

HIGH BODY FAT PERCENTAGE AMONG ADULT WOMEN IN MALAYSIA: THE ROLE OF LIFESTYLE

S. M. Johari¹, N. J. Nordin^{1*}, M. A. Sahar¹, A. H. Sulaiman¹, S. Shahr², N. I. M. F. Teng³, N.
A. Amin⁴ and A. S. M. Saudi⁴

¹Faculty of Medicine and Health Sciences, Universiti Sains Islam Malaysia, 55100 Kuala Lumpur, Malaysia

²Faculty of Health Sciences, Universiti Kebangsaan Malaysia, 50300 Kuala Lumpur, Malaysia

³Faculty of Health Sciences, Universiti Teknologi MARA, 42300 Puncak Alam, Selangor, Malaysia

⁴Institute of Medical Science Technology (MESTECH), Universiti Kuala Lumpur, 43000 Kajang, Selangor, Malaysia

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ABSTRACT

Body fat percentage is regarded as an important measurement for diagnosis of obesity. The aim of this study is to determine the association of high body fat percentage (BF%) and lifestyle among adult women. The study was conducted on 327 women, aged 40-59 years, recruited during a health screening program. Data on socio-demography, dietary intake and physical activity were collected through validated questionnaires. BF% was measured using InBody 270 Body Impedance analyzer machine. Association between lifestyle factors and body fat percentage were investigated using multiple linear regression, adjusted for age and body mass index (BMI). Intake of protein, calcium and physical activity on household intensity were the predictors of high BF%.

Author Correspondence, e-mail: njuliana@usim.edu.my

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1. INTRODUCTION

1.1. Body Mass Index (BMI) and Body Fat % (BF%)

Obesity is becoming more prevalent worldwide. It is defined as abnormal or excessive fat accumulation that may impair health. Due to its simplicity and association with diseases, Body Mass Index (BMI) is the most commonly used method to diagnose obesity at the population level [1]. However, the recommended BMI cut-off values for overweight and obesity have been criticised due to their inconsistent relationship with body fat percentage (BF%) [2-4]. Moreover, it is also limited to discriminate between fat and lean mass [5]. Given these findings, there may be a variation in BF% for the same BMI range among people in a population or between individuals [6]. Thus, BF% is regarded as one of the most important measurement for diagnosis of obesity whereby excess BF% has been shown to be associated with metabolic dysregulation regardless of body weight [7].

1.2. Obesity and Overweight in Malaysia

Based on the recent National Health Morbidity Survey [8], by using the World Health Organization [9] classification, the prevalence of overweight and obesity in Malaysia were 33.4% and 17.7% respectively. More precisely, the prevalence of obesity was significantly higher among women (20.6%) than men (15.0%). Moreover, hypercholesterolemia was reported as significantly more prevalent among women (52.2%) than men (43.5%). The prevalence of diabetes mellitus (DM), although not significant was also higher among adult women (18.3%) as compared to men (16.7%).

1.3. Health Related Outcomes among Obese and Overweight Women Adult

Having excess body fat and being overweight or obese negatively impacts health in many ways and can account for many diseases. Specifically, among women, the risk of DM increases with a more central or visceral distribution of body fat [10]. Other than that, abdominal obesity may be harmful in women as waist circumference is an independent risk factor for developing coronary artery disease (CAD). Moreover, morbidly obese women had an odd ratio (OR) of 2.7 for CAD and 5.4 for hypertension which are higher than men [11].

Obesity is frequently associated with disturbances in menstrual cycle [12]. As the impact of

this condition, it can affect fertility. One of the problem related to this is polycystic ovarian syndrome (PCOS) and this can be attributed to multiple endocrine mechanisms [13]. It can also cause pregnancy complications due to elevated risks of antepartum complications and mechanical difficulties with delivery. The complications include pregnancy-induced hypertension, preeclampsia, gestational diabetes, caesarean section and neonatal death [10]. Evidence of cancer risk among obesity and overweight women is also raising, namely breast, ovarian, cervical and endometrial cancer. Obese women with cancer may have decreased survival because of co-morbid illness or poorer response to treatment. They may also have increased surgical and possibly radiation complications [14].

1.4 Lifestyle Factors and High BF%

A healthy lifestyle is a crucial factor for the prevention of having excess body fat. The percentage of energy from dietary fat is believed to be an important determinant of body fat accumulation. Theoretically, diet composition could affect body fat contents through metabolism of fat calories and that will cause a tendency to partition the calories in adipose tissue [15]. Other than that, higher calorie intake will also involve digesting and disposing of fatty acids, carbohydrate or protein as storage as fat or glycogen in the body [16]. In general, the contributions of dietary composition and body fat must consider the metabolic state of a person. Thus, the overall energy balance will have significant effect on net energy storage resulting from the ingestion of food [15].

