
Perceived Severity	Severe	12	40	2	6,7	14	46,7
	Not Severe	3	10	13	43,3	16	53,3
Perceived Benefits	Benefit	15	50	4	13,3	19	63,3
	Not benefit	0	0	11	36,7	11	36,7
Perceived Barriers	Helpful	11	36,7	2	6,7	13	43,3
	Not Helpful	4	13,3	13	43,3	17	56,7
Self-Efficacy	Feeling Capable	15	50	4	13,3	19	63,3
	Feeling Not Capable	0	0	11	36,7	11	36,7
Cues to Action	There is support	15	50	6	20	21	70
	No support	0	0	9	30	9	30

Based on table 2, it can be interpreted that someone who has a susceptibility or risk of being prone to hyperglycaemia is 46.7% (14 DM patients) and who has not susceptibility or no risk of being prone to hyperglycaemia is 53.3% (16 DM patients). Those who have severity or risk of severe hyperglycaemia are 46.7% (14 DM patients) and those who do not have severity or risk of severe hyperglycaemia are 53.3% (16 DM patients). Those who had the benefit of hyperglycaemia prevention were 63.3% (19 DM patients) and those who did not had the benefit of hyperglycaemia prevention were 36.7% (11 DM patients). A person who has barriers or risk of hyperglycaemia barriers is 43.3% (13 DM patients) and who has no barriers or no risk of hyperglycaemia barriers is 56.7% (17 DM patients). A person who has Self-efficacy or risk of hyperglycaemia ability is 46.7% (11 DM patients) and who does not have Self-efficacy or not risk of hyperglycaemia ability is 63.7% (19 DM patients). A person who has a cue to action or risk of hyperglycaemia drive is 70% (21 DM patients) and who does not have cues to action or no risk of hyperglycaemia drive is 30% (9 DM patients). And someone who has a behavioural tendency to prevent hyperglycaemia is 50% (15 DM patients) and who does not have a tendency to prevent hyperglycaemia is 50% (15 DM patients).

Discussion

The results of this study showed that 53.3% of respondents did not perceive themselves as susceptible to hyperglycemic emergencies, while only 46.7% perceived susceptibility. This indicates that more than half of the respondents had a low perception of their risk of experiencing hyperglycemia emergencies. Perceived susceptibility reflects an individual's belief regarding the possibility of experiencing a health problem. Individuals who perceive themselves as vulnerable are more likely to engage in preventive health behaviors. Conversely, when individuals do not feel vulnerable, they tend to underestimate the risk and are less motivated to perform preventive behaviors. Perceived susceptibility plays a significant role in encouraging self-care behavior among patients with type 2

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diabetes(18). Patients who understand their risk are more likely to adhere to preventive measures such as diet regulation, medication adherence, and glucose monitoring.

The relatively low perception of susceptibility in this study may be influenced by several factors, including the duration of diabetes and patient knowledge. Based on Table 1, 70% of respondents had diabetes for 1–5 years, which may cause some patients to feel accustomed to their condition and underestimate the possibility of complications. Previous studies also indicate that inadequate awareness of the risk of hyperglycemic crises can lead to delayed preventive actions (21). Hyperglycemic emergencies such as Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycemic State (HHS) remain major causes of hospital admissions among diabetic patients and can lead to serious complications if not prevented (2)(3). Therefore, increasing patients' awareness of their vulnerability is essential in improving preventive behavior. It is important for healthcare providers to consider these psychological and social factors in designing effective prevention programmes for DM patients.

This study found that 53.3% of respondents had low perceived severity, while 46.7% recognized the severity of hyperglycemic emergencies. These findings indicate that many patients may not fully understand the seriousness of hyperglycemia complications (22). Perceived severity refers to an individual's belief about the seriousness of a health problem and its potential consequences. According to the Health Belief Model, individuals who perceive a disease as serious are more likely to adopt preventive behaviors. The complications of hyperglycemic emergencies include dehydration, electrolyte imbalance, coma, and even death (4). Individuals realise diabetes is a dangerous disease and can cause strokes, visual impairment and kidney seriousness and skin wounds that are difficult to heal but must be prevented by routine treatment and medical consultation to always maintain their health(23)

