DESCRIPTION OF TRIGLYCERIDE LEVELS IN OBESE PATIENTS IN THE WORKING AREA OF DR. M.M DUNDA LIMBOTO HOSPITAL

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ABSTRACT

The purpose of this study is to determine the Triglyceride (TG) levels in obese patients. The research is conducted in a descriptive quantitative approach. Primary data in the form of research findings on TG levels in obese patients and secondary data in the form of data from the literature, books, questionnaires, books, and medical records were used. Purposive sampling was used with a sample size of 30 participants.

The results showed that of 30 obese patients, 27 (90%) had abnormal TG levels. While 3 persons (10%), had normal TG levels. The factors that had the greatest influence on the level of TG in obese patients were their physical features (body mass index/BMI) and dietary habits (number of calories). The study concluded that 90% of obese patients had normal triglyceride levels, while 10% had abnormal levels. Suggestions for obese people to manage and control their triglyceride levels on a regular basis, as well as engage in other activities that can help prevent obesity.

Keywords: Triglycerides, Obesity and Body Mass Index

INTRODUCTION

Currently, food delivery services are available by phone or internet. Technological advancements should be used to pamper people. Automatic physical activity to burn calories and fat is also significantly reduced. As a result, excess fat is accumulated, which is frequently referred to as obesity. (2016) (Billy et al.). Obesity is defined as a condition in which the body weight-to-height ratio exceeds a predetermined standard. Obesity is defined as an increase in total body fat; it occurs when men > 20% overweight and women > 25% overweight [5].

Increased obesity as a result of a change in lifestyle, such as a decrease in physical activity. Additionally, genetic factors may predispose people to weight management procedures via hormonal and neurologic effects [16].

Obesity occurs in a variety of people and is often associated with diet, social status, physical activity imbalances, and food intake. Obesity has implications not only medically, psychologically, and socially, but also in terms of patient survival [5].

As a result, regulating triglyceride levels is important for managing obesity. Triglycerides are formed when glycerol and fat are consumed in excess. Excess calories are converted to triglycerides, which means that increasing calorie intake as needed can result in increased triglyceride formation. Hypertriglyceridemia is a condition in which triglyceride levels are elevated above normal. Increased triglyceride levels result in atherosclerosis, which leads to coronary artery disease [6].

According to World Health Organization (WHO) data, obesity is the

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leading risk factor for death worldwide. Obesity has more than doubled globally since 1980. Over 600 million of these are obese. 39% of adults over the age of 18 are considered overweight, while 13% are considered obese. The global population's average body mass index (BMI) is 24 kg/m2. Obesity prevalence is highest in the WHO Americas region and lowest in the WHO Southeast Asia region. The World Health Organization (WHO) has set a goal of maintaining obesity prevalence at 2010 levels by 2025.

According to the 2019 Indonesian Health Profile, 35.4 % of the 15-year-old population is obese (body mass index or BMI 25-27 kg/m2 & BMI 27 kg/m2), although only 21.8 % of the obese population has a BMI of 27 kg/m2. Women (29.3 %) had a higher prevalence of obesity than men (15 years) among the obese population (14.5%). The prevalence is greater in urban areas (25.1%) than in rural areas (17.8%). Meanwhile, the group aged 40-44 years had the highest rate of obesity (29.6%).

According to the 2019 Indonesia Health Profile study, obese Indonesians aged 15 years reported having a threshold cholesterol level (200.239 mg/dL) of 25.8 % and a high cholesterol level of 10.1. Abnormal triglycerides accounted for 13% of abnormal triglyceride levels between 150 and 99 mg/dl, 11.4 % of abnormal triglyceride levels between 200 and 499 mg/dl, and 0.5 percent of abnormal triglyceride levels over ≥ 500 mg/dl.

According to Riskesdas data (2018), Gorontalo Province ranks tenth in Indonesia for obesity prevalence, with a prevalence of 24.4%. According to the Gorontalo Provincial Health Office's (2019) data, the number of obese people in Gorontalo was 517 in 2017 and increased to 8,020 in 2019. If you compare the growth rate of obesity from 2017 to 2019, there has been a significant increase in the last two years, amounting to approximately 7503 people, particularly in areas where obesity is higher than in some areas of Gorontalo Province, most notably Gorontalo Regency at 40% or 4,327 people. While 105 obese patients were treated at Dr. M.M Dunda Limboto Hospital.

