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The Role of STDE Training in Improving Coastal Community Preparedness for Diabetes Emergencies

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ABSTRACT

Diabetes mellitus is one of the chronic diseases with an increasing prevalence in Indonesia, including in coastal areas. Emergencies due to complications of diabetes, such as hypoglycaemia or hyperglycaemia, are often not handled quickly due to limited public knowledge. Therefore, real efforts are needed to equip the community with basic skills in managing diabetes emergencies. Simple Treatment for Diabetic Emergency (STDE) is one of the educational methods developed by the STIKES Hang Tuah emergency department team to increase knowledge and skills in recognizing the signs and symptoms of hypoglycaemia or hyperglycaemia in patients with diabetes mellitus. This program aims to equip the community with basic skills in handling diabetes mellitus emergencies, including hypoglycaemia and hyperglycaemia conditions. The target of this STDE program is the community of Gisik Gebang Hamlet, Gisik Cemandi, Sedati Sidoarjo as many as 39 people. This activity was carried out for 1 week, which was divided into 3 sessions, namely initial assessment and pre-test, training with simulation, and post-test. The results showed that the average pre-test attitude and knowledge score was 69.18, the average post-test score was 87.3, and with the Wilcoxon statistical test, $p < 0.001$, there was a difference in attitude and knowledge of the participants before and after STDE training, with an increase of 27.8%. This program is an innovation that coastal communities hope will be able to recognize the early signs of a diabetes emergency and take simple actions that can save lives before advanced medical help is available.

Keywords : Diabetic Emergency, Coastal Communities, Hypoglycemia, Hiperglycemia Simple Treatment

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INTRODUCTION

Diabetes mellitus is a chronic disease with a high incidence rate, both in Indonesia and globally. In addition to causing long-term complications, this condition can also trigger a potentially life-threatening emergency. Emergency situations occur when blood sugar levels

drop drastically (hypoglycemia) or rise very high (hyperglycemic crisis), so that the body loses the ability to maintain normal function. Both of these conditions can lead to decreased consciousness, seizures, coma, and even death if not treated immediately. The signs and symptoms of both conditions are often not recognized by coastal communities. This can be caused by lack of exposure to information about danger signs, local culture and customs where coastal communities prefer traditional medicine. Both of these conditions require quick and appropriate treatment in emergency facilities. Early diagnosis in the emergency department and evidence-based treatment can prevent amputation, related disability, and death (Frazee, 2024). In coastal areas and communities with limited access to health services, public knowledge of the signs of diabetes emergencies is still low. This increases the risk of delayed treatment and worsens morbidity and mortality.

Of the 171 cases of diabetic distress, 55 were HHS diagnoses, 47 were DKA, and 49 were combined DKA and HHS. This review shows the prevalence of diabetes emergencies; episodes of DKA range from (3.8%-73.4%), HHS (0.9%-58%), and severe hypoglycemia (3.3%-64.7%) per year in developing countries. Infections, the onset of new diabetes, and non-adherence to medication and diet are reported as the most common risk factors of this diabetes emergency (Haile & Fenta, 2025). The prevalence of **HHS** is more common in older people with type 2 diabetes, the course of the disease is slower, they tend to be severely dehydrated, and the risk of death is higher (Patel, 2025). This figure shows that cases of hyperglycemia are more common than hypoglycemia. The age prevalence in patients with diabetes mellitus was in the range of 44 – 69 years, with a mortality rate of 4.8% (MacIsaac et al., 2002). The prevalence of diabetes continues to increase across all age groups, mainly triggered by high cases of overweight and obesity, unhealthy diets, and lack of physical activity (Azbeg et al., 2022). In addition, diabetes mellitus is often found along with other diseases such as hypertension, chronic kidney failure, and stroke. Findings from previous community service activities found that about 70% of people who came to the initial screening had been diagnosed with hypertension, and 73% had been diagnosed with diabetes mellitus (Rahman, 2023). Diabetic distress, especially hyperglycemia, is statistically caused due to infections (30–40%), especially pneumonia and urinary tract infections, and non-adherence to medication (28–50%). Another very important factor is inadequate insulin (Castell Saun et al., 2026). Findings from previous service activities to coastal communities in Kendari, the results of random screening were obtained from 46 respondents, there were 15% indicated to have blood sugar levels above normal. This shows that coastal communities' awareness of the importance of early detection of their health is still not optimal(I Putu Sudayasa et al., 2024).

