CHANGES IN NUTRITIONAL STATUS AMONG MALAYSIAN ADULTS POPULATION FROM 2003 TO 2014

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Abstract. Obesity has become a major health problem all over the world with the number of prevalence keeps on rising year after year. In Malaysia the prevalence of overweight and obesity in adults has increased based on the previous National Health and Morbidity Survey (NHMS). This study determined the association between socio-demography characteristics and nutritional status as well as evaluated trends in the prevalence of overweight and obesity from 2003 to 2014 among Malaysian adults. A total of 4,044 living quarters were selected with eligibility of the respondent defined as age between 18 to 59 years old, not pregnant or breastfeeding at the time of the interview and not on any specific diet due to illness. The mean body mass index for adult Malaysians increased from 24.4 (95% CI: 24.2-24.5) in Malaysian Adult Nutrition Survey (MANS) 2003 to 25.6 (95% CI: 25.3-25.9) in MANS 2014. The prevalence of overweight and obesity was 32.4% (95% CI: 30.29-34.59) and 18.5% (95% CI: 16.6-20.5) respectively, increases since MANS 2003 when the prevalence was 26.71% (95% CI: 25.5-27.96) and 12.15% (95% CI: 11.26-13.1), respectively. Our findings indicate there is a need for a more comprehensive and integrated population-based strategy to combat the growing problem of overweight and obesity in Malaysia.

Keywords: nutrition status, obesity, overweight, Malaysian adult

INTRODUCTION

Obesity has become a major health problem all over the world with prevalence keeping on rising year after year (Parikh *et al*, 2007; Wan Mohamud *et al*, 2011; Stevens *et al*, 2012). In 2014, it was estimated that globally 39% of adults aged ≥18 years were overweight and 13% obese. It has become a health care cost burden, a cause of poor quality of life as well as higher incidence of cardiovascular diseases (CVD) and type 2 diabetes and certain types of cancer (Hampel *et al*, 2005; Yusuf *et al*, 2005; Moghaddam *et al*, 2007).

Based on the previous Malaysian National Health and Morbidity Survey, the prevalence of overweight in adults has increased from 29.1% in 2006 to 33.3% in 2011 while obesity increased from 14.0% to 27.2%. The increasing numbers of overweight and obesity cases are

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alarming as WHO predicted that by 2015 approximately 2.3 billion adults will be overweight of whom >700 million will be adults (Nguyen and El-Serag, 2009).

The present study determined the association between socio-demographic characteristics and nutritional status as well as evaluating trends in the prevalence of overweight and obesity from 2003 to 2014 among Malaysian adults.

MATERIALS AND METHODS

The Malaysian Adult Nutrition Survey (MANS) was a cross-sectional population-based survey, being conducted for the second time in 2014 covering Peninsular Malaysia, Sabah and Sarawak, with the first MANS survey having been conducted in 2003 (Nutrition Section, Ministry of Health Malaysia, 2008). A multi-stage stratified cluster sampling of living quarters (LQs) was used for this survey. Eligibility of the respondent was defined as: age between 18 to 59 years old, not pregnant or breastfeeding at the time of the interview, and not on any specific diet due to illness. A total of 4,044 LQs were selected throughout the country.

Weight and height of adults were taken by trained health personnel working in pairs using recommended standard procedures (IPH, 2014). Standard digital weighing scales (Tanita Personal Scale HD 319; TANITA, Tokyo, Japan) and body length meters (Seca Stadiometer 213; SECA, Hamburg, Germany) were used. The weighing scales were calibrated every morning before measurements were undertaken. Subjects were measured in their home while wearing light clothing without any footwear or other personal items. Body weight was measured to the nearest 0.1 kg, while height to the nearest 0.1 cm. The readings were taken twice and the average value was recorded. Body mass index (BMI) was calculated by dividing weight (kg) by height (m) squared (WHO, 1998). Using the BMIs, subjects were categorized based on a modified WHO classification (WHO, 1998).

