Effect of Diet Program on Upper Arm Circumference

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ABSTRACT

Introduction: As time goes by, lifestyle is changing. The imbalance of energy intake and energy expenditure will result in underfeeding or overfeeding. Police officers at Polresta Depok are obese about 34,6 %. This research is the first research to investigate the effect of the diet program with Mid-Upper Arm Circumference on Policemen at Bhayangkara Prof. Dr. Awaloedin Djamin hospital in Semarang City.

Methods: The design of this study is one group pre-test and post-test design with inclusion criteria that are Policemen with BMI >30 and willing to take part in this study. The exclusion criteria are having a history of medullary thyroid carcinoma. The data collected in this study used consecutive sampling. The statistical analysis used a nonparametric Wilcoxon test.

Results: Mid-Upper Arm Circumference mean before and after intervention were $36,8 \pm 5,72$ and $38,9 \pm 3,22$ with Asymp. Sig. (2 - tailed) p= <0,001. (p<0,05). Thus, the effect of a diet program with Mid-Upper Arm Circumference is significant.

Conclusion: A diet program, consisting of liraglutide injection, diet food, and exercise, has a significant effect on Mid-Upper Arm Circumference.

Keywords: *diet food; exercise; liraglutide, mid-upper arm circumference; obesity*

INTRODUCTION

Overweight and obesity pose a major challenge in the prevention of chronic diseases around the world[1]. Along with the times, human life patterns have also changed. The intake of nutrients that enter is not balanced with what is needed by the body resulting in the body being deficient or overnourished[2]. Obesity is a condition where there is a buildup of fat in adipose tissue, which can interfere with health[3].

The proportion of obesity BMI (Body Mass Index) from 2007 based on Basic Health Research continues to increase. The proportion of obesity in adults aged >18 years in 2007 was 10.5%. The proportion increased in 2013 by 14.8% and continued to increase to 21.8% in 2018[4]. Research by Rachman and Ratu Tatya (2013) at polresta Depok obtained results of 34.6% of police having nutritional status[5]. Another study on the police in the Banjarmasin City Resort Police by Kurniawati et al (2016) found that 33.3% had an obese nutritional status[6]. The high prevalence of obesity in members of the National Police is associated with hypertension, hyperlipidemia, and sedentary behavior. The police profession in general is faced with an increased risk of hyperlipidemia and metabolic syndrome that contribute to the increasing prevalence of heart disease [7].

Liraglutide is a Glucagon-like peptide-1(GLP-1) receptor agonist. Glucagon-like peptide-1(GLP-1) is an incretin hormone that has a role in insulin secretion and reduces glucagon secretion in a glucose-dependent manner. In addition to these roles, GLP-1 delays gastric emptying and causes satiety, thus causing weight loss[8]. A high-energy and high-fat diet leads to a build-up of energy in the form of fat which is a trigger for weight gain. Diets that cause weight loss result in a reduction in hsCRP and are independent of the composition of macronutrients[9]. Aerobic exercise increases peak oxygen consumption (VO_2 peak) which is related to the percentage of total body fat (BF%). Aerobic exercise can also lose weight especially in reducing body fat[10].

This study aims to determine the effect of the diet program on the upper arm circumference in members of the National Police at Bhayangkara Hospital Prof. Dr. Awaloedin Djamin Semarang. The hypothesis in this study is that there is an influence of diet programs on the size of the upper arm circumference.

Based on the description above, obesity is a challenge in the prevention of chronic diseases and the increase in the prevalence of obesity makes researchers interested in conducting research on the effect of diet programs on upper arm circumference in members of the Obese National Police in Semarang City.

METHOD

Quasi-experimental research with a one-group pre and post-test design research design with inclusion criteria, namely members of the National Police who have a BMI of >30 and are willing to take part in research and research exclusion criteria, namely having a history of thyroid medullary carcinoma, was carried out at Bhayangkara Hospital Prof. Dr. Awaloedin Djamin Semarang. Data retrieval using consecutive sampling techniques.

In this study, measurements of the circumference of the upper arm before and after the intervention were given. Measurement of the circumference of the upper arm is carried out on the first day before the intervention and the ninetieth day after the intervention is administered. The interventions provided include giving liraglutide injections, dietary diets, and aerobic exercise. Liraglutide injections are given once a week with an initial dose of 0.6 mg at week 1, a dose of 0.6 at week 2, dose of 0.12 at weeks 3 to 6 for six weeks. After that, measurements were taken three months later. Food diet and physical activity in this study have been consulted with the nutrition and medical rehabilitation department of Prof. Dr. Awaloedin Djamin Hospital Semarang. Recommended food diets such as reducing foods containing coconut milk, starchy, and fried. In addition, not eating sweet foods and hot white rice and drinking water is accompanied by a lot of physical activity such as aerobic exercise 3-5 times a week for 30-45 minutes. Monitoring diet and physical activity are carried out by recalling, namely respondents fill in the data in the books that have been given.

