

## **Dietary and Other Factors Associated with Overweight Among Women Workers in Two Electronics Factories in Selangor**

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### **ABSTRACT**

This study was a cross-sectional survey conducted among 122 women workers employed in the electronics factories in the Ulu Klang Free Trade Zone (FTZ) and the Bangi FTZ, Selangor, Peninsular Malaysia. The purpose of the study was to examine the problem of overweight (>25.0 kg/m<sup>2</sup>) among this group of women, and factors (socio-demographic, work, exercise, and dietary) associated with overweight, and, to study the food intake pattern of the women in both the overweight and non-overweight groups. Data was collected using a set of questionnaires, while anthropometric measurements were obtained to calculate body mass index (BMI) and waist hip ratio (WHR). The results of the study indicated that 64.0% of the women were overweight (29.5% pre-obese, 34.5% obese). About one-tenth of the women (11.5%) had a WHR of above 0.85. From the bivariate analysis, it was found that women who were older, ever married, had lower educational level, had higher salary, not living in the hostel, involved in shiftwork, and trying to lose weight were more likely to be overweight. After adjusting for age, each of the above factors, except for educational level, remained significantly associated with overweight. Women's diet was found to be monotonous and lacking in variety as accessibility to and availability of a variety of food was a problem for them due to the nature of their work. They also had a sedentary lifestyle. Therefore, further research focusing on changing the poor dietary habits and sedentary lifestyle of the women workers is necessary to address the problem of overweight.

### **INTRODUCTION**

Overweight and obesity is a global health problem, and it has emerged as an epidemic in the developed and developing countries (WHO, 2003). In the year 2000 alone, it was estimated that there were about 300 million obese adults worldwide, and the figure is still on the increase.

Obesity is a threat to the health of the general population, and many studies have shown that it is a risk factor for cancer, hypertension, hypercholesterolemia, diabetes mellitus, metabolic disorders, and disability in adulthood (Krauss & Winston, 1998; Takeshita & Morimoto, 2000; Bray, 2002; Ferraro *et al.*, 2002; Florentino, 2002). For women in particular, obesity is associated with an increased risk of asthma, and cancer of the endometrium, breast, colon, and gallbladder (Bray, 2002; Chen *et al.*, 2002).

Environmental and behavioral factors are believed to contribute more to the development of obesity than genetic factors (Popkin & Doak, 1998; Crawford & Ball, 2002). Examples of environmental factors are urbanisation, industrialisation and low socio-economic status, whereas the major behavioral factors are changes in patterns of physical activity and diet, where there is an increase in the consumption of fats, meats, eggs, and refined grains. Obesity-related behavior of each population and sub-population is different. Therefore, it is important for researchers to understand the eating, physical activity and sedentary behaviors of different populations in their effort to address the problem of overweight and obesity (Crawford & Ball, 2002).

In Malaysia, studies have revealed moderate to high prevalence of overweight and obesity in adult males and females in both rural and urban areas (Ismail *et al.*, 1995, Ng, Tee & Azriman, 1995; Chee *et al.*, 1996; Khor *et al.*, 1999). Based on the National Health and Morbidity Survey II (NHMS, 1996) which was carried out on a nationwide representative sample of adults in Malaysia, the age-adjusted prevalence of overweight and obesity among the general women population was 21.4% and 7.6% respectively (Lim *et al.*, 2000). Ethnic differences have also been observed. For example, the age-adjusted prevalence of overweight and obesity for Malay and Indian women was higher than that for Chinese women.

Nevertheless, very little information is available on the prevalence of overweight and obesity among women in sub-population groups in Malaysia such as women workers in the electronics industry. The electronics industry is the largest private sector employer and is one of the largest women workforce employers in Malaysia (Ministry of Finance, 1997).

The purpose of this paper is to examine the problem of overweight among one group of electronics women workers, and factors (socio-demographic, work, exercise, and dietary) associated with overweight. The paper will also describe the food intake pattern of the overweight and non-overweight women workers.

