

RELATIONSHIP OF BLOOD GLUCOSE LEVELS WITH USE OF HORMONAL CONTRACEPTION IN PUSKESMAS KOTA BARAT

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ABSTRACT

Injectable hormonal contraceptives contain the hormone progesterone which can cause adverse side effects for the wearer. The hormone used can affect the work of insulin in sugar metabolism as a result of which insulin becomes resistant. Insulin resistance causes the glucose levels that enter the body's cells to decrease as a result of which glucose remains in the blood vessels which results in high glucose levels in the body.

West city health center has increased diabetes sufferers. According to data obtained from the Gorontalo City Health Office, there were 111 DM patients recorded at the West City Health Center in 2017, in 2018 there were 110 people and in 2019 there were 125 people. The purpose of this study was to determine the relationship between blood glucose levels and the use of injectable hormonal contraceptives at Puskesmas Kota Barat.

This research is an analytic observational research with a quantitative approach method. The sample used was 30 patients with simple random sampling technique. The results of the study were found that 40% experienced an increase in blood glucose levels and as much as 60% were in the normal category. Based on the results of the examination, it can be concluded that there is no relationship between blood glucose levels and the use of injectable hormonal contraceptives $p = 0.617$ ($\alpha > 0.05$). This is because most of the patients are in the productive age category and the duration of using injection contraception is < 10 years.

Keywords: Blood Glucose Levels, Injectable KB, DM

INTRODUCTION

The world's population according to [26] has reached 7.7 billion people and is expected to continue to increase every year. Indonesia itself in 2018 has a population of 265 thousand people with a growth rate of 1.33% [3] while Gorontalo Province has a population of 1.1 million, spread across five districts and one city. In the District. Boalemo has a population of approximately 158,333 people, Kab. Gorontalo 374,923 people, Kab.

Pohuwato 153,991, Kab. Bone Bolango 157,186 people, Kab. North Gorontalo 112,975 people and Gorontalo City 210,782 people [4].

Efforts to cope with the ever-increasing population explosion resulted in a population policy which is expected to control the number and rate of population growth by controlling three main variables, namely birth, death and immigration [9]. One of the programs made by the government to suppress

population growth is through the Family Planning (KB) program where this program is an attempt to spacing out or planning the number and distance of pregnancies using contraception.

In Indonesia alone in 2017, injectable hormonal contraceptive users were around 47.96%, while in Gorontalo Province in 2017, injection contraceptive users were 37.36% [2]. In the District. Gorontalo users of injectable hormonal contraceptives 27,419 people. According to data obtained at the West City Puskesmas, the use of injectable hormonal contraceptives in 2019 was 109 people[17].

Injectable hormonal contraceptives contain progesterone hormones which can cause adverse side effects for the wearer. It is suspected that the hormone used can affect the work of insulin in sugar metabolism[21]. Insulin resistance that occurs causes the glucose level that enters the body's cells to decrease as a result of which glucose remains in the blood vessels which results in high glucose levels in the body [15].

According to [18] in their study, there was an increase in blood glucose levels in the combined injection contraceptive user respondents who examined with a presentation of 41% of the total sample studied. In a study conducted [19], it was found that respondents experienced an increase in blood glucose levels by 19.6% of the total respondents who used injectable hormonal contraceptives who were used as research samples. Whereas in the research of [11] of the total respondents who used the depogestin injection contraceptive, it was found that

65% experienced an increase in blood glucose levels.

According to data obtained from the Gorontalo City Health Office, DM patients

who were registered at the West City Health Center in 2016 were 46 people, in 2017 there were 111 people, 2018 totaled 110 people and in 2019 totaled 125 people [8]. One indicator of diabetes mellitus is an increase in blood glucose levels.

Based on the background that has been described, the researchers wanted to conduct research on the relationship between blood glucose levels and the use of injectable hormonal contraceptives at the West City Health Center.

RESEARCH METHODOLOGY

This research is an analytic observational study with quantitative methods using a cross sectional approach. The number of samples examined was 30 samples using simple random sampling technique. Data collection techniques used questionnaires and random blood glucose checks. The data analysis technique used univariate and bivariate analysis. This research was conducted at the West City Health Center from 18 August - 18 September 2020.

RESEARCH FINDINGS

Univariate Analysis

The following data is data that describes the characteristics of respondents in general, including the respondent group based on age, duration of use, history of diabetes mellitus, routine exercise, consuming certain drugs, consuming alcohol and undergoing a diet program.