Analysis of research data using Wilcoxon nonparametric tests. This research has been declared ethically feasible by the Medical/Health Research Bioethics Commission, Faculty of Medicine, Sultan Agung Islamic University Semarang through Ethical Clearance Letter number 101/III/2021/Bioethics Commission.

RESULT

Research on "The Effect of the Upper Arm Circumference Diet Program" was conducted on members of the National Police who have a BMI of >30 in Semarang City.

Univariate Analysis

Univariate analysis is used to describe the distribution and percentage of individual variables such as sex. The ratio of male and female patients in this study was 53.6% and 46.4% as in table 1.

Table 1 Sample Distribution

Gender	Frequency	Percentage (%)
Male	30	53,6
Female	26	46,4
Total	56	100,0

In table 2, the size of the upper arm circumference before being given the intervention was about 29-42.5 cm with an average of 36.8 cm, and the size of the arm circumference after being given the intervention was about 29-46 cm with an average of 38.9 cm.

Table 2 Upper Arm Circumference Characteristics of Pre- and Post-Intervention

Variable	Min-Max	Mean ± SD
Upper Arm Circumference (*Pre*)	29-42,5	36,8 ± 5,72
Upper Arm Circumference (*Post*)	29-46	38,9 ± 3,22

Bivariate Analysis

From the normality test with the Kolmogorov-Smirnov test (study sample >50), table 3 shows the results of the pre-upper arm circumference normality test and the post-upper arm circumference with a p-value of < 0.05 so that the data are abnormal and do not meet the parametric test requirements. The measurement scale in this data uses a numerical scale but does not meet the requirements of the parametric test, so a non-parametric test is carried out with the Wilcoxon test.

Table 3 Normality test with Kolmogorov-Smirnov

Variabel	statistik	df	sig
Upper Arm Circumference (*Pre*)	0,238	56	0,000
Upper Arm Circumference (*Post*)	0,163	56	0,001

The Wilcoxon test results in table 4 show a p-value of < 0.05 or significant. The results showed significant differences in upper arm circumference before and after being given the intervention of liraglutide injections, dietary diets, and aerobic exercise.

Table 4 Wilcoxon Test Results

Variable	P	Information
Upper arm circumference post and pre	<0,001	There are meaningful differences

DISCUSSION

Research on "The Effect of the Upper Arm Circumference Diet Program" was conducted on members of the National Police who have a BMI of >30 in Semarang City. The number of subjects who participated in the study was 56 participants. In this study, measurements of the circumference of the upper arm before and after the intervention were given. Administration of liraglutide injections once a week with an initial dose of 0.6 mg at week 1, a dose of 0.6 at week 2, dose of 0.12 at weeks 3 to 6 for six weeks. After that, measurements were taken three months later. Food diet and physical activity in this study have been consulted with the nutrition and medical rehabilitation department of Bhayangkara Hospital Prof. Dr. Awaloedin Djamin Semarang. Recommended food diets such as reducing foods containing coconut milk, starchy, and fried. In addition,

not eating sweet foods and hot white rice and drinking plenty of water is accompanied by physical activity 3-5 times a week for 30-45 minutes. Monitoring diet and physical activity are carried out by recalling, namely respondents fill in the data in the books that have been given.

The measurement of the circumference of the upper arm is the total of muscles, bones, and fat at the midpoint of the upper arm[11]. Based on the research of Rondanelli et al (2016) that weight loss due to liraglutide comes from a decrease in fat mass rather than lean tissue mass[12]. Research by Sam et al (2016) states that there is a strong relationship between upper arm circumference and obesity as measured by Body Mass Index (BMI)[13].

Changes in the size of the upper arm circumference due to liraglutide administration cause a decrease in fat mass, fat mass index, android fat, and trunk fat which results in weight loss. This is because GLP-1 induces a decrease in gastric emptying mediated by the direct activation of GLP-1 receptors in the central nervous system. In addition, GLP-1 also triggers the activation of the vagal[12] nervus. The intensity of physical activity has the effect of controlling body composition. High-intensity physical activity can increase catecholamine and secreted growth hormone, post-exercise oxygen consumption, and lipoprotein lipase activity. Conversely, higher energy expenditure during physical activity can lead to greater body fat loss[10]. Diets that cause weight loss result in a reduction in hsCRP and are independent of macronuclear composition[9].