RESEARCH METHODS

The research method chosen was narrative. The term "narrative research" refers to research that tries to describe or reveal an occurrence, symptom, or event. The researchers examined triglyceride levels in obese patients at Dr. M. M. Dunda Limboto Hospital in Gorontalo Regency, Gorontalo Province.

Sugiyono (2017) defines sampling technique as a technique for determining the number of samples based on the sample size used as the actual data source.

Purposive sampling was used in this study, which means that the author selected participants based on specific criteria.

RESEARCH RESULTS

Based on the research that has been done, the following results were obtained

1. Distribution of Samples by Gender

Gender	Frequency	Percentage (%)
Male	13	43,3
Female	17	56,7
Total	30	100,0

(Source: Primary Data, 2021)

The table above shows that of the 30 respondents with obesity studied, 13 were male (43.3%), while 17 were female (56.7%).

2. Distribution of Samples by Age

Age	Frequency	Perscentage (%)
20-30 y.o	5	16,7
31-39 y.o	9	30,0
40-50 y.o	16	53,3
Total	30	100,0

(Source: Primary Data, 2021)

According to the table above, the oldest age group among the 30 obese respondents analyzed is 40-50 years, represented by 16 people (53.3 %), followed by 31-39 years, represented by 9 people (30%), and 20-30 years, represented by 5 people. (16.7%).

3. Sample Distribution by Occupation

Occupation	Frequenci	Percentage (%)
Civil servant	2	6,7
Entrepreneur	6	20,0
Honorary	3	10,0
Farmer	3	10,0
Laborer	2	6,7
IRT	10	33,3
Student	4	13,3
Total	30	100

(Source: Primary Data, 2021)

According to the table above, most obese respondents work up to ten hours per week as housewives (33.3 %), followed by six hours per week as entrepreneurs (20 %), four hours per week as students with professional status (13,3 %), three hours per week as volunteers and farmers (10 %), and finally two hours per week as civil servants and workers 2 persons (6.7%)

4. Distribution of Samples Based on Physical Patterns (Body Mass Index/BMI)

Physical Patterns (IMT)	Frequency	Percentage (%)
Obesitas I	20	66,7
Obesitas II	10	33,3
Jumlah	30	100,0

(Source: Primary Data, 2021)

The table above indicates that most of obese people (66.7 %) have physical characteristics or a body mass index (BMI) between 1 and 20, while obesity II is 10 people (33.3%).

5. Distribution of Samples Based on Diet (Total Calories)

Diet habits (Calory amount)	Frequency	Percentage (%)
Normal	3	10,0
Obesity II	27	90,0
Total	30	100,0

(Source: Primary Data, 2021)

The table above shows the pattern of calorie intake for food intake from morning to night. This shows that of the 30 obese respondents examined, 27 people (90%) with calories or eating habits above average (abnormal) and only 3 people (10%).

DISCUSSION

Triglycerides (TG) are a type of fat found in the bloodstream and many organs of the body. This fat is generated in the liver and is stored as fat beneath the skin and in other organs. TG is the primary source of energy for the body's numerous functions. If you consume more calories than necessary, your TG level will increase.

The researcher next converts the respondent's blood into serum by placing it in a tube that does not contain anticoagulants and allowing it to clot entirely. After frozen, the blood is spun in a centrifuge at 3000 revolutions per minute for ten minutes. Centrifugation serum was then pipette and transferred to another test tube, where it was labeled with the respondent's identity. Finally, the researchers determined the concentration of TG using the Glyserol Peroxidase Phosphate Acid (GPO-PAP) method on a Biosystem A15 chemical analyzer. As indicated in the table above, the sample size or number of respondents obtained is up to 30.