RESULTS

Mean BMI for adult Malaysians increased from 24.4 (95% CI: 24.2-24.5) in MANS 2003 to 25.6 (95% CI: 25.3-25.9) in MANS 2014. Mean BMI among women and those 30-39 years old increase significantly over the same period (Table 1). Based on WHO (1998) classification, the national prevalence of overweight and obesity was 32.4% (95% CI: 30.3-34.6) and 18.5% (95% CI: 16.6-20.5), respectively. These numbers increased since MANS 2003 when the prevalence of overweight and obesity was 26.7% (95% CI: 25.5-27.9) and 12.2% (95% CI: 11.3-13.1), respectively (Tables 2 and 3).

The prevalence of overweight and obese men and women increased since 2003, from 28.55% (95% CI: 26.77-30.40) to 33.33% (95% CI: 30.24-36.57) for overweight men, and from 24.8% (95% CI: 23.16-26.51) to 31.37% (95% CI: 28.53-34.36) for overweight women, while for obese men, prevalence increased from 9.72% (95% CI: 8.54-11.06) to 14.48% (95% CI: 11.95-17.43) and from 14.66% (95% CI: 13.37-16.04) to 22.93% (95% CI: 20.4-25.67) for obese women. It is worth noting that the prevalence of overweight men was higher compared to overweight women while that of obese women was higher compared to obese men (Fig 1).

Adults in the age group of 50-59 years old were more overweight (43.46%; 95% CI: 37.97-49.11) than other age group. There was also a trend among the different age groups prevalence of overweight

Table 1
Mean body mass index (BMI) according to socio-demographic characteristics.

Sociodemographic characteristic	MANS 2003		MANS 2014	
	Mean BMI (kg/m^2)	95% CI	Mean BMI (kg/m^2)	95% CI
Malaysia	24.4	24.2 - 24.5	25.6	25.3 - 25.9
Zone				
Peninsular Malaysia	-	-	25.7	25.3 - 26.0
East Malaysia	-	-	25.2	24.8 - 25.5
Sex				
Men	24.2 (*n*=3,331)	23.9 - 24.4	24.9 (*n*=1,364)	24.6 - 25.4
Women	24.6 (*n*=3,435)	24.4 - 24.8	26.2 (*n*=1,549)	25.9 - 26.6
Age group (years)				
18-19	21.4 (*n*=421)	20.7 - 22.1	22.0 (*n*=128)	20.9 - 23.1
20-29	23.5 (*n*=1,969)	23.2 - 23.8	24.7 (*n*=662)	24.1 - 25.2
30-39	24.9 (*n*=1,932)	24.7 - 25.1	26.0 (*n*=805)	25.5 - 26.5
40-49	25.5 (*n*=1,536)	25.3 - 25.8	26.4 (*n*=745)	25.9 - 26.8
50-59	25.7 (*n*=908)	25.2 - 26.1	26.4 (*n*=573)	25.8 - 26.9
Ethnic group				
Malay	24.9	24.6 - 25.1	26.1	25.7 - 26.5
Chinese	23.6	23.3 - 23.9	24.5	23.9 - 24.9
Indian	24.5	24.1 - 25.0	26.8	25.9 - 27.7
Bumiputera Sabah	23.5	22.9 - 24.0	24.9	24.4 - 25.4
Bumiputera Sarawak	23.8	23.3 - 24.4	25.8	25.1 - 26.4
Others	23.5	22.6 - 24.5	23.9	22.9 - 24.8
Marital status				
Never married	22.6	22.2 - 22.9	23.8	23.4 - 24.3
Married/cohabiting	25.2	25.0 - 25.4	26.2	25.9 - 26.5
Divorced/separated	24.1	23.1 - 25.1	26.8	25.6 - 27.9
Widow (er)	26.1	25.1 - 27.2	26.5	25.2 - 27.7
Education level				
Non-formal	-	-	25.7	24.8 - 26.6
Primary	-	-	25.7	25.1 - 26.2
Secondary	-	-	25.5	25.1 - 25.8
Tertiary	-	-	25.8	25.2 - 26.3
Work status				
Government/semi-government	-	-	26.9	26.3 - 27.7
Private	-	-	24.9	24.5 - 25.3
Self-employed	-	-	25.6	25.2 - 26.0
Unpaid worker	-	-	23.4	21.6 - 25.3
Not working	-	-	26.8	26.1 - 27.5
Retired	-	-	25.3	23.0 - 27.7
Monthly household income				
< MYR 1,500	24.2	23.9 - 24.4	24.9	24.6 - 25.4
MYR 1,500-3,500	24.6	24.4 - 24.9	25.9	25.5 - 26.4
> MYR 3,500	24.3	23.9 - 24.8	25.9	25.5 - 26.5

