Comparison of Determinants Medication Adherence on Diabetes Mellitus Type 2 Patients in Island Area of Barrang Lompo Public Health Center and In Non-Island Area of Antang Public Health Center at Makassar City In 2017

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Abstract: *The increasing number of deaths from Diabetes mellitus is associated with poor management of diabetes itself. One of it is the usage of diabetes' drugs. So that it requires adherence in medication of diabetes. The adherence's issue of therapy is a hard and serious medical problem which faced by the health professionals in both island and non-islands. This research aims to obtain information about the relationship and the difference of determinant of medication adherence toward people with Diabetes Mellitus Type 2 (DMT2) in the island and non-island of Makassar City in 2017. Type of this research is cross sectional study. Population of this research was all DMT2 in the island and non-island of Makassar City in 2017. The sampling method conducted by proportionate stratified random sampling which obtained 158 of samples, including 31 samples in the island area of Barrang Lompo Public Health Center and 127 samples in non-island area of Antang Public Health Center. The data analysis consisted of univariate analysis, bivariate analysis with chi square test, differentiation analysis with mann whitney test, and multivariate analysis with logistic regression. The results showed that the adherence in the island area is 61.3% while in the non-island region is 63.0%. The factors which associated with the adherence of medication to diabetes mellitus type 2 in island region was Health Locus of Control (HLC) internal (p = 0.008), whereas in non-island area was complication of DMT2 (p = 0.003), HLC internal (p = 0.000), and family support (p = 0.000). Age and education level are not associated with DMT2 medication adherence in both areas. Education level (p = 0.000) became a different determinants of medication adherence in island and non-island areas.*
Keywords : *Medication adherence, Diabetes Mellitus Type 2, Island Area, Non-Island Area.*

I. INTRODUCTION

The case of diabetes in adults has increased in the last two decades. Starting from 108 million in 1980 to 425 million by 2017 and have been estimated this year 1.6 million of deaths directly caused by diabetes and it is estimated increase by 3.3% in 2030 from 1.9% in 2004[1]. The number of the direct deaths caused by diabetes in Indonesia by 2016 is about 99.4 thousand and currently diabetes is the number 3 of the death cause in Indonesia. While in Makassar, diabetes mellitus was fourth rank of disease that causing death[2,3]. If not handled nicely, this condition could lead to decreased of productivity, disability, and premature death[2]. The increasing cases of deaths due to diabetes proved that it is still low in controlling of diabetes.

Lifestyle modification is an important step in controlling blood glucose as a factor of causing diabetes. But most of diabetics still find it difficult to apply lifestyle modifications[4]. Therefore, a more rapid method of controlling blood glucose is needed. Taking medicine is very important in the management of diabetes mellitus, especially diabetes mellitus type 2 (DMT2). So that it required adherence in diabetes therapy. The issue of adherence to therapy is a difficult and serious medical problem which faced by the health professionals. WHO has reported that 50% of patients with chronic illness do not take their medicines as prescribed by the doctor[5].

The problem of health disparity between the island and non-island area is one of health problems that still need special attention. This could happen because of several differences in infrastructure, population characteristics, and socio-economic issue. In addition, disparity inter-regions could occur because the population which living in small islands clusters have several issues like limited means of transportation, information and communication, so tend to have lower health status than non-island or urban areas[6].

In complying a series of medication action routinely is basically not an easy thing to run and great challenge to avoid the complications. Several researches have shown that pharmacological medication could reduce the morbidity and mortality which associated with long-term or lifelong medication.

Medication adherence is the most decisive thing to achieve good outcomes for patients with chronic disease conditions. For those with diabetes, the adherence towards medication was associated with better risk factor control, lower hospital admissions, lower health care costs, and lower mortality rates[7]. The estimates of adherence towards medication of diabetes vary greatly, depending on the population under study and how adherence is defined. Several research results related to adherence medication of DMT2, stated that the proportion of non-adherence of patients with diabetes mellitus towards medication which conducted in several research areas ranged between 25% - 60%[8].

This research categorizes the determinants of adherence towards medication of diabetes mellitus in patient factors and external factors. The patient factors consist of age, education level, health locus of control (HLC), complication of DMT2. 1 year age decrease increases the possibility of non adherence, and this condition can be explained from several other studies which showing that the older patient's age, the higher medication is[4,8,9]. High levels of HLC internal and external, education, and as well as the presence of complicating diseases could improves patient medication's adherence[4,10,11]. Family support in this research is investigated as an external factor. 'Living with others' has a positive effect on medication's adherence. In addition, for patients without family support is 2 times more risk to not to adhere towards the medication of diabetes mellitus[12,13].