Table 1.1 Frequency Distribution of Respondents based on Age for Hormonal Injecting Contraceptive Users in West City Health

| No. | Age | Injecting KB users | | Not Using Injectable KB | |
|--------|---------------|--------------------|-------|-------------------------|-------|
| | | Frequency | n (%) | Frequency | n (%) |
| 2. | 26 - 35 Years | 14 | 56% | 2 | 40% |
| 3. | 36 - 45 Years | 10 | 40% | 3 | 60% |
| 4. | 46 - 55 Years | 1 | 4% | 0 | 0% |
| amount | | 25 | 100% | 5 | 100% |

Centers

Table 1.2 Frequency Distribution of Respondents Based on Duration of Use of Hormonal Injectable Contraceptives Users in West City Health Centers

| No. | Duration of Use | Injecting KB users | | Not Using Injectable KB | |
|--------|-----------------|--------------------|-------|-------------------------|-------|
| | | Frequency | n (%) | Frequency | n (%) |
| 1. | <10 Years | 14 | 56% | 4 | 80% |
| 4. | > 10 Years | 11 | 44% | 1 | 20% |
| amount | | 25 | 100% | 5 | 100% |

Table 1.3 Frequency Distribution of Respondents Based on History of DM Disease in Users of Hormonal Injectable Contraceptives at West

| No. | History of DM | Injecting KB users | | Not Using Injectable KB | |
|--------|-------------------------------------|--------------------|-------|-------------------------|-------|
| | | Frequency | n (%) | Frequency | n (%) |
| 1. | Have a history of DM | 0 | 0% | 0 | 0% |
| 2. | Do not have a history of DM disease | 25 | 100% | 5 | 100% |
| amount | | 25 | 100% | 5 | 100% |

City Health Centers

| No. | Exercise regularly | Injecting KB users | | Not Using Injectable KB | |
|--------|---------------------|--------------------|-------|-------------------------|-------|
| | | Frequency | n (%) | Frequency | n (%) |
| 1. | Exercise Routine | 8 | 32% | 2 | 40% |
| 2. | No Exercise Routine | 17 | 68% | 3 | 60% |
| amount | | 25 | 100% | 5 | 100% |

Table 1.4 Frequency Distribution of Respondents by Routinely Exercising for Injecting Hormonal Contraceptive Users at Puskesmas Kota Barat

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Table 1.5 Frequency Distribution of Respondents Based on the Consumption of Certain Drugs in Hormonal Injecting Contraceptive Users in West City Health Centers

| No. | Consumption of Certain Medicines | Injecting KB users | Not Using Injectable KB |
|--------|----------------------------------|--------------------|-------------------------|
| | | Frequency n (%) | Frequency n (%) |
| 1. | Taking Certain Medicines | 0 0% | 0 0% |
| 2. | Do not consume certain drugs | 25 100% | 5 100% |
| amount | | 25 100% | 5 100% |

Table 1.6 Frequency Distribution of Respondents Based on Alcohol Consumption in Users of Hormonal Injectable Contraceptives at Puskesmas Kota Barat

| No. | Consumption of alcohol | User Injectable KB | Not Using Injectable KB |
|--------|------------------------|--------------------|-------------------------|
| | | Frequency n (%) | Frequency n (%) |
| 1. | Consuming alcohol | 0 0% | 0 0% |
| 2. | Not Consuming Alcohol | 25 100% | 5 100% |
| amount | | 25 100% | 5 100% |

Table 4.7 Frequency Distribution of Respondents Based on Respondents Who Underwent a Diet Program for Injecting Hormonal Contraceptive Users at Puskesmas Kota Barat

| No. | Diet Program | User Injectable KB | Not Using Injectable KB |
|--------|------------------------------|--------------------|-------------------------|
| | | Frequency n (%) | Frequency n (%) |
| 1. | Going on a Diet Program | 0 0% | 0 0% |
| 2. | Not Following a Diet Program | 25 100% | 5 100% |
| amount | | 25 100% | 5 100% |

Table 1.8 Frequency Distribution of Blood Glucose Levels in Hormonal Contraceptive Users in West City Health Center.

| No. | Blood Glucose Levels | Injectable KB | Not Using Injectable KB |
|--------|----------------------|-----------------|-------------------------|
| | | Frequency n (%) | Frequency n (%) |
| 1. | Normal | 14 56% | 4 80% |
| 2. | Risk Limit | 9 36% | 1 20% |
| 3. | High Risk | 2 8% | 0 0% |
| amount | | 25 100% | 5 100% |