1. Respondent's Gender

Based on results on gender characteristics, it can be stated that the most respondents who are overweight are women, as compared to men. According to the results presented in the preceding table 4.2, 17 of the 30 interviews (56.7 %) were female, while 13 were male (43.3%).

This result is consistent with Nursyamsiyah's (2017) theory that women are more likely to be obese

than men. According to Soegondo (2015), obesity may be directly associated to the distribution of body fat, which is grouped into two types: upper body obesity and lower body obesity. Obesity of the upper body is the accumulation of body fat around the abdomen; this fat is stored in the upper body (abdomen, chest, back and face) [29].

In men, it is primarily prevalent on the upper body, with a distinctively huge (belly) but small thighs and buttocks. Men with high testosterone levels accumulate fat in the upper body (beginning from the belly above or outside the hips), which is why this type of obesity is more commonly referred to as central obesity. Because this form of obesity is associated with (insulin resistance syndrome), it increases the risk of cardiovascular disease [29].

Women have more abdominal fat deposits than men. Women, particularly those who have experienced menopause, have a larger percentage of fat, belly fat, total cholesterol, and triglycerides than non-menopausal women. Women will have an increase in body fat content as they age and enter menopause [29]. Arisman (2018) claimed the same thing, that lower body obesity is associated with an increase in fat storage in the gluteofemoral region, which includes the hips, thighs, and buttocks. The individual has a small stomach but huge hips, buttocks, and thighs. The area's lipoprotein lipase cells can become fatty as a result of diet [4].

Then, as a result of the presence of hormones or sex hormones in women, the enzyme will drive fat from the bloodstream into fat cells. This type of obesity is more prevalent in women, which is why it is frequently referred to as "gynoid obesity." It is closely associated with menstrual disorders in women and is most seen by women approaching menopause [4].

The findings of this study are in line with Nimas Puspitasari's (2018) research, which found that when analyzing the incidence of central obesity in adulthood, 50 (80.6 %) of the 62 female respondents were obese. with central obesity, while 12 persons (19.4 %) did not. Meanwhile, out of 40 male respondents, 19 (47.5%) had central obesity and 21 (52.5%) did not [19].

However, the results of the preceding research and this study contradict the findings of Lenny et al. (2019), who obtained a greater proportion of male respondents than female respondents. In terms of gender, their investigation found 28 men (70%) and 13 women (30%) [15].

The number of male gender research findings Lenny et al. since they used coronary heart disease patients as their population and sample and then connected them with the prevalence of obesity. This is consistent with Pudiastuti's (2013) theory that men are more likely than women to get coronary heart disease. Since the age of 15, the process of atherosclerosis takes a long time. Elevated blood cholesterol levels, particularly LDL, are associated with an increased risk of developing coronary heart disease in middle-aged men aged 40 years and above. Specifically, the hormone estrogen can be quite beneficial for cholesterol control [22].

2. Respondent's Age

Regarding age characteristics, it was emphasized that, of the 30 obese respondents studied, most of the age

group suffering from obesity was 40-50 years old, up to 16 people (53.3 %), or age 3139 to 9 people (30%), and the smallest age group, namely the age of 20-30 to 5 people (20-30 to 5 people) (16.7%).

The findings corroborate Arisman's (2018) theory that the prevalence of central obesity increases with age. With increasing age, the total body protein-rich diet, particularly in the central fat distribution, increases. Central obesity prevalence grows with time and then decreases again at the age of 55. The older sample had a higher prevalence of central obesity. In the elderly (55 years and older), muscle mass decreases and various hormone levels fluctuate, resulting in the accumulation of belly fat [4].

This result is supported by Ministry of Health data from Riskesdas 2018 and Sirkesnas 2018, which indicate that in Indonesia, 13.5 % of adults over the age of 18 are overweight, 28.7 % are obese (BMI 25), and up to 15.4 % are obese in 2015-RPJMN 2019. (BMI 27). Meanwhile, 18.8% of children aged 5 to 12 years were overweight, and 10.8 % were obese.

This finding is supported by data from the 2019 Indonesia Health Profile, which indicates that the 40–44-year age group has the highest rate of obesity (29.6 %), followed by the 45-49 year age group, which has a rate of 25.10%. 35-39 years represents 20.90 %, 30-34 years represents 18.18 %, and 18 years or less represents 6.2%.