II.   MATERIALS AND METHODS

The type of the research which used in this study is observational-analytic with cross sectional study design. This research was conducted in March - April of 2018, in Barrang Lompo Island and for non-island area is in the working area of Antang Public Health Center. The population of this research were all diabetes mellitus type 2 (DMT2) patients who visited Barrang Lompo Public Health Center and Antang Public Health Center in 2017, with 267 patients in medication process and aged $\geq$ 25 years. Sampling was conducted by proportionate stratified random sampling to obtain 158 samples including 31 samples in the island area of Barrang Lompo Public Health Center and 127 samples in non-island area of Antang Public Health Center. Respondents who are not permanent residents in the work area of the public health center, or pregnant, will not be used as the research's samples. Interviews were conducts to obtain patient demographic data, complications of diabetes mellitus, Health Locus of Control (HLC), family support and adherence assessment through Morisky Medication Adherence Scale-8 (MMAS-8).

The HLC questionnaire uses Multidimensional health locus of control scales (MHLC) with Aber form where there are 18 number of questions, consisting of 6 questions for internal HLC and 12 questions for external HLC. Family support questionnaire uses Hensarling Diabetes Family Support Scale (HDFSS). The classification of adherence rate is based on the total score of MMAS-8, ie the score <6 is categorized as less adherent, the score of 6 - 8 is categorized as adherent. The validity test of MMAS-8 questionnaire has been done on previous research which consist of 23 DM patients with Pearson Product Moment test result got r> r table (0,3) in each question. Reliability test using KR-20 (Kuder-Richardso 20) and obtaining reliability value from the questionnaire of 0.76[14].

III.   STATISTICAL ANALYSIS

Data analysis was performed using Statistical Package for Social Science (SPSS) version 16.0.1. The basic descriptive statistics use the mean and standard deviation for numerical data variables such as; age, HLC score, and family support. Categorical data such as education level and complications of diabetes mellitus are expressed in terms of frequency and percentage. The chi-square test was used to examine the relationships and the differences between independent and dependent variables in island and non-island area. The mann whitney's test is used to test the difference of variable which has ratios scale; age, internal HLC score, external HLC, and family support. Statistical significance is accepted at 95% credence level. Logistic regression analysis was performed to identify factors which related to adherence and in accordance with the covariates. Analysis of the variables in which P-value <0.25 will be proceed to logistic regression model analysis using the stepwise backward Likeward Ratio (LR) method, so that factors that significantly influence the medication adherence can be identified.

IV.   RESULTS

Diabetes Mellitus type 2 (DMT2) patients, both in the island area (61.3%) and non-island area (63.0%) were mostly adhere towards medication. The percentage of patients with DMT2 that not adhere the medication was greater in the island area (38.7%) than non-island areas (37.0%). The mean age of DMT2 patients in the island area was 54.97 ($\pm$ 9.74) years (min-max: 32 - 73 years) where a small portion of respondents aged $\leq$ 40

years (9.7%), and most were 40-64 years old (74.2 %), while the mean age of DMT2 patients in non-island areas was 56.18 (± 8.55) years old (min-max: 28 - 72 years) where age of ≤ 40 years old (4.7%), 40-64 years old (77.2%), and ≥ 65 years old (18.1%).

The education of the respondents in the island area is largely finished their primary school were (61.3%) whereas in the non-island area most of the respondents graduated from high school (33.1%). Respondents in the island area (74.2%) and non-island (70.9%) mostly have complication disease. The most common DMT2 complication in the island area were hypertension, cholesterol, and uric acid is (12.9%) while in non-island were hypertension is (22.8%).

The score of the Internal Health Locus of Control (HLC) for the average respondent in the non-island area is 69.38% of the total score (36), this percentage is higher when compared with the island area with 62.91%. The percentage of family support was also higher in non-island area, ie 60.3% of the total score (116) compared with the percentage in the island area of 58.5%.

Internal HLC variables correlated significantly (p = 0.008) toward DMT2 medication adherence in the island area. The DMT2 complication variables (p = 0.003), internal HLC (p = 0.000), and family support (p = 0.000) were significantly correlated with DMT2 medication adherence in non-island areas. There are differences in education level (p = 0.000) and internal HLC (p = 0.015) on medication adherence between island and non-island area.