Bivariate Analysis

Table 1.9 Distribution of Frequency of Relationship between Blood Glucose Levels and Use of Injectable Hormonal Contraceptives at Puskesmas Kota Barat

| Types of Hormonal Contraception | Category Blood Glucose Levels | | amount | ρ | OR | 95% CI |
|-------------------------------------|-------------------------------|----------|---------|--------|-------|----------------|
| | Normal | Abnormal | | | | |
| | N% | N% | N% | | | |
| Injectable KB | 14 56% | 11 44% | 25 100% | 0.617 | 3,143 | 0.306 - 32,278 |
| Do not use injectable birth control | 4 80% | 1 20% | 5 100% | | | |
| amount | 18 60% | 12 40% | 30 100% | | | |

DISCUSSION

In the early 20s, the body generally has not experienced a decline in the function of the organs, so that if there is insulin resistance caused by the progesterone hormone contained in injectable birth control, the body is able to suppress or minimize the increase in blood glucose levels. This is inversely proportional to increasing body age. Increasing age causes the pancreas to experience a decline in function, so that if there is insulin resistance caused by the hormone progesterone which is in injectable contraception, the pancreas is forced to

produce more insulin to convert glucose into energy. So that blood glucose levels return to normal. Insulin resistance caused by the hormone progesterone causes the hormone insulin to be insensitive to blood glucose levels, consequently high glucose levels in the blood. The condition in which the pancreatic organ continues to be distorted to produce more insulin will have an impact on the function of the pancreas, as a result, pancreatic beta cells will experience interference which

will affect the amount of insulin produced [5].

In a study conducted by [7], a study was carried out to measure blood glucose levels in users of hormonal contraceptives (injections, pills and implants). The results of this study indicated that 67% of injection contraceptive users did not experience an increase in blood glucose levels while the remaining 32% experienced an increase in blood glucose levels. 67% of injection contraceptive users who did not experience an increase in blood glucose levels were in the age group of 20s while 32% of injection contraceptive users who experienced an increase in blood glucose levels were in the age category over 35 years.

Based on 1.2, it shows that most of the respondents used injectable hormonal contraceptives <10 years with a total of 56% compared to respondents who used injectable hormonal contraceptives for > 10 years with 44%. 80% of respondents who did not use injection contraceptives used kb for <10 years and as many as 20% of respondents used kb for > 10 years. Based on the research that has been done, it was found that most of the use of hormonal contraceptives > 10 years experienced an increase in blood glucose levels. this is influenced by the hormone progesterone contained in injectable hormonal contraceptives.

The use of injectable contraceptives in the short term has a small risk of experiencing an increase in blood glucose levels while the use of injectable contraceptives for a long time can interfere with the work of the pancreas. Insulin resistance caused by using kb injections for a long time causes the

pancreas to work harder because it is forced to produce insulin continuously in large quantities. So that over time the pancreas does not function optimally which then causes the amount of insulin produced to be unable to convert all glucose into energy which results in an increase in blood glucose levels.

In a study conducted [19], blood glucose levels were examined in users of injectable hormonal contraceptives, pills and implants at the central city center. The results of this study found that there was no increase in blood glucose levels in 81% of respondents using injectable hormonal contraceptives with a duration of use <10 years, while 19% of respondents who used injectable contraceptives experienced an increase in blood glucose levels with a duration of use > 10 years.

Based on table 1.4, it shows that all respondents who used injectable hormonal contraceptives and did not use injectable contraceptives did not have a history of diabetes mellitus, meaning that the blood glucose levels obtained at the time of the study were not influenced by the respondent's history of diabetes mellitus.

According to [23] inheritance of genes from parents to children will undergo mutations that are expressed in the genes of the offspring. If there is a history of diabetes mellitus in the lineage, the first lineage has a greater potential for diabetes mellitus. This will be exacerbated by the presence of the hormone progesterone in injectable birth control which will result in insulin resistance so that blood glucose levels will increase. Changes in genetic material in type 2 diabetes can increase

gene expression on Langerhans islands which will then have an impact on disruption of insulin secretion, reduced plasma insulin, and can reduce insulin sensitivity thereby increasing the risk of developing type 2 diabetes.

A study conducted by [14] where an examination of obesity and genetic history of DM with the incidence of DM in depongestin injection contraceptive users found that 66% of injecting contraceptive users who did not have a history of DM did not experience an increase in blood glucose levels while 44% of user kb injections with a history of diabetes have increased blood glucose levels.

