

## Original article

# Association among basal metabolic rate, body composition and pulmonary function in university students

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**Background:** Variation in basal metabolic rate (BMR) has been closely related to obesity and pulmonary function.

**Objectives:** To determine the association between BMR, body composition and pulmonary function among university students aged 19 - 22 years old.

**Methods:** This cross-sectional study was carried out among the pre-clinical students of the Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak. Data was collected using questionnaire, anthropometric measurement, and spirometer. Statistical analysis was performed using IBM SPSS version 20.0.

**Results:** A total of 230 respondents participated in this study. There were 47.7% males and 41.1% females who were overweight and obese, 40.3% of the males and 46.0% of the females had high percentage of body fat, and 22.4% of the male respondents had high and very high visceral fat compared to 7.4% of the female respondents. BMR and force vital capacity (FVC) values were significant higher for males than females. Multivariate analysis showed that after adjusted for gender, percentage of visceral fat (adjust  $\beta = 0.620$ , 95% CI = 24.436 - 32.738), and FVC (adjust  $\beta = 0.152$ , 95% CI = 19.762 - 49.038) were significant associated with BMR.

**Conclusions:** Visceral fat has a stronger effect on BMR compared to body fat and FVC. Body fat, visceral fat and pulmonary function were found to be significantly associated with BMR, with visceral fat the highest effect on BMR. Understanding the association of these variables help in the intervention of obesity among young adults.

**Keywords:** Basal metabolic rate, body composition, pulmonary function, overweight and obese.

Basal metabolic rate (BMR) is defined as the rate of energy expenditure by our body during awake to maintain the physiology functions of human body.<sup>(1)</sup> It is usually measured about 12 hours after the last meal under controlled condition of thermal neutrality.<sup>(2)</sup> It is the minimum level of energy required to exist and its accounts for about 50.0 – 70.0% of the daily energy expenditure in most sedentary individuals.<sup>(3)</sup>

Measurement of BMR is one of the essential element in the assessment of nutritional and weight management programme.<sup>(4)</sup> Previously measured

using direct calorimetry, now prediction using equation is widely found in both clinical and non-clinical setting as the later method is more practical, less time consuming and less costly. There are various equations in measuring BMR, ranging from Frankenfield D, *et al.*<sup>(5)</sup>, Mifflin MD, *et al.*<sup>(6)</sup>, Food and Agriculture Organization/World Health Organization/United Nations University<sup>(3)</sup>, and Henry CJ. and Rees DG.<sup>(7)</sup> In Malaysia, Ismail and his team had developed a BMR predictive equation based on Douglas bag technique for general population of Malaysia adults.<sup>(8)</sup> These equations based on body-weight reveal that FAO/WHO/UNU<sup>(3)</sup> and Henry CJ. and Rees DG.<sup>(7)</sup> predictive equations overestimated BMR of adult Malaysia. As explained by Ismail and his team that the differences could be due to the hot and humid climate experience throughout the year slow down the metabolism of Malaysians.<sup>(8)</sup>

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