Treatment of diabetes mellitus in hyperglycemia requires hospitalization for aggressive intravenous fluid administration, insulin therapy, electrolyte replacement, and identification and treatment of the underlying cause, along with periodic monitoring of the patient's clinical and laboratory conditions (Eledrisi & Elzouki, 2020). The initial assessment in Gisik Cemandi hamlet was obtained by many participants who rarely checked themselves to the medical center. In line with previous findings, the awareness of people with diabetes mellitus to continue to check blood sugar levels, take medication, regulate diet, and exercise is still a challenge in the management of diabetes mellitus (Simanjuntak et al., 2020). Early detection and treatment of this disease is essential to help people with diabetes mellitus lead a healthy life, as it helps prevent serious complications (Azbeg et al., 2022). The prevention and treatment of diabetes mellitus cannot run alone, but there must be good cooperation between patients, family members, and health services, especially in elderly patients (Susilawati et al., 2024). So this requires the right instruments and methods so that early identification can be carried out. Simple Treatment for Diabetic Emergency (STDE) is a form of intervention that

answers the urgency of efforts to improve the ability to recognize diabetes mellitus emergencies and is innovative where educational methods are made as simple and community-based as possible so that they can be widely applied with various backgrounds of community service participants. Health awareness is not only a matter of knowledge, but also a change in attitudes and behaviors. With the use of STDE, it is hoped that coastal communities will gain a better understanding of the recognition of disease danger signs faster, take advantage of available health services and reduce the risk of complications and deaths due to chronic diseases. Through additional simulations as part of educational interventions, simple training with Simple Treatment for Diabetic Emergency (STDE) is expected to be a real step to increase community preparedness in dealing with diabetes emergencies.

METHOD

This community service activity will be carried out in Sekardadu Hamlet, Gisik Gebang, Gisik Cemandi, Sedati, Sidoarjo, East Java in October 2025. The main target of this activity is coastal community groups. The main purpose of this service activity is to increase the knowledge and attitude of the community in recognizing the early signs of diabetes crisis. The measurement of the attitude and knowledge score of participants was carried out before being given STDE training, and then attitude and knowledge score measurements were carried out afterwards. The facilitators of this STDE program include 3 lecturers, 2 education staff, supported by 12 nursing professional students who are in the community practice stage, and collaborate with 3 people from the health team from the Sedati Health Center and 4 cadres. This activity is divided into 3 stages. The first stage includes blood sugar screening, blood pressure, and a pre-test. In this first stage, an initial assessment was carried out in the form of periodic blood sugar checks, blood pressure checks, and focus group discussions about participants' knowledge about diabetes mellitus and its emergency in the form of discussions and questionnaires. At this stage, demographic data on age, gender, and diseases experienced in recent years are obtained. In the next stage, education on diabetes mellitus emergencies (hypoglycemia and hyperglycemia) was provided by providing STDE materials in the form of take-home booklets and explanatory banners. At this stage, cadres play a fairly important role where cadres monitor the understanding of the participants regarding the knowledge information in the STDE booklet that has been distributed. This is not only aimed at participants but also families. This was followed by a third stage, a simulation of hypoglycemia and hyperglycemia events, which concluded with a post-test. In the implementation of the simulation of hypoglycemia and hyperglycemia, the role of cadres is to accompany the participants and help provide an understanding of the emergency situation that occurs and the actions that should be taken by the participants. The post-test was conducted by measuring knowledge and observing actions conveyed verbally during the simulation. This activity was attended by cadres and the elderly community, totaling 41 people. The selection of participants was carried out by total sampling according to inclusion criteria, including participants with a residential address in Gebang village who were willing to participate in the STDE program until it was completed. Participants who are unable to participate in the program until the end are excluded from the criteria. At the beginning of the program, 41 participants were recruited. Over time, there were 2 participants who dropped out and did not continue, so the pre and post-measurements were followed by 39 participants. Data collection was carried out by interviews and observations. The instrument for educational guidance is provided in the form of an STDE booklet that contains guidelines explaining hypoglycemia and hyperglycemia, each of which includes a definition, causes, signs and symptoms, pre-hospital management, and complications. For the attitude and knowledge instrument in the form of a questionnaire of 20 questions, Gutman questions with a ratio scale and tested using the Wilcoxon test ($p< 0.05$).

