

Fat but Fit: How physical fitness can mitigate the cardiovascular risks of obesity?

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Abstract

Obesity has long been recognized as a major independent risk factor for cardiovascular diseases (CVD). However, intriguing paradoxes such as the "obesity paradox" and the "fat but fit" phenomenon have been associated with it. The "fat but fit" paradigm suggests that overweight or obese individuals might face a lower risk of developing cardiovascular disease if they possess high levels of physical fitness. In other words, higher fitness levels may mitigate the negative impact of obesity on cardiovascular risk, leading to a reduction in overall mortality due to CVD.

The evidence surrounding this paradox is conflicting, highlighting the necessity for further research. The complex relationship between physical fitness, obesity, and cardiometabolic health is influenced by individual and environmental factors. Consequently, it becomes imperative to conduct more studies to comprehend this intricate interplay fully. To address this issue, it is important to focus on formulating strategies that promote the maintenance and enhancement of cardiorespiratory fitness in overweight and obese individuals. Moreover, including fitness evaluations in comprehensive risk stratification can significantly improve clinical decision-making.

Keywords: Cardiovascular diseases, obesity, obesity paradox, physical fitness.

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Introduction

Obesity is a multifactorial disease, which is directly linked to the development of cardiovascular diseases (CVD) and mortality due to CVD, independent of other risk factors.¹ The World Obesity Atlas 2022 predicted, that roughly over 1 billion individuals worldwide will be affected by obesity by the year 2030. With the rapidly rising rate of obesity among all age groups, it is now being regarded as a global epidemic.²

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The obesity paradox

Although obesity increases many risk factors associated with cardiovascular and metabolic diseases, but it is intriguing to observe that many CVD patients classified as overweight or obese may actually have a better prognosis as compared to normal or underweight individuals. This particular phenomenon is known as the "obesity paradox".³ Yet it is important to note that this paradoxical benefit is more pronounced only in overweight and class-I obese categories, rather than in the higher BMI categories of class-II, III or morbidly obese population.⁴ Although the coronary heart disease (CHD) risk profile is considerably worse in overweight and obese patients, with higher glucose levels, blood pressure, dyslipidaemias and inflammatory markers like C-reactive proteins, yet prognosis is often found to be poorer in lean patients with CHD, despite of having a metabolically healthy risk profile.^{5,6} This phenomenon can also be explained by viewing it as "lean paradox" i.e. normal or underweight individuals might have poor prognosis regarding CVD, consequent of their reduced lean muscle mass and progressive muscle wasting.⁷ Numerous studies and meta-analyses have identified this paradox in patients with hypertension, heart failure, peripheral arterial disease, atrial fibrillation as well as many other chronic diseases such as various respiratory conditions, human immunodeficiency virus and end-stage renal disease.⁶

Research studies have been done in an effort to debunk this concept of obesity paradoxes by proposing alternative explanations, which suggest that the existence of this paradox maybe apparent due to the earlier diagnosis of cardiovascular diseases in obese patients, which might lead to an improved prognosis by providing timely intervention.^{8,9} However, these studies mainly confirmed the association between obesity and CVD, rather than investigating the effects of excess adiposity after the diagnosis of CVD. By observing the impact of obesity on progression of disease and outcomes, such studies could have effectively challenged the obesity paradox.⁷ Furthermore, concerns have been raised regarding the limitations of using body mass index (BMI) as the sole measure of adiposity. Higher BMI values may not necessarily correspond to a higher body fat level but could also indicate greater muscle mass, which could potentially

contribute to the observed favourable health outcomes in such individuals.¹⁰

Fat but fit Paradox

Emerging evidence from many longitudinal studies suggest that individuals with moderate to high physical fitness levels, particularly cardiorespiratory fitness (CRF), may experience a reduction in the adverse effects of obesity, even after adjusting for significant confounding factors. This intriguing phenomenon, commonly referred to as the "fat but fit" paradox, implies that individuals who are overweight or obese but maintain good CRF levels might exhibit better health outcomes compared to their sedentary counterparts. This paradox is particularly observed in certain age groups, including adolescents, children and the elderly.¹¹

