Analysis of Diabetes Mellitus Prevalence Number of the People of Horai–Quic, Maubesi, Ainaro, Timor Leste and its correlation with Their Lifestyle

Mirah Rejeki[1], Erinda Nur Pratiwi[2], Maria Goreti Owa[3]
{miraulin@ukh.ac.id[1]}

Universitas Kusuma Husada Surakarta, Indonesia[1,2]
Universidade Oriental de Timor Lorosa'e, Timor Leste[3]

Abstract. Diabetes Mellitus is metabolic disorder disease where body prevents to convert carbohydrate into energy. This disease is mainly indicated by excessive glucose level in blood causing medical complications that may lead to deadly effect. The prevalence number of this disease increases persistently and more than 45% of the cases are undiagnosed. People of Timor Leste have lifestyle that strongly leads to the risk of suffering from Diabetes Mellitus. Some people do not receive proper formal education, some of them are jobless and their lifestyle is not quite healthy. In term of medical literacy, people of Timor Leste do not have sufficient knowledge on this subject. Since Diabetes Mellitus may not indicate significant physical problem, people who starts having this disease may not feel any serious problem. On the other hand, the facility of medical service is not really sufficient to provide initial diagnose for Diabetes Mellitus and, as a result, some people are not aware that they are suffering from the disease. A test was carried for the people of Horai-Quic, Maubesi, Ainaro, Timor Leste, aged 25 – 50 year. From the 47 people participating the test, it was identified that 40 people (85.11%) tend to suffer from Diabetes Mellitus. Some lifestyles are described and analyzed, and their impact on the possibility of having the disease will be highlighted.

Keywords: Diabetes mellitus, prevalence number, diagnose, lifestyle

1 Introduction

In the recent years, the number of people living with diabetes is considerably high. In the global level, this number has quadrupled in the past three decades [1]. About 1 from 11 adults currently suffer from this disease worldwide, and 90% of them are with type 2 Diabetes Mellitus (T2DM). In terms of region, Asia is the area where the prevalence number of T2DM rapidly increases where China and India are the two top epicenters. People with T2DM mostly have at least one complication problem. Cardiovascular complications are the major reason of morbidity and mortality in these patients [2]–[4]. More generally, Diabetes Mellitus is the ninth major cause of death.

According to the IDF Diabetes Atlas 2017, 425 million people in the world suffer from the disease. This number is equivalent with 8,8% people aged 20-79 year. If the age range is extended to 18 - 99 year, this number increases to 451 million. In term of distribution, people with diabetes are about 79% living in developing countries with low to middle income. Based on the 2019 estimates, by 2030 a projected 578.4 million adults aged 20 -79 years will be living

with diabetes. The prevalence number of people with diabetes increases persistently and, if this trend continues, it is predicted that at 2045 about 629 million people aged 20 – 79 will suffer from diabetes. This will increase to 693 million if the age range is expanded to 18 – 99 [5].

Diabetes Mellitus is metabolic related disease due to less insulin production, lower body response to insulin, other hormones influencing insulin performance and dysfunction of β pancreas cell [6]–[8]. Diabetes Mellitus is indicated with the high level of glucose level in the blood, caused by insulin deficiency, insulin resistance or both [9]. High glucose level in the blood may cause nerve damage, destruction of blood vessel, heart disease, high blood pressure, stroke, kidney disfunction, blindness, and dental disease [5]. Some factor may affect Diabetes Mellitus such as lifestyle, medical history, and genetical aspect. Age is no longer considered as the main reason of having this disease according to the fact that this may happen to people with age disparity [3].

Diabetes Mellitus may be classified based on the reason behind. One of the types is Diabetes Mellitus Type 1, which is caused by autoimmune disease where the immunity destructs the cells of Langerhans that produces insulin. Therefore, pancreas is unable to produce insulin and, as a result, the body does not have sufficient insulin leading to the increase of glucose level in the blood. In general, Diabetes Mellitus Type 1 happens on young people less than 40 years. Diabetes Mellitus Type 2 is the dominant type of this disease where people are suffering from. It is about 90-95% of the disease in the world and happens at elder people. The reason of this exact reason of the disease is undetermined yet experts believe that this is combination of genetical and environmental factors [10]. Gestational Diabetes Mellitus is the 3rd type of this disease happening only to pregnant woman. This may lead to problem if an immediate treatment is not taken. A fast response for this disease may save the mother and her baby. Therefore, a complete recovery is expected after childbirth.

