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Relationship of Body Mass Index and Haemoglobin with Cardiorespiration Endurane in Female College Students

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ABSTRACT

Cardiorespiratory endurance is the maximum capacity of using oxygen which can be influenced by Hb and BMI levels, so it does not get tired easily after doing activities. Students tend to have unbalanced Hb and BMI. This study aims to determine the relationship of BMI and hemoglobin levels with cardiorespiratory endurance in female college students.

A literature review searched three database (Google Scholar, Pro Quest, and National Journal) that use cross-sectional or quasi-experimental designs published after 2010. The prism checklist is used as a guide to assess the feasibility of studies. The research findings were carried out by tabulating data and narrative analysis. Found 8 journals that met the inclusion criteria based on two broad that affected cardiorespiratory endurance, BMI (n=3), Hb (n=5). Most of these studies use cross-sectional or quasi-experimental designs. The average number of respondents of the study was more than 50 people for the study of the relationship of hemoglobin and body mass index with cardiorespiratory endurance in female college students.

The research examined in this article shows that BMI and Hb are associated with cardiorespiratory endurance in female college students. This can be used as nurses to provide education about the importance of maintaining a balance of BMI and hemoglobin levels in increasing cardiorespiratory endurance so that they can perform physical activity maximally.

Keywords : Cardiorespiratory endurance, body mass index; haemoglobin; Female college students.

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INTRODUCTION

Human activity always requires physical or physical support so that it can become a basic factor for human activity [1] . One of the physical fitness related to health is cardiorespiratory resistance [2]. Cardiorespiratory resistance is the maximum ability for oxygen utilization in the body. A person who has good cardiorespiratory endurance, does not get tired quickly after doing activities [3]. Cardiorespiratory endurance can be seen from the measurement of body mass index and blood composition, especially hemoglobin levels [4].

The latest research conducted by Putri at the Faculty of Medicine, Andalas University, from 38 students studied, found that 24 students (63.2%) were at a very poor fitness level, 6 students (15.8%) were at a low fitness level, and each 4 students (10.5%) at a sufficient and good fitness level and not a single student has a very good level of physical fitness. This shows that more than 50% of students have a very low level of physical fitness [5]. According to Riskesdas, the prevalence of adult population status (> 18 years) based on BMI category, Indonesian population with underweight 15.8%, population with normal BMI 63.6%, population with BMI overweight 8.4%, and population with obesity 12.1%. The prevalence of anemia nationally in Indonesia reached 21.7% in 2013 and there was an increase in 2018, namely 48.9%, with the largest prevalence in pregnant women aged 15-24 years, amounting to 84.6% [6]. Research from Astuti, revealed that the cardiorespiratory endurance was higher at 47.59 ml / kg / minute on normal hb, and only 37.84 ml / kg / minute at low db. During the blood donation event at STIKES Hang Tuah Surabaya, it was known that 71.7% of the 46 female students who did not pass the blood donation test were due to Hb levels that were less than normal [4].

Cardiorespiratory endurance can determine the level of physical fitness because oxygen processing is a metabolic ability that the body has [2]. Cardiorespiratory resistance can be affected by BMI [7]. Body mass index can be seen by weight and height. Someone who is overweight will often feel out of breath, heavy body, often feel hot, pain in the waist, hips, thighs and knees. This is a warning that a person must be aware and must make adequate and appropriate eating arrangements and physical exercise to stay healthy and fit [8]. Cardiorespiratory resistance can also be affected by hemoglobin because it requires oxygen, which in the oxygen-producing body which acts as a transport medium that delivers oxygen throughout the body is hemoglobin [9]. Hairy argues that hemoglobin levels can increase if you do regular exercise [10].

For students, physical fitness is needed to support activities during lectures [11]. Students in each faculty have different demands, especially nursing students who have to take practical and theoretical lectures. Nursing students as prospective health workers in the future are expected to be role models in their environment and be able to promote physical activity to each patient.

METHOD

The method used in this Literature review begins with selecting a topic, then determining keywords for journal searches using English and Indonesian through databases, namely Google Scholar, Pro Quest and National Journal. This search was limited from January 2015 to October 2020. Journals were selected for review based on studies taking into account the inclusion criteria. The inclusion criteria in this literature review are the relationship between body mass index and hemoglobin levels with cardiorespiratory resistance in female students. A search using English keywords found 8 journals and with Indonesian keywords obtained 22 journals. Of all journals that match the theme and inclusion criteria, 8 journals, namely 3 English journals and 5 Indonesian journals. The 8 journals were then scrutinized and conducted critical appraisals. Then a Literature Review is carried out in accordance with the previous Critical Appraisal results.