Based on table 1.5, it shows that most of the respondents did not regularly exercise with a number of 68% and as much as 32% of respondents routinely doing sports. Meanwhile, 60% of respondents who did not use injectable contraceptives did not regularly exercise, while 40% of respondents did exercise regularly.

According to the theory of [12] which states that inadequate physical activity is one of the factors that can trigger insulin resistance. Physical activity can prevent type 2 diabetes by reducing the risk of insulin resistance and increasing glucose tolerance. The less physical activity that is done, the less glucose is consumed, so that the glucose level in the blood will also be higher. The use of injectable birth control containing progesterone will cause insulin resistance, so it must be balanced with regular exercise so that blood glucose levels remain within normal limits.

In a study conducted by [16] regarding the assessment of the effectiveness of

exercise in injection contraceptive users, it was found that blood glucose levels tended to be within normal limits with regular exercise, while injecting kb users who did not regularly exercise had blood glucose levels within the risk limit. thus, proving that regular exercise can affect a person's blood glucose levels.

Based on the research that has been done, it shows that all injectable hormonal contraceptive users and not injectable hormonal contraceptive users at West City Center do not consume decongestants, beta blockers, niacin or corticosteroid drugs. So that the blood glucose levels obtained at the time of the study were not influenced by the type of drugs because all respondents did not consume decongestants, beta blockers, niacin or corticosteroid drugs.

According to theory of [1] the use of certain types of drugs, for example oral decongestants in diabetes mellitus sufferers, can result in an increase in blood glucose levels and can interfere with the secretion of the hormone insulin by reducing the up and take mechanism of glucose into the tissue or disrupting the breakdown process. glycogen. The use of these types of drugs when coupled with the use of injection contraceptives will make blood glucose levels even more uncontrollable. This is caused by insulin resistance caused by the use of injectable birth control.

Based on 1.6, it shows that all injectable hormonal contraceptive users and non-injectable hormonal contraceptive users at Kota Barat Puskesmas do not consume alcohol. So that the glucose levels obtained at the time of the examination are not influenced by

alcohol, because all respondents do not consume alcohol.

According to the theory of [6] alcohol can cause chronic inflammation of the pancreas called pancreatitis. This disease can interfere with the production process of the insulin hormone which will then result in blood glucose levels in the body. So that DM disease control can be applied through healthy living behavior by not consuming alcohol.

Based on 1.7, it shows that all injectable hormonal contraceptive users and non-injectable hormonal contraceptive users at the City Health Center are not on a diet program. So that the blood glucose levels obtained at the time of the examination are not influenced by the diet program because all hormonal contraceptive users are not on a diet program.

This is supported by the theory of [25] that a diet program that is carried out correctly in an appropriate number of calories is able to control glucose levels in the blood. According to [22] diets that contain a lot of fat, salt and sugar cause people to consume these types of foods excessively, which can lead to increased blood glucose levels.

Research conducted by [24] carried out measurements of blood glucose levels in a group of respondents who used injectable contraceptives who were on a diet. The results showed that respondents who ran a sugar diet program were 29 times more controlled than respondents who did not undergo a diet program, meaning that the diet program is able to reduce blood glucose levels in injection family planning users.

Based on 1.8, it shows that 44% of injecting contraceptive users

experienced an increase in blood glucose levels which were divided into two categories, namely the risk limit category and the high-risk category. In the risk limit category, there were 36% who experienced an increase in blood glucose levels, in the high-risk category there were 8% who experienced an increase in blood glucose levels while 56% of other respondents had blood glucose levels in the normal category. Respondents who did not use injection contraceptives had glucose levels in the normal category with a total of 80% and 20% of respondents in the normal category.

Injectable hormonal contraceptives contain progesterone hormones which can affect insulin work in sugar metabolism[21]. Insulin resistance that occurs causes the glucose level that enters the body's cells to decrease as a result of which glucose remains in the blood vessels which results in high glucose levels in the body [15].

The ineffective action of insulin in helping glucose absorption into body cells causes the pancreas to be forced to produce more insulin so that glucose levels in the blood are not excess [27]. The condition in which the pancreas is continuously forced to produce excess insulin can make the function of pancreatic beta cells experience disruption caused by the response to increased work of the pancreas and stimulation of insulin resistance [5].