It may be noted that, at the beginning stage, people with Diabetes Mellitus do not indicate any sign of suffering the disease. For some people they are not even aware that they have the disease after some time. This is due to no significant indication may be detected although the disease has happened for long time. This circumstance may lead to dangerous situation since the disease has caused complications for the patient. Therefore, understanding the initial signs of the disease will certainly save the people.

It is unfortunate that based on the fact, more than half of people with diabetes are undiagnosed. There are some signs that people should be aware that if they experience one of these, since they may suffer from the disease. These include: feeling tired and fatigue, often feeling thirsty, very often urinate, very quick getting hungry, very often getting infection on skin and vagina, stomatitis, urethritis, numbness, gingivitis, blur vision, long time recovery for an injured, sudden weight drop, and -for man- sometime get impotence. To avoid a more serious problem, when getting one of the indications, a consultation with doctor is required.

Although genetic predisposition partly determines individual susceptibility to T2DM, an unhealthy diet and a sedentary lifestyle are important drivers of the current global epidemic; early developmental factors (such as intrauterine exposures) also have a role in susceptibility to T2DM later in life. Preventing the disease is better than curing it. It is necessary to minimize the risk of suffering from Diabetes Mellitus. Since Diabetes Mellitus is closely related with lifestyle, to improve the life quality and to avoid the disease, moving to the healthier lifestyle is necessary. This include controlling the consumption pattern, regular exercise, weight control, consume more vegetable and fruit, reduce consuming sugar, and having enough rest.

This paper presents the results of research on investigating the lifestyle of Timor-Leste people and its relationship with the possibility of suffering from Diabetes Mellitus. Appointment of this location is based on some considerations, including the research regarding the topic on

this area is very rare, the people lifestyle may be used to confirm that this is correlated with the possibility to have DM, the lack of medical service may lead to the undiagnosed DM. The research was carried out by observation of people daily life and the test of blood glucose level. The result will be presented to confirm that more than half of respondents were having glucose level more than maximum allowable limit.

1.1 Diabetes mellitus and lifestyle

Diabetes Mellitus (DM) is a medical problem related with metabolic disorder due to several reasons including genetic factors, age, smoking, alcohol consumption, lack of physical activity and unbalanced diet. Diet settings to prevent and recover diabetes is recommended by taking foods that are low in sugar, containing a lot of fiber and consume more fruits and vegetables that contain vitamin C. Vitamin C serves as an antioxidant that can support DM recovery.

If the people's lifestyle is not healthy, they can have the probability to suffer from Diabetes Mellitus. To prevent and recover Diabetes, it is necessary to consider the lifestyle that must be changed to a healthy lifestyle, including:

1.1.1 Healthy diet

A healthy diet for DM patients should consume food containing fibber, fish rich with omega-3 and good fats. To minimize the risk of diabetes they should consume whole grains, vegetables and fruits. The benefits of fibber is to help digesting food and to help control blood glucose level. The food that contains high fibber includes fruits, vegetables, nuts, and wheat. The beverages with high sugar ingredient should also be avoided [1].

1.1.2 Balanced diet

Diet settings every day must be well planned to be balanced between fruits, vegetables, protein and healthy fats. So that blood glucose levels will remain stable [7].

1.1.3 Setting meal portions

In the management of DM, controlling carbohydrate consumption is important because carbohydrates can increase blood glucose level. For DM patients who have insulin injection, the amount of carbohydrates in the diet must be calculated so that the meal portion is adjusted based on the needs of each patient differently, not more than the dosage.

1.1.4 Exercise

Physical activity in changing lifestyle needs to be done, but it is according to the patient's condition. For example, walking, jogging, doing household works and farming in the garden. Physical exercise may convert carbohydrate into energy and therefore it helps the body to have insulin hormone secretion processing the carbohydrate.

1.1.5 Stop smoking

For people with type 2 Diabetes, it is advisable not to smoke because it can increase the chance of having a heart attack, stroke, kidney disease.

1.1.6 Avoid alcohol

DM patients should not consume alcohol because it can raise blood glucose levels which make their condition worse. On the other hand, alcohol can cause complications.

By following a healthy lifestyle, it is expected that it can prevent the occurrence of DM and can improve the condition of patients who are already suffering from DM. Moreover, it will not cause further complications [11].

