International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 08, 2020
ISSN: 1475-7192

# The Impact of Diabetes Mellitus Gym for Controlling the Level of Blood Glucose (HbA1c)

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***ABSTRACT***--- *Diabetes Mellitus (DM) is a chronic progressive disease. Based on Health Department of Republic Indonesia (2016) was reported that DM prevalence increase from 1,1% (2007) to 2,1% (2013). There are four aspects for controlling DM such as education, arrange of nutrition, practice, and drug compliance (Health Department of Republic Indonesia, 2016). This controlling is aim to increase the quality of life for DM patients. This study is aimed to know the impact of DM gym for controlling the level of blood glucose (HbA1c). Type of this study is an experimental study by static pretest and posttest with control groups design. Respondents of study were DM patients in area of Puskesmas II Sokaraja. The number of samples were 26 respondents. The measurement was done by using questioner and blood glucose check (HbA1c) for pre and posttest. The analysis was used t test. Majority of respondents were female, almost all of respondents educational were basic education (SD and SMP), majority of respondents were 35. 60 years old, majority of respondents were unemployed, and majority of respondents suffering from DM were in middle duration (1-5 years). DM gym can decrease the level of HbA1c for 1,79 mg/dl (p=0,00) from intervention group and 0,63 mg/dl (p=0,00) from control group. The analysis of t test show that DM gym can control the level of blood glucose (HbA1c) significantly (p=0,00). DM gym can control the level of blood glucose (HbA1c). Health staffs need to increase motivation of public in doing DM gym regularly.*

***Keywords***--- *DM gym, HbA1c*

## I. INTRODUCTION

The death that was caused by non-communicable disease was predicted increase in over the world. The highest incidence will occur in poor and development countries. More than two-thirds (70%) of global population died because of non-communicable disease. In 2030, there will be 52 thousands people died every year because of non-communicable disease. It increase 9 thousands of 38 thousand people nowadays (WHO, 2010).

The prevalence of non-communicable disease are very high in Indonesia, such as hypertension (31,7 %), hearth disease (7,2%), stroke (8,3%), diabetes mellitus (1,1%) and diabetes mellitus in city area (5,7%), asthma (3,5%), ankyloses disease (30,3%), cancer (4,3‰), and traffic accident (25,9%) (Riskesdas, 2007).

In 2013, the proportion of diabetes in Indonesia increase more than twice compare of 2007 and the proportion of village people that suffer from diabetes mellitus nearly same as town people. Prevalence of diabetes mellitus increase of 1,1 % (2007) to 2,1 % (2013) (Kemenkes RI, 2013). Diabetes mellitus is related to the risk of atherosclerosis and it is a predisposition for microvascular diseases such as retinopathy, nephropathy, neuropathy (Boedisantoso, 2009). Diabetes mellitus is a chronic disease that can not cause the death directly, but it will be

**Received: 02 Jan 2020 | Revised: 12 Feb 2020 | Accepted: 17 Mar 2020** 

fatal if the management is not suitable for disease. Diabetes mellitus need to manage by multidiscipline methods of non-drug and drug therapy. As a result of Diabetes Control and Complication Trial (DCCT) show that good diabetes mellitus control can decrease chronic complication of diabetes mellitus between 20–30%. If this problem is obeyed, diabetes mellitus complications can attack all the body systems. Diabetes Mellitus is known as "Mother of Disease" because it is a source or mother of other diseases such as hypertension, blood vessel, hearth, stroke, renal failure and blindness. For this reason, controlling of diabetes mellitus should be a priority. There are five basic fundamentals for controlling diabetes mellitus such as education, diet, practice, and drug compliance (Kemenkes RI, 2016). The purpose of these actions are for increasing the quality of life and prolong the patient's life.

This study is aimed to know the impact of DM gym for controlling the level of blood glucose (HbA1c). So, it will be useful in preventing and decreasing mortality of disease. Also, it will be useful in increasing the quality of life for achieve health optimum level for patients.

Diabetes mellitus gym is a kind of practice that was chosen consciously, follow the music rhythmic, continuously, and it will be done in exact duration. This activity was done for increasing heart and lungs ability, forming the body, and increasing the body vitality (Hitachisulandari, 2008). As a reported by Dinata (2007) aerobic gym is a body movement that is chosen consciously by following music rhythmic during exact duration. The steps of aerobic gym are: a) warning up for 10 minutes, b) Major practice for 15–20 minutes, and c) cooling down for 5 minutes (Akhiajun, 2010).