MANS, Malaysian Adult Nutrition Survey; 1 MYR ≃ 0.22 USD.

Table 2
Prevalence of overweight according to sociodemographic characteristics.

Sociodemographic characteristic	MANS 2003		MANS 2014	
	Prevalence (%)	95% CI	Prevalence (%)	95% CI
Malaysia	26.71	25.50 - 27.96	32.40	30.29 - 34.59
Zone				
Peninsular Malaysia	-	-	32.41	29.86 - 35.07
East Malaysia	-	-	32.38	29.28 - 35.64
Sex				
Male	28.55	26.77 - 30.40	33.33	30.24 - 36.57
Female	24.80	23.16 - 26.51	31.37	28.53 - 34.36
Age group (years)				
18-19	12.76	8.60 - 18.53	-	-
20-29	20.20	18.27 - 22.28	22.25	18.52 - 26.49
30-39	29.17	27.03 - 31.41	32.73	28.64 - 37.10
40-49	34.14	31.60 - 36.78	39.33	34.99 - 43.83
50-59	35.17	32.06 - 39.53	43.46	37.97 - 49.11
Ethnic group				
Malay	27.16	25.54 - 28.84	32.85	29.95 - 35.88
Chinese	24.95	22.50 - 27.58	31.86	27.21 - 36.90
Indian	31.01	26.64 - 35.76	28.06	20.44 - 37.19
Bumiputera Sabah	23.73	19.47 - 28.59	31.68	26.71 - 37.11
Bumiputera Sarawak	28.07	23.24 - 33.47	36.39	29.68 - 43.68
Others	21.52	15.04 - 29.83	31.43	22.54 - 41.93
Marital status				
Never married	16.34	14.29 - 18.62	21.98	17.97 - 26.60
Married/cohabiting	31.66	30.19 - 33.15	36.44	33.95 - 39.00
Divorced/separated	26.10	17.13 - 37.65	21.24	14.11 - 30.68
Widow (er)	28.24	20.32 - 37.78	51.41	32.46 - 69.96
Education level				
Non-formal	-	-	36.01	26.12 - 47.25
Primary	-	-	35.04	30.41 - 39.96
Secondary	-	-	31.15	28.29 - 34.16
Tertiary	-	-	32.86	28.92 - 37.06
Work status				
Government/semi-government	-	-	37.17	31.04 - 43.74
Private	-	-	30.55	27.36 - 33.93
Self-employed	-	-	33.83	29.96 - 37.93
Unpaid worker	-	-	-	-
Not working	-	-	30.54	25.89 - 35.63
Retired	-	-	64.10	37.11 - 84.38
Monthly household income				
< MYR 1,500	25.14	23.51 - 26.85	29.03	25.85 - 32.43
MYR 1,500-3,500	28.14	26.00 - 30.39	32.68	28.77 - 36.86
> MYR 3,500	28.70	25.45 - 32.20	36.68	32.71 - 40.83

MANS, Malaysian Adult Nutrition Survey; 1 MYR ≃ 0.22 USD.

Table 3
Prevalence of obesity according to sociodemographic characteristics.

