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Original Research Article

Differences of blood glucose and insulin in childbearing aged women acceptors of depo medroxy progesterone acetat with non acceptors in Padang City 2017

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ABSTRACT

Background: Contraception was the way to prevent pregnancy, both temporarily and permanently. Depot Medroxyprogesterone Acetate (DMPA) is a contraceptive injection of synthetic progesterone hormone and is injected every three months, which is most commonly used currently, but that emerging consequences of long time usage of contraception, especially the hormonal one, cannot be denied. This research was aimed to see difference in blood sugar, insulin and lipid profile in childbearing aged women who used DMPA injection and Non-Acceptors.

Methods: The study was observational with the comparative cross sectional approach. Research was conducted in the Biomedical Laboratory in Andalas University and Regional Technical Service Unit (UPTD) Laboratory in West Sumatera Province. Data was taken from December 2017 until June 2018. The research sampled 48 DMPA acceptors and 48 non-Acceptors. Sampling technique used stratified random sampling. Examination of blood glucose carried out by the enzymatic method of GOD-PAP, ELISA for insulin. Data were analyzed using independent T-test and if the data was not normal, non parametric Mann-Whitney test was used. The differences were considered statistically significant if the value of $p < 0.05$.

Results: The mean blood glucose acceptors 91.2 mg/dl, non acceptors 88.83mg/dl and mean Insulin acceptors 23.63mIU/L, non akseptor 24.18 mIU/L. The results showed that there were no significant differences between DMPA acceptors and non acceptors ($p > 0.05$) in blood glucose (0.059) and insulin ($p = 0.603$).

Conclusions: There were no significant differences in blood glucose and insulin levels between DMPA acceptors and non acceptors.

Keywords: Blood glucose, Depot medroxyprogesterone acetate, Insulin

INTRODUCTION

Indonesia has the most population after China, India, and America. This number reflects the low quality of Indonesian population, which is a problem. To overcome the rapid growth of population, the government is trying to overcome problems with the program from BKKBN

(Badan Koordinasi Keluarga Berencana Nasional) with the aim of reducing the rate of population growth, which can lead to improvement of the quality of human resources.¹

Contraception is an effort to prevent pregnancy temporarily or permanently. Contraception consists of

hormonal and non-hormonal contraception. Hormonal contraception is divided into 3 types, namely birth control pills, injections and implants.²

The Indonesian population is predicted to increase for the next twenty-five years continuously, from 238.5 million in 2010 to 305.6 million in 2035. The number of women aged 18 to 49 years will be 76.096.7 million (Central Bureau of Statistics, 2010-2035). The 2016 data showed at around 1.545.8 million women in West Sumatra were in the age range of 18-49 years. In Padang City, the data in 2015-2016 showed that there were as many as 257.886 women in aforementioned age range.^{3,4}

Depot Medroxyprogesterone Acetate (DMPA) is a synthetic progesterone injectable contraception and is injected every three months, which is currently most often used by acceptors, because it is safe, effective, does not require monthly visit, and can be used postpartum. There are notable side effects that can be caused from the contraception. Its chemical composition resembles progesterone which has glucocorticoid properties that affect fat metabolism and reduce insulin secretion so that this type of contraception can cause an increase in body weight.^{5,6}

According to Berenson et al, 2011 men who used DMPA contraception experienced an increase in serum glucose levels of 2mg/dl at 6 months and 3mg/dl in the first 30 months. One mechanism that causes DMPA to increase glucose and insulin levels is compensating mechanism in state of increased insulin resistance.⁷

In 2013, a study conducted by Innocent, et al. proved that DMPA users (3-9 months) had an increase in insulin levels, which meant that DMPA caused hyperinsulinemia which was associated with an increase in the insulin resistance index. This study has reported that DMPA users are significantly associated with an increase in glucose and insulin levels in response to glucose load, and an increase in insulin glucose ratio.⁸

In contrast to those results, a study conducted by Jamil, Subia 2016 in Pakistan, women representing reproductive age ranging from 26 to 32 and treated in various types of hormonal and non-hormonal contraceptives (oral contraception, DMPA; Depot-medroxyprogesterone acetate, NET-EN; Norethisterone, Intrauterine contraceptive device (IUCD) and non-hormonal implants. This study concluded that all hormonal and non-hormonal methods do not have a detrimental effect on carbohydrate metabolism.⁹

