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Determinant of Diabetes Mellitus Focusing on Differences of Indonesian Culture: Case Studies in the Java and Outer Java Region in Indonesia

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Abstract:

Background:

In 2017, Indonesia was ranked 6th in the world, with 10.3 million DM sufferers. Indonesia consists of many islands with diverse communities, diverse social and cultural environments, which allow different factors to affect the increasing number of DM cases.

Objective:

This research objective is to analyze the differences in the factors of the social environment, cultural environment, knowledge and behavior that are potential to DM in Java and outside Java.

Methods:

This research uses a quantitative approach with independent sample t-test data analysis techniques. The population was DM type 2 patients, with a sample size of 294 people. The technique was to determine the sample by accidental sampling in patients who seek treatment during prolanis (chronical disease management program) activities. The independent variables consist of social environment, cultural environment, knowledge and behavior. The dependent variable is DM disease. Data is equipped with qualitative data.

Results:

The results showed that there were differences between Javanese and Outer Java respondents on social environmental factors (t value 6.682), cultural environment (t value 5.752), knowledge (t value 7.079) and behavior (t value 16.579) with each Sig 0.000 value. All factors that are variables in this study have higher values in the Java region compared to those outside Java, and the highest difference is in the social environment variable (average difference of 3,979), which has an effect on very high behavioral differences (average differences average 6,037).

Conclusion:

It can be concluded that there are differences in the social environment, cultural environment, knowledge, and behavior that influence the incidence of diabetes mellitus in Indonesian society.

Keywords: Diabetes Mellitus, Social culture, Behavior, Island, Lifestyle, Cultural environment, Knowledge.

1. INTRODUCTION

Diabetes Mellitus (DM) is considered as a non-communicable disease and is also a metabolic disease characterized by chronic hyperglycemia due to impaired insulin secretion, insulin performance or both [1 - 5]. DM patients cannot absorb glucose properly, so glucose builds up in the blood and causes hyperglycemia. The number of DM patients is increasing every year, in 2017, DM patients in the world reached 425 million and it is estimated that in 2045 it will reach 629 million [6 - 9]. The world health agency predicted an increase in the number of people with DM in Indonesia, from 8.4 million in 2000 to around 21.3 million in 2030 [10 - 13]. In 2017, Indonesia also ranked 6th in the world, with 10.3 million sufferers, and 73.7% of people with DM in Indonesia do not realize they have DM [6, 14]. Most cases of DM in the world are DM type 2 [15, 16], which is DM that occurs because the amount of insulin produced is likely to be normal or decreased and there is a decrease in tissue sensitivity in responding to insulin. The cause of this type 2 diabetes is a lifestyle, especially food consumption and lack of physical activity [2].

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Diabetes is a major cause of blindness, heart attacks, stroke, kidney failure and amputations [17 - 19]. While diabetes and complications are the third leading cause of death in Indonesia [20, 21]. In 2013, DM caused one of the biggest health expenditure expenses in the world, which was around 11% of total health expenditure [22, 23]. From 2010 to 2030, losses from Gross Domestic Products worldwide due to DM are estimated at around 1.7 trillion dollars [24 - 27]. DM is ten years faster in the Southeast Asian Region than in people from the European region, and mostly occurs at productive ages. The large medical expenses result in economic pressures and family financial burdens, thereby increasing the severity of symptoms and grievance in people with diabetes [28, 29].

Modifiable risk factors for diabetes are closely related to unhealthy behavior, namely overweight [30 - 34], abdominal obesity [35 - 40], lack of physical activity [41 - 45], unhealthy diet [46 - 50] and smoking [50, 51], which can arise due to lack of knowledge, social environment, and cultural environment [52 - 61].

The novelty of this study begins with the thought that Indonesia, which is made up of many islands with diverse communities and diverse social and cultural environments, allows different factors to influence the increasing number of DM cases. As illustrated in the picture of the top 10 regions with the most DM cases in Indonesia in 2013, where 4 areas were in Java and 6 other regions were outside Java. The results of a study stated that various socio-cultural and psychosocial problems are factors that play an important role in the incidence of diabetes and cause diabetes treatment to be ineffective [62, 63]. The results of this research are also considered to be related to interventions that manage to reduce DM cases in various regions. This research objective is to analyze the differences in the factors of the social environment, cultural environment, knowledge and behavior that are potential to DM in Java and outside Java.