Sociodemographic characteristic	MANS 2003		MANS 2014	
	Prevalence (%)	95% CI	Prevalence (%)	95% CI
Malaysia	12.15	11.26 - 13.10	18.46	16.59 - 20.50
Zone				
Peninsular Malaysia	-	-	19.45	17.15 - 21.97
East Malaysia	-	-	14.88	12.75 - 17.29
Sex				
Male	9.72	8.54 - 11.06	14.48	11.95 - 17.43
Female	14.66	13.37 - 16.04	22.93	20.40 - 25.67
Age group (years)				
18-19	5.94	3.11 - 11.08	-	-
20-29	10.26	8.80 - 11.93	17.84	14.41 - 21.86
30-39	12.68	11.20 - 14.33	21.18	17.67 - 25.18
40-49	15.12	13.27 - 17.19	18.97	15.57 - 22.92
50-59	15.49	12.89 - 18.51	18.44	14.57 - 23.06
Ethnic group				
Malay	15.28	13.91 - 16.77	22.00	19.41 - 24.82
Chinese	7.20	5.94 - 8.69	10.79	7.62 - 15.06
Indian	12.66	10.16 - 15.67	28.05	20.08 - 37.69
Bumiputera Sabah	7.86	5.56 - 11.01	14.13	10.94 - 18.05
Bumiputera Sarawak	6.82	4.60 - 10.00	16.97	12.48 - 22.66
Others	9.57	5.76 - 15.49	-	- -
Marital status				
Never married	8.01	6.46 - 9.88	13.61	10.6 - 17.30
Married / cohabiting	13.78	12.73 - 14.90	20.51	18.36 - 22.84
Divorced / separated	8.76	3.69 - 19.42	21.24	14.11 - 30.68
Widow (er)	23.65	16.36 - 32.92	-	-
Educational level				
Non-formal	-	-	16.57	10.39 - 25.39
Primary	-	-	17.28	13.60 - 21.70
Secondary	-	-	18.17	15.65 - 20.99
Tertiary	-	-	20.22	16.69 - 24.28
Work status				
Government / semi-government	-	-	24.67	19.10 - 31.25
Private	-	-	15.05	12.46 - 18.07
Self-employed	-	-	17.42	14.47 - 20.81
Unpaid worker	-	-	-	-
Not working	-	-	28.48	23.70 - 33.78
Retired	-	-	-	-
Monthly household income				
< MYR 1,500	12.29	11.01 - 13.71	16.24	13.79 - 19.02
MYR 1,500-3,500	13.13	11.66 - 14.76	20.34	17.14 - 23.96
> MYR 3,500	9.26	7.43 - 11.49	19.61	16.08 - 23.69

MANS, Malaysian Adult Nutrition Survey; 1 MYR ≃ 0.22 USD.

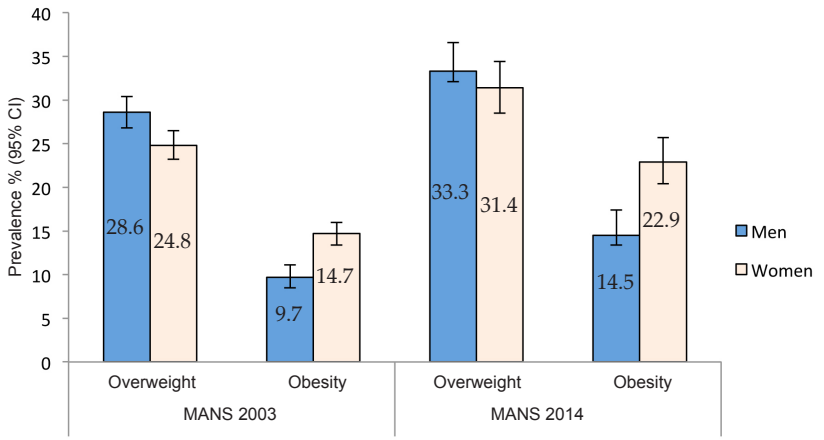

Fig 1–Prevalence of overweight and obesity: comparison of the MANS 2003 and MANS 2014. MANS, Malaysian Adult National Survey.

increasing with age as well (Table 2). Interestingly, adults aged 30-39 years old were the most obese (21.18%; 95% CI: 17.67-25.18) compared to other age groups. On the other hand, in 2003 it was adults in the age group of 50-59 years old who had the highest prevalence of obesity (15.49%).