Some benefits of gym are : increase heart and lungs function, increase body vitality, increase body coordination for aging people, increase body immunity , prevent of many disease such as diabetes mellitus, cholesterol, hypertension and so on, prevent of depression because gym can increase a good feeling, decrease body weight, and forming body for more excellent form (Yanuaristya, 2012).

Routine physical activity is a practice that is done 3 times a week in 30 minutes every activity as routinely, and practice for 12 weeks can decrease body weight (Kayman et al., 2000). Sport and practice are done by routinely in minimum 6 to 8 weeks for minimum duration 30 minutes per practice can impact of decreasing body weight (Amalia, 2005). Practice activity is useful for human health.

Physical practice that is done by diabetes mellitus patients as routinely can decrease of complication risk and increase the level of life expectation (Sudoyo, 2009). Based on ADA (2015), a factor that can influence glucose level in the blood is physical activity. High level of body activity can increase the use of glucose in the muscle. Synthesis of glucose endogen will be increased for maintaining the balance level of blood glucose. In normal condition, this homoeostasis can occur by many mechanisms of hormonal system, nerve, and glucose regulation (Kronenberg et al., 2008). Physical of run activity also influence of glucose level for normal adult (Herwanto, 2016). Physical practice : aerobic gym impact of decreasing glucose level for patients with DM type 2 in Public Health Center area of Bukateja, Purbalingga ($p=0.0001$) by decreasing rate 30,14 mg% (Indriyani, 2015).

Measurement of HbA1c is an accurate method for knowing the level of blood glucose in range of last 2-3 months. The level of HbA1c show average value of blood glucose during 3 months. The decrease of 1% HbA1c may decrease 15% - 20% of cardiovascular incidence and 37% of microvascular complications (Church, 2011). Endocrinology Association of Indonesia (PERKENI) was categorized 3 variables of HbA1C laboratory evaluation

as a good control (HbA1C level < 6,5% ), mild control (HbA1C level 6,5% - 8 % ), and poor control (HbA1C level ≥8% ) (Yulianti, dkk, 2011). Expert Committee decided that HbA1c value between 6,0-6,4% is a risk for diabetes; and then value of 6,0% decrease to 5,7% by ADA in 2010 (Soulimane S, Simon D, Shaw J, & Witte D, 2011).

HbA1c is a single of the best measurement for evaluating the risk of sell damage that caused by high glucose level (Rismayanthi, 2014). Factors that impact the increasing of glucose level such as minimal of practice, over consumption of food, stress level increase and emotion factor, body weight and age increase, also as an impact of giving drug for example : steroid (Fox & Kilvert, 2010). Diabetes mellitus complication that are often occur such as renal failure, diabetic retinopathy, neuropathy (nerves damage) on feet that can cause feet ulus increase, infection and feet amputation, risk of heart disease and stroke increase, and the mortality of diabetes patients in globally increase twice compare with non-diabetes mellitus patients (Kemenkes RI, 2014).

## II. METHODOLOGY

Type of this study is quasi experimental by static pretest and posttest with control groups design. This design measures the level of blood glucose for intervention and control groups (pretest). DM gym was given to intervention group. On the other hand, the control group was given routine gym in Posbindu. At the end of study, the glucose level was measured for intervention and control group (posttest).

The study was done in 2018 at the area of Public Health Center II of Sokaraja. The study population was all DM patients which were 26 patients. Respondents were chosen by characteristic : type 2 DM, stay in area of Public Health Center II of Sokaraja, active in Posbindu, drug consumption every day, DGS >200 mg/dl. All respondents were divided in two groups, 13 respondents as intervention group and 13 respondents as control group.

Dependent variable in this study is blood glucose level of level of HbA1C and independent variable is DM gym. Instrument for study is questioner, speaker, laptop, blood glucose measurement set for HbA1C. Intervention group was given DM gym for 30-40 minutes twice a week during 12 weeks. Data was analyzed by computer. Uni variate analyze use distribution and frequencies by percentage. T test analyze is used for measure the correlation of independent and dependent variable.

## III. RESULTS

The table 1 show that majority of gender is female. Almost all respondents' education are basic education. Majority of respondent's age > 60 years old. Job of respondents are almost balance between jobless and worker. A part of respondents suffer from DM in middle duration (1-5 years).

Result of kolmogorov-smirnov analyzed show that 0,270 and 0,992. It can be concluded that the data come from normal distribution of population. So, alternative analyze used independent sample paired t-test.

