

Waist-to-Height Ratio as an Alternative to Body Mass Index



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Abstract

- The body mass index (BMI) has many limitations and it is important to explore alternative options for estimating excess body adiposity and therefore determine patient risk for obesity-related diseases. The disadvantages of BMI are outlined and discussed here using existing literature. Further, the benefits of waist-to-height ratio are explored and compared to BMI. Waist-to-height ratio is a reliable and realistic alternative to BMI as a measurement of health in terms of excessive adiposity and its related health risks. Further research is needed to explore the barriers to implementation of waist-to-height ratio in the place of BMI.

Purpose

- To examine the limitations of body mass index as an indicator of health and explore the option of waist-to-height ratio as an alternative.

Background

- What is BMI?**- BMI is measured by dividing an individual's weight (in kilograms) by their height (in meters squared).
- Where did BMI come from?** – Originally called the Quetelet index, BMI is a measurement that was introduced by statistician Dr. Lamber Adolphe Jacque Quetelet as a way to determine averages of height to weight ratio in the general population.¹
- Why do we use it?** – BMI as a health measurement was renamed and popularized by researchers Keys et al. who advocated for the adoption of BMI, due to its flexibility and application within and across populations as opposed to average weight percentages within a specific population.²

Limitations of BMI

- BMI is a non-specific measurement of excess adiposity. The variable of weight is generalized and does not differentiate between adipose tissue and lean mass (bone and muscle).¹
- Data from a study performed by Romero-Corral et. al demonstrated that among individuals with the exact same "normal" BMI of 25 kg/m², percentage of body fat ranged from 14% - 35% in men and 26% - 43% in women. Therefore, individuals who would be considered of healthy body composition according to the BMI score might actually fall within the overweight/obese ranges according to their body fat percentages.¹
- BMI as a measurement lacks information regarding body fat distribution. Literature has demonstrated that body fat distribution, rather than percentage of body fat alone, is a known risk factor for non-communicable diseases.³
- Another study found that using BMI alone to screen for health risks could cause a provider to overlook a patient with central obesity, therefore placing them at risk for obesity-related disease.⁶ This is because even though the patient would fall into a "normal" BMI range, their body fat distribution could qualify as central obesity.⁶

Waist-to-Height Ratio

- Waist-to-height ratio is calculated by dividing an individual's height (in centimeters) by the circumference of their waist (in centimeters) measured at the level of their umbilicus.
- In a meta-analyses comparing data of over 300,000 individuals, it was found that waist-to-height ratio was significantly (P < 0.005) more accurate in predicting patient risk of hypertension, dyslipidemia, diabetes, metabolic syndrome, and cardiovascular disease.⁴
- In a British study containing 550 participants, waist-to-height ratio was been found to be more sensitive than BMI in predicting patients' future risk of obesity associated disease and therefore, mortality.⁵
- Waist-to-height ratio is equally simple to obtain when compared to BMI and therefore would not be difficult to implement into practice

Discussion

- Waist-to-height ratio more accurately identifies excess adipose tissue and screens for obesity-related diseases in patients. Advocacy and implementation strategies are needed to replace BMI with more accurate alternatives. A good starting place for implementation is family medicine practices/clinics.

Conclusion

- Waist-to-height ratio has been shown to be a good alternative to BMI given the existing literature. Future research is needed, especially within the United States to further explore waist-to-height ratio and its efficacy in population-based research.

References

- Nuttall FQ. Body Mass Index Obesity, BMI, and Health: A Critical Review. *Nutrition Today* 2015 May; 50 (3): 117-128 doi: [10.1097/NT.0000000000000092](https://doi.org/10.1097/NT.0000000000000092) Accessed January 29, 2022.
- Keys A, Fidanza F, Karvonen MJ, Kimura N, Taylor HL, Indices of relative weight and obesity. *Journal of Chronic Diseases*. 2004 April; 25 (6-7): 329-343. doi: [https://doi.org/10.1016/0021-9681\(72\)90027-6](https://doi.org/10.1016/0021-9681(72)90027-6) Accessed January 30, 2022.
- Romero-Corral A, Somers V, Sierra-Johnson J. et. al. Accuracy of body mass index in diagnosing obesity in the adult general population. *International Journal of Obesity*. 2008 February; 32: 959-966. doi: <https://doi.org/10.1038/ijo.2008.11> Accessed January 29, 2022.
- Ashwell M, Gunn P, Gibson S. Waist-to-height ratio is a better screening tool than waist circumference and BMI for adult cardiometabolic risk factors: systematic review and meta-analysis. *Obesity Reviews*. 2012 March; 13(3): 275-286. doi: [10.1111/j.1467-789X.2011.00952.x](https://doi.org/10.1111/j.1467-789X.2011.00952.x) Accessed January 30, 2022
- Amirabdollahian F, Haghghatdoost F. Anthropometric Indicators of Adiposity Related to Body Weight and Body Shape as Cardiometabolic Risk Predictors in British Young Adults: Superiority of Waist-to-Height Ratio. *Journal of Obesity*. 2018 November. doi: [10.1155/2018/8370304](https://doi.org/10.1155/2018/8370304) Accessed January 30, 2022.
- Ashwell M, Gibson S. Waist to Height Ratio Is a Simple and Effective Obesity Screening Tool for Cardiovascular Risk Factors: Analysis of Data from the British National Diet and Nutrition Survey of Adults Aged 19–64 Years. *The European Journal of Obesity*. 2009; 2: 97-103. doi: <https://doi.org/10.1159/000203363> Accessed January 31, 2022.