2. METHODS

The research was conducted in Semarang for Java and in Gorontalo for outside Java, based on the top 10 regions with the most DM cases in Indonesia. This research used a quantitative approach by using independent sample t-test data analysis techniques. The population was type 2 DM sufferers, the sample size was calculated by the formula given by Naing *et al*. [64], and a sample of at least 140 people was determined

for each region, so that the total sample at the end of the research was 294 people. The technique was to determine the sample by accidental sampling in patients seeking treatment during prolanis activities at the Public Health Center (Puskesmas), so that the determined sample criteria are DM type 2 patients who come to prolanis activities, can communicate well, and are willing to be respondents in this study.

The independent variables consist of 1) social environment (in the form of relationships formed as a result of interactions between individuals and individuals or groups of people, in the form of aspects of help, mutual assistance, a sense of family and family relationships), cultural environment (in the form of habits, values, beliefs, myths that affect the incidence of DM), knowledge and behavior. The dependent variable is DM disease. The instruments used consisted of questionnaires, checklist sheets and observation sheets. The data obtained, in addition to quantitative data, also includes qualitative data. The validity and reliability test of the questionnaire was carried out on the question / statement item using the Cronbach Alpha coefficient formula, with samples in DM patients at other health centers who were not used as research samples. This study uses a quantitative approach, and because the data is normally distributed, then the data analysis is performed with an independent sample t-test.

The process of data collection was approved and permitted by the Medical and Health Research Ethics Committee (HREC) Universitas Negeri Semarang with the number 022/KEPK/EC/2019.

3. RESULTS

Semarang is located on the island of Java (with an area of $128,297$ km^2), while Gorontalo is located on the island of Sulawesi (with an area of 174,600 km2) which includes 5 large islands in Indonesia. Java island is an area where there is the Capital City of the Government of Indonesia, besides that, in Java, there are also 5 provinces, and Semarang is the capital of Central Java Province. Whereas Sulawesi Island has 6 provinces and Gorontalo is the capital of Gorontalo Province.

3.1. Respondents Characteristics

Characteristics of respondents in this research include age, gender, education level and income (Table **1**).

Table 1. Respondents characteristics.

Characteristics	Category	Java		Outside Java	
		n	%	n	%
Age	15-25 years	0	0	37	24.7
-	26-35 years	4	2.8	21	14
-	36-45 years	12	8.3	24	16
-	46-55 years	40	27.8	41	27.3
-	56-65 years	59	41	20	13.3
-	>65 years	29	20.1	7	4.7
-	Total	144	100	150	100

(Table 1) cont.....

Characteristics	Category	Java		Outside Java	
		n	**%**	**n**	**%**
Gender	Male	33	22.9	62	41.3
	Female	111	77.1	88	58.7
-	Total	144	100	150	100
Education level	No formal education	8	5.6	1	0.7
	Elementary school uncompleted	18	12.5	0	0
-	Elementary	44	30.6	35	23.3
-	Junior High	28	19.4	31	20.7
-	Senior High	38	26.4	62	41.3
-	Graduate	7	4.9	21	14
-	Post Graduate	1	0.7	0	0
-	Total	144	100	150	100
Family Income	< IDR 1.000.000	70	48.6	95	63.3
	> IDR 1.000.000 - IDR 2.000.000	49	34	37	24.7
-	> IDR 2.000.000 - IDR 3.000.000	15	10.4	12	8
-	> IDR 3.000.000 - IDR 4.000.000	3	2.1	4	2.7
-	> IDR 4.000.000 - IDR 5.000.000	5	3.5	1	0.7
-	> IDR 6.000.000- IDR 7.000.000	2	1.4	0	0
-	> IDR 7.000.000	0	0	1	0.7
-	Total	144	100	150	100

Table 2. Results of differences in variables of social environment, cultural environment, knowledge and behavior in java and outside java.

Social Environment	N	Mean	Average Difference	t-count	sig.
Java	144	22.465	3.979	6.682	0.000
Outside Java	150	18.487			
Cultural Environment	N	Mean	Average Difference	t-count	sig.
Java	144	10.910	2.356	5.752	0.000
Outside Java	150	8.553			
Knowledge	N	Mean	Average Difference	t-count	sig.
Java	144	30.194	3.154	7.079	0.000
Outside Java	150	27.040			
Behavior	N	Mean	Average Difference	t-count	sig.
Java	144	25.250	6.037	16.579	0.000
Outside Java	150	19.213			

The characteristics based on the age of respondents in the Java region were mostly 56-65 years old (41%), andrespondents outside the Java region were mostly 46-55 years old (27.3%). The characteristics based on gender in the Java region were mostly women (77.1%) and regions outside Java were mostly women (58.7%). Based on the level of education in Java, there were mostly elementary school graduates (30.6%) and those outside Java were mostly high school graduates (41.3%). Based on the income of the Javanese family, it was mostly less than IDR. 1 million (48.6%) and the regions outside Java were mostly less than IDR. 1 million (63.3%).

