The Effect of Aerobic Exercise on hsCRP Levels, Before and After Intervention in Obese Young Adults

Rosdiana Rosdiana[1*], Nilam Fitriani[2], Baktiana Ratna Etnis[3], Nur Qamariyah[4], Nursyamsiyah Nursyamsiyah[5]
[1]Faculty of Public Health, Universitas Indonesia Timur, Sulawesi Selatan, Indonesia
[2]Faculty of Public Health, Universitas Indonesia Timur, Sulawesi Selatan, Indonesia
[3]Faculty of Public Health, College of Health Sciences, Papua, Indonesia
[4]Faculty of Nursing, Universitas Indonesia Timur, Sulawesi Selatan, Indonesia
[5]Faculty of Nursing, Universitas Indonesia Timur, Sulawesi Selatan, Indonesia

***Corresponding Author**: E-mail: rosdiana_lia83@yahoo.com

ABSTRACT

Background: Overweight and obesity are accumulations of excess fat (globally, regionally, and in organs as ectopic lipids) increasing the risk of health impacts. In Indonesia, childhood obesity has a high prevalence rate. According to the Indonesian Ministry of Health. The number of children aged 5-12 years experiencing overweight problems is 18.8% which consists of the category of fat 10.8% and obesity by 8.8%.

Methods: This study is a research with intervention, quasi-experimental research design, to distinguish high sensitivity C-reactive protein (hs-CRP) levels before and after receiving treatment in two groups, namely the control group (the group that did not receive treatment), and the intervention group (the group that performed aerobic exercise).

Result: With dietary and aerobic interventions for 4 weeks, no statistically significant differences were found, although the mean hsCRP levels of the subjects decreased from 2.8 to 2.2 mg/l. The results of non-parametric statistical tests with man whitney test obtained ($\rho > 0.05$), namely ($\rho = 0.346$) indicating that there is no significant effect between aerobic exercise on hsCRP levels in the treatment group and control group with a value of ($\rho = 0.24$) before and after aerobic exercise.

Conclution: Based on the results of research and discussion, it can be concluded that aerobic exercise can provide sufficient changes to reduce hsCRP levels in obese significantly, although the results of statistical analysis do not provide significant changes. Food recall does not have an impact on sufficient change, but if control and dietary interventions are applied it will provide significant changes, this can be seen in the results of different calorie consumption levels.

Publisher: Fakultas Kesehatan Masyarakat Universitas Muhammadiyah Palu

INTRODUCTION

Overweight and obesity is a disorder or disease characterised by excessive accumulation of fat tissue in the body. Until now, there is still a growing assumption among Indonesians that obesity is a symbol of prosperity. However, this needs to change, because obesity is a condition that will increase a person's risk of suffering from various diseases, including coronary heart disease, atherosclerosis, stroke, ostreoarthritis, respiratory problems and social and psychological impacts. Overweight and obesity is a build-up of excess fat accumulation (globally, regionally, and in organs as ectopic lipids) increasing the risk of health impacts (4) (5). In Indonesia, childhood obesity has a high prevalence rate. According to the Indonesian Ministry of Health. The number of children aged 5-12 years experiencing overweight problems is 18.8% which consists of the category of fat 10.8% and obesity by 8.8% (3).

The World Health Organization defines obesity as a condition of body mass index (BMI) ≥30 kg/m2, while BMI ≥25 kg/m2 is defined as overweight, obesity is associated with a greater risk of disability or premature death because it will pose a risk of chronic disease (6). According to the Word Health Organisation (WHO) Obesity is a global pandemic. In the world there are 671 million people with obesity, and more than 50% of them live in ten countries in the world. The shift in consumption and diet is influenced by sedentary lifestyle factors, as the prevalence of chronic non-communicable diseases (NCDs) associated with obesity continues to grow in both developed and developing countries. The increasing trend of childhood obesity has been evident at the global level. Around 10% of children aged 5-17 years are overweight worldwide, and 2-3% are obese. The occurrence of weight gain in school children is high enough to cause the occurrence of obesity problems in developing countries to be higher than in developed countries. The same increasing trend in childhood obesity, especially in Indonesia, has increased significantly (5).