Despite its strong correlation with overall health status and its potent predictive ability for future cardiovascular disease risk, the significance of cardiorespiratory fitness for risk stratification of CVD has often been overlooked.⁷ Barry et al. demonstrated the combined association of CRF and weight status with mortality, revealing that unfit individuals had a two-fold higher risk of death, regardless of their BMI. Whereas, those overweight and obese individuals who were physically fit, exhibited similar mortality risk as normal weight subjects.¹² These findings align with other studies highlighting the significant influence of CRF on cardiovascular disease outcomes, emphasizing its role as a stronger predictor of mortality compared to obesity. Higher levels of physical fitness have been demonstrated to independently reduce the mortality risk regardless of an individual's body mass index, suggesting that being within a normal weight range might not be sufficient to ensure optimal cardiovascular health; rather, physical fitness plays a key role.¹³

Evidence from multiple cohort studies has also indicated that the obesity paradox is significantly altered by cardiorespiratory fitness levels. Engaging in increased physical activity and exercise training to maintain or enhance CRF levels has been proven as an effective and safe strategy for primary and secondary prevention of cardiovascular diseases across all weight groups.⁷ Moreover, CRF is considered one of the most reliable predictors of health outcomes, irrespective of factors such as gender, age, body composition, ethnicity, risk factors and presence of chronic disease.¹⁴

Challenging the fat but fit phenomenon

Results of a large-scale observational research study conducted in Europe over 12 years depicted that obese individuals with metabolic risk factors were two and a half times more likely to develop CVD as compared to healthy

individuals with normal weight. This study also reported that even in the absence of these additional risk factors, obese persons are still at 28% higher risk of developing heart disease compared to their healthy counterparts with normal weight status. These findings advocate upon the acknowledgement of excess weight as an independent risk factor, thus challenging the notion that individuals can be fat but fit.¹⁵

It is also imperative to note that the evidence supporting the fat but fit paradox is primarily available from observational studies. Though these provide valuable prognostic information due to their prospective cohort study designs, however cause and effect relationship can still not be established. Recommendations have been made to conduct experimental studies for effectively testing this paradox. Future randomized controlled trials observing the effects of exercise training in obese population should also incorporate physical fitness and cardiorespiratory evaluation pre and post intervention, so that more light could be shed on the role of CRF in mediating the observed improvements in health. Objective evaluation of fitness and physical activity can also enhance the clinical decision making process by allowing a comprehensive risk stratification in overweight and obese patients.¹¹

Although the obesity paradox has been observed in various contexts, but it does not apply to morbid obesity due to adverse effects on prognosis in cardiac conditions. While the concept of "fat but fit" phenomenon has also been argued upon, yet assessment and enhancement of CRF among individuals with morbid obesity can be challenging. Furthermore, overweight and obesity severely impacts both systolic and diastolic cardiac function and many of such obesity associated modifications in cardiac morphology and performance are also reversible with a purposeful and balanced weight loss programme.¹⁴

Implications for healthcare professionals

It is crucial to emphasize that discussions about the various paradoxes related to obesity does not promote overweight or obesity. On the contrary, a substantial proportion of morbidity burden in CVD patients can be attributed to the excess percent body fat percentage. Additionally, shedding light on these paradoxes aims to draw attention to the potentially poor prognosis in underweight or lean CVD patients with low fitness levels and muscle mass.⁷ The ongoing debate on obesity paradoxes, particularly the fat but fit phenomenon, carries significant public health implications. It is proposed that clinicians, researchers and public health officials should prioritize physical activity and fitness based interventions, instead of focussing solely on weight-loss driven management approaches to decrease

the mortality risk.¹² By encouraging regular physical activity and promoting cardiorespiratory fitness, health care professionals can play a pivotal role in improving the overall health outcomes of individuals with varying body compositions and cardiovascular conditions.

Conclusion

The fat but fit paradox, though intriguing, must not overshadow the well-established association between obesity and an elevated risk of cardiovascular diseases. While exploring the intricacies of the fat but fit phenomenon, it becomes essential to identify individual and environmental factors that contribute to this unique relationship. By doing so, we can better understand the complexities involved and focus on addressing the distinct risks faced by patients who deviate from the traditional cardiovascular disease profile. Promoting cardiorespiratory fitness and encouraging regular physical activity emerge as crucial elements in mitigating morbidity and mortality risks. As healthcare professionals, it is important to advocate for and endorse regular exercise training as an integral strategy to reduce the burden of disease and enhance health outcomes.

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