SPORTS MEDICINE TO REDUCE OBESITY BODY FAT RATE AND PROMOTE HEALTH RESEARCH

MEDICINA DO ESPORTE NA REDUÇÃO DA TAXA DE GORDURA CORPORAL NA OBESIDADE E PROMOÇÃO DE PESQUISAS NA SAÚDE

MEDICINA DEL DEPORTE EN LA REDUCCIÓN DE LA TASA DE GRASA CORPORAL EN OBESIDAD Y PROMOCIÓN DE INVESTIGACIONES EN LA SALUD

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ABSTRACT

Introduction: Obesity is a chronic disease with excessive accumulation of body fat, exceeding the normal health level and affecting the physiological functioning of the body. Objective: To establish an obesity evaluation standard closely related to health based on sports medicine indexes, and to provide a new theory and method for the formulation of an obesity evaluation standard in China. Methods: Height, weight, skin fold thickness (shoulder, arm) and medical indexes (SBP, DBP, TC, TG, HDL, INS) of 108 female subjects in a city were tested by means of anthropometry, experiment, and mathematical statistics. All the selected medical indicators were evaluated according to clinical medical standards. Results: the body mass index of 108 women was positively correlated with such medical indexes as systolic blood pressure, diastolic blood pressure, triglycerides, high density lipoprotein cholesterol, insulin and so on (P<0.05~0.01). Conclusions: The correlation between medical indexes and BMI is high, and the abnormal rate increases with the increase in the level of obesity. Clinical indicators can be used as an important scientific basis for the establishment of obesity evaluation criteria. ***Level of evidence II; Therapeutic studies - investigation of treatment results.***

Keywords: Academic Medical Centers; Obesity; Obesity Management; Adipocytes.

RESUMO

Introdução: A obesidade é uma doença crônica em que há acumulo excessivo de gordura corporal, excedendo o nível saudável normal e afetando o funcionamento fisiológico do corpo. Objetivo: Estabelecer uma avaliação padrão de obesidade estritamente relacionada a saúde com base nos índices de medicina do esporte, e fornecer uma nova teoria e novo método para a formulação de uma avaliação padrão de obesidade na China. Métodos: Altura, peso, espessura de dobras cutâneas (ombro, braço) e índices médicos (PSS, PSD, TC, HDL, INS) de 108 sujeitos do sexo feminino, moradoras de uma cidade, foram tomados por meio de antropometria, experimentos e estatísticas matemáticas. Todos os indicadores médicos selecionados foram avaliados de acordo com padrões médicos clínicos. Resultados: o índice de massa corporal de 108 mulheres se correlaciona com índices médicos como pressão sanguínea sistólica, pressão sanguínea diastólica, triglicerídeos, alta densidade de colesterol lipoproteico, insulina e assim por diante (P<0.05~0.01). Conclusões: A correlação entre índices médicos e o IMC é alta e a taxa anormal aumenta com o aumento no grau de obesidade. Indicadores clínicos podem ser usados como base cientifica importante para o estabelecimento de critérios de avaliação de obesidade. ***Nível de evidência II; Estudos terapêuticos – investigação de resultados de tratamento.***

Descriptores: *Centros Médicos Acadêmicos; Obesidade; Manejo da Obesidade; Adipócitos.*

RESUMEN

Introducción: La obesidad es una enfermedad crónica en que hay acúmulo excesivo de grasa corporal, excediendo el nivel saludable normal y afectando el funcionamiento fisiológico del cuerpo. Objetivo: Establecer una evaluación estándar de obesidad estrictamente relacionada a la salud con base en los índices de medicina del deporte, y brindar una nueva teoría y método para la formulación de una evaluación estándar de obesidad en China. Métodos: Altura, peso, espesor de pliegues cutáneos (hombro, brazo) e índices médicos (PSS, PSD, TC, HDL, INS) de 108 sujetos del sexo femenino, residentes de una ciudad, se tomaron por medio de antropometría, experimentos y estadísticas matemáticas. Todos los indicadores médicos seleccionados se evaluaron de acuerdo a patrones médicos clínicos. Resultados: El índice de masa corporal de 108 mujeres se correlaciona a índices médicos como presión sanguínea sistólica, presión sanguínea diastólica, triglicéridos, colesterol de lipoproteínas de alta densidad, insulina y así sucesivamente (P<0.05~0.01). Conclusiones: La correlación entre índices médicos y el IMC es alta y la tasa anormal aumenta con el aumento en el grado de obesidad. Indicadores clínicos pueden usarse como base científica importante para el establecimiento de criterios de evaluación de obesidad. ***Nivel de evidencia II; Estudios terapéuticos – investigación de resultados de tratamiento.***