According to the Indonesian Ministry of Health (2020), the youngest age group (40-50 years) had the highest prevalence of obesity in developing countries when compared to developed countries. This is a significant public health problem in low- and middle-income countries [14].

The findings of this study corroborate those of Lenny et al. (2019), who examined the relationship between obesity and lipid status in CHD patients and concluded that 47.5 % (19 people) of patients with coronary artery disease (CHD) were between the ages of 46 and 55 years, 70% (28 people) were male, and 62.5 % (15 people) were obese I.

However, the findings of this study and those of Lenny's (2019) research contradict the findings of Nugroho's (2020) study, which examined obesity in terms of gender and age. Adolescents in Indonesia accepted the respondent's age was < 14 years.

3. Respondent's Occupation

Additionally, respondents were requested to enter information about the type of work they performed in the statement of permission to collect information about the respondent's employment level.

According to the characteristics of respondents' most recent educational qualifications, Table 4.4 shows that most of the respondents do not work in an agency or agency, from the results of the study including 10 people (33.3%) who work as housewives (TRI), followed by entrepreneurs, namely 6 people (20 %), then 4 people (13.3%), work status as students, volunteers and farmers, 3 people (10%), and finally as civil servants and workers. , where only 2 people (6.7%).

According to the findings above, 10 of the 17 women interviewed in this study did not work in an agency or office but instead became housewives.

These findings are consistent with Arisman's (2018) theory,

according to which the prevalence of obesity among unemployed individuals is assumed to be related to physical activity, which can result in energy expenditure. Certain jobs require a high level of energy expenditure, while others require little [4].

People who do not work or exercise frequently consume less energy, particularly those who tend to overeat, which might result in body fat formation. Individuals who sit for an extended period can experience an increase in total blood cholesterol levels as a result of decreased sensitivity to insulin and fat-breaking enzymes [4].

The results of this study are in line with the research of Nimas Puspitasari (2018) which determined that of the 26 respondents who did not work, 19 people (73.1%) were obese and 7 people (26.9%) were not.

Although the findings of this study are supported by various theories and research findings by Nimas Puspitasari (2018), they contradict the findings of Reni et al. (2018), who examined TG levels in nurses at the ITU Makassar Tourism Hospital and discovered that TG levels in some nurses were mostly within normal limits, whereas the study's findings indicated that TG levels were abnormal up to 20% normal 80%, abnormal 20% and normal 80%.

4. Physical Pattern (Body Mass Index/BMI)

To determine if someone is obese or not, one can easily classify their body mass index (BMI) by measuring their height and weight. Additionally, researchers conducted this activity to determine whether the 30 selected respondents were obese.

The researcher first determined the respondent's height; the data were then converted to meters (m2). The authors calculated the body weight in kilograms (kg). Finally, the body mass index index is calculated using the BMI formula, which is body mass index (BMI) = body weight (kg): height $(m)^2$ Following the BMI results, researchers define obesity according to WHO guidelines (Ministry of Health, 2019), calculating that a BMI of 25 to 29.9 is considered Obesity I, while a BMI of 30 is considered Obesity II.

Based on the characteristics of 30 respondents' physical patterns or body mass index (BMI), as shown in Table 4.5, the result is that as many as 20 people (66.7 %) have a physical pattern or BMI classification of obesity I, while as many as 10 people have a physical pattern or BMI classification of obesity II (33, 3 percent).

These findings corroborate data from the Ministry of Health of the Republic of Indonesia (2020), which indicates that the global population's average body mass index (BMI) is 2 kg/m2 (obesity I). Additionally, it was claimed that 13.5 percent of adults over the age of 18 in Indonesia were overweight, 28.7 percent were obese (BMI 25), and 15. % were obese according to the 2015-2019 RPJMN indicators. BMI). 18.8% of children aged 512 years were overweight, while 10.8 % were obese. Thus, it may be concluded that in Indonesia, the obese I population outnumbers the obese II population.