The prevalence of obesity at the age of 6-15 years based on Riskesdas 2018 data, the prevalence of obesity at 3.8% and obesity aged 18 years and over is 21.8% (Ministry of Health RI, 2018). Central obesity at the age of less than 15 years based on Riskesdas data starting from 2007 was 18.8%, in 2013 it was 26.6% and in 2018 there was a significant increase of 31.0% (7). Prevalence of obesity in the age group less than 15 years. South Sulawesi Province, respectively 30.9%, and Makassar is the first place at 30.1% among which children are 7.5% higher than adults (8). Obesity in children is at risk of continuing into adulthood (9).

METHOD

This study is a research with intervention, quasi-experimental research design, to distinguish high sensitivity C-reactive protein (hs-CRP) levels before and after receiving treatment in two groups, namely the control group (the group that did not receive treatment), and the intervention group (the group that performed aerobic exercise).

Population and Sample

The population was all physiotherapy students of Unhas Makassar, the sample was part of obese Unhas Makassar students, the sampling technique was carried out by non-probability sampling. Sample size estimates are calculated based on the sample size formula for unpaired two-group categorical-numerical analytical research.

Research Location

This study will be conducted on Physiotherapy Unhas students, carried out for one month and started in March - April 2023.

Instrumentation or Tools

The researcher determined the sample population aged 19-20 years at the Hasanuddin University physiotherapy faculty who had met the inclusion criteria Purposive sampling of the selected sample, anthropometric measurements, exercise and diet programmes were carried out.

Data Analysis

To analyse the effect of hsCRP levels in obese adults before and after aerobic exercise, the statistical test used is the paired T test if the data is normally distributed with a confidence level of 95% (p = 0.05), if the data is not normally distributed will continue with man witney.

RESULT

Table 1. Discription of age TB BMI gender and hsCRP levels

Variabel	N	Mean	Min	Max	SD
Age	20	19	17	21	1,0
IMT (Intervention)					
Pre	11	28,8	25,0	35,2	3,4
Post	11	27,7	23,0	34,8	3,5
IMT (Control)					
Pre	9	27,5	25,1	32,8	2,9
Post	9	27,4	23,4	31,2	2,3
WC (Intervention)					
Pre	11	84,7	70,0	107,0	11,0
Post	11	82,7	68,0	107,0	10,3
WC (control)					
Pre	9	88,7	81,0	95,0	4,4
Post	9	89,0	81,0	95,0	4,4

Source: Primary Data

From table 1. It can be seen that the age of the research subjects is limited between 17-21 years with a mean value + SD. 21.0 ± 1.0 years, Body mass index (BMI) of research subjects with an average value in the treatment group before exercise mean 28.7 after 27.6 minimun 25.0 after 23.4 maximun 35.2 after 34.8 and SD 3.4 after 3.5. The waist circumference of the research subjects in the treatment group before exercise mean value 84.8 after 82.8 minimun 70.0 after 68.0 maximun 107.0 after 107.0 and SD 11.0 after 10.4. and in the control group body mass index (BMI) of the research subjects before the mean value 27.5 after 27.4 minimun 25.1 after 23.4 maximun 32.8 after 31, 2 and SD 2.3 after 2.2. The waist circumference of the research subjects before the mean value of 88.8 after 89.0 minimun 81.0 after 81.0 maximun 95.0 after 95.0 and SD 4.4.

Table 2. Effect of aerobic exercise and hsCRP levels in the treatment group

Group	Effect of hsCR levels in the treatment group	Value ρ
	Mean ± sd	
Pre	2,8 ± 1,9	0,34
Post	2,2 ± 1,7	

Source: Primary Data

The effect of exercise in the treatment group before exercise with a mean ± SD value of 2.9 ± 1.9 and after exercise mean ± SD 2.2 ± 1.7 and statistical test results of $\rho = 0.34$ (<0.05) showed no significant effect between aerobic exercise on hsCRP levels in the treatment group.