6,7% patient did not show a tendency to take preventive measures against hyperglycaemia. This is due to the feeling of hopelessness that some DM patients feel in dealing with this condition (24). Perceived severity is related to individual beliefs or beliefs about the seriousness or severity of a disease. Where the perception of severity itself is often based on medical information or individual knowledge of the disease, and can come from individual beliefs that he will feel difficulties due to his illness and can have an effect on his life in general and significantly (25). Meanwhile, there were 3 DM patients (10%) who were not at severe risk of hyperglycaemia. They tend to take preventive measures against the condition, driven by an awareness of the importance of maintaining stable blood glucose levels to avoid long-term complications. The severity of DM disease can cause a person to experience a worsening health condition if they do not take prevention. A total of 13 patients (43.3%), did not show a tendency to take preventive measures against hyperglycaemia. They felt that there was nothing to worry about the condition, so they were not active in making preventive efforts (26). Perceived severity is an individual's belief in the severity of the disease at hand, if the individual does not feel the severity of the disease then he will not prevent a disease (27).

Patients who realise the risk of disease severity are more likely to take precautions, while those who do not feel the severity of the disease are less likely to take precautions. The researcher believes that there is a need to emphasise the importance of increasing awareness of disease severity and linking it to appropriate preventive behaviours such as appropriate education and effective communication about the potential consequences of hyperglycaemia so as to help increase patient awareness and encourage healthier behaviour.

The results of the study from 15 DM patients (50%) who were at risk of benefits against hyperglycaemia showed a tendency to take preventive measures against this condition. Respondents do this because they feel the benefits of treatment and a healthy lifestyle. Perceived benefit is a belief in the benefits felt by individuals if they carry out

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healthy behaviour as recommended. Individuals believe that the benefits they get if they take treatment are stable blood sugar, a heavy stomach feels lighter and the body feels healthier and fresher(23). Therefore, DM patients must believe that the benefits of healthy behaviour are very important for themselves to become healthier. Meanwhile, out of 30 DM patients, there were 4 people (13.3%) who did not show a tendency to take preventive measures against hyperglycaemia. This is due to not realising the benefits of medication and healthy lifestyle. other research results that do not correspond states that the benefits felt by patients after taking a preventive measure will have confidence that if they take the prevention, their DM disease will be cured. Of the 11 DM patients (36.7%) who did not have the risk of benefits to hyperglycaemia, showed a tendency to take preventive measures against the condition (28). Respondents felt that there was nothing to worry about their health conditions so they were not active in making preventive efforts. This is not in line with the research result, which states that the benefits of a sugar diet are useful for controlling blood sugar in the body and reducing the risk of DM, the benefits of exercising to train the body so that the body becomes light and not easily weak, taking traditional and medical medicine is believed to be a preventive measure of a disease (15).

Belief in the benefits of medication and a healthy lifestyle are key factors in the prevention of hyperglycaemia. According to the researcher, the importance of perceived benefits lies in medical personnel providing the ability to motivate individuals to take proactive measures in caring for themselves, so it is necessary to emphasise the importance of adhering to a healthy diet, managing weight, exercising regularly, and adhering to medication to prevent hyperglycaemia and its complications through education to DM patients.

The results showed that out of a total of 11 DM patients (36.7%) who had barriers or risks to hyperglycaemia, tended to take precautions against the condition. This is due to their motivation to behave healthier. Perceived barriers are an element in determining whether a behaviour change is necessary (29). This relates to the new behaviour to be adopted by individuals, that individuals must believe that the benefits of the new behaviour outweigh the consequences of continuing the old behaviour. This allows barriers to be overcome and new behaviours adopted. Only 2 DM patients (6.7%) showed no tendency to take preventive measures against hyperglycaemia. The reasons include not having family members who can take them to the nearest health facility, busy work that makes it difficult to arrange health care time, and difficulty in reducing food consumption that can increase blood sugar levels. Based on the research result, the perception of obstacles for DM patients is the busyness of work, taking care of children, and household chores that are carried out daily so that it becomes an obstacle in doing exercise. Meanwhile, as many as 4 people (13.3%) who do not have the risk of obstacles to hyperglycaemia, tend to prevent this condition (15). Respondents are aware of the consequences of complications from hyperglycaemia and act accordingly to prevent them. The other 13 DM patients (43.3%) did not show any tendency to take precautions. Respondents felt that there was nothing to worry about the condition so they were not active in taking preventive measures. This is in line with the research result, which states that diabetes melitus risk behaviour is more in respondents who have high perceived barriers compared to respondents who have low perceived barriers. So it can be concluded that respondents who have high perceived barriers have higher Diabetes Melitus risk behaviour compared to respondents who have low perceived barrier (28).