1.2   The lifestyle of Timor-Leste people

East Timor or Timor-Leste is an island country in Southeast Asia. East Timor lies between latitudes 8o and 10o, and longitudes 124o and 128o E. It covers the eastern half of the island of Timor, the nearby islands of Atauro and Jaco, and Oecusse, an exclave on the northwestern side of the island surrounded by Indonesian West Timor. Australia is the country's southern neighbor, separated by the Timor Sea. The area of the country is about 14,919 km2 (5,760 sq mi). East Timor has an exclusive economic zone of 70,326 km2 (27,153 sq mi). East Timor recorded a population of 1,183,643 in its 2015 census. Much of the country is mountainous, and the climate is tropical and generally hot and humid. It is characterized by distinct rainy and dry seasons.

The economy of East Timor is a market economy depending on exports of a few commodities. The country's economy is reliant on government spending and, to a lesser extent, assistance from foreign donors. A small funding is provided for development of villages, which still rely on subsistence farming. As of 2012, nearly half the East Timorese population was living in extreme poverty. Private sector development has lagged due to human capital shortages, infrastructure weakness, an incomplete legal system, and an inefficient regulatory environment. After petroleum, the second largest export is coffee. The agriculture sector employs 80% of East Timor's active population. According to data gathered in the 2010 census, 87.7% of urban (321,043 people) and 18.9% of rural (821,459 people) households have electricity, for an overall average of 38.2% [12].

After achieving independence, East Timor had a high illiteracy rate, with 55% of women and 46% of men illiterate. Approximately 18% of the adult population had achieved secondary education and approximately 1.4% of them had an academic degree or achieved other higher education, nearly all of whom resided in urban areas, primarily the capital Dili. Attempts to improve education services face challenges in the form of a lack of educated and experienced teachers. Continuing high fertility rates also translates to greater strains on the government to increase education budgets. However, problems remain as the quality of education was deemed secondary to the need to increase enrollment in East Timor.

Another problem in improving education levels is economic conditions of the people. Due to the high proportions of the people living below the poverty line and high number of family with many children, the direct costs of schooling is significant for families. Lack of financial capability to send their children to school implies the difficulty to increase enrollment rates in Timor-Leste. Furthermore, some parents seem to be disappointed with the low education quality and therefore may not even be interested to send their children to schools. The inaccessibility of schools with sufficient facilities adds to the problem of providing adequate education for the children. Furthermore, schools are located far away from homes and, together with low quality of schools, will prevent early enrollment or lead to early drop-outs [12].

Apart from the aforementioned description, the people of Timor-Leste are very kind. They friendly welcome the guest coming to their place, particularly to present some kind of food. It

may even be said that the number of foods provided for the guest is quite a lot. It may represent their habit that they normally have a lot of food. It is further confirmed that when they order the food in restaurant the quantity of food is about double compared with that normally consumed by Indonesian People. It happens in a number of restaurants, since when we order the food, the quantity of the food is big, which is enough consumed by two Indonesian people.

From this situation, it can be predicted that their habit on having food may lead to suffer from Diabetes Mellitus. People of Timor-Leste have less physical activity and some of them have no permanent job. Having excessive food in one hand and doing less physical activity on the other hand will lead them to have Diabetes Mellitus very quickly. As previously mentioned, that more than half of people with Diabetes Mellitus are undiagnosed. The number of medical service in Timor-Leste is about limited. Besides the equipment and facility that is inadequate, this medical service is not always open. Their location is also far while the public transportation service is not always available. These conditions make the people of Timor-Leste have minimum access to have their medical condition regularly checked. On the other hand, their knowledge about Diabetes Mellitus is limited such that they can anticipate preventing the disease. Since at the beginning stage this disease does not give any physical effect, they feel that everything is alright and nothing to worry about the disease. However, this disease will continue to achieve more serious level that may affect some medical complications. Considering the conditions, some attempts may be offered for the people of Timor-Leste including educating them to have better lifestyle to avoid Diabetes Mellitus and providing medical check to identify the possibility to suffer from the disease. These activities were carried for the people of Horai-Quic, Maubesi, Ainaro, Timor-Leste.

Ainaro is one of 13 municipalities of Timor-Leste, in the southwest part of the country. Based of 2010 census, the number of population at this district is 59,175 people occupying the area of 804 km². The capital of this district is city of Ainaro, a small mountain town [13]. The place of Ainaro is quite nice and natural. It has a great abundance of rivers and fertile terrain for agriculture. It has a coastal area, on the Timor Sea, but also mountainous zones, including the highest point in East Timor, Mount Ramelau (2,960 m), also known as Tatamailau, which lies near the border with Ermera. In this place, organic coffee and cinnamon are grown by people as the main commodities. People of Ainaro accept the religion of Catholic, Protestant and Islam and they live side by side.