Table 3. Effect of aerobic exercise and hsCRP levels in the treatment control

Control	Effect of hsCR levels in the treatment control	value ρ
	Mean ± sd	
Pre	3,10 ± 2,7	0,24
Post	3,11 ± 2,6	

Source: Primary data

In table 3. the effect of exercise in the control group before exercise with a mean ± SD value of 3.10 ± 2.7 and after exercise mean ± SD 3.11 ± 2.6 and statistical test results of $\rho = 0.24$ (<0.05) showed no significant effect between aerobic exercise and hsCRP levels in the control group.
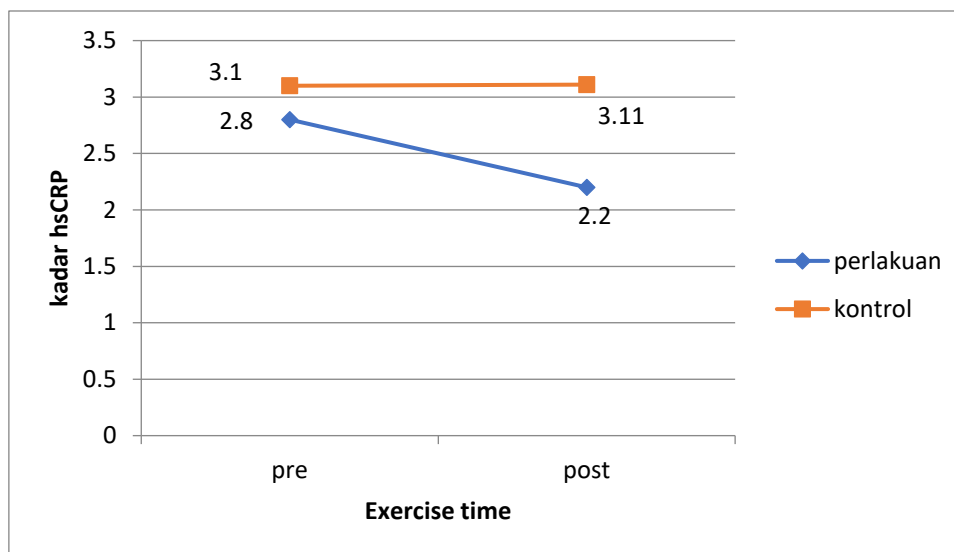
Figture 1. Graph of the difference in the effect of aerobic exercise on hsCRP levels

DISCUSSION

Based on the results of non-parametric statistical test analysis, namely the man whitney test of dietary factors, it was found that there was no significant effect between the energy adequacy rate before and after the intervention, thus causing data habituation, because the dietary factors applied by the sample were not well regulated. This is not in accordance with the theory, the results of research (10). say that a person given a high diet will reduce adipose tissue inflammation, especially to improve insulin sensitivity and reduce the increase in C-reactive protein (hs-CRP) and we know hsCRP is an early marker of inflammation in obesity (11).

Aerobic exercise with mild intensity, which is done for a long time can burn a lot of fat in the body, aerobic exercise is an exercise that uses oxygen. The energy used during exercise is fat. Aerobic exercise, for example circuit training, is an interval exercise and is done sequentially with the aim that the person doing the exercise does not feel bored, because the tendency of women who like aerobics is to feel bored if they only do one type of aerobic exercise continuously. In addition, circuit training exercises performed can stimulate the muscles so that the muscles contract, with the increase in muscle it will also increase aerobic metabolism in cells, namely by increasing the number and size of mitochondria, and the amount of myoglobin in muscle cells.

Limitations and Cautions

The lack of time period given is only about 4 weeks. The nutritional intake of each sample given the intervention was not well controlled at the time of the study, even though it used 24-hour food recall, this was due to the limitations in controlling the subject because it was not together in 24 hours, The lack of samples at the time of the study caused the results of laboratory tests and data analysis to be less than optimal. Although there are many obese female students at Hasanuddin University, they are not willing to be research subjects for various reasons.

Recommendations for Future Research

The results of Anderson's research (2002). Saying that the important contribution of exercise is to maintain muscle mass and only reduce fat mass, which refers to endurance training. Young women need to get used to applying exercise to control obesity early on by exercising, in this case aerobics, by paying attention to the elements: movement model, movement intensity, time, duration, place, and music.