3.2. Differences in Social Environment Variables, Cultural Environment, Knowledge and Potential Behavior of DM in Java and Outside Java

Based on Table **2**, the difference in the average value of the variable scores on respondents in Java and outside Java is 3.979 (social environment), 2.356 (cultural environment), 3.154 (knowledge), 6.037 (behavior), and based on the results of the independent t-test, we get conclusions as follows: 1) there are differences in social environment variables between Java respondents and those outside Java. 2) there are differences in cultural environment variables between Java respondents and those outside Java. 3) there are differences in knowledge variables between Java respondents and those outside Java. 4) there are differences in behavioral variables between Java respondents and those outside Java. Based on the average difference of each variable, it is known that the behavior variable has the highest average difference between Java and outside Java compared to other variables, and overall, the average value of each variable is higher in the Java area.

In this study, the results of the qualitative data obtained are:

The existing social environment in the form of: sharing

knowledge or health information from members of the community, helping one another among community members in a state of illness and needing help, a sense of caring for the circumstances of the neighbors around them. In Java, this social environment still seems strong, whereas outside Java, the community is more likely to have high ego values.

The cultural environment in the form of: eating habits with a large portion of carbohydrates, like foods with a sweet taste, lack of physical activity, cannot manage stress properly, healthy conditions do not have the highest value, trust, there is still dependence or dominance with drugs, herbal medicines.

In Java, the main carbohydrate that is the staple food is rice, while outside Java, besides rice, it also consumes cassava or corn, sometimes also sago to replace rice.

4. DISCUSSION

The social environment, cultural environment and knowledge between Java and outside Java respondents are statistically different. The existing social environment in the form of: 1) the sharing of knowledge or information from members of the community including health and diabetes related issues, 2) if there are sick people in their environment and need help, then community members will help so that health problems that occur immediately can be overcome, 3) a sense of caring in their environment, such as visiting the sick, motivating to seek treatment, because they feel they are still part of the family in the sense of living in the same area or the same RT. The environment is a factor that can suppress the emergence of DM cases. In Java, this social environment still seems strong, especially in rural or suburban areas, while outside Java, the community tends to be more independent or with a higher ego value, this causes the social environment to be the factor that has the highest difference between Java and outside Java. Deari's research results stated that there are social structures, such as family networks and church groups, very strong in Fiji that have the potential to increase understanding of changes in healthy lifestyle behavior, for the prevention of DM cases that appear to be increasing [65].

The cultural environment that has the potential for the emergence of DM cases in this research is in the form of habits, values, beliefs that will directly affect the incidence of DM. The cultural environment in the form of: 1) eating habit in large quantities with a large portion of carbohydrates and like sweetness, lack of exercise or physical activity, providing less rest time or sometimes excessive and sometimes less, and cannot manage stress properly, 2) the value associated with DM in the community has not been a concern, such as being healthy does not have the highest value, so a person does not maintain his lifestyle with healthy food and proper portion, adequate exercise, 3) trust in treatment, where the community is still dependent or dominant with herbal medicines that are known based on information from the environment and various media. In Java, the main carbohydrate source is rice which is consumed in large quantities, while outside of Java, besides rice, cassava or corn is consumed as the source, sometimes also sago. The results found that eating habits related to culture in one area were related factors in the prevention and treatment of DM type 2 [66].

Herbal medicines and similar ones (traditional herbs and treatments) for regions outside Java are of more variety. The results of research in the City of Swahili Lamu, Kenya, found that herbal medicine was an important component for the treatment of diabetes in the community. The effect of education, economic and cultural status and the possibility of health services that are not easily accessible or unreachable, is a system of mutual influence, so holistic thinking to address the increasing number of cases of DM and treatment of DM patients is an important consideration [67]. On the other hand, research in Sudan stated that there is also a belief that honey is considered by fundamentalist Muslims as a 'cure' for all diseases, including diabetes, which can adversely affect the glycemic control of diabetic patients [68].

The tradition lived will relate to culture, lifestyle and family responsibilities, which must be a very important concern in the context of treatment efforts and care for people with DM [69]. As well as the traditions exist in the regions of Java and outside Java, each with a different social and cultural environment that forms a lifestyle that has the potential for the emergence of DM cases in the community. Other research that affirms the results of this study was the high incidence of DM Type 2 in the population of Latin American society, which was likely due to a combination of genetic vulnerability factors, lifestyle and culture. Other research also confirms that interventions addressing social and cultural issues are generally more effective [70].

