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Influence of Waist-to-Hip Ratio on Health and Fertility in Humans

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ABSTRACT

Ancel Keys gave the formula devised in the 1840's a new name, Waist to Hip Ratio (WHR) in the early 70's. Since then it has become an important parameter for measurement of health. The Waist-to-Hip Ratio (WHR) gives more meaningful information rather than Body Mass Index (BMI). Here we have described the applications of WHR in prediction of certain diseases due to change in WHR values. If both males and females do not maintain proper WHR values, they suffer with many health problems.

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Introduction

Proportionate growth of different organs during growth and development is very essential to keep a healthy body. The health conscious people are particular about this property and became popular even among teenagers and has received increased attention among all ages in recent years [1]. In other words if this proportion is going beyond the limits (standards set by Canadian Standardized Test of Fitness (CSTF) operations manual. Ottawa: Canadian Association of Sport Sciences, 1986 from the Canada Fitness Survey) one gets sick. While modelling the human body, nature used laws of physics for the growth of all essential and major organs in the body finally so that proper human shape comes out of a healthy and functional human being. A Nobel prize winner in physics in 2004 for asymptotic freedom David Gross explained the fundamental interaction between forces, among any of the four basic forces—gravitational, electromagnetic, strong, and weak-that govern how objects or particles interact and how certain particles decay.

The basis of the growth and shaping of the object after the discovery of the 'god particle' , the known rules of particle physics that scientists believe govern the basic building blocks of matter [2,3]. Physics becomes "King of All Sciences"said by David Gross [2].

All humans are nor created equally; humans evolved through evolution. Seeing the differences, the human population was classified in to five races: African, Asian, European, Native American, and Oceanian [4]. However, due to genetic variation among human individuals and populations 'Race' cannot be biologically defined. Race is a social construct, not a biological attribute. Today, scientists prefer to use the term "ancestry" to describe human diversity which focuses on understanding how a person's history unfolded, not how they fit into one category and not in another. In a clinical setting, for instance, scientists would say that diseases such as sickle-cell anaemia and cystic fibrosis are common in those of "sub-Saharan African" or "Northern European" descent, respectively, rather than in those who are "black" or "white".

Sexual Dimorphism and WHR

Sexual dimorphism refers to the morphological differences (in form or appearance between males and females of the same species aside from the differences in sexual organs). This means that the males are recognizable from the females of the same species. Hence, sex can be readily identified based on morphological features. Males and females differ in many parameters. The Body Mass Index (BMI) has been relied on as the tool to measure relative fat levels and weight status for decades. It first came into popular use in the early 1970s, when the famous American physiologist Ancel Keys gave the formula a new name, devised in the 1840s ``The Waist- to Hip Ratio (WHR). This became and remains popular among government health agencies, doctors and offices. One of the bodily features WHR is a reliable indicator in humans and that too only in adults. It is therefore important to note that a WHR is not designed to measure the health of children. Systematic variation in the size of WHR also systematically affects the judgment of female attractiveness, and youthfulness. A combination of things happens, especially in skin, muscles and bones as we age. We tend to lose muscle mass, so our abdominal muscles aren't as tight as they were once , and the loss of elastin and collagen in our skin allows gravity to have its way so skin starts to sag [5]. Both can cause the waistline to expand. The distinction can be based on the differences in size, shape, or color. The WHR has been shown to be an accurate predictor of risk for various diseases, premature mortality, degree of androgenecity/ estrogenecity and fecundity of women, independent of overall body weight. Men should have a WHR of 0.9 whereas women should have 0.7 which has been shown to correlate strongly with general health and fertility. In general one should keep waist to less than half the height. That means someone who is 5 foot 5 (65 inches; 167.64 centimeters) should maintain a waistline smaller

than 33 inches or 84 centimeters. Women within the 0.7 range have optimal levels of estrogen and are less susceptible to major diseases such as diabetes, cardiovascular disorders and ovarian cancers. A WHR of over 0.85 indicates obesity in women and a WHR of over 0.90 indicates obesity in men [6].