## **METHODS**

### **Selection of respondents**

This study was part of a larger study of 1,720 women workers from 10 electronics factories in Peninsular Malaysia<sup>1</sup>. The factories in the larger study were selected based on the criteria of having a workforce of 500 or more Malaysian women workers, having been in operation for two years or more, and producing electronics components, final electronics products, or

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<sup>1</sup> This study is entitled "A Study of Working Women's Health Status in Relation to Lifestyle." Details of the methods used in this study have been published in Chee *et al.* (2003).

semiconductors. The selection criteria for the respondents were that they were women, Malaysian citizens, had worked for a minimum of one year in their current factory, and were working either as production worker, line leader, or quality control (QC) worker. Subsequent to this larger study, a sub-study was undertaken in one electronics factory in the Ulu Klang Free Trade Zone (FTZ), and one hostel run by an electronics factory in the Bangi FTZ, Selangor. Non-pregnant women workers who had participated in the larger study were invited to participate in the sub-sample study. In the factory, an equal number of women in the obese, overweight and normal categories were invited, while in the hostel, all the former participants were invited. Finally, a total of 134 women workers (101 from the factory and 33 from the hostel) agreed to participate. Of this number, data from 12 respondents had to be omitted due to inconsistencies and incompleteness of the returned questionnaires. Therefore, the data analyzed for this paper were from 122 women workers (90 from the factory and 32 from the hostel).

### **Data collection**

Information on the respondents' socio-demographic and background characteristics was collected using a pre-coded self-administered questionnaire, which had been pre-tested on 60 women production workers in an electronics factory in Bayan Lepas, Penang. Data for the main study was collected over a period of six months (April to September 1999) during the workers' lunch break or free time (before or after work).

After briefing the respondents on the background and purpose of the study, and assuring them that the information they gave will be treated confidentially, they completed the self-administered questionnaire in the presence of research assistants. Respondents with low literacy level or who had problems completing the questionnaire were helped by the research assistants. Upon completion of the questionnaire, anthropometric measurements were taken. Following that, the respondents were asked if they were willing to give further information on their diet and exercise in a subsequent interview. Those who agreed were approached in November 1999 for the sub-sample study.

In the sub-sample study, data on the respondents' diet, exercise, and history of trying to lose weight, were collected using a questionnaire through a one-to-one interview method. This questionnaire had been pre-tested on five Malay women with a similar educational background as the majority of the workers.

### *Dietary knowledge, attitude and practice (KAP)*

Dietary knowledge, attitude and practice (KAP), were assessed using a content validated instrument. Dietary knowledge was assessed through a 12-item instrument. Respondents were asked whether the statements were correct. Option answers provided for each statement were "Yes," "No," or "Do not know." Each positive statement required the answer "Yes" and was given one point, while each negative statement with the answer "No" was given one point. Scoring was based on the assumption that the higher the score, the better the dietary knowledge. The median score was used as the cut-off point to categorise respondents' dietary knowledge into poor/moderate (a score of  $\leq$  median score) and good (a score  $>$  median score).

For assessing dietary attitude, an instrument with 12 statements on attitude towards diet in general, diet and disease, and a balanced diet was formulated. Respondents were asked to rate the degree of agreement or disagreement on a scale of 1 to 5. One point was given to every positive statement that was answered with “agree” or “strongly agree,” responses which reflect a positive attitude. One point was given to every negative statement when the response was “disagree” or “strongly disagree,” reflecting a positive attitude. The higher the scoring, the more positive the dietary attitude. The median score was used as the cut-off to categorise respondents’ dietary attitude into poor/moderate (a score of - median score) and good (a score > median score).

Assessment of dietary practice was conducted using a 12-item instrument. Based on a scale of 1 to 5, respondents were asked to indicate to what degree they agreed or disagreed with the statements reflecting their dietary practice. For every positive statement answered with “agree” or “strongly agree,” one point was given, and for every negative statement answered with “disagree” or “strongly disagree,” one point was given. A higher score indicates a more positive dietary practice. The median score was used as the cut-off to categorise the dietary practice levels as poor/moderate (a score of - median score) and good (a score > median score).

### *Food frequency*

Food intake was assessed using a semi-quantitative food frequency questionnaire (FFQ). The food items in the FFQ were selected to include the most commonly consumed foods in Malaysia based on the Nutrient Composition of Malaysian Foods (Tee *et al.*, 1997). Respondents were required to recall the frequency of their food intake over the past 12-month period. The food consumption would be described based on these six categories: cereals and grain products, vegetables, meat and meat products, fish, shellfish and products, fruits, and cooked foods that were bought.