2 Method

This research was conducted by the department of Hospital Administration, Kusuma Husada Medical Higher Institution Indonesia in collaboration with Universidade Oriental de Timor Lorosa'e (UNITAL). This research was performed in the form of observational study using cross-sectional method. This method was appointed since the measurement of variables is only done once at a specific time [14]. The reason is due to the researchers from Indonesia had limited time to visit the place and meet the participants. The method is also proven to be suitable to describe the correlation between variables based on instantaneous measurements/ observations. It may be noted that there is no need to measure all subjects at the same time. The correlation between variables may be constructed from their status at the observation time. This method includes the following steps:

    a.   Constructing the research questions and the related hypotheses,
    b.   Identifying independent and dependent variables,

c. Assigning research subjects (sample),
d. Carrying out measurements,
e. Analyzing the measurement results.

This activity involved some people of Horai-Quic as participant. They will get a presentation about Diabetes Mellitus and other related topics. They will also get the medical check on the level of blood glucose. It may be noted that the distance to the place from Dili is about 3 hours travelling by car. The road to the place is not quite good causing the journey takes longer time. The people of Horai-Quic life at some distance each other and dominantly life far from the venue of activities. Therefore, the number of participants is not high as expected.

The objectives to run the activities are:
a. Improving the knowledge of people of Horai – Quic, Maubesi, Ainaro, Timor Leste on DM therefore they enable preventing the disease,
b. Improving awareness to have better lifestyle to prevent Diabetes Mellitus,
c. Initial Diagnose on DM for the people and consultation on how to recover the disease.

The result of medical check will be analyzed to quantify the people who have glucose level 126 mg/dL or more. This number is based on American Diabetes Association 2020 for fasting condition [15]. The results are also used to give them advice what to do for avoiding any worse condition. Once they get the knowledge about Diabetes Mellitus and get the glucose level checked, they will anticipate not to suffer from the disease. They will also change their lifestyle better. They are also expected to spread information to the community about DM and how to anticipate suffering from the disease.

3 Results and Discussion

3.1 Results

For this research the number of participants coming for the activity was 47 persons including 26 males and 21 females, aged from 15 to 50 years. At the beginning, a presentation is given to the participants about Diabetes Mellitus and the factor of lifestyle affecting the occurrence of the disease. It might be described here that the people attending the presentation were very enthusiastic. Fig. 1 shows the participants of this program. From this activity, it may be seen that the people are very interested. It is not all the things about DM that they fully understand, and the presentation is beneficial for them. In particular, about the influence of lifestyle on the probability to suffer from the disease.

After getting the presentation about Diabetes Mellitus, the participants can proceed to the medical check on blood glucose level. For this purpose, the sample from their blood is taken and checked. The activity of taking the blood sample is shown in Fig. 2. For the activity of blood test, they were happy, even it seems to be new for them. The result of blood test is given in Table 1. The graphical presentation from the data is shown in Fig. 3. It may be observed that majority of blood glucose level of participant is over the borderline of 126 mg/dL.

Fig. 1 The participants of activity program pay attention for presentation

Along with taking the blood sample, the team did some interview and discussion with the participant regarding their habit and lifestyle. From this activity a set of primary data may be obtained for analysis. The blood test and interview are aimed to determine the prevalence number of Diabetes Mellitus and to describe the relationship between lifestyle and the possibility to suffer from the disease.

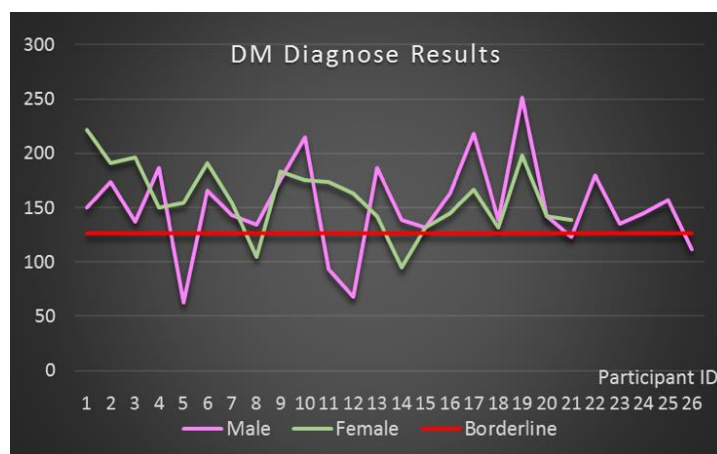**Fig. 2** The activity of taking blood sample for DM checking