Patients with high perceived barriers tend to have greater risk behaviour, while patients who have motivation and awareness of the benefits of healthy behaviour are more likely to prevent hyperglycaemia. According to the researchers, there is a need for emphasis on understanding the barriers to adopting preventive behaviours and the need for approaches that focus on overcoming barriers to adopting preventive behaviours.

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The findings as many as 15 people (50%) who have self-efficacy or capable risk of hyperglycaemia, tend to be active in prevention. Respondents do this because they receive counselling from health workers and get support from their families. That perceived self-efficacy has a positive and significant influence on DM patient compliance. An individual's belief in the cure of their disease will give the individual the motivation to take precautions (27). A total of 4 people (13.3%) did not show a tendency to take preventive measures against hyperglycaemia. Respondents feel bored doing the recommended prevention, so they are not active in following these steps. Self-efficacy is an individual's belief in his or her ability to take preventive action. Individuals will not try to do something new if they do not believe that the new behaviour is beneficial and can be felt the benefits, and do not think that they are able to do it (29). A total of 11 people (36.7%) who did not have the risk of being able to prevent hyperglycaemia, did not show a tendency to prevent the condition. Respondents felt that there was nothing to worry about the health condition, so they were not active in taking preventive measures. DM patients with low self-efficacy have higher diabetes melitus risk behaviour. And someone who has good self-efficacy will hold firmly to his goal of preventing DM disease, while someone who has poor self-efficacy will have a low commitment to his goal of preventing disease (28).

Patients with high self-efficacy, supported by counselling and family support, are more likely to take preventive measures. Conversely, patients with low self-efficacy or bored with preventive measures are likely to have riskier behaviours. Good self-efficacy is important to ensure commitment to DM prevention. According to the researcher, there is a need to emphasise the importance of improving patients' self-efficacy in managing their condition and providing appropriate education about the disease, treatment and healthy lifestyle management.

The findings of 15 DM patients (50%) who showed cues or risk of encouragement towards hyperglycaemia tended to be active in preventive behaviour. Respondents do this because they get support and encouragement from family, and have high motivation to prevent the condition. On the other hand, there were 6 DM patients (20%) who did not tend to prevent hyperglycaemia. This is due to the lack of support and motivation from the closest people, and because they are used to the conditions experienced. A cue to action is an event, person or thing that moves people to change their behaviour. Where these cues to action come from information from the mass media, advice from people around, personal or family experiences, articles and so on (29). Whereas 9 DM patients (30%) who did not have a risk of encouragement to hyperglycaemia, did not show a tendency to take precautions against the condition. Respondents felt that there was nothing to worry about their health condition, so they were not active in taking preventive measures. A person's belief in the cure of his illness has a motivation for the individual to take action to change. And patients with high cues to action will increase DM self-care and will be more adherent to preventive behaviour to carry out a prevention (15).

Family support, individual motivation are key factors that influence hyperglycaemia prevention behaviour in DM patients. Patients who receive support and have high motivation tend to be more committed to prevention, while lack of support and low risk perception inhibit preventive behaviour. According to the researcher, it is necessary to support DM patients in identifying cues to action and provide support about the potential consequences of hyperglycaemia so that it can help increase patient awareness and encourage healthier behaviour.

Conclusions and Recommendations

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Preventive behaviour toward hyperglycaemia among diabetes mellitus patients is generally influenced by key components of the Health Belief Model. Patients who perceive themselves as vulnerable, understand the severity of the condition, recognize the benefits of treatment and healthy lifestyles, and have strong self-efficacy tend to actively engage in preventive measures. Support systems such as family encouragement, counselling, and motivational cues also play a crucial role in strengthening preventive behaviour. Conversely, low risk perception, limited awareness of benefits, perceived barriers, and lack of support contribute to reduced preventive actions. Overall, awareness, motivation, and social support are the main drivers of effective hyperglycaemia prevention.

Diabetes melitus patients are expected to improve their hyperglycaemia prevention behaviour and improve their quality of life by managing stress, monitoring blood sugar levels regularly, adhering to medication, following a diet programme, and moderate activity.

Acknowledgment

The researcher would like to thank the Head of the Diploma Three Nursing Study Program in Blitar who has given the researcher permission to conduct the research, thank you to Aminah Blitar General Hospital who has provided guidance during the research process and of course all respondents who are willing to cooperate in this research process.

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