Belly Fat

Abdominal obesity can have causes that aren't due to underlying disease. Examples include diet, sedentary lifestyle or alcohol use. Deposition of visceral fat spoils the whole show. It surrounds the organs in the belly. WHR is used as a measurement of obesity, which in turn is a possible indicator of other more serious health conditions [7]. The WHO states that abdominal obesity is defined as a waist-hip ratio above 0.90 for males and above 0.85 for females, or a body mass index (BMI) above 30.0. The WHO advises that a healthy WHR is: 0.85 or less for women and 0.9 or less for men. WHR is an easy, inexpensive, and accurate way to see how much body fat you have. It can also help predict your risk for heart disease and diabetes. A few studies suggest that WHR is even more accurate than BMI for predicting the risks of cardiovascular disease and premature death [7].

Belly fat is a problem, and not just because of how it looks. The type of fat that collects in your belly is called visceral fat. To find out if you have excess fat in this area, put a tape measure around your midsection at belly button-level. More than 35 inches in women and 40 inches in men is too much. Waist circumference is a good measure of fat around your middle. This type of fat builds up around your organs, and is linked to high blood fat levels, high blood pressure and diabetes. A larger waist usually also means there is excess fat inside the organs. If most of the fat is around the waist rather than at the hips, one is at a higher risk for heart disease [7,8]. This risk goes up with a waist size that is greater than 35 inches for women or greater than 40 inches for men.

Impact on Health

Those with a high WHR carry weight around their middle, so their body shape may be described as an "apple." Research shows people who are "apple-shaped" are at a greater risk of certain health conditions than those who are "pear-shaped" (when the hips are wider than the upper body) [9].These health conditions found that abdominal obesity increased the risk of cardiovascular disease and cancer [10]. It was found that the WHR predicted cardiovascular disease more effectively than BMI or waist circumference. Also found that WHR is a better indicator of risk of mortality from cardiovascular disease than waist circumference alone.

These Health Conditions Include

- **Cardiovascular Disease:** Abdominal obesity increases the risk of cardiovascular disease and cancer [8,10]. Another study found the WHR predicts cardiovascular disease more effectively than BMI or waist circumference. A third study found that WHR is a better indicator of risk of mortality from cardiovascular disease than waist circumference alone [8].
- **Type 2 Diabetes:** A study found that an increased waist circumference was linked to an increased risk of type 2 diabetes [10,11].
- **Fertility:** A 2009 study found that women with a WHR of over 0.80 have a lower pregnancy rate than those with a lower WHR, regardless of their BMI.
- **Waist Circumference and Waist–Hip Ratio:** Although age and obesity have significant impacts on reproductive hormones such as testosterone, SHBG (sex hormone binding globulin) and estradiol, semen parameters related to FSH (follicular stimulating hormone) and LH (luteinizing hormone) could not be influenced, indicating that obesity-associated markers could not predict male semen quality [12,13]. Using WHR it is possible to indicate how likely someone is to develop certain health conditions and obesity.

Preeclampsia

WHR might be more sensitive in predicting the risk of preeclampsia, compared with BMI. The incidence of preeclampsia was assessed in 1200 pregnant women with singleton pregnancies were taken after 20 weeks of gestation. The maternal WHR and BMI at the beginning of pregnancy were significantly associated with the occurrence of preeclampsia (P=0.006 and P=0.001, respectively). WHR≥0.85 and BMI≥25 kg m−2 in the first 12 weeks of pregnancy had relative risks of 2.317 (confidence interval (CI): 1.26–4.27) and 3.317 (CI: 1.6–6.86) for preeclampsia .BMI had greater predictive value in preeclampsia [14,15].

Menopausal Women

Age and degree of obesity are the factors to account for the differences in WHR between pre- and post-menopausal women; these parameters can also account for the condition for WHR in post-menopausal women. Post-menopausal women who reported to use estrogens for menopausal complaints were found to have lower WHR values compared to non-users (0.74 vs 0.78 P less than 0.05). It is also observed that WHR is independent of age at menopause, age at menarche or parity. During menopause testosterone to estradiol ratio changes after menopause, which is linked to enhanced central adiposity deposition. therefore Attention has to be paid to the accumulation of central fat after menopause, whereas increase in total fat mass should be monitored consistently across the lifespan [16]. It was interesting to note that smokers have higher WHR values compared to non-smokers although the mechanisms for such an association remain obscure [17]. Hypertension was associated with abdominal fat distribution in premenopausal but not in post-menopausal women. Diabetes mellitus was associated with abdominal fat distribution in post-menopausal women [18].