A study conducted by [19] in which blood glucose levels were checked using injectable hormonal contraceptives. It was found that 81% of injectable hormonal contraceptive users did not experience an increase in blood glucose

levels and as many as 19% of injectable hormonal contraceptive users experienced an increase in glucose levels.

Risk factors that influenced the study were all respondents had no history of diabetes mellitus, did not consume alcohol and did not consume decongestants, niacin, corticosteroids and beta blockers. So that most respondents who used injectable hormonal contraceptives had glucose levels within normal limits.

Based on table 1.9, it shows that the results of statistical analysis using the chi square test indicate that there is no significant relationship between blood glucose levels and the use of injectable hormonal contraceptives at the West City Health Center. This is evidenced by the value of $p = 0.617$ ($\alpha > 0.05$) OR 3.143 and 95%, which means that H_a is rejected and H_o is accepted. So that there is no relationship between blood glucose levels and the use of injectable hormonal contraceptives at the West City Health Center.

Injectable hormonal contraceptives contain the hormone progesterone which can affect the work of glucose metabolism. Contraception with the use of the hormone progesterone will show high blood glucose levels in the user, besides this hormone can also slow down or decrease the speed of absorption of carbohydrates from the human digestive system. This is related to the level of the hormone progesterone in the hormonal contraceptive content used [21].

The results of this study contradict the research of [19] which states that from research conducted on injectable

hormonal contraceptive users there is an increase in blood glucose levels which then after analysis there is a significant relationship ($p 0.025$) between the use of injectable hormonal contraceptives with the occurrence of blood glucose levels.

The factors that influence the absence of a relationship between the injection contraceptive variable and the blood glucose variable are because the age of the respondents who examined was mostly in the productive phase, namely the age of 26-35 years, so it did not show significant results on blood glucose levels. In addition, the use of injectable contraceptives <10 years also affects the results obtained. Based on the theory of [13], in general the human body will experience a drastic decline in body function at the age after 40 years, this is also at risk of the work function of the endocrine pancreas which produces the hormone insulin. Prolonged use of contraception over 10 years and the age of the respondents who are over 40 years can cause an increase in blood glucose levels.

The use of injectable birth control containing the hormone progesterone for a long time can increase appetite and increase carbohydrate and sugar metabolism. This is in accordance with the opinion of [10] which states that the progesterone hormone stimulates the appetite control center in the hypothalamus which can cause the injection family planning acceptors to eat more than usual. Excess food consumption causes obesity. In a person who is overweight his organs are forced to work harder. The pancreas organ which is continuously forced to work causes the pancreas to experience a

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disturbance so that it has an impact on the resulting insulin levels as a result of

CONCLUSION

Based on the research that has been done, it can be concluded as follows:

1. There is no relationship between blood glucose levels and the use of injectable hormonal contraceptives at the West City Health Center $p = 0.617$ ($\alpha > 0.05$). This is because most of the samples are in the productive age category and the duration of use of injectable hormonal contraceptives is <10 years.
2. Blood glucose levels in injection contraceptive users are in the normal category with the remaining 56% in the risk limit category with 36% and 8% being in the high risk category.
3. The risk factors based on age of most injection contraceptive users were in the 26-35 years age category as much as 56%, the 36-45

which the glucose level in the blood becomes uncontrolled.

age category as much as 40% and the 46-55 year age category as much as 4%. Risk factors based on the length of use, most of the respondents used injection contraception <10 years, namely 56% and 44% used injection contraception > 10 years. The risk factor is based on routine exercise, most of the injecting contraceptive users do not routinely exercise with the number as much as 68% and the rest as much as 32% routine exercise. Risk factors based on a history of DM, all respondents did not have a history of DM. risk factors based on consumption of certain drugs, all respondents did not consume drugs of the type of niacin, beta blockers, corticosteroids.

REFERENCES

- [1] Acosta WR. 2010. LWW's Foundations in pharmacology for pharmacy technicians. 1st edition. Philadelphia: Lippincott, Williams and Wilkins: 139-40.
- [2] National Population and Family Planning Agency. 2017. Government Installation Performance Accountability Report. Jakarta: BKKBN.
- [3] Indonesian Statistics Agency. 2018. Statistics Indonesia: Statistical Yearbook of Indonesia. Jakarta: Statistics Indonesia.
- [4] Indonesian Statistics Agency. 2019. Statistics Indonesia: Statistical Yearbook of Indonesia. Jakarta: Statistics Indonesia.
- [5] Barbara RS 2005. Mother-newborn nursing. Edition 3. Translation: Maria A. Wijayarini, S.Kp, MSN. Jakarta: EGC.
- [6] Canadian Diabetes Association (CDA), 2008, Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. Canadian Journal of Diabetes, Volume 32, No 1.
- [7] Deleskog, A. Hilding A Ostenson CG. 2011. Oral contraceptive use and abnormal glucose regulation in