A research conducted by Dariush found that in people with 4 risk factors of low-risk lifestyle (physical activity, eating patterns, smoking, and drinking alcohol) had an 82% lower incidence of diabetes. When a good body mass index is added to the other 4 low-grade lifestyle factors, the incidence of DM was 89% lower. Overall, 9 out of 10 new cases of diabetes emerged due to these 5 lifestyle factors [70]. Cultural elements in the form of beliefs or cultural values are important factors that can affect the health status and the care process and the results of care for people with DM [71]. In the United States, cultural beliefs, practices, and attitudes have been demonstrated to have a vital role in diabetes Self-management Behavior (SMB) among African Americans, Asian Americans, and Mexican Americans. Studies among these populations have ascertained the effectiveness of tailoring self-care behavior to the cultural needs of the community in question [72 - 75]. People in Swahili Kenya also have a unique set of cultural beliefs and practices that play a vital role in matters related to health, illness, and well-being [67, 76]. Besides that, the differences in race, ethnicity and tradition can affect differences in health treatment and health care [77 - 79]. Although the results of other research stated that the level of education related to the knowledge is a more dominant factor related to the DM case, rather than the factor of ethnic differences [80].

Community's knowledge can help to assess causes, risk of diabetes and motivate them to seek proper treatment and care [81]. The community's knowledge related to DM can be affected by regions in different island conditions. In this study, respondents' knowledge was higher in the Java Island area (an average of 30.194) compared to those from outside Java (an

average of 27.040). Java is an island that is located closer to the center of the State government, so that information, technology, health infrastructure facilities are more easily accessed, including related to existing health promotion. Knowledge related to DM will have an impact on a person's behavior or lifestyle that is potentially positive or negative for DM. Research results in Saudi, as well as most research results, concluded that most DM patients have low knowledge related with risk factors and complications of DM [82], whereas, in Pakistan, it was found that knowledge about diabetes risk factors, management, and care in DM sufferers is low [83]. A healthy diet carried out along with physical activity will reduce the risk of DM by 45%, despite having a family history of diabetes. Therefore, efforts to increase knowledge to promote healthy lifestyles are a very important part or need to get attention [82]. The result of other research mentioned knowledge is a factor that needs to be considered in developing prevention and treatment programs for type 2 diabetes in culturally diverse populations and reducing inaccuracies in health care [83]. According to Trisha G, individual education to increase knowledge must be complemented by interventions at the community level to overcome socio-cultural constraints that exist in an area [84].

The result of this research gets a view that knowledge related to DM in Java and outside Java has a difference in the average value of 3.154 and the average value of knowledge is higher in the Java area. Even if we look closely at the description of the education level of respondents in areas outside of Java, they have the highest percentage at the high school level (41.3%) or higher than the Java region at the elementary level (30.6%). This situation was possible because the people in Java were in the central area of government and the center of technological development, so that various information and health services were easier to obtain.

Social environment, cultural environment and knowledge are interrelated factors. All factors that are variables in this research have higher values in the Java region compared to those outside Java, and the highest difference is in the social environment variable (average difference of 3.979), which has an effect on very high behavioral differences (average differences average 6.037). The results showed that these factors are closely related to the behavior of a person who forms his lifestyle, particularly an unhealthy one, which facilitates the onset of symptoms of DM, such as lack of physical activity, unhealthy eating habit, smoking, overweight and abdominal obesity [58, 59]. Various socio-cultural and psychosocial problems are factors that play an important role in the incidence of diabetes and cause the treatment to be ineffective, which needs to be holistically understood [62, 63]. This finding is also aligned with the result of research which stated that, family support and the role of relatives are very valuable to improve medical adherence or have an important role in the curing process of the disease [28, 29, 85]. Whereas lifestyle is the main reason for the increase in diabetes cases [62, 86 - 88].

CONCLUSION

From the results of the study, it can be concluded: there are

differences in the social environment, cultural environment, knowledge and behavior between Java respondents and those outside Java. Social environment, cultural environment and knowledge are factors that are interrelated with the behavior and emergence of DM cases. All factors that are variables in this study have higher values in the Java region compared to those outside Java, and the highest difference is in the social environment variable (average difference of 3.979), which has an effect on the very high behavioral difference (average difference average 6.037).

ETHICS APPROVAL AND CONSENT TO PARTI-CIPATE

This study was approved by the Health Research Ethics Committee (HREC) of Semarang State University , Indonesia with document number: 022 / KEPK / EC / 2019.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Written informed consent was obtained from all the participants prior to publication.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of the article is available in the SIMLITABMAS (Research and Community Service Information System) Ministry of Research, Technology, & Higher Education of the Republic of Indonesia which can be accessed at http://simlitabmas.ristekdikti.go.id/, with the document number 192 / SP2H / LT / DRPM / 2019.

CONFLICT OF INTEREST

The author declares no conflict of interest, financial or otherwise.

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