Until now, the government is still promoting family planning programs, but the impact of long-term contraceptive use on reproductive health has not been studied, one of which is the increase in blood glucose levels and insulin that can disrupt the body's metabolism. Increased levels of blood glucose levels and insulin decreased HDL and excessive body weight are diagnostic

criteria for metabolic syndrome, which can increase the risk of type II diabetes. Therefore, blood glucose are the best predictor of metabolic syndrome (ATP III, 2002).¹⁰

METHODS

This study was an observational study. Insulin examination was carried out at the Biomedical Laboratory of the Medical Faculty of Andalas University and blood sugar levels and lipid profiles examinations were carried out at the UPTD Regional Health Laboratory Center. This study was conducted for 7 months (December 2017-June 2018). The population in this study were all DMPA acceptors and non acceptors in the East Padang District and Kuranji District. The selected research subjects were those who met the inclusion and exclusion criteria. The inclusion criteria were women of childbearing age aged 20-49 years, using DMPA injection contraception for >1 year, and the non acceptors did not use family planning for at least of 2 years, and did not suffer from metabolic syndrome. The number of subjects was calculated using the hypothesis test formula on the mean of two independent populations. Based on the formula, the number of DMPA acceptors (N = 48) and non acceptors (N = 48) were obtained.

Examination of blood Glucose was carried out by enzymatic spectrophotometry method namely GOD-PAP, insulin examination was carried out using ELISA. Data were analyzed using the independent test and non parametric test, namely the Mann-Whitney test. The results were considered significantly different if $p < 0.05$.

RESULTS

After research and results analysis, each group consisted of 48 DMPA acceptors and 48 non acceptors with a total sample of 96 people. The results were displayed in the following table. Table 1 showed that the average age of respondents using DMPA were (36.19±6.12) years, and non acceptors were (34.31±7.22) years.

Table 1: Age characteristics of respondents.

Groups	Age	
	n	Mean±SD (year)
Acceptor	48	36.19±6.12
Non acceptor	48	34.31±7.22

Table 2 showed that the average waist circumference of respondents using DMPA were (86.85±8.57) cm, and non acceptors were (80.22±10.71) cm.

Table 3 showed that the average waist circumference of respondents using DMPA were (26.49±4.44) kg/m², and non acceptors were (23.90±3.65) kg/m².

Based on Table 4, it was seen that the average blood sugar was (91.27±9.64) mg/dl in the DMPA acceptor

group and (88.83±12.77) mg/dl in the non acceptor group. The average results showed that the blood Glucose levels of DMPA acceptors were higher than non acceptors with $p = 0.074$ ($p > 0.05$). Insulin levels were (23.63±8.59) mIU/L in the DMPA acceptor group and (24.63±11.34) mIU/L in the non acceptor group with $p = 0.545$ ($p > 0.05$). There were no significant differences in blood sugar and insulin in acceptors of depo medroxy progesterone acetate and non acceptor ($p > 0.05$).

Table 2: Waist circumference of respondents.

Groups	Waist circumference (cm)	
	n	Mean±SD
Acceptor	48	86.85±8.57
Non acceptor	48	80.22±10.71

Table 3: BMI of respondents.

Groups	BMI (kg/m ²)	
	n	Mean±SD
Acceptor	48	26.49±4.44
Non acceptor	48	23.90±3.65

Table 4: Differences in blood glucose and insulin in acceptors of depot medroxyprogesterone acetate and non acceptors.

Groups	n	Mean±SD (mg/dl)	p	
Blood sugar	Acceptor	48	91.27±9.64	0.074
	Non acceptor	48	88.83±12.77	
Insulin	Acceptor	48	23.63±8.59	0.545
	Non acceptor	48	24.63±10.34	

DISCUSSION

Age determines in the choice of contraceptive method in women. Older aged woman tends to choose to use high effectiveness contraception with long-term pregnancy prevention. In this study, respondents were restricted to reproductive age, namely 20-49 years. The aging process cause anatomical, physiological and biochemical changes in the body, starting from cell level, tissue, and ends at organ level, thus affecting normal homeostasis function in the body. In this state, respondents should have higher awareness to pay attention to their health, and have awareness to do routine check up before suffering significant health problems.