Fig. 3 The result of DM Diagnose

Table 1. The result of blood glucose level

Participant ID	Blood Glucose Level	
	Male	Female
1	150	222
2	174	191
3	137	196
4	187	150
5	63	154
6	166	191
7	143	154
8	134	105
9	175	183
10	215	175
11	93	174
12	68	163
13	187	142
14	139	95
15	132	132
16	163	145
17	218	167
18	139	132
19	251	198
20	142	142
21	123	139
22	180	
23	135	
24	145	
25	157	
26	112	

The test on blood glucose level for the people of Horai-Quic provides the result that on average the level is higher than the border line. Classification based on gender gives the result that from 26 male participants, 21 of them have the blood glucose level higher than 126 mg/dL. For female participant, there are 21 participants and 19 of them are with blood glucose level more than 126 mg/dL. For the total 47 participants, 40 of them have the glucose level higher than the borderline. This is equivalent with 85.11%. The summary of blood test results is given by Table 2 showing that on average the blood glucose level of the participants is higher than borderline.

Table 2. The summary of blood glucose level test

Sex	Blood Glucose Level	
	Average	Maximum
Male	151.08	251
Female	159.52	222
Overall	154.85	251

It may again be stated that this research was conducted due mainly to the minimum research about the prevalence number of DM for the people of Timor-Leste. Therefore, no sufficient information is available in publication about this disease at Timor-Leste. This research is therefore aimed to provide information about the DM prevalence number of Timor-Leste people.

3.2 Discussion

The results of the blood glucose test carried out in the Horai - Quic, Maubesi, Ainaro, Timor Leste communities were quite high, i.e. 85.11% that the blood glucose was higher than the borderline of 126 mg/dL. With the results of laboratory assessment conducted at the time, it shows that many people have the probability to suffer from Diabetes Mellitus. This is due to the low level of education at the region, and also half of the population of Timor Leste is still illiterate so that information about Diabetes Mellitus is still lacking and very much needed. The enthusiasm of the community was seen by the large number of people who came, following the whole series of events until it was finished, no one left the venue before the event over. During the question and answer section, many of them asked questions.

The habits of the people of Timor Leste in terms of consumption patterns lead to Diabetes Mellitus. In the daily life of the people in Timor Leste they eat quite a lot. On some opportunities to eat in restaurants, it was found that they eat big portion of foods, maybe about twice of the food consumed by Indonesian. Many people embrace Catholicism and Christianity, and they consume pork. The pig is a livestock as a symbol of the establishment of the population. With this lifestyle, the energy is not used for activities so that people have the probability to suffer from Diabetes Mellitus

Diabetes Mellitus initially did not cause significant symptoms and signs, so that people did not realize that they had a big possibility for living with diabetes mellitus. The consumption pattern and lifestyle that are not modified or changed may lead to suffer from Diabetes Mellitus. Due to the lack of medical personnel and a lack of knowledge, the people of Timor Leste are unable to immediately aware about the disease and change their habits. An unhealthy lifestyle is also found in Timor Leste, namely the large number of people who smoke during the activity

If this situation continues, it is possible that the prevalence number of Diabetes Mellitus may not be controlled. People do not realize that the disease at this time can occur due to unhealthy diet and lifestyle. In addition, the lack of adequate health facilities has another problem for people who need health information, especially about Diabetes Mellitus. In Horai-Quic, there are health service centers such, but they open about once a month. Therefore, for those that need health services, they have to go to the health service at the city. It may require difficult transportation because the location is mountainous, and the roads are not really good. Meanwhile, the ideal health facility for Diabetes Mellitus should also be equipped with special hospice beds, as reported by Sodiq et al. [16].

4 Conclusion

The knowledge enhancement followed by medical assessment have been carried for the people of Horai - Quic, Maubesi, Ainaro, Timor-Leste. These are aimed to identify the rough prevalence number of Diabetes Mellitus and to draw the relationship between the lifestyle and the probability of suffering from Diabetes Mellitus. It was observed that the people of Timor-

Leste -in general- have food more than other people. The presentation about the disease and the related topics carried out for the people of Horai-Quic seemed to be useful and they were interested. Medical assessment for 47 participants identified 40 of them having blood glucose level higher than 126 mg/dL (85,11%). It was discovered that they are not aware that they suffering from Diabetes Mellitus since no physical problem that they are experiencing. This confirms the previous researches that more than half of people with Diabetes are undiagnosed. It might also be suggested that lifestyle has close relationship with suffering from Diabetes Mellitus and moving toward healthier lifestyle is therefore necessary. This will prevent the disease as well as recover it, for those already suffering from the disease.

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