RESULTS AND DISCUSSION

Body Mass Index

In the research of Anna Herdina, M. Zen Rahfiludin, Apoina Kartini, revealed that there is a relationship between body mass index and aerobic endurance in softball athletes. The higher the body mass index, the lower the aerobic resistance of softball athletes [12]. This research was supported by Robert Podstawski, et al entitled Relationship Between BMI and Endurance-Strength Abilities Assessed by the 3 Minute Burpee Test involving 204 female students of Warmia and Mazury University in Olsztyn (UWM) [13]. This study shows that body mass is the most influencing parameter in cardiorespiratory endurance. Women who are obese have lower cardiorespiratory fitness, decreased muscle strength of the lower extremities with normal peer body weight [14]. Obesity in a person can make changes in the body, such as the presence of adipose / fat tissue around the ribs, abdomen, and visceral cavities that fill the abdominal wall resulting in increased intra-abdominal pressure resulting in inadequate inspiratory process so that vital lung capacity decreases [15]. Thick chest wall by fat folds in an advanced state will greatly inhibit chest wall breathing movements, and can even cause intermittent airway obstruction and the visceral cavity that fills the abdominal wall resulting in increased intra-abdominal pressure resulting in an inadequate inspiratory process so that the vital capacity of the lung decreases [16].

Hemoglobin levels

This researcher is in line with research by Fannisa Mahastuti, and Zen Rahfiludin that the better the hemoglobin level, the better the level of physical fitness. Researchers also added that if the better the energy adequacy level, the better a person's hemoglobin level. if the better iron sufficiency, the better a person's hemoglobin level [17]. The research was also supported by Philo U Saunders, Laura A Garvican-Lewis, Walter F Schmidt, Christopher J Gore entitled Relationship between changes in hemoglobin mass and maximal oxygen uptake after hypoxic exposure revealed that there was a relationship between hemoglobin levels and VO2max [18].

In a study on hemoglobin status, smoking habits and cardiorespiratory endurance (vo2 max) in basketball student activity unit athletes by Anggraeni and Wirjatmadi, it was suggested that athletes who were not anemic and non-smoking had good cardiorespiratory endurance. Basketball athletes are advised to maintain a balanced Hb level and avoid smoking in order to have good cardiorespiratory endurance. Researchers added that normal hemoglobin levels in the body are very beneficial for athletes because they match their function. Hemoglobin can bind to oxygen which will then be carried to tissues or organs in the body that need it to do work. Researchers added that normal hemoglobin levels in the body are very beneficial for athletes because they match their function [19].

Gender

In the research of Rini Wuri Astuti entitled Hematocrit and Hemoglobin Levels with Maximum Oxygen Consumption (Vo2max) in adolescent athletes, it was revealed that gender had an effect on the relationship between hemoglobin and VO2max levels [4]. Oxygen consumption can be affected by body composition. The most common measurement of body composition is the percentage of fat. In this study, there was no measurement of fat percentage, where a person is advised to have a body fat percentage of between 8-18% to maintain cardiorespiratory. Generally, men have lower fat than women [20] .

CONCLUSIONS AND SUGGESTIONS

Cardiorespiratory endurance will run well if accompanied by adequate body composition (BMI and Hb levels). A person who has a high BMI tends to have a low VO2 max. Body weight can affect speed, endurance and muscle strength. Fatigue is caused by a decrease in the maximum amount of oxygen uptake (VO2 max). A decrease in hemoglobin levels for female students can result in a lack of oxygen being circulated to the body and brain. This is influenced by the number of red blood cells and the status of hemoglobin in them. Good hemoglobin has enough oxygen for the body's metabolic system. Therefore, if oxygen transport decreases, the cardiorespiratory capacity will also decrease.

Maintaining good body mass index status and hemoglobin levels is important for female students to get maximum cardiorespiratory endurance, get optimal appearance and support daily activities so as to improve health. The health team, such as nurses, are expected to be able to implement and provide health education about the importance of training cardiorespiratory endurance. Additional research needs to be done with similar themes but with different research methods and instruments.

DAFTAR PUSTAKA

1. Arimbi et al. Efektivitas Glukosa dan Sukrosa Terhadap Peak Expiratory Flow Rate (PEFR) dan Daya Tahan Kardiovaskular. *Semin Nas LP2M UNM*. Published online 2019.

2. Afriwardi. *Ilmu Kedokteran Olahraga*. EGC; 2010.

3. Lubis HM, Sulastri D. Hubungan indeks massa tubuh dengan ketahanan kardiorespirasi,

ketahanan dan kekuatan otot dan fleksibilitas pada mahasiswa laki-laki jurusan pendidikan dokter Universitas Andalas angkatan 2013. *J Kesehat Andalas*. 2015;4(1):142-150.