The case of high obesity in this study is consistent with the findings of Agustina and Novannisa (2017), who found that out of 15 obese respondents, 13 (86.7 %) were

classified as obese I, while two were classified as obese II (13, 3%).

According to the researcher's literature review, there have been no theories or findings from earlier studies that contradict the findings of this study. This is because someone is considered obese if the results of weight and height measurements are out of balance, particularly if the patient's BMI categorization is Obesity I or II.

As a result of the findings above, it can be inferred that all respondents in this study met the study's inclusion criteria, specifically that they were obese.

5. Diet (calorie count)

After measuring the respondents' body mass index (BMI), the following phase in this study is to determine the quantity of calories (diet) consumed from morning to evening (breakfast, lunch, and dinner). The researcher collected this data by having interviewees complete questionnaires.

Based on the dietary parameters (calorie count) stated in Table 4.6, it is known that 27 respondents (90 %) had a higher calorie count or diet than normal. (abnormal) and limited to three people (10%). The high abnormal results in this study corroborate the theory advanced by the Indonesian Ministry of Health (2019), namely that there are multiple factors that contribute to an individual's obesity and overweight. Genetic factors, environmental factors such as nutrition and physical activity patterns, as well as pharmacological and hormonal factors are all included [15].

Eating habits that contribute to obesity and overweight Here is an example of excessive energy consumption, which contributes to obesity. Foods with a high energy density, excess fat, sugar, and a deficiency of fiber are all related with an increase in energy imbalance, i.e. food intake is not balanced with ongoing physical activity [15].

Arisman (2018) adds that a lack of physical exercise results in a slowing of the body's metabolism. When you move less, you burn fewer calories and hence collect more calories in your body [4].

The findings of this study corroborate with Nimas Puspitasari's (2018) research, which found that among 51 respondents with a high calorie consumption, 43 people (84.3 %) had central obesity and 8 people (15.7 %) did not. Meanwhile, 26 (51.0 %) of the 51 low-calorie respondents had central obesity, whereas 25 (49.0 %) did not.

Additionally, another study that supports the findings of this study is Evan et al. (2017), who discovered that 24 or (77.4 %) eating patterns had a high-fat diet and 29 or (93.5 %) obese individuals were obese I, while Spearman Rank results revealed p values = 0.004 and lt; (0.05), indicating that there is a relationship between eating patterns and obesity incidence.

6. Triglyceride (TG) Test Results

According to the results of an examination of triglyceride (TG) levels in obese patients in the working area of RSUD Dr. MM Dunda Limboto, which are shown in Table 4.7, the majority of obese patients had TG levels within abnormal limits, with 27 (90 %) having abnormal Tg levels and only three having normal Tg levels. Individuals (10%).

The high results of this study cannot be separated from the risks to the body associated with fat accumulation, one of which is

triglycerides (TG). This is consistent with Septyne and Dian's (2015) theory that accumulation of excess fat results in triacylglycerol deposits in adipose tissue. Additionally, verified by Hidayati et al (2017), argument, which states that increased triglyceride levels relate to obesity. Patients who are obese accumulate an excessive amount of fat, which results in an increase in the amount of free fatty acids digested by endothelial lipoprotein lipase. Lipogenesis is inhibited by the release of free fatty acids, which results in an increase in blood triglyceride levels.

CONCLUSION

According to the study's findings and analysis of the data, 90% of 30 obese patients had abnormal TG levels. Meanwhile, the typical TG concentration is 10%. The most important factors affecting TG levels in obese people are physical patterns (body mass index/BMI) and eating habits (number of calories).

REFERENCES

[1] Agustina, Dwi, Novannisa, Nikky. 2017. *Pilates Exercise Dapat Menurunkan Indeks Massa Tubuh (IMT) Perempuan Obesitas Tingkat 1 Di Perumahan Bumi Dirgantara Permai Bekasi. Jurnal Ilmu dan Teknologi Kesehatan, Vol 4 Nomor 2, Maret 2017, hlm : 111 – 122.* Diakses pada 15 Agustus 2021.