Descriptores: *Centros Médicos Académicos; Obesidad; Manejo de la Obesidad; Adipocitos.*

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INTRODUCTION

Obesity is a chronic disease with excessive accumulation of body fat, which exceeds the normal health level and affects the physiological function of the body. The incidence of obesity is not only high in economically developed countries such as the United States, Australia, Japan, South Korea and Hong Kong, China, but also increasing in developing countries.[1] Current, besides the traditional underwater weighing method, skin pleat thickness and ultrasonic measurement method, the magnetic resonance imaging that uses high-tech means in recent years, the measurement method such as two-photon X-ray scan, CT tomography also is trying to the test of fat. Numerous measurement methods will inevitably bring a variety of evaluation indicators.[2,3] According to test methods and test data processing methods, it can be roughly divided into body shape index and body fat percentage index. Different indicators are used in the same group or individual to judge the results of obesity, so it is difficult to truly judge the influence of body fat weight or lean body weight on obesity. Hosseini S A et al measured bone mineral density (BMD) and total fat using A Hologic Horizon WI densitometer, and A P value below 0.05 was considered significant, with A positive correlation between fatty masses and bone mineral density in all postmenopausal women.[4]

METHOD

Subjects

108 female volunteers aged between 40 and 60 in a certain city, with an average age of 48.5 years; The height is between 141 and 171cm, with an average of 157.7cm, and the weight is between 44.2 and 88.4kg, with an average of 60.6kg.[5]

Research Methods

Calculation of body fat rate

By measuring the skin fold thickness of the arm and shoulder blade, the suzuki body density formula is used: D=1.0897-0.00133×(shoulder blade + arm) skin fold, calculate the volume density, and then use the world-recognized Brozek formula: Body fat rate (F%)=(4.570/D-4.142)×100%, calculate body fat percentage. The skin pleat thickness meter adopted the improved domestic skin fat thickness meter produced by the National Institute of Sports Science in imitation of the Japanese rong research. The thickness of skin pleat was measured according to the operation instruction.[6]

Experimental methods

Blood pressure measurement

The mercury column sphygmanometer (XJ14-300) made by Shanghai Hospital Equipment Factory was used to measure the blood pressure according to the standard method.

Blood lipid and insulin levels were measured

Subjects were fasting on an empty stomach, fasting within 12h and no greasy food within 24h. 5ml of blood was collected intravenously by a professional nurse. Blood samples were sent to the laboratory within 2h for clinical sports medicine diagnosis determination of TC, TG, HDL and INS by professional experimenter. TC, TG and HDL were determined by automatic biochemical analyzer.

Mathematical Statistics

All the collected data are processed by MI-Crosoftexcel software package in Office 2000.[7]

RESULTS

Table 1 shows the test results of various indicators of the subjects. As can be seen from the table, the mean values of all other indexes were within the normal range except that the mean value of INS was above the normal range (the mean value of INS was >20μIU/ mL). These results suggest that the INS level of middle-aged women in China is generally higher, and the higher INS level may be associated with the tendency of hyperinsulinemia. Hyperinsulinemia may be caused by the decrease of insulin sensitivity in obese patients and the decrease of insulin clearance rate in the liver, which leads to the increase of insulin concentration in blood and the formation of hyperinsulinemia.[8]

Comparative analysis of body fat percentage between normal group and abnormal group of sports medicine indicators

The mean value and difference test results of the body fat percentage between the normal group and the abnormal group of sports medicine indicators are shown in Table 2. As can be seen from Table 2, the body fat percentage of the abnormal sports medicine indicators group was higher than that of the normal group. The results showed that the abnormal sports medicine indicators may be related to the increase of body fat percentage, which is consistent with the results of clinical sports medicine research. The increase of body fat percentage is one of the main causes of abnormal sports medicine indexes. To establish the evaluation standard of obesity from the perspective of health, it is obvious that the standard of sports medicine should be based on the index standard of sports medicine that does not damage the health state.