- Swedish middle-aged women. *Diabetes Res Clin Pract.* Vol. 92 (2), p. 288-292.
- [8] Gorontalo City Health Office. 2019. Health Profile of Gorontalo Province. Gorontalo City, Gorontalo.
- [9] Harahap EN 2019. Guidance and Coaching of the BKKBN in the Family Planning Sector in the West Siantar District, Pematang Siantar City. *Journal of Community Empowerment.* Vol. 7, No. 2, Pg: 128-144.
- [10] Hartono H. 2003. Family Planning and Contraception. Jakarta: Pustaka Sinar Harapan.
- [11] Hidayah N. Purnomo. Dani F. 2015. Obesity and Genetic History with Diabetes Mellitus in Depogestin Injection Kb Users at BPM Handayani Isro 'Welah village. *Journal Volume 6 No. 3 August 2015* 36-45.
- [12] Kusmana. 2012. The Concept of Elderly Gymnastics. Jakarta. Rineka Cipta
- [13] Merck H. Beers MD. 2008. Diabetes Mellitus. The Merck Manual of Medical Information. 2 en ed. Chapter 165: 873-881.
- [14] Noor H, Purnomo, Dani F. 2015. Obesity and Genetic History with the Incidence of Diabetes Mellitus. Depogestin Injection Kb Users in Bpmhandayani Isro 'Wagian Village. *Journal Volume 6 No. 3 August 2015* 36-45
- [15] Nurrahmini U. 2012. Stop Diabetes. Yogyakarta: Familia Group, Core Media Relation.
- [16] Pahra D. Sharma N. Ghai S. Hajela A. Bhansali S. Bhansali A. 2017. Impact of PostMeal and Onetime Daily Exercise in Patient with Type 2 Diabetes Mellitus: a Randomized Crossover Study. *Diabetol Metab Syndr*; 64 (9): p. 5–11.
- [17] West City Health Center. 2019. Health Profile of West City Health Center 2019. City of Gorontalo, Gorontalo.
- [18] Rahayu S. Sundari S. Widiyani E. 2015. The Old Relationship of Using Combined Injectable Contraceptives with Blood Glucose Levels at Bpm "E" Purwosari District, Pasuruan. *The Southeast Asian Journal of Midwifery* Vol. 1, No.1, October 2015, Page: 10-15.
- [19] Rahma S. Andi M. Yuli YR 2019. Blood Sugar Levels of Hormonal Contraceptive Users. *Jambura Nursing Journal.* Vo. 1, No. 2, Pg: 73-84.
- [20] Rasjidi I. 2014. Muslim Pregnancy Guide. South Jakarta: Noura Books.
- [21] Sari F and Mustika P. 2015. Comparative Study of Blood Glucose Levels at Combined Injectable and Progestin Family Planning Acceptors at Bpm Yosi Trihana, Klaten Regency, Central Java, 2015. *Journal of Health Samodra Ilmu.* Vol. 08 No. 01. Pages: 27-31.
- [22] Sugiyono. 2008. Qualitative quantitative research methods. Bandung
- [23] Sun X, Yu W, Hu C. 2014. Genetics of Type 2 Diabetes: Insights into the Pathogenesis and Its Clinical Application. *Biomed Res Int.* Page: 713-926.

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North Mamuju Regency, West Sulawesi Province

- [24] Suryani N. Pramono. Henny S. 2015. Diet and Exercise as Efforts to Control Blood Sugar Levels in Type 2 Diabetes Mellitus Patients at the Internal Medicine Polyclinic of Ulin Hospital, Banjarmasin, 2015. Journal of Jurkessia, Vol. VI, No. 2.
- [25] Tjokroprawiro A. 2007. Diabetes mellitus, Textbook of Internal Medicine Faculty of Medicine Airlangga Dr. Soetomo Surabaya, printing 1, Airlangga University press, Surabaya, p. 32-38,4670
- [26] United Nations. 2019. World Population Prospect 2019. New York: Department of Economic and Social Affairs.
- [27] Waris LM 2015. Diabetes (Diabetes Mellitus) in South Sulawesi. ed Jakarta. Pustaka Obor Indonesia Foundation