RESULTS

Table. 1 Demographic Data Characteristics STDE (n=39)

Characteristics	n	%
Gender		
Male	17	43,6
Women	22	56,4
Age		
18 – 59 Years old	23	59
60 – 69 Years old	5	12,8
70 – 79 Years Old	11	28,2
Comorbid		
Diabetes Mellitus	6	15,4
DM + HT	11	28,2
HT	18	46,2
Etc	4	10,3

The results of the STDE program show that the community is very enthusiastic about recognizing the types and signs of symptoms in diabetes mellitus disorder. This is illustrated by the 3 stages of the activity; there were only 2 participants who dropped out due to illness. The distribution of STDE program participants is in the age range of 43 - 79 years, with an average age of 60 years. Most of the program participants are women (56.4%). At the blood sugar level check, the average participant was in the range of 105 – 240 mg/dl with an average of 166 mg/dl. Related to comorbid disease, 15.4% of participants were people with diabetes mellitus, 46.2% people with hypertension, 28.2% with diabetes mellitus and hypertension, and a small number of others, namely 10.3% suffering from cataracts, hepatitis, and pulmonary TB

Table 2. Knowledge and Attitude Scores Before and After the STDE 2025 Training Program (n=39)

	n	Median (Min – Max)	Rerata ± s.b	p
Pre-Test	39	70 (42 – 74)	69,18 ± 5,160	< 0,001
Post-Test	39	87 (69 - 100)	87,33 ± 8,628	

The results of the pre-test were obtained with an average attitude and knowledge score of 69.18, and the post-test obtained an average of 87.3. Thus, there was an increase in knowledge and attitudes by 27%. The changes that seemed significant were in the participants' knowledge of the recognition of hypoglycemia and hyperglycemia, as well as the difference in signs in the two conditions. At the beginning of the screening in stage 1, most of the program participants were able to correctly mention the definition of diabetes mellitus, normal sugar levels, what are the causes of diabetes mellitus, and the signs and symptoms of diabetes mellitus, but for the difference in signs and symptoms in hypoglycemia and hyperglycemia, almost half could not mention them correctly. In addition, related to awareness to take medication is quite good, but most of the participants showed a lack of awareness of routine check-ups.

Figure 1. The atmosphere of checking blood sugar and blood pressure of community service participants