Other than dietary intake, physical activity is well-known to be a modifiable factor for fatness issues and its related health risks. It has been suggested that physical activity can reduce the risk of various diseases that is associated with overweight, obese or excess body fat [17]. Moreover, physical activity may provide a low-risk method of preventing weight gain and maintenance of weight loss among overweight and obese women [18].

2. METHODOLOGY

This cross-sectional study was carried out from 2014 until 2016. Ethical approval was obtained from Ethical Committee of Islamic Science University of Malaysia (USIM) and informed consent was obtained from all subjects.

2.1. Subjects

Subjects involved in this study were volunteers consist of Malay, Chinese and Indian adult women aged 40-59 years, recruited during a health screening program at multiple designated community centres. All subjects were able to communicate and residing in an urban area of central Malaysia. Exclusion criteria included those who have mental disorders, concomitant diseases (i.e. dialysis, cancer and stroke) and being handicapped.

2.2. Demographic, Anthropometry, Dietary Intake and Physical Activity

All subjects were recruited at multiple designated community centres for screening. Interview sessions were carried out based on a pretested questionnaire to collect data on socio-demography (age, gender, education status and marital status), dietary intake and physical activity. The face-to-face interview sessions were conducted by trained fieldworkers. More specifically, dietary intake was assessed using diet history questionnaire (DHQ) [44]. Nutritionist-Pro software (Axxya Systems) was used to estimate energy and nutrient intake by converting household measurement serving size into estimated food weight in gram. Physical activity level was assessed using Short Questionnaire to Assess Health-Enhancing Physical Activity (SQUASH) [45].

Anthropometry measurements including body height, weight and body fat percentage (BF%) were measured using calibrated InBody 270 Body Impedance Analyzer machine to the nearest 0.1 cm, kg and %. Body mass index (BMI) was calculated as body weight/standing height (kg/m^2). BF% was classified according to cut off points by [19]. Based on this definition, a subject is classified as having high adiposity if the BF% is more than 33%.

2.3. Statistical Analysis

Statistical Package for Social Sciences (SPSS) software version 21.0 was employed for all statistical analyses. Descriptive analysis was carried out on socio-demography, anthropometry, dietary intake and physical activity data. Prevalence of obesity, overweight and high BF% were presented in percentage. Multiple linear regression (Stepwise Method) analysis was employed to determine the relative predictors of high BF% at $p < 0.05$.

3. RESULTS AND DISCUSSION

In the present study, subjects were aged 40-59 years (mean 50.4 ± 5.6 years) consist of mostly

Malays (70.0%), followed by Chinese (17.4%), Indian (12.2%) and “others” (0.3%) (Table 1). There were no significant different in education level and working status among the normal and high BF% subjects. Prevalence of high BF% was 72.8%. Generally, the mean of high BF% among this population was $38.2 \pm 8.2\%$. Specifically, the mean for normal group was $28.0 \pm 4.1\%$. While among high BF% group, the mean was $41.9 \pm 5.7\%$ ($p < 0.001$).

Overall, for dietary data, only carbohydrate intake showed significant difference between the two groups where carbohydrate intake was higher among normal group (180.7 ± 49.8 g/day) than the high BF% group (164.3 ± 55.6 g/day) (Table 2). Meanwhile, there was no significant different on physical activity data among normal and high BF% group except for total intensity variable. Mean for total intensity was higher among high BF% group (6002.0 ± 10137.2 MET-minute/week) than the normal group (5712.9 ± 2885.5 MET-minute/week).

After adjusting for age and BMI (Table 3), intake of protein ($B = -0.018$; $p = 0.001$), calcium ($B = 0.001$; $p = 0.010$) and physical activity of household intensity ($B = -4.566E-5$; $p = 0.021$) were found to be the important predictors for high BF%.