The results of logistic binary regression analysis showed that DMT2 patients in the islands had low internal HLC 18.8 (95% confidence interval [CI]: 1.927-184.290) times for not adhere toward medication in compared with DMT2 patients who had high internal HLC. Low family support has the greatest impact on non adherence toward DMT2 medication, where for non-island area there are 5,257 times compared to patients with DMT2 who have high family support. Overall, however, the presence of DMT2 complications, internal HLC and low family support had 67% probability of increasing non adherence.

Education level, both in island and non-island area, is considered as the most different determinant of 10,059 times compared with other determinants of DMT2 medication adherence. The educational level has probability toward the difference of DMT2 medication adherence, where in the island area of Barrang Lompo public health center was 34.7% and the non-island area Antang's public health center was 82%.

Table 1. Determinants of Medication Adherence on Diabetes Mellitus Type 2 Patients in Island Area (n = 31)

Determinants	Medication Adherence				p-value
	Less Adherent		Adherent		
	n	%	n	%	
Age					
≤ 45 Years	3	75.0	1	25.0	0.272
> 45 Years	9	33.3	18	66.7	
Education Level					
Low	11	40.7	16	59.3	1.000
High	1	25.0	3	75.0	
Complications of DMT2					
Yes	10	43.5	13	56.5	0.433
No	2	25.0	6	75.0	
Internal HLC					
Low	9	64.3	5	35.7	0.008*
High	3	17.6	14	82.4	
Eksternal HLC					
Low	7	50.0	7	50.0	0.242
High	5	29.4	12	70.6	
Family Support					
Low	9	50.0	9	50.0	0.129
High	3	23.1	10	76.9	

Note: *chi square test; significant at P < 0.05.

Table 2. Determinants of Medication Adherence on Diabetes Mellitus Type 2 Patients in Non-Island Area (n = 127)

Determinants	Medication Adherence				p-value
	Less Adherent		Adherent		
	n	%	n	%	
Age					
≤ 45 Years	4	36.4	7	63.6	1.000
> 45 Years	43	37.1	73	62.9	
Education Level					
Low	26	28.9	64	71.1	0.962
High	21	56.8	14	43.2	

	n	%	n	%	
Complications of DMT2					
Yes	26	28.9	64	71.1	0.003*
No	21	56.8	14	43.2	
Internal HLC					
Low	22	68.8	10	31.2	0.000*
High	25	26.3	70	73.7	
Eksternal HLC					
Low	24	40.7	35	59.3	0.425
High	23	33.8	45	66.2	
Family Support					
Low	42	50.0	42	50.0	0.000*
High	5	11.6	38	88.4	

Note: *chi square test; significant at P < 0.05.

Table 3. Differences in Medication Adherence, Level of Education, and Complications of DMT2 in Diabetes Mellitus Type 2 in Island and Non-Island Area (n = 158)

Variables	Island		Non-Island		p-value
	n	**%**	**n**	**%**	
Medication Adherence for DMT2					
Less Adherent	12	38.7	47	37.0	0.861
Adherent	19	61.3	80	63.0	
Education Level					
Low	27	87.1	51	40.2	0.000*a
High	4	12.9	76	59.8	
Complications of DMT2					
Yes	23	74.2	90	70.9	0.713
No	8	25.8	37	29.1	

Variables	Island	Non-Island	p-value
	Mean (± SD)	**Mean (± SD)**	
Internal HLC	22.65 (± 4.51)	24.98 (± 4.87)	0.015*b
Eksternal HLC	43.90 (± 8.19)	42.86 (± 6.38)	0.628
Family Support	69.97 (± 12.22)	67.95 (± 11.25)	0.375

Note: *a: chi square test; significant at P < 0.05.
    *b: mann whitney test; significant at P < 0.05

Table 4. Multiple Logistic Regression Analysis of Determinant Medication Adherence of Diabetes Mellitus Type 2 in Island and Non Island Area

