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Google Maps: Prevalence and Distribution of Uncontrolled Type 2 Diabetes Mellitus in Kalasin Province, Thailand

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Abstract. Diabetes Mellitus (DM) is a major public health problem worldwide. Most of the problems are caused by uncontrolled blood sugar level, resulting in complications and possible death. This study aimed to investigate the prevalence and distribution of uncontrolled type 2 diabetes mellitus (T2DM). A cross-sectional of 385 patients between September 2019 and December 2019, using the google maps, a questionnaire and laboratory examination. The results revealed that the prevalence of uncontrolled T2DM was 79.74% and densely distributed in the municipality. This data indicates that the prevalence and distribution of uncontrolled T2DM need to be concern and solve problems to decrease complications and death rates from diabetes.

Keywords. Google maps, Prevalence, Distribution, Uncontrolled type 2 diabetes mellitus, Glycemic control

1. Introduction

Diabetes Mellitus (DM) is a large public health problem. Worldwide about 422 million are living with DM, especially in low and middle income countries [1]. DM was the 7th cause of death and the number of deaths globally increased from less than 1 million in 2000 to 1.6 million in 2016 [2]. Majority had poor glycemic control. Uncontrolled type 2 diabetes mellitus (T2DM) can lead to serious complications. Prevalence of uncontrolled T2DM is increased in many countries, Ghana, Nigeria, Bangladesh, Sudan, and Zambia were 86.4%, 83.3%, 82.0%, 80.0% and 61.3%, respectively. [3-7].

Thailand has tended towards an increase in the morbidity rate and mortality rate per hundred thousand with diabetes every year and DM was the 6th ranking cause of death in 2018 [8]. In addition, the percentage of T2DM that could be controlled lower than the indicators of the Ministry of Public Health of Thailand. Patients with uncontrolled or poorly controlled T2DM will develop acute and chronic complications. Technologies in mobile, computer, e-mail, and internet approaches have shown evidence in enhancing chronic disease management, suggesting great potential for diabetes management technologies [9]. Google maps is a part of Google website used to search for places, get driving directions, and view maps that people around the world are extensively used by

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reason of easily accessible, convenient and easy to use. Therefore, Google maps is an option that can be used for public health to monitoring and surveillance the health risk of patients. This study aimed to determine the prevalence and distribution of uncontrolled T2DM in Kalasin Province, Thailand.

2. Methods

2.1. Study design and Sampling

This study was a cross-sectional study among T2DM patients in Kalasin Province, covering a period of 4 months from September 2019 to December 2019. There were 385 patients from 18 hospitals. They were selected by systematic random sampling.

2.2. Inclusion Criteria

- T2DM patients, both males and females without age restriction.
- Patients were registered and treated in the hospitals in Kalasin Province.
- Patients had laboratory examination results from their last 3 times of Fasting Plasma Glucose (FPG) tests or results of glycosylated haemoglobin (HbA1C) tests.
- Patients participated voluntarily.
- Patients could communicate by speaking.

2.3. Exclusion Criteria

- Patients had severe complications of the disease and were unable to provide information.

2.4. Research Instrument

This study used the standardsfor diagnosis of uncontrolled T2DM according to the Ministry of Public Health of Thailand's criteria for classification, HbA1C with a ≥ 7, or FPG ≥ 130 mg./dl. The questionnaire was divided into three parts, which were

- Demographic characteristics
- Health data
- Geographic coordinates

2.5. Data collection

Data were collected using a questionnaire and laboratory examinations.

2.6. Statistical analysis

Descriptive statistics were used to describe the characteristics of the prevalence of uncontrolled T2DM in patients.

2.7. Ethic Declarations

This protocol was approved by the Mahasarakham University ethical committees number 059/2019 and passed through from Kalasin provincial public health official. Written informed consent was obtained from all participants.

3. Results

The prevalence of uncontrolled T2DM in patients was 307 out of 385 patients, accounting for 79.74% (95%CI = 75.71 to 83.77) (Table 1) and spot map of uncontrolled T2DM cases were distributed throughout the province and clustered somewhat more densely in the center of municipal area shown in the figure 1.

Table 1. Assessment of controlled type 2 diabetes mellitus classified by diagnosis

Diagnosis	Number	Percentage (%)	95%CI
Controlled type 2 diabetes mellitus	78	20.26	
Uncontrolled type 2 diabetes mellitus	307	79.74	75.71 to 83.77
Total	385	100.00	

Figure 1. Distribution of uncontrolled type 2 diabetes mellitus in Kalasin Province

4. Discussion

The results showed that 79.74% of uncontrolled T2DM was similar to the report of Ministry of Public Health of Thailand which 71.68% of uncontrolled T2DM [10]. However, limited information about the prevalence of uncontrolled T2DM in Thailand. In addition, using the google maps to create a spot map helps to identify the distributed of uncontrolled T2DM cases that distributed more densely in the center of municipal area, as patients in the municipality have a sedentary lifestyles and unhealthy diets, which was consistent with a previous study that the prevalence of DM in urban higher than rural areas [11-14]. Due to lifestyles and dietary habits that are different in each area causing patients in the municipality able to control the glycemic control differently from outside the municipality.

5. Conclusions

The prevalence of uncontrolled T2DM is very high and densely distributed in the municipality. The spot map on the google maps will be a warning sign of health risk

among DM patients in the area. Evidence based on electronic health data will support health care system.

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