Table 1. Characteristics of the studied participants [presented as mean \pm s.d. or n (%)]

Items	Normal (n=89)	High BF% (n=238)	Total (n=327)	P ^a Value
Age (years)	49.8 \pm 6.0	50.6 \pm 5.5	50.4 \pm 5.6	
Ethnic				
Malay	49 (55.1)	180 (75.6)	229 (70.0)	<0.001 ^b
Chinese	31(34.8)	26 (10.9)	57 (17.4)	
Indian	9 (10.1)	31 (13.0)	40 (12.2)	
“Others”	0	1 (0.4)	1 (0.3)	
Education level				
Primary	6 (6.7)	18 (7.6)	24 (7.3)	0.072
Secondary	47 (52.8)	155 (65.1)	202 (61.8)	
Tertiary	36 (40.4)	65 (27.3)	101 (30.9)	
Work status				
Employed	54 (60.7)	121 (50.8)	175 (53.5)	0.072
Unemployed	35 (39.3)	117 (49.2)	152 (46.5)	
Body composition				
BMI (kg/m ²)	21.4 \pm 2.0	28.5 \pm 4.1	26.6 \pm 4.8	<0.001 ^b
Body fat (%)	28.0 \pm 4.1	41.9 \pm 5.7	38.2 \pm 8.2	<0.001 ^b

^aAnalysis using Mann-Whitney U test or Chi-Square test.

^bSignificant at p<0.001.

Table 2. Physical activity and dietary intake (presented as mean \pm S.D.) of the studied participants

Items	Normal (n=89)	High BF% (n=238)	Total (n=327)	P ^a Value
Dietary intake				
Energy (kcal/day)	1544.0 \pm 387.3	1502.7 \pm 404.0	1513.9 \pm 399.4	0.406
Carbohydrate (mg/day)	180.7 \pm	164.3 \pm 55.6	168.7 \pm	0.015 ^b

	49.8		54.5	
Protein (mg/day)	62.9 ± 22.6	69.6 ± 35.3	67.8 ± 32.4	0.065
Fat (mg/day)	63.3 ± 22.1	62.8 ± 22.8	62.9 ± 22.6	0.853
Vitamin C (mg/day)	166.6 ±	166.5 ± 137.2	166.5 ±	0.630
	126.7		134.3	
Vitamin E (mg/day)	6.1 ± 4.1	5.6 ± 3.2	5.7 ± 3.5	0.563
Calcium (mg/day)	546.7 ±	512.8 ± 293.2	522.0 ±	0.573
	350.6		309.7	
Physical activity				
Commute activity	114.6 ±	118.6 ± 152.4	117.5 ±	0.206
(minutes/week)	109.1		141.8	
Leisure activity	143.6 ±	127.8 ± 199.9	132.1 ±	0.631
(minutes/week)	188.8		196.8	
Household activity	1011.5 ±	1101.1 ±	1076.7 ±	0.290
(minutes/week)	651.1	2090.7	1814.8	
Working activity	2305.0 ±	1246.8 ±	1226.3 ±	0.151
(minutes/week)	2595.6	1888.6	1735.6	
Total activity (minutes/week)	5712.9 ±	2594.3 ±	2552.5 ±	0.107
	2885.5	2703.2	2403.7	
Commute intensity	208.8 ±	205.3 ± 284.8	206.2 ±	0.118
(MET-minute/week)	213.4		267.0	
Leisure intensity	678.2 ±	533.7 ± 924.8	573.0 ±	0.443
(MET-minute/week)	921.6		924.8	
Household intensity	2521.0 ±	2922.7±9669.9	2813.3 ±	0.088
(MET-minute/week)	1669.7		8292.4	
Working intensity	2305.0 ±	2340.3 ±	2330.7 ±	0.278
(MET-minute/week)	2595.6	3754.0	3473.4	
Total intensity	5712.9 ±	6002.0 ±	5923.3 ±	0.043 ^b
(MET-minute/week)	2885.5	10137.2	8773.4	

^aAnalysis using independent t-test or Mann-Whitney U test.

^bSignificant at $p < 0.05$.

Table 3. Predictors of body fat percentage (BF%) of the studied participants

Items	B	P value
Adjusted R ²	0.876	NA
Constant	-8.329	<0.001
Coefficients		
Protein	-0.018	0.001
Calcium	0.001	0.010
Household intensity	-4.566E-5	0.021

NA-non applicable

^a significant at $p < 0.001$

In this study, the prevalence of high BF% as assessed using [19] cut-off for women adult aged 40-59 years old was high, which affects about three quarter people of this population. This prevalence was higher as compared to obesity prevalence according to BF% among Saudi adults (60%, $n = 318$) [20], which used lower cut-off value ($\geq 30\%$ for women). The prevalence of overweight (37.9%) and obesity (22.9%) in this present study were also higher as compared to NHMS data in 2015 [8], which were reported at 30.9% and 20.6% respectively among Malaysian adult women.