Figure 2 Implementation of phase 1, initial assessment and pre test

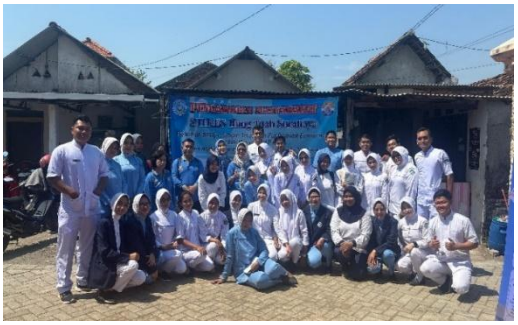

Figure 3. Community Service Team from STIKES Hang Tuah Surabaya

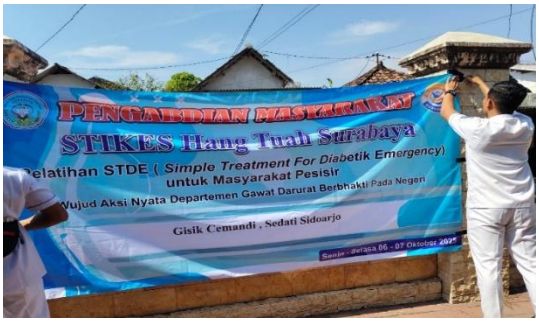

Figure 4. Community Service Team from STIKES Hang Tuah Surabaya

Figure 5. Implementation of stage 2 diabetic emergency education and simulation

Figure 6. Implementation of phase 3 and post test

DISCUSSION

Early management of diabetes mellitus emergencies is crucial, considering that the majority of people with diabetes mellitus are elderly. Severe osmotic diuresis in hyperglycemia due to insulin deficiency is caused by old age, infection, or illness that prevents adequate fluid intake. The onset of hyperglycemia arises slowly, characterized by severe dehydration, changes in mental status, and is closely correlated with mortality (Patel, 2025). In previous findings, it was found that when age was associated with the emergency category of diabetes mellitus and mortality assessed through logistic regression analysis, age was found to be one of the strongest predictors (MacIsaac et al., 2002). Based on the results of the distribution of program participants, the average age of the program was obtained. This is a real challenge if it is associated with the goal of improving attitudes and knowledge. The elderly group is an age group that, on average, has experienced cognitive limitations due to the natural aging process. Early detection of diabetes mellitus is a very important step for the management and treatment of diabetes (Azbeg et al., 2022). The Simple Treatment for Diabetic Emergency program is one of the innovations in an effort to increase the preparedness and resilience of coastal communities in dealing with diabetes mellitus emergencies. Thus, the idea of making it simple information is important. The implementation of the program in 3 stages aims to ensure that community service participants have a strong retention of their understanding of pre-hospital management. If you look at the distribution of blood sugar data at the time, the majority of participants were at an average of 166 mg/dl. Blood sugar screening can be used to detect hyperglycemia and hypoglycemia emergencies early (Rahmawati et al., 2024). These findings suggest that the occurrence of hyperglycemia is more common than hypoglycemia. HHS is more common in Type 2 Diabetes and is associated with a mortality rate ranging from 10–50%

due to delays in diagnosis and treatment (Haile & Fenta, 2025).In previous findings, it was found that the incidence of hyperglycemia (DKA) was mostly caused by non-compliance with insulin therapy. And this non-compliance is also attributed to factors such as lack of patient education, limited access to health services, economic limitations, underlying psychiatric conditions, and eating disorders (Pedersen et al., 2025). Future incidence of DKA can be reduced through patient education programs that focus on insulin adherence and self-care guidelines during illness, as well as increased access to medical providers. New approaches, such as the wider availability of telephone services, the use of telemedicine, and the utilization of public campaigns, can provide further support for DKA prevention (Eledrisi & Elzouki, 2020). However, the limitation of this activity is that it is still based on blood sugar checks at the time, not serum blood sugar; there are still internal factors that result in bias. This is because serum blood sugar testing is not possible if it is carried out directly at the village hall.

Based on the initial assessment, most students think that controlling blood sugar is not to eat. This is very dangerous compared to hyperglycemia. Hypoglycemia is more dangerous and shows the highest mortality due to its rapid onset (Haile & Fenta, 2025). In the case of hypoglycemia, where the blood sugar level is less than 70, it results in several symptoms such as visual impairment, decreased consciousness, and numbness. In the random forest model, GCS/triage awareness levels and classification were identified as the most significant predictors of survival. Patients with diabetes mellitus with a higher GCS score and immediate triage classification (P1) have a greater chance of survival (Nikentari et al., 2025). The signs and symptoms of hypoglycemia are very similar to those of stroke, or even these complaints are considered common, reminding most people with diabetes mellitus that they are elderly. The main effective management of hypoglycemia is the administration of 10% dextrose (D10) and 50% dextrose (Maharjan et al., 2024). In the STDE program, participants and cadres get short and simple information about what the signs and symptoms are and how to get first aid, especially in cases of hypoglycemia. With the early recognition of signs and symptoms, and the provision of simple and easy actions, for example, by preparing warm sweet tea when you feel dizzy and spinning and visual disturbances that are assumed to be the first signs of hypoglycemia, the opportunity for management in the emergency room of the Health Center will produce a better outcome. Thus, educating patients and families about the signs and symptoms of hypoglycemia, as well as available treatment methods, can effectively reduce the risk of severe hypoglycemia episodes (Umpierrez & Korytkowski, 2016). Early detection and education of the signs and symptoms of a diabetic emergency is very important. People with diabetes continue to monitor independently, identify signs and symptoms that appear, so that there is no delay in treatment (Minarti et al., 2024). The implementation of STDE can be carried out independently. The implementation of this STDE program includes the use of booklets and banners that contain simple steps in recognizing the signs and symptoms of hypoglycemia and hyperglycemia. This aims to reduce the number of pain and death due to hypoglycemia, especially.