Use of progesterone contraception because of the fertile age that still has estrogen fluctuations in hormones during the menstrual cycle are thought to cause changes in blood glucose levels. Increased levels of progesterone are said to cause temporary insulin resistance, causing blood glucose levels to be higher than normal. High estrogen levels can increase sensitivity to insulin, so that blood glucose levels can be lower than normal. This change in

blood glucose levels may also be related to the presence of mild inflammation before menstruation.¹¹

In this study, the average blood glucose and insulin were still in normal susceptibility because of the body's compensation in maintaining the state of blood sugar under normal conditions. But the term effect, this short obtained from DMPA fixing results in fat accumulation which results in central obesity. If the use continues to manage with long periods of time, this central obesity will have an impact on glucose tolerance so that insulin resistance occurs

Decreasing insulin production results in reduced amount of glucose entering the cell, so that glucose will remain in the blood vessels and cause blood glucose levels to increase.¹² In addition, the 20-30 year age group can also have high glucose levels due to lifestyle changes and physical activity patterns. Changes in lifestyle occur because of changes in diet. The diet in society has shifted from a traditional diet to a diet that contains a lot of energy, fat, sugar, and salt but lacks vitamins, minerals, and fiber.¹³

Physical activity is any body movement produced by skeletal muscle that requires energy (WHO, 2013). Physical activity is associated with an increase in the speed of muscle glucose recovery (how much muscle takes glucose from the bloodstream). When on the move, muscles use stored glucose and, if glucose decreases, the muscle fills the void by taking glucose from the blood. This will result in a decrease in blood glucose, thus increasing the control of blood glucose.¹⁴

Blood sugar is a term about the amount of sugar contained in the blood, which is formed from carbohydrates in food and stored as glycogen in the liver and skeletal muscles.¹⁵ Blood sugar regulation is mainly carried out by tissues that are sensitive to insulin. Increased blood sugar levels will stimulate insulin release. Some hormones play a role in maintaining P blood sugar levels within normal range. Blood sugar examination is often done to monitor the success of this regulator mechanism. Blood sugar levels which are considered too high or too low indicate the presence of homeostatic disorders.¹⁶ In addition, high blood sugar levels in the body pathologically play a role in increasing the concentration of glycoproteins, which are triggers or risk factors for some vascular diseases.¹⁷

Fasting glucose and insulin levels remain within the normal range in women using injectable or oral contraception, with only a slight increase among women using depot medroxyprogesterone acetate (DMPA), according to new research from the University of Texas Medical Branch (UTMB Health) in Galveston.¹⁸

Insulin is a polypeptide hormone that regulates carbohydrate metabolism. Apart from being the main effector in carbohydrate homeostasis, it has an effect on

fat metabolism and can change the ability of the liver to release fat deposits. The insulin concentration has a very wide effect throughout the body.¹⁹

Based on the analysis of blood sugar in this study it was still normal but from the use of hormonal contraception DMPA was obtained by the accumulation of visceral fat tissue and increased obesity. Obesity occurs because of an imbalance between the incoming energy and the energy that comes out. Obesity is a picture of the metabolic syndrome, as is insulin resistance. All images of the metabolic syndrome are closely related to being overweight. This is the case for insulin resistance and impaired glucose metabolism which gradually begins with increasing body weight and obesity.²⁰

CONCLUSION

In this study the average blood glucose and insulin were still in normal susceptibility because of the body's compensation in maintaining the state of blood glucose under normal conditions, however, short term effect can be obtained from DMPA making, the accumulation of fat which results in central obesity, if the use continues to manage with long periods of time, this central obesity will have an impact on glucose tolerance so that insulin resistance. As for other factors that affect are age, waist circumference, Body mass index, physical activity. There was no significant difference in blood Glucose and insulin between DMPA acceptors and non acceptors.

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Researcher Links

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