Relationship between body fat rate and abnormal rate of sports medicine indicators

Establishment of abnormal benchmarks for evaluating sports medicine indicators of obesity

Figure 1 is to test the significance of difference of body fat percentage between the two groups according to one or more abnormal sports medicine indicators in all subjects. And the test results of average body fat percentage of abnormal group (AG) and normal group (NG) based on two or more abnormal sports medicine indicators in all subjects.[9]

Analysis of the relationship between body fat rate and abnormal rate of sports medicine indicators

With the percentage of body fat as the independent variable and the abnormal rate of sports medicine index (the percentage of people with abnormal sports medicine index in the total number above the body fat rate as the abnormal rate of sports medicine index) as the dependent variable, the curve graph of the abnormal rate of sports medicine index with the

Table 1. Correlation coefficient between test results and body fat percentage and sports medicine indexes.

Index	$\overline{X} \pm S$	Index	$\overline{X} \pm S$	Correlative coefficient
biceps(mm)	24.4±5.6	SBP(mmHg)	119.0±15.7	0.311**
Sub -scapular(mm)	24.9±7.6	DBP(mmHg)	79.0±10.7	0.322**
sum(mm)	49.3±12.1	TC(mmol/ L)	5.00±0.88	0.047
F%(%)	32.1±7.1	TG(mmol/ L)	1.27±0.59	0.318**
		HDL(mmol/ L)	1.31±0.20	-0.212*
		INS(μIU/ mL)	25.6±18.6	0.275**

*P<0.05;**P<0.01.

Table 2. Comparison of the mean body fat percentage between the normal group and the abnormal group of sports medicine indicators.

	NG	AC	P	
SBP	31.6±6.9	35.8±6.9	<0.05	*
DBP	31.3±6.9	36.1±6.6	<0.01	**
TC	31.4±7.0	34.4±7.0	>0.05	
TG	30.8±6.4	37.2±7.3	<0.01	**
HDL	31.6±6.9	35.8±7.3	<0.05	*
INS	31.0±5.7	32.9±7.9	>0.05	

*P<0.05;**P<0.01.

increase of body fat rate was made in the Cartesian coordinate system, as shown in Figure 2. It can be seen from the figure that with the increase of body fat percentage, the abnormal rate of sports medicine indicators is also increasing, which is basically consistent with the results of clinical sports medicine research. Therefore, we can try to establish the evaluation standard of obesity by referring to the abnormal rate of sports medicine indicators.

Establishment of body fat rate standard for evaluation of obesity

Taking all 108 subjects as the population, 38 of them had abnormal clinical sports medicine diagnostic indicators, accounting for 35.2% of the total, that is, the overall abnormal rate of sports medicine indicators was 35.2%. The subjects with abnormal fat rate of a certain body were regarded as the sample, and the proportion of the number of abnormal clinical sports medicine diagnostic indicators in the sample to the total number of samples was the sample abnormal rate. The body fat percentage increased by 1%, and the significance test of sample abnormality rate and total abnormality rate was conducted successively. When the body fat percentage was less than 30%, there was no significant difference between the sample abnormality rate and the total abnormality rate.[10] (Table 3)

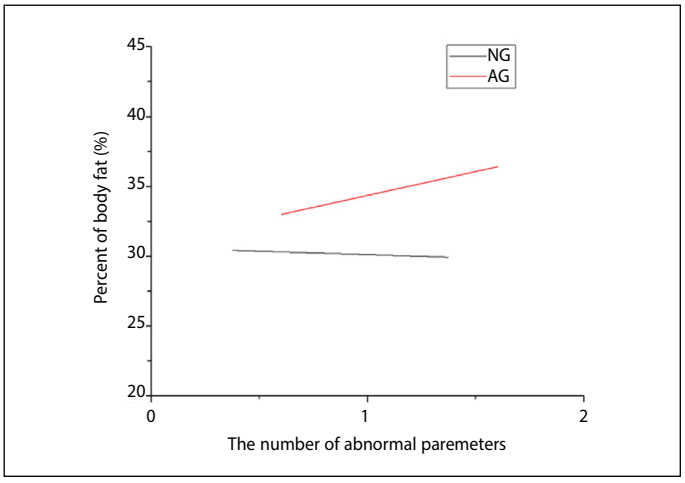

Figure 1. Comparison of the mean body fat percentage between the normal group and the abnormal group of sports medicine indicators.

