

## Application of Dual Energy X-ray Absorptiometry to study Body Composition and Cardiometabolic Health in Mauritius

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Over the past few decades, the island of Mauritius has experienced sustained socio-economic development, but also a surge in cardiovascular and musculoskeletal diseases, largely driven by an epidemic of type 2 diabetes affecting almost equally its two main ethnic groups: Indian (South Asian ancestry) and Creole (African/Malagasy ancestry). As excess adiposity and/or low skeletal muscle mass are believed to play a central role in the pathogenesis of these chronic diseases, it is of central importance for early preventive strategies and treatment monitoring to acquire the diagnostic tools that would reliably assess body composition in this multi-ethnic population. To this end, this research work, conducted on a total of 368 young adults (Indian and Creole men and women), used Dual-Energy X-ray Absorptiometry (DXA) to investigate:

(i) the comparability of DXA and isotopic dilution technique for whole-body composition assessment,  
(ii) the relationships between DXA-derived body composition and cardiometabolic health markers that include glycemic & lipid profiles, inflammation markers and handgrip strength. The main results are summarized below.

I. Comparison of DXA and isotopic (Deuterium) dilution technique in Mauritians with a wide range of body mass index (BMI) indicate high correlation but poor agreement in their estimations of fat mass and fat-free mass. Consequently, these two reference methods - DXA and isotopic Deuterium dilution - cannot be used interchangeably for measuring body composition. However, the high correlation for their body composition measures suggest that the differences in the absolute values at the individual level may not impact upon the outcome of investigations into the relationship between body composition using either of these two techniques and cardiometabolic health.

II. Analysis of DXA-derived regional body composition revealed that compared to women, Mauritian men have a more android pattern of fat deposition associated with a more adverse blood lipid profile and higher blood pressure. In both men and women, however, Indians showed greater fat mass (and less lean mass) than Creoles for the same BMI or waist circumference. Indians also showed more visceral adiposity and higher ratio of trunk fat-to-limb fat, associated with a more adverse blood lipid profile (higher triglyceride and cholesterol). Furthermore, while sex and ethnic differences in handgrip strength (men > women and Indians < Creoles) could be explained by their differences in arm lean mass, an inverse correlation between HOMA-IR index for insulin resistance and relative handgrip strength underscored a possible link between low muscle strength and insulin resistance.

III. Comparison of DXA-derived body composition in Mauritian Indian women with Polycystic Ovary Syndrome (PCOS) and a control cohort indicate that those with PCOS show a BMI-independent (intrinsic) android pattern of adiposity, characterized by higher visceral adiposity associated with higher values for the markers of insulin resistance and chronic low grade inflammation. The women with PCOS also show a lower handgrip strength than the controls, associated with altered thyroid hormone metabolism/signalling.

Taken together, this research work applying DXA technology reinforces the foundations for future investigations for body composition phenotyping in Mauritius, with potentially major implications for ethnic-based population research for improving the early diagnosis of risks for obesity, type 2 diabetes, cardiovascular and musculoskeletal diseases, and their management in this (and other) 'at risk' populations worldwide.

### Jury:

Prof. tit. Abdul G. Dulloo (thesis supervisor)  
Prof. Bengt Kayser (external co-examiner)  
Prof. Yves Schutz (external co-examiner)  
Prof. Zhihong Yang (internal co-examiner)  
Prof. Jean-Pierre Montani (internal co-examiner)  
Prof. David Hoogewijs (president of the jury)