How liraglutide works directly in weight loss through the regulation of hunger, satiety, and delayed gastric emptying[14]. The delay in gastric emptying insignificantly interferes with the absorption of drug interactions such as acetaminophen, digoxin, warfarin, oral contraceptive pills, statins, ACE inhibitors, and griseofulvin. Delayed absorption of drug interactions can be avoided by taking such drugs one hour before administration of GLP-1 agonist[15]. Early administration of insulin or sulfonylureas is often followed by weight gain, given that insulin use is associated with weight gain[14].

The results of this study can be used as additional information from previous studies that there is a strong relationship between upper arm circumference and obesity as measured by Body Mass Index (BMI)[13].

The limitation of the research is that research has not been carried out with the control group, the hope is that in the next research, research can be carried out with the control group.

CONCLUSION

There was an effect of the diet program on the upper arm circumference with an average size of upper arm circumference before the intervention of 36.8 cm and after the intervention of 38.9 cm.

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REFERENCES

1. Hruby, A. & Hu, F. B. The Epidemiology of Obesity: A Big Picture Adela. Pharmacoeconomics 33, 673–689 (2016).
2. Musdalifa, N. R. & Wicaksono, S. Hubungan Indeks Massa Tubuh dengan Kadar Kolesterol Total pada Staf dan Guru SMA Negeri 1 Kendari. 4, 361–367 (2017).
3. Sahib, A. S. et al. Eating Behavior in a Sample of Overweight and Obese: A Cross Sectional Study. J. Obes. Weigh-loss Medicat. 2, 1–6 (2016).

4. Kemenkes RI. HASIL UTAMA RISKESDAS 2018. (2018).

5. Rachman, Ratu Tatya, K. Asupan Lemak Sebagai Faktor Dominan Obesitas Pada Polisi Satuan Samapta Bhayangkara Polresta Depok Tahun 2013. Fak. Kesehat. Masy. Univ. Indones. (2013).

6. Kurniawati, Y., Fakhriadi, R. & Yulidasari, F. Hubungan Antara Pola Makan, Asupan Energi, Aktifitas Fisik, dan Durasi Tidur Dengan Kejadian Obesitas Pada Polisi. J. Publ. Kesehat. Masy. Indones. 3, 112–117 (2016).

7. Alghamdi, A. S., Yahya, M. A., Alshammari, G. M. & Osman, M. A. Prevalence of overweight and obesity among police officers in Riyadh City and risk factors for cardiovascular disease. Lipids Health Dis. 16, (2017).

8. Mehta, A., Marso, S. P. & Neeland, I. J. Liraglutide for weight management : a critical review of the evidence Obesity Science & Practice. (2016) doi:10.1002/osp4.84.

9. Dewantari, N. M. & Ambartana, I. W. Pengaruh Komposisi Diet Dan Senam Aerobik Terhadap Penurunan Berat Badan. Gizi Indones. 40, 59 (2017).

10. Chiu, C. et al. Benefits of different intensity of aerobic exercise in modulating body composition among obese young adults : a pilot randomized controlled trial. 1–9 (2017) doi:10.1186/s12955-017-0743-4.

11. Shinsugi, C., Gunasekara, D. & Takimoto, H. Use of mid-upper arm circumference (MUAC) to predict malnutrition among Sri Lankan schoolchildren. Nutrients 12, (2020).

12. Rondanelli, M. et al. Twenty-four-week effects of liraglutide on body composition, adherence to appetite, and lipid profile in overweight and obese patients with type 2 diabetes mellitus. Patient Prefer. Adherence 10, 407–413 (2016).

13. Sam, U., Ticoalu, S. H. R. & Pasiak, T. F. Hubungan lingkar lengan atas dengan obesitas pada mahasiswa Kandidat Skripsi Fakultas Kedokteran Universitas Sam Ratulangi Manado. J. e-Biomedik 4, (2016).

14. Garvey, W. T. et al. Efficacy and safety of liraglutide 3.0 mg in individuals with overweight or obesity and type 2 diabetes treated with basal insulin: The SCALE insulin randomized controlled trial. Diabetes Care 43, 1085–1093 (2020).

15. Pakkir Maideen, N. M. Pharmacologically relevant drug interactions of Glucagon-like peptide-1 receptor agonists. J. Anal. Pharm. Res. 8, 51–53 (2019).