References

1. Sadhu Tridiband, Dhar Deepak (2012) Modelling proportionate growth Current Science 103: 512-517.
2. "David Gross" Britannica, The Editors of Encyclopaedia, Encyclopedia Britannica https://www.britannica.com/biography/David-Gross.
3. https://www.smithsonianmag.com/science-nature/how-the-higgs-boson-was-found-4723520/.
4. https://sitn.hms.harvard.edu/flash/2017/science-genetics-reshaping-race-debate-21st-century/.
5. Gupta PD, Pai BR, Abdul Khader SM (2013) Coping gravity: Better Living, LAMBERT Academic Publishing, GmbH & Co. KG, Saarbrücken, Germany https://www.amazon.com/Coping-gravity-Better-Influence-gravitational/dp/365922118X.
6. Gupta PD, Pushkala K (2021) Waist-to-Hip Ratio: An Indicator of Health J Cell Tissue Res 21.
7. Poehlman ET (1998) "Abdominal Obesity: The Metabolic Multi-risk Factor". Coronary Heart Disease 9: 469-471.
8. Westphal SA (2008) "Obesity, abdominal obesity, and insulin resistance". Clinical Cornerstone 9: 23-29.
9. Gupta PD, Iino A (2008) Better Living. Capricorn Publishing House, Jaipur, India.
10. Mauland KK, Ytre-Hauge S, Øyvin Eng, Sigmund Ytre-Hauge, Gunnar Mellgren et al (2017) High visceral fat percentage is associated with poor outcome in endometrial cancer. Oncotarget 8: 105184-105195.

11. Cheng CH, Ho CC, Yang CF, Huang YC, Lai CH, et al (2010) Waist-to-hip ratio is a better anthropometric index than body mass index for predicting the risk of type 2 diabetes in Taiwanese population. Nutr Res 30: 585-593.
12. Wang F, Wu S, Y Song, X Tang, R Marshall, et al (2009) Waist circumference, body mass index and waist to hip ratio for prediction of the metabolic syndrome in Chinese. Nutr Metab Cardiovasc Dis 19: 542-547.
13. Lu JC, Jing J, JY Dai, AZ Zhao, Q Yao, et al (2015) Body mass index, waist-to-hip ratio, waist circumference and waist-to-height ratio cannot predict male semen quality: a report of 1231 subfertile Chinese men. Andrologia 47: 1047-1054.
14. Andersen BL, Legrand J (1991) "Body Image for Women: Conceptualization, Assessment, and a Test of its Importance to Sexual Dysfunction and Medical Illness", J Sex Res 28: 457-477.
15. Taebi M, Sadat Z, Farzaneh Saberi, Masoumeh Abedzadeh Kalahroudi (2015) Early pregnancy waist-to-hip ratio and risk of preeclampsia: a prospective cohort study, Hypertens Res 38: 80-83.
16. Yamamoto S, Douchi T, N Yoshimitsu, M Nakae, Y Nagata (2001) Waist to hip circumference ratio as a significant predictor of preeclampsia, irrespective of overall adiposity. J Obstet Gynaecol Res 27: 27-31.
17. Ambikairajah A, Walsh E, Hossein Tabatabaei-Jafari, Nicolas Cherbuin (2019) Fat mass changes during menopause: a metaanalysis. Am J Obstet Gynecol 221: 393-409.
18. Tonkelaar ID, Seidell JC, P A van Noord, E A Baanders-van Halewijn, J H Jacobus, et al (1989) Factors influencing waist/hip ratio in randomly selected pre- and post-menopausal women in the dom-project (preliminary results). Int J Obes 13: 817-824.