**Table 1:** Distribution and frequency of education, age , gender, job, duration of suffer from DM at the area of Public Health Center II of Sokaraja, Banyumas Regency in 2018

| Variable | Frequency(13) | (%) | (13) | (%) |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 3 | 23 | 2 | 14 |
| Female | 10 | 77 | 11 | 86 |
| **Education** | | | | |
| Basic | 13 | 100 | 12 | 92 |
| High school | 0 | 0 | 1 | 8 |
| University | 0 | 0 | 0 | 0 |
| **Age (year)** | | | | |
| 35 – 60 | 12 | 92 | 9 | 69 |
| ≥ 60 | 1 | 8 | 4 | 31 |
| **Job** | | | | |
| Jobless | 5 | 38 | 8 | 62 |
| Worker | 8 | 62 | 5 | 38 |
| **Duration of suffer from DM** | | | | |
| Short duration | 0 | 0 | 1 | 8 |
| Middle duration | 9 | 69 | 10 | 77 |
| Long duration | 4 | 31 | 2 | 15 |

Intervention Contro

Percentage

Frequen

***Blood glucose level before and after intervention for intervention and control groups.***

**Table 2:** Blood glucose level before and after intervention of intervention group at the area of Public Health Center II of Sokaraja, Banyumas Regency in 2018.

| HbA1C | Minimum | Maximum | Mean | SD | P |
|---|---|---|---|---|---|
| Pre test | 6,6 | 14,6 | 9,42 | 2,48 | 0,00 |
| Post test | 6,1 | 10,1 | 7,63 | 1,76 | |

Blood glucose level for intervention group show that there are a different significance ( $p$= 0,00).

**Table 3:** Blood glucose level before and after intervention of control group at at the area of Public Health Center II of Sokaraja, Banyumas Regency in 2018.

| HbA1C | Minimum | Maximum | Mean | SD | P |
|---|---|---|---|---|---|

**Received: 02 Jan 2020 | Revised: 12 Feb 2020 | Accepted: 17 Mar 2020**

| | | | | | |
|---|---|---|---|---|---|
| Pre test | 6,4 | 10,1 | 7,93 | 1,06 | |
| Post test | 6,1 | 9,3 | 7,30 | 0,97 | 0,00 |

Blood glucose level for control group show that there are a different significance ( *p*= 0,00).

***The impact of DM gym for controlling the level of blood glucose for intervention and control group.***

**Table 4:** The impact of DM gym for controlling the level of blood glucose for intervention and control group at at the area of Public Health Center II of Sokaraja, Banyumas Regency in 2018.

| **HbA1C** | **Mean** | **SD** | **SE** | ***p* Value** | **N** |
|---|---|---|---|---|---|
| Intervention group | 1,79 | 1,00 | 0,27 | 0,00 | 13 |
| Control group | 0,63 | 0,23 | 0,06 | | 13 |

Average of decreasing blood glucose for intervention group is 1,79 mg/dl and control group is 0,63 mg/dl. It means that there is a significant impact of DM gym in controlling the level of blood glucos

## IV. DISCUSSION

The result of study show that majority of gender from intervention and control group were female. As study by Salindeho, A., Mulyadi & Rottie, J. (2016) said that majority gender was female. Priyanto, M.H., Andid, R. & Zanaria, Tj.M. (2016) also found that of 43 respondents majority was female which was 65,1%.

The majority of respondents education were basic education (primary school and junior high school) and few of their education were Senior High School. This study suitable with Wijaya, et al (2015) said that majority of respondents education were primary education (40,58%). Education can influence of DM incidence. High education people may have more knowledge of health. So, by knowledge of health people can aware of maintaining their health (Anisa, 2008). This study was difference from Salindeho, A., Mulyadi & Rottie, J. (2016) that said the majority of respondents education were high education (senior high school). Also, Priyanto, M.H., Andid, R. & Zanaria, Tj.M. (2016) said that the majority education was bachelor which was 39,5%.

Age of respondents showed that the majority less than 60 years old. This study as suitable as Ugahari, dkk, (2016) said that hyperglycaemia respondents tend to 41- 60 years in range compare to under less than 40 years old. Theoretically, ability of cell in using glucose will decrease when age of someone increase. Study of Salindeho, A., Mulyadi & Rottie, J. (2016) said that majority respondents in range of 44-70 years old. Another study mentioned that the majority of abnormal HbA1c was found in range of age 15-64 years old (31,5%) (Ya'kub, dkk, 2014). As a study of Utomo, dkk (2015) said that the age in range 41-60 years old show the majority of HbA1c level was uncontrollable (72,7%) compare to people more than 60 years old. Another study found that from 43 respondents in range 46 - 55 years old were majority which was 44,2% (Priyanto, dkk., 2016).