CONCLUSION

The lack of time period given is only about 4 weeks. The nutritional intake of each sample given the intervention was not well controlled at the time of the study, even though it used 24-hour food recall, this was due to

the limitations in controlling the subject because it was not together in 24 hours The lack of samples at the time of the study caused the results of laboratory tests and data analysis to be less than optimal. Although there are many obese female students at Hasanuddin University, they are not willing to be research subjects for various reasons.

BIBLIOGRAPHY
1.   Pluimakers VG, van Atteveld JE, de Winter DTC, Bolier M, Fiocco M, Nievelstein RJAJ, et al. Prevalence, risk factors, and optimal way to determine overweight, obesity, and morbid obesity in the first Dutch cohort of 2338 long-term survivors of childhood cancer: a DCCSS-LATER study. Eur J Endocrinol [Internet]. 2023 Nov 18 [cited 2024 Sep 4];189(5):495–507. Available from: https://pubmed.ncbi.nlm.nih.gov/37837608/
2.   Lee A, Cheng FFK, Yuen H, Ho M, Lo A, Fung Y, et al. Achieving good standards in health promoting schools: Preliminary analysis one year after the implementation of the Hong Kong Healthy Schools Award scheme. Public Health. 2007 Oct 1;121(10):752–60.
3.   Modjo R, Lestari F, Tanjung H, Kadir A, Putra RS, Rahmadani M, et al. COVID-19 infection prevention and control for hospital workers in Indonesia. Front Public Heal [Internet]. 2023 [cited 2024 Oct 8];11. Available from: /pmc/articles/PMC10800904/
4.   Pluimakers VG, van Atteveld JE, de Winter DTC, Bolier M, Fiocco M, Nievelstein RJAJ, et al. Prevalence, risk factors, and optimal way to determine overweight, obesity, and morbid obesity in the first Dutch cohort of 2338 long-term survivors of childhood cancer: a DCCSS-LATER study. Eur J Endocrinol [Internet]. 2023 Nov 18 [cited 2024 Apr 26];189(5):495–507. Available from: https://pubmed.ncbi.nlm.nih.gov/37837608/
5.   YUEN WS, LO HC, WONG WN, NGAI FW. The effectiveness of psychoeducation interventions on prenatal attachment: A systematic review. Midwifery. 2022 Jan 1;104:103184.
6.   Purnell JQ. Definitions, Classification, and Epidemiology of Obesity. Endotext [Internet]. 2023 May 4 [cited 2023 Nov 17]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK279167/
7.   Almutairi N, Burns S, Portsmouth L. Barriers and enablers to the implementation of school-based obesity prevention strategies in Jeddah, KSA. Int J Qual Stud Health Well-being [Internet]. 2022 [cited 2024 Feb 4];17(1). Available from: https://www.tandfonline.com/action/journalInformation?journalCode=zqhw20
8.   World Health Organization. Global nutrition targets 2025: stunting policy brief [Internet]. [cited 2024 Aug 9]. Available from: https://www.who.int/publications/i/item/WHO-NMH-NHD-14.3
9.   Doak CM, Visscher TLS, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. Obes Rev [Internet]. 2006 Feb [cited 2024 Jan 17];7(1):111–36. Available from: https://pubmed.ncbi.nlm.nih.gov/16436107/
10. Lokasi: Pengantar epidemiologi Penyakit Menular [Internet]. [cited 2024 Jan 18]. Available from: https://onesearch.id/Record/IOS3450.INLIS000000000000983?widget=1
11. Bikdeli B, Madhavan M V., Jimenez D, Chuich T, Dreyfus I, Driggin E, et al. COVID-19 and Thrombotic or Thromboembolic Disease: Implications for Prevention, Antithrombotic Therapy, and Follow-Up: JACC State-of-the-Art Review. J Am Coll Cardiol [Internet]. 2020 Jun 16 [cited 2024 Oct 8];75(23):2950–73. Available from: https://pubmed.ncbi.nlm.nih.gov/32311448/