Variables	B	Wald	Sig	Exp (B)	95 % CI	
					LL	**UL**
Island Area						
Internal HLC	2.936	6.369	0.012*	18.843	1.927	184.290
HLC Eksternal	1.989	2.946	0.086	7.310	.754	70.858
Constant	**-2.899**	**6.195**	**0.013**	**0.055**		
Non-Island Area						
Complications of DMT2	-1.048	5.342	0.021*	0.351	0.144	0.853
Internal HLC	1.590	11.035	0.001*	4.901	1.919	12.520
Family Support	1.660	8.850	0.003*	5.257	1.762	15.687
Constant	**-1.495**	**6.322**	**0.012**	**0.224**		
Island and Non-Island Area						
Education Level	2.308	16.663	0.000*	10.059	3.320	30.473
Constant	**-2.944**	**32.945**	**0.000**	**0.053**		

Note: The final model was tested for goodness-of-fit by the Hosmer–Lemeshow test.
    significant at P < 0.05.

V.   DISCUSSION

Medication adherence of DMT2 in the island and non-island comprises > 35%, but has different determinants. This is due to differences in individual characteristics and characteristics of the area on island communities and non-island communities. Island communities are synonymous with a lack of knowledge and awareness of health and still have a high level of trust. The equations of behavior and socio-economic was impacted on the view of health. on the contrary, the population in the non-island area consists of people with various behaviors.

Age and education level have no relationship with medication adherence on patients with DMT2 in island and non-island area. Several researches have also shown similar results[15]. Several previous researches also have inconsistent results regarding age and education level of medication adherence. However, this

research indicates that there is a significant difference between education level of the respondents in the island and non-island area on DMT2 medication adherence. Island communities tend to not to pay much attention to education, due to the lack of facilities and the ability of the community to attend the school. The problems that occur in the outermost small islands are relatively isolated and distant from the main island and was limited to educational facilities[16]. Most of the respondents in the island did not complete their primary school education, only a small percentage graduated from junior high school. While in non-island area most of the respondents graduated from high school.

Complications of DMT2 were only related in non-island area. Respondents who had complications were largely adhere to the medication of DMT2, this is because the respondents who had complications did not want to increase other complications, so they remained adhere in the medication. Diabetics only want to change their behavior when they have DMT2 complications[17]. However, the researches that show the opposite result that the presence of complications or other diseases make patients often do not adhere the dietary recommendations and the medication which provided[4,18].

Internal Health Locus of Control (HLC) is significantly related with DMT2 medication adherence in island and non-island area, as well as having differences in both areas. Communities in non-island area have higher awareness and have the ability to manage their health than island communities. In contrast, external HLCs have no significant association with DMT2 medication adherence in island and non-island area. The external HLC of DMT2 patients in the island area was higher than non-island, but there was no significant difference, as well as no external HLC difference in both areas. The island community still believes that controlling over their health is determined by others who are more powerful, fate, opportunity and luck. Patients with high internal HLC are more willing to adhere to medication recommendations because they believe that the development of the disease can be controlled by themselves compared to locus of control external powerful others and chance[11,19,20].

There is no relation between family support and DMT2 medication adherence in the island region, whereas in non-islands there is a relationship. Family support in non-island area is in line with other researches which proves that good family support or family support have a strong power to generate patient's behavior that is adhere to the medication of DMT2[13,21,22]. There is no difference of family support in both areas. Family support which given to the people with DMT2 in both island and non-island area is largely support for food control and encourage several physical activities, the management of diabetes mellitus from the families of the respondents has an impact on improving the medication adherence. The absence of a familial support relationship with DMT2 medication adherence in the island area is largely due to respondents admitted that families often support respondents to be adhere in medication but respondents remain not to adhere. The adherence of respondents in the island area is more influenced by internal factors or motivation of respondents.

This research has several limitations. The small samples size in the island area has affected the results of the research. Different responses may occur between patients with DMT2 at two areas in answering the questions that related to the medication adherence. The variable of DMT2 complications in this research is still lacks in explaining about the kinds of complications specifically to DMT2 medication adherence in both island and non-island areas.

VI. CONCLUSION

This study provides a number of information upon the health professionals related to the determinants of adherence in diabetes mellitus medication accordance with the target of health facilities in each area. Internal Health Locus of Control (HLC) is considered to be most associated with non adherence of DMT2 medication in island area with low awareness and individual motivation of patient itself. Family support in non-island area is lower than island area, so that family support greatly affects the medication adherence in non-island area. The determinants which can be considered as the basis of the differences in adherence levels in both island and non-island areas in this research is the education level. In fact, most of the DMT2 patients in the island area is have lower education level than non-island area.

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