Among the different ethnic groups, Bumiputera Sarawak had the highest overweight prevalence (36.39%; 95% CI: 29.68-43.68), followed by Malay (32.85%; 95% CI: 29.95-35.88), Chinese (31.86%; 95% CI: 27.21-36.90), Bumiputera Sabah (31.68%; 95% CI: 26.71-37.11) and Indian (28.06%; 95% CI: 20.44-37.19) (Table 2). Meanwhile, for the prevalence of obesity, Indian ethnic group was the highest with 28.05% (95% CI: 20.08-37.69), followed by Malay (22%; 95% CI: 19.41-24.82), Bumiputera, Sarawak (16.97%, 95% CI: 12.48-22.66) and Bumiputera Sabah with 14.13% (95% CI: 10.94-18.05).

DISCUSSION

The prevalence of obesity in Malaysia had increased from 12.15% in 2003 to 18.46% in 2014 with women having a higher prevalence of 22.93% compared to men while Indian ethnic group had the highest prevalence among the ethnic groups.

The rise of obesity prevalence is alarming as it is becoming the leading public health concern not just in Malaysia but also in the rest of the world (Pon *et al*, 2006; Wan Mohamud *et al*, 2011; Stevens *et al*, 2012). Similar to previous studies, the prevalence of obesity showed different results when compared between gender, age group and ethnicity, (Lekhraj Rampal *et al*, 2007; Narayan and Khan, 2007; Wan Mohamud *et al*, 2011). The rising trend of obesity in women is evident throughout the world. There is a 2.2% increase of obese women per decade throughout the world with 2.2% increase in prevalence of obese women in Southeast Asia alone, the highest among Asian region (Stevens *et al*, 2012). Among the three main ethnic groups in Malaysia, Chinese is the least likely to be obese as shown in previous studies (Lekhraj Rampal *et al*, 2007; Wan Mohamud *et al*, 2011; Tan *et al*, 2012). The difference in dietary pattern among these three ethnic groups (Chinese, Indian and Malay) may have caused the different obesity occurrence among them. Looking at the trend of obesity among the different age groups, an interesting trend was found when compared between 2003 and 2014, in that obesity was the highest in 50-59 years old during 2003 but in 2014, adults in the age of 30-39 years old was the most obese. This shows that obesity is becoming more common in younger adults

in 2014 compared to when it was in 2003.

When compared with other Southeast Asian nations, Malaysia has the highest obesity prevalence, followed by Singapore (10.8%) and Thailand (9.0%) (Foo *et al*, 2013; Aekplakorn *et al*, 2014). Interestingly, there is no country that shows any significant decline in obesity prevalence in the previous three decades (Ng *et al*, 2014). This raises the question whether there is enough effort to overcome this overweight and obesity problem globally. However, they also reported that there is a hope the rates of increase of overweight and obesity have slowed down in the developed world.

Aekplakorn *et al* (2014) discussed how socioeconomic status affects obesity in general; people who have higher income have better access to food supply as well as being physically less active. Total income is also a predictor of obesity (Mustafa *et al*, 2013). Obesity is common among people who work in government office (Hazizi *et al*, 2012; Abu Saad *et al*, 2014). This was attributed to the high percentage of sedentary workers in a government setting.

There is a limitation to this study in that both MANS surveys of 2003 and 2014 were cross sectional studies. Therefore, comparison of overweight and obesity prevalence between these two surveys should be interpreted with caution as two different groups of respondents were involved.

In conclusion, prevalence of overweight and obesity in Malaysia had increased substantially from 2003 to 2014. Our findings indicate that there is an urgent need for a more comprehensive and integrated population-based strategy to combat this growing problem of obesity in Malaysia. Health education and promotion programs for obesity prevention should be strengthened in the community.

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