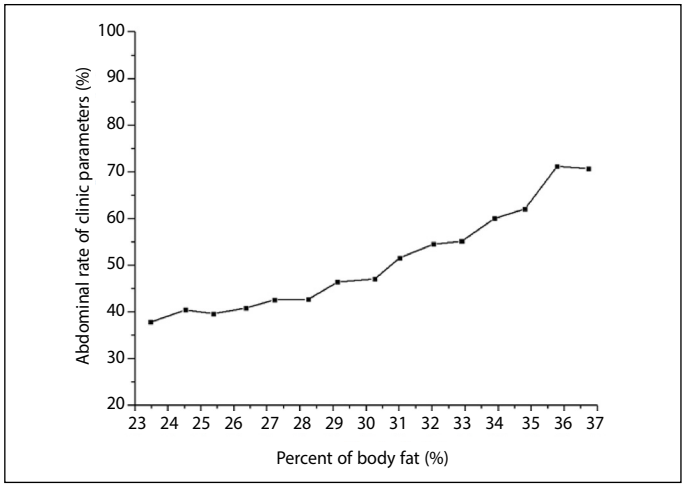

Figure 2. Relationship between body fat rate and abnormal rate of sports medicine indicators.

Table 3. Obesity evaluation criteria.

	critical value of F%	abnormal rate of total	abnormal rate of over critical value
criterion of MO	30	35.2	47.7
criterion of O	36	47.7	70.0

Comparison of abnormal rates of sports medicine indicators

According to the above criteria, if the body fat percentage is less than 30%, it is not obese. Mild obesity occurs when the body fat percentage is equal to or greater than 30% and less than 36%. Obesity is defined as having a body fat percentage equal to or greater than 36%. The subjects were divided into non-obese group (N group), mildly obese group (MO group) and obese group (O group), and the abnormal rates of sports medicine indicators in each group were compared. The results were shown in Figure 3. There were significant differences in the abnormal rate of sports medicine indicators between group N and group MO, and between group MO and group O. The difference between the N and O groups was significant. This indicates that the obesity evaluation criteria established in this study can more truly reflect the abnormal possibility that the increase of body fat percentage will inevitably produce clinical sports medicine diagnostic indicators.

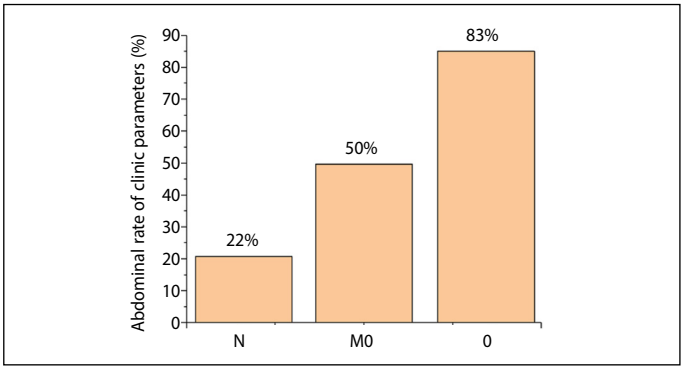

Figure 3. Comparison of abnormal rates of sports medicine indicators in group N, group MO and group O.

DISCUSSION

The above results showed that with the increase of obesity degree, the test value of sports medicine index showed significant difference, and the abnormal rate increased significantly. The criteria for the evaluation of mild obesity and obesity established from the perspective of health showed that when the subjects were mildly obese, the test value of sports medicine indicators and the abnormal rate might develop towards the direction of causing related diseases, when the subjects were obese, they were more likely to develop disease than if they were mildly obese. The study further clarified the internal relationship between obesity and health diagnostic indicators. Therefore, taking the abnormal rate of sports medicine index as the reference basis, establishing the evaluation standard of obesity is a kind of theory and method worth reference.