[2] Ali Khosman, dan Faisal, Anwar. 2008. *Sehat Itu Mudah, Wujudkan Hidup Sehat Dengan Makanan Tepat*. Pervetakan Hikmah. Jakarta.

[3] Arifnaldi, M.S. 2014. *Hubungan Kadar Trigliserida dengan Kejadian Stroke Iskemik Di RSUD Sukoharjo.* Fakultas Kedokteran Universitas Muhammadiyah Surakarta, Surakarta.

[4] Arisman, D. 2018. *Buku Ajar Ilmu Gizi. Obesitas, Diabetes Mellitus & Dislipidemia.* Penerbit Buku Kedokteran. EGC. Jakarta.

[5] Billy, Senduk, dkk., 2016. *Gambaran Profil Lipid Pada Remaja Obesitas Di Kota Blitung*. Blitung.

[6] Dewi, AC. 2011. *Hubungan Pola Makan, Aktivitas Fisik, Sikap dan Pengetahuan Tentang Obesitas dengan Status Gizi Pegawai Negeri Sipil di Kantor Dinas Kesehata Provinsi Jawa Timur*. Program Studi Kesehatan Masyarakat, UNAIR, Surabaya.

[7] Evan. Joko Wiyono. Erlisa fauziah. 2017. *Hubungan Antara Pola Makan Dengan Kejadian Obesitas Pada Mahasiswa Di Universitas Tribhuwana Tunggadewi Malang. Nursing News. Volume 2, Nomor 3, 2017.* Diakses pada 12 Agustus 2021.

[8] Fauziah, Y.N., Suryanto. 2012. *Perbedaan Kadar Trigliserid pada Penderita Diabetes Melitus Tipe 2 Terkontrol dengan Diabetes Melitus Tipe 2 Tidak Terkontrol.* Fakultas Kedokteran dan Ilmu Kesehatan UniversitasMuhammadiyah Yogyakarta, Yogyakarta.

[9] Ganong, Wiliam. F. 2012. *Buku Ajar Fisiologi Kedokteran*. EGC. Jakarta.

[10] Hidayati, SN. Hadi, H. Lestariana W. 2017. *Hubungan Asupan Zat Gizi dan Indeks Masa Tubuh dengan Hiperlipidemia pada Murid SLTP yang Obesitas di Yogyakarta. Sari Pediatri. 2017; 8(1):25-31.* Diakses pada 04 Agustus 2021.

[11] Joewono, Soeroso, dan Algristian, Hafid., 2011. *Hipertrigliseridemia*. Penebar Swadya Group. Jakarta

[12] Kee, Joyce L. 2014. *Pedoman Pemeriksaan Laboratorium & Diagnostik*. Edisi 6. EGC. Jakarta.

[13] Kemenkes RI. 2019. *Kit Informasi : Epidemi Obesitas*. Kementerian Kesehatan RI. Jakarta.

[14] Kemenkes RI. 2020. *Profil Kesehatan Indonesia Tahun 2019.*. Kementerian Kesehatan RI. Jakarta.

[15] Lenny Indrayanti. Tahiruddin. Nurfantri. 2019. *Obesitas Berhubungan dengan Status Lipid pada Penderita PJK di Poli Jantung RSU Bahteramas Provinsi Sulawesi Tenggara. Jurnal Keperawatan. Volume 03. Nomor 01 Juni 2019. ISSN: 2407-4801*. Diakses pada 11 Agustus 2021.

[16] Limanan D., Prijanti A.R., 2013. Tesis *: Hantaran Sinyal Leptin dan Obesitas : Hubungan dengan Penyakit Kardiovaskuler.* FK UI. Jakarta.

[17] Masturoh dan Anggita. 2018. *Metodologi Penelitian Kesehatan.* PPSDM Kementerian Kesehatan RI., RI. Kementerian Kesehatan RI. Jakarta.

[18] Maulidina, F.A. 2014. *Pengaruh Vitamin C Terhadap Kadar Trigliserida Lanjut Usia Setelah Pemberian Jus Lidah Buaya (Aloe Barbadensis Miller)*. Fakultas Kedokteran Universitas Diponegoro. Semarang.