The prevalence reported in this paper may represent the general prevalence of overweight, obesity and high BF% among Malaysian adult women, as the sample comprised of major ethnic groups in Malaysia with the proportion (Malays 75.6%, Chinese 10.9%, Indians 13.0% and 0.4% "others") was quite similar to the national proportion (Malays 68.6%, Chinese 23.4%, Indians 7% and 1.0% "others") [21]. This small scale data is very useful to generalize the prevalence of overweight, obesity and high BF% among adult women across the country. However, the participants community were recruited in an urban area of the country. Thus, further study which involving larger scale of random sample from the population is suggested to provide a more precise epidemiology evidence.

For dietary data, except for protein intake, all data among high BF% group showed lower mean than the normal group. Particularly, carbohydrate intake among the high BF% group was significantly lower as compared to the normal group which suggests possible dieting

issues among subjects in high BF% group. According to [22], common failure in following traditional weight loss strategies among overweight and obese people has prompted a surge in alternative diet approaches like carbohydrate restriction (Atkins), fat restriction (Ornish) or replacing carbohydrate with protein (Zone). However, without proper weight loss strategy, losing weight is rather difficult to achieve. Based on previous studies, individuals with a history of dieting will gain more weight than those without a history of dieting [23]. Nevertheless, the reason for this relationship is debatable with some studies suggested dieting makes dieters more susceptible to weight gain or it is a proxy of an already-existing susceptibility toward weight gain [24-26].

This study also revealed that decreased in protein intake will contribute significantly to the increment of fat percentage. Again, the possible dieting issue which involves the alteration in other macronutrients (i.e. carbohydrate and fat) distribution may explain the reason. According to [27], dieting to lose weight is more common among women of all ages and body weight. This study also found that women who reported dieting at the study entry were heavier and gained more weight over time than did non-dieters. Basically, to maintain health, it is recommended to follow a balance diet that is low in saturated fats and high in vitamins [28-29]. Although this guideline is well-known globally, most people do not adhere to this health behaviour and many have not even contemplated adopting it [30-31].

Increased calcium intake was also found to be a significant predictor for high body fat percentage. This finding is rather conflicting with other study which reported calcium has an anti-obesity effect, in particular, increased dietary calcium would result in decreased levels of intracellular calcium, triggering increased lipolysis [32-33]. Studies also reported inverse relationships between calcium intake and BF% in women [34-36]. However, some studies have not supported an inverse relationship between calcium intake and body fat among women [37-39]. A review of 49 randomized control trials also reported that dairy consumption does not aid weight or fat loss [40]. However, 91.4% of participants in this study did not achieve the recommended nutrient intake (RNI) for Malaysian which are 1000 mg/day and 1200 mg/day for women adults aged 40-49 years and 50-59 years respectively [41].

This study also found that one of the physical activity variable, which is the total intensity variable, was higher among high BF% group as compared to normal group. Although the

mean was slightly higher, the standard deviation value was bigger which quantifies farther amount of value dispersion among high BF% group. Specifically, the minimum total intensity value within the high BF% group was much lower (70 MET-min/week) than the normal group (496 MET-minute/week) which remarks the possibility of lower physical activity score among the participants in high BF% group.

For physical activity predictor, decreased household intensity was found to be the factor for high BF% among women. Our data were consistent with the evidence which indicates that depending on frequency and intensity, not only exercise, habitual physical activity-defined as all forms of body movement with energy expenditure above resting levels including household chores-can beneficially influence health parameters [42]. By doing household chores, it can reduce the time spent being sedentary and may be as important for the promotion of physical activity to prevent fat gain, simultaneously reduce obesity among women [43]. However, in this study, the magnitude of household intensity per day and guidelines which associated with BF% was not investigated.

It is acknowledged that there were some limitations in the present work. This research was limited solely to the Malaysian adult women population. In addition, the involvement of Chinese and Indian subjects were low that might overestimated the prevalence among this ethnicity. Aside from that, biomarkers which are related to body weight status were not included in this research. Sensitive biomarkers such as C-reactive protein (CRP), cortisol and adinopectin should be included in future studies.

4. CONCLUSION

In summary, these results indicate the continuous surge of the global public health concern namely obesity. Specifically, almost three quarter proportion of adult women in Malaysia have high BF% which remarks unhealthy lifestyle. In order to better screen overweight and obesity, BMI and BIA should be used in combination. It can also be concluded that this manuscript presented lifestyle related factors that can predict BF% among adult women. Monitoring the prevalence of obesity is relevant for preventing health risks, especially among women. Development of preventive measures and behavioural-changing strategies are paramount to curb undesirable health related outcomes among women.

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