CONCLUSION

There was a high correlation between sports medicine index and body mass index and body fat percentage. The percentage of body fat in the abnormal group was higher than that in the normal group. The mean difference of body fat percentage between the abnormal group with two or more abnormalities and the normal group with less than two abnormalities was very significant. According to the abnormal rate of medical indexes, the critical point of body fat rate causing the abnormal rate of medical indexes was found, namely the evaluation standard of mild obesity and the evaluation standard of obesity. Referring to the abnormal changes of sports medicine indicators and according to the principle of rate difference test in statistics, the critical point of BMI for the change of abnormal number of sports medicine indicators, namely the evaluation criteria for overweight and obesity, was found out. Therefore, sports medicine indexes can be used as an important scientific basis for the establishment of obesity evaluation criteria.

The author declare no potential conflict of interest related to this article

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REFERENCES

1. Daulay FR, Simarmata T. Current status and prospect of halotolerant biofilm PGPR (plant growth promoting rhizobacteria) as bioagent to increase crops growth on saline soils. IOP Conference Series: Earth and Environmental Science. 2021 [cited 2021 Oct 8];748(1):012042. Available from: https://iopscience.iop.org/article/10.1088/1755-1315/748/1/012042.
2. Zhang Y, Liu S, Fan C, Zeng Y, Li J, Xie C, et al. [Effect of glucagon-like peptide 1 receptor agonists on body fat redistribution and muscle mass in overweight and obese type 2 diabetic patients]. Nan Fang Yi Ke Da Xue Xue Bao. 2019;39(4):450-455. Chinese. doi: 10.12122/j.issn.1673-4254.2019.04.11.
3. Noer ER, Dewi L, Huriyati E, Djamiatun K, Susanto H, Tjahjono K, et al. The Impact of Weight Loss Program in Metabolic Profile and Body Fat Improvement among Indonesian Young Obese: A Randomized Clinical Trial. J Nutr Sci Vitaminol (Tokyo). 2020;66(Supplement):S308-S313. doi: 10.3177/jnsv.66.S308.
4. Hosseini SA, Hosseini SR, Ghadimi R, Noreddini H, Bijani A. Association between body fat and bone mineral density in non-obese post-menopausal women over 60 years old. Caspian J Intern Med. 2021;12(2):200-6. doi: 10.22088/cjim.12.2.200.
5. Chung GKK, Yu RH, Woo J, Lai FT, Chung RY, Yeoh EK, et al. Accelerated progression of waist-to-hip ratio but not body mass index associated with lower socioeconomic position: a cohort study of nonobese early postmenopausal Chinese women. Menopause. 2020;27(5):550-58. doi: 10.1097/GME.0000000000001503.
6. Wadee AN, Shafeek MM, Tawfick AM. Influence of Different Exercise Regimens on Segmental Body Fat in Obese Primary School Children. Indian Journal of Public Health Research and Development. 2019;10(11):3380.
7. Lee J Y, Jo YJ. Effect of 12 weeks Jumping Aerobic dance Exercise on C-reactive protein, pulse transmit time and % body fat in obese women. Korean Journal of Sports Science. 2020;29(5):937-45.
8. Sun J, Cheng W, Fan Z, Zhang X. Influence of high-intensity intermittent training on glycolipid metabolism in obese male college students. Ann Palliat Med. 2020;9(4):2013-9. doi: 10.21037/apm-20-1105.
9. El-Alameey IR, Ahmed HH, Mahmoud RA, Kairy AS, Medany EA. Significance of Myeloperoxidase in the Onset of Cardiovascular Disease among Obese Children and Adolescents. Biomed Pharmacol J. 2019;12(4):1647-59. doi: https://dx.doi.org/10.13005/bpj/1795.
10. Sang GS, Park SH, Yoon JH, Kim BW, Jee H. The Effect of Five Weeks of Basic Military Training on Physical Fitness and Blood Biochemical Factors in Obese Military Recruits Just Conscripted into the Army. Exerc Sci. 2020;29(2):154-61. doi: https://doi.org/10.15857/ksep.2020.29.2.154.