[19] Nimas, Puspitasari. 2018. *Faktor Kejadian Obesitas Sentral Pada Usia Dewasa. HIGEIA 2 (2) (2018). p ISSN 1475-362846. e ISSN 1475-222656.* Diakses pada 02 Agustus 2021.

[20] Nugroho, Purwo, Setio. 2020. *Jenis Kelamin Dan Umur Berisiko Terhadap Obesitas Pada Remaja Di Indonesia. An-Nadaa: Jurnal Kesehatan Masyarakat, 7 (2) Desember 2020 : 110-114. ISSN : ISSN 2442-4986.* Diakses pada 11 Agustus 2021.

[21] Nursyamsiyah. 2017. *Berdamai Dengan Diabetes*. Jakarta: Tim Bumi Medika.

[22] Pudiastuti, Dewi Ratna. 2013. Penyakit-Penyakit Mematikan. Yogjakarta: Nuha Medika.

[23] Pujiati, S. 2010. Tesis : *Prevalensi dan Faktor Risiko Obesitas Sentral pada Penduduk Dewasa Kota dan Kabupaten Indonesia Tahun 2007.* Fakultas Kesehatan Masyarakat Universitas Indonesia. Jakarta.

[24] Rembang, A.A., Rampengan, J.J.V., Supit, S. 2015. *Pengaruh Senam Zumba Terhadap Kadar Trigliserida Darah Pada Mahasiswa Fakultas Kedokteran Universitas Sam Ratulangi.* Fakultas Kedokteran Universitas Sam Ratulangi. Manado.

[25] Reni Sarira. Andi Auliyah Warsyidah. Nardin. *Gambaran Hasil Pemeriksaan Kadar Trigliserida Pada Petugas Perawatan Lantai 4 RSU Wisata Universitas Indonesia Timur Makassar 2018. Jurnal Media Laboran, Volume 7, Nomor 2, Mei 2017.* Diakses pada 11 Agustus 2021.

[26] Ria, Qadariah, Arief. 2012. Obesitas Dan Profil Lipid Pada Mahasiswa Baru Angkatan 2012-2013 Universitas Hasanuddin. Program Studi Kesehatan Masyarakat Pascasarjana Universitas Hasanuddin Makassar.

[27] Riset Kesehatan Dasar (Riskesdas) (2018). Badan Penelitian dan Pengembangan Kesehatan Kementerian RI tahun 2018.

[28] Rumaisha Hasnah Ibrahim. Aryono Hendarto. Saptawati Bardosono. Ali Khomaini Alhadar. 2019. *Hubungan Asupan Kalori Total dan Makronutrien dengan Derajat Obesitas pada Remaja Obesitas Usia 14-18 Tahun di Jakarta. Sari Pediatri, Vol. 21, No. 3, Oktober*

2019. Diakses pada 12 Agustus 2021.

[29] Septyne, Rahayuni, Putri. Dian, Isti. 2015. *Obesitas sebagai Faktor Resiko Peningkatan Kadar Trigliserida. Jurnal Kesehatan Majority, Volume 4 Nomor 9, Desember 2015.* Diakses pada 03 Agustus 2021.

[30] Soegondo, Sidartawan, et all. 2015. *Penatalaksanaan Diabetes Melitus Terpadu,* edisi 2, Badan Penerbit FKUI. Jakarta.

[31] Sugiyono. 2017. *Metode Penelitian Kuantitatif, Kualitatif, dan R & D*. Alfabeta, CV. Bandung.

[32] Titin, Wihastuti. Andri, dkk. 2016. *Patofisiologi Dasar Keperawatan Penyakit Jantung Koroner : Inflamasi Vaskular.* UB Press. Malang.

[33] Yuliadewi, Luh, Gede. Arimbawa, I Made. 2020. *Gambaran Profil Lipid Dan Dislipidemia Pada Remaja Dengan Obesitas Di Kota Denpasar, Bali, Indonesia. Intisari Sains Medis 2020, Volume 11, Number 2: 629-633. P-ISSN: 2503-3638, E-ISSN: 2089-9084.* Diakses pada 12 Agustus 2021.