In previous studies, it was stated that the self-management of patients with type 2 diabetes mellitus was related to self-efficacy, compliance, and family support. Good family support for DMT2 sufferers will have a good impact on their self-management (Adinata et al., 2022). Diabetes mellitus treatment management adherence is linked to the prevention of complications such as hypertension, stroke, and heart disease. This is in line with previous findings that of the 25 participants who experienced hypertension, 36% also experienced an increase in blood sugar during the initial screening (Cahyati et al., 2021). In the distribution of STDE program participants, it was found that almost half also experienced other comorbidities such as hypertension, cataracts, hepatitis, and pulmonary TB. Participants with diabetes

mellitus need special attention, especially if they experience other diseases, in this case Pulmonary TB. Management becomes more complex where an understanding of 3 ways to meet the nutritional needs of DM and TB patients by paying attention to the amount of food, type, and diet to maintain blood sugar stability and TB treatment efforts (Zendrato & Yoan, 2023). With the existence of this comorbidity, a good attitude and knowledge will have a good impact on management awareness in accordance with the treatment program. Healthcare providers are advised to increase monitoring, particularly for patients with identified risk factors (kidney disorders, infections, comorbidities) (Tassew et al., 2024).

Similarly, the role of cadres and other family members is no less important in monitoring the condition of the participants of this service program, especially in program participants who also experience comorbid diseases that can aggravate diabetes mellitus. One of the efforts to prevent emergency diabetes is to understand the factors that are the triggers. This condition is generally associated with low glucose conditions, such as hunger, chronic liver disease, pregnancy, and infection (Long et al., 2021). The identification of these triggering factors cannot be done by the patient alone but must be with the support of family members (Maharjan et al., 2024) and cadres, the characteristics of the participants, the majority of whom are elderly. The involvement of family members and cadres at all stages of the diabetes mellitus education program emphasizes early detection and prevention of further complications (Maria Karolina Selano & Oke Dwi Astuti, 2025). This supports previous findings stating that family support will increase good self-efficacy, and good self-efficacy is associated with a lower prevalence of emergency room visits (Pedersen et al., 2025).

Educational media play an important role in strengthening self-management and reducing the risk of hyperglycemia emergencies in patients with diabetes mellitus (Purnomo et al., 2025). Currently, public education can be carried out through the use of information technology, such as health applications that support the monitoring of diabetic patients while providing the latest information. Planned interventions include education on healthy eating, physical activity, regular check-ups, counselling services in the community, as well as the development of digital applications to help with diabetes management (Subarkat Bangun Satoto et al., 2025). Although STDE comes in manual form instead of an application, this program has the advantage of being in the simulation stage. Program participants are given examples of situations either felt by themselves or if they find that a diabetic emergency situation, such as hypoglycemia or hyperglycemia, occurs in family members. It is hoped that this program can continue and can be taught independently by cadres with an even wider scope. Audiovisual media is also effective in clarifying understanding, while print media remains beneficial to certain groups despite its limited interactivity. The educational approach must be able to pay attention to the characteristics and needs of the participants. Although the level of education of the participants also affects the level of understanding of the material given, the simple and applicable steps give excellent results, which is reflected in the increase in the average knowledge score and attitude of the participants. The use of STDE can also be widely used not only in coastal communities in the hamlets of Sekardadu Hamlet, Gisik Gebang, Gisik Cemandi, Sedati, Sidoarjo but also in coastal communities in Indonesia in general

CONCLUSION

The STDE program in community service activities has been proven to increase the knowledge and attitudes of program participants in dealing with diabetes mellitus emergencies. With good knowledge, awareness of the importance of recognizing early signs and symptoms that threaten life will form and reduce the death rate due to complications of diabetes mellitus. This will be one of the innovative results that can be continued and developed in other

degenerative diseases, so that it will produce a resilient community of people. Recommendations for the next community service activities can present STDE in the form of a digital application so that it can be widely used

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