The majority of respondents job were house wife. It could be a predisposition factor of DM because of house wife minimum in activity. As a consequence, it can influence metabolic and endocrine functions that can cause obesity. (Anisa, 2008). Wijaya, (2015) studied of patients job, the majority of patients job were house wife

(48,57%). Anoteher study show that the majority of job were house wife (Priyanto, M.H., Andid, R. & Zanaria, Tj.M., 2016). The majority of duration suffer from DM were midlle duration (1 – 5 years). As Dewi (2013) said that the majority of respondents were suffer from DM in 1 - 5 year (52,8%). Another study by Utomo, dkk ( 2015) mentioned that the majority respondents suffer from DM in range of 1-5 years (54,5 %). Result of study by Wijaya, et al (2015) also mentioned that the majority of DM patients were suffer from DM in range of 1-5 years (39,14%).

***Blood glucose level (HbA1C) before and after intervention for intervention and control group.***

HbA1C level before intervention for intervention group was 9,42 mg/dl and after intervention was 7,63 mg/dl. It decrease 1,79 mg/dl. It show a significant difference with *p*=0,00. For control group, HbA1C level before intervention was 7,93 mg/dl and 7,30 mg/dl after intervention. It decrease 0,63 mg/dl. Also, It show a significant difference with *p*=0,00. It can be concluded that average value of HbA1C for intervention and control group were > 7 mg/dl, so HbA1c value uncontrollable. As Utomo (2015) reported that DM patients tipe 2 was found 77,3% HbA1c value was uncontrollable (>7%). Uncontrollable HbA1c value may cause complications. By this reason, ADA (*American Diabetes Association*) mentioned that controlled HbA1c if the value < 7% and uncontrollable HbA1if the value > 7%.

***The impact of DM gym for controlling the level blood glucoce (HbA1C)***

Blood glucose value (HbA1C) decreased 1,86 mg/dl for intervention group and 0,63 mg/dl for control group with *p value* 0,00. It means there is a significant impact of DM gym for controlling the level of blood glucose (HbA1C) for DM patients.

This study is relevant with study by Salindeho, A., Mulyadi & Rottie, J (2016) that mentioned there was a significant impact of DM gym toward the level of blood glucose for DM tipe2. Another study mentioned that for decreasing HbA1C level can be done as effectively by prolanis gym in 3 times/week compare with once per week (Tompira, B.M., Marunduh, S.R. & Sapulete, I.M., 2016). Many factors may cause of decreasing blood glucose level. The study of Herwanto, dkk, (2016) show that there was a significant impact of physical activity, especially run activity for decreasing blood glucose level of man (p =

0,001). By doing mild run activity during 15 minute can decrease blood glucose for 1 mg/dL and 60 mg/dL. Another physical practice is aerobic gym can decrease blood glucose level. Indriyani, dkk (2015) said that there was an impact of physical practice. There was an impact of diabetes mellitus gym toward the level of blood glucose for patients with DM tipe 2. (Salindeho, A., Mulyadi & Rottie, J., 2016). Level of HbA1c show the average of blood glucose level in 3 months and the decrease of 1% HbA1c is related to decrease 15% - 20% cardiovascular disease and complication of micro vascular disease for 37% (Church, 2011). Physical practice can increase insulin ability for transport glucose to the muscles, this effect can be maintained for some hours after physical practice (Power, 2012; Price , 2005; & Guyton, 2008). It can prove that regular physical activity is very important for managing DM Tipe 2. Another study also found that there was a significant correlation between physical activity and HbA1c level of DM tipe 2 patients (Ramadhanisa, 2013). Exercise, as one of above-mentioned strategies, has significant effects on the metabolism of nutrients. In particular, it diminishes the blood glucose

levels, and plays an important role in the treatment of patients with diabetes (Asif , 2014). Regular aerobic exercise may result in high insulin sensitivity, considerable weight loss and improved body composition (Najafipour, 2017).

## V. CONCLUSION

Respondents characteristic based on gender show that majority was female. Almost all respondents' education is basic education. Majority of respondents age is >_60 years old. Job of respondents are balance for jobless (house wife) and worker. Majority respondents suffer from DM in category middle duration (1-5 years). The average of blood glucose level before intervention for intervention group was 9,42 mg/dl and after intervention was 7,63 mg/dl. It shows that there is a significant difference (p= 0,00). The average of blood glucose level before intervention for control group was 7,93 mg/dl and after intervention was 7,30 mg/dl. It shows that there is a significant difference (p=0,00). The DM gym can impact for controlling blood glucose level (p = 0, 00). Every one recommend to do DM gym routinely, so the healthy can increase significantly. The health staffs need to motivate all people in doing DM gym and they must control activity of practice in *Posbindu* or community group at Public Health Center area.

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