4. Astuti RW. Hematokrit Dan Kadar Hemoglobin Dengan Konsumsi Oksigen Maksimal (Vo2Maks) Pada Atlet Remaja. *Med Respati J Ilm Kesehat*. 2019;14(2):151. doi:10.35842/mr.v14i2.250

5. Aminullah. Hubungan Daya Tahan Kardiovaskuler dengan Indeks Massa Tubuh pada Mahasiswa Fakultas Kedokteran Universitas Andalas. Published online 2019.

6. Riskesdas. HASIL UTAMA RISKESDAS 2018, Kementerian Kesehatan. *Ris Kesehat Dasar*. Published online 2018.

7. Ahmetov II FO. Current progress in sports genomics. *Crossref PubMed Google Sch*. Published online 2015:(70):247-314. doi:doi: 10.1016/bs.acc.2015.03.003

8. Meiriani. Kontribusi Kapasitas Vital Paru Terhadap Daya Tahan Kardiorespiratori. *J Endur*. Published online 2017:2.3: 258-262.

9. Zeiher J, Ombrellaro KJ, Perumal N, Keil T, Mensink GBM, Finger JD. Correlates and Determinants of Cardiorespiratory Fitness in Adults: a Systematic Review. *Sport Med - Open*. 2019;5(1). doi:10.1186/s40798-019-0211-2

10. Katherine J. Ombrellaro, Nita Perumal, Johannes Zeiher, Jens Hoebel, Till Ittermann, Ralf Ewert, Marcus Dörr, Thomas Keil GBMM& JDF. Socioeconomic correlates and determinants of cardiorespiratory fitness in the general adult population: a systematic review and meta-analysis. *Sport Med*. Published online 2018:4(1), 25.

11. Anindita P, Darwin E. Artikel Penelitian Hubungan Aktivitas Fisik Harian dengan Gangguan Menstruasi pada Mahasiswa Fakultas Kedokteran Universitas Andalas. *J Kesehat Andalas*. 2016;5(3):522-527.

12. Herdina A, Rahfiluddin MZ, Kartini A. Hubungan Kadar Hemoglobin, Persentase Lemak Tubuh, Aktivitas Fisik dan Status Merokok dengan Daya Tahan Aerobik Atlet Softball. *J Kesehat Masy*. Published online 2019:7(4), 668-674.

13. Podstawski R, Bernard K, Tomasz B, Michał B, Dariusz C. Relationship Between BMI and Endurance-Strength Abilities Assessed by the 3 Minute Burpee Test. *Int J Sport Sci*. 2013;2013(1):28-35. doi:10.5923/j.sports.20130301.06

14. Bonney E, Ferguson G, Smits-Engelsman B. Relationship between body mass index, cardiorespiratory and musculoskeletal fitness among south african adolescent girls. *Int J Environ Res Public Health*. 2018;15(6). doi:10.3390/ijerph15061087

15. Satriani, Hayu Andita, Dono Indarto and YLRD. The path analysis of body mass index, physical exercise, sleep quality, and parental education on physical fitness among male adolescences. *J Heal Promot Behav*. Published online 2018:3(4), 270-278.

16. Christensen, Martin and JC. The cardio-respiratory effects of intra-abdominal hypertension: Considerations for critical care nursing practice. *Intensive Crit Care Nurs*. Published online 2018:44: 53-58.

17. Mahastuti, Fannisa, M. Zen Rahfiludin and SS. Hubungan Tingkat Kecukupan Gizi, Aktivitas Fisik dan Kadar Hemoglobin dengan Kebugaran Jasmani. Published online 2018:6.1: 458-466.

18. Saunders PU, Garvican-Lewis LA, Schmidt WF, Gore CJ. Relationship between changes in haemoglobin mass and maximal oxygen uptake after hypoxic exposure. *Br J Sports Med*. 2013;47(SUPPL. 1). doi:10.1136/bjsports-2013-092841

19. Anggraeni L, Wirjatmadi RB. Status Hemoglobin, Kebiasaan Merokok dan Daya Tahan Kardiorespirasi (Vo 2 Max) pada Atlet Unit Kegiatan Mahasiswa Bola Basket. *Media Gizi Indones*. 2019;14(1):27-34.

20. Ryan M. Weatherwax, Nigel K. Harris AEK& LCD. The incidence of training responsiveness to cardiorespiratory fitness and cardiometabolic measurements following individualized and standardized exercise prescription: study protocol for a randomized controlled trial. Published online 2016:17.1: 1-12.