The food intake frequency was categorized into a 7-point scale rating, that is 1 = never/rarely, 2 = once a month, 3 = 2–3 times a month, 4 = once a week, 5 = 2–3 times a week, 6 = once daily, and 7 = 2–3 times daily. Information on the frequency of intake of each food item in the FFQ was used to calculate the food consumption frequency score of the food item consumed by respondents who were overweight and non-overweight. The formula used was taken from Chee *et al.* (1996) who adapted it from Reaburn, Kronl & Lau (1979). It is as follows:

Food consumption frequency score =

$$\frac{R_1S_1 + R_2S_2 + R_3S_3 + \dots + R_7S_7}{7}$$

- $S_1 - S_7$  = the scale ratings  
 $R_1 - R_7$  = percentage of respondents selecting a rating  
7 = the maximum scale rating

The higher the score, the more frequent the specific food was consumed.

*Exercise and trying to lose weight*

In this study, adequate exercise was defined as being engaged in exercise for a minimum of 30 min per session and at least three times a week. Exercise was defined as being involved in sports, recreational and fitness activities, excluding any physical activity undertaken during the course of work and daily household chores, during the month prior to the study. In assessing history of trying to lose weight, respondents were asked whether they had tried to lose weight in the 12 months prior to the study.

*Anthropometric measurements*

Heights were measured using a bodymeter (SECA, Germany) to the nearest 0.1 cm, and weights were measured using a digital weighing scale (TANITA, Japan) to the nearest 0.2 kg. The respondents were measured in light clothing and without shoes. Body mass index (BMI) was calculated by the formula  $BMI = \text{weight (kg)}/\text{height}^2 \text{ (m}^2\text{)}$ , and classified as follows (WHO, 1998):

Underweight	< 18.5 kg/m <sup>2</sup>
Normal	18.5 – 24.9 kg/m <sup>2</sup>
Overweight	
Pre-obese	25.0 – 29.9 kg/m <sup>2</sup>
Obese class I	30.0 – 34.9 kg/m <sup>2</sup>
Obese class II	35.0 – 39.9 kg/m <sup>2</sup>
Obese class III	≥ 40.0 kg/m <sup>2</sup>

In the sub-sample study, waist and hip measurements were obtained using a plastic measuring tape to the nearest 0.1 cm. The waist circumference was measured “at the mid-point between the lower border of the rib cage and the iliac crest” (WHO, 1998), whereas, hip circumference was measured “at the greater trochanters” (Lean, Han & Morrison, 1995). The waist and hip measurements were used to calculate waist hip ratio (WHR). A WHR that is greater than 0.85 for women indicates an “increased risk from obesity-related illness due to abdominal fat accumulation” (WHO, 1998).

**Data analysis**

The data was analysed using SPSS for Windows (version 11.5) to obtain descriptive and inferential statistics. Crude odds ratio (OR) with 95% confidence interval (CI) was calculated from cross-tabulation between BMI (overweight/ non-overweight) and socio-demographic, work, exercise, and dietary variables. Adjusted odds ratio (Adj OR) for overweight was obtained by binary logistic regression for each variable with age as covariate. The associations were considered statistically significant when the respective OR or age-adjusted OR had a 95% CI that did not include the value 1.00 in its interval. Multivariate analysis was undertaken using a logistic regression model, where only variables that were significantly associated with overweight were included as covariates.

## RESULTS

### Socio-demographic and background characteristics

More respondents from the factory participated compared to those from the hostel. Hence, it resulted in the study population consisting mostly of women (73.8%) who were not staying in the hostel (Table 1). This sample comprised 58.1% who were 35 years and above. Their mean age was  $33.8 \pm 8.1$  years, with their age ranging from 19 to 50 years. Most of these women were Malays (76.2%), and 60.6% were ever-married women (54.9% currently married, 5.7% divorced/widowed). Nearly all had at least a minimum of secondary school education (96.7%). The mean monthly salary of the women was  $RM891.65 \pm 284.49$ , with the largest percentage (40.2%) earning between RM751-RM1000 per month. Their salary ranged from RM415 to RM1700. Most of the women were involved in shiftwork (75.4%) and did overtime work in the past month (83.6%).

Table 1. Distribution of respondents by socio-demographic and background characteristics (N=122)

	No.	%
Age (years old)		
< 20	3	2.5
20 - 24	24	19.7
25 - 29	14	11.5
30 - 34	10	8.2
35 - 39	32	26.2
$\geq 40$	39	31.9
Ethnicity		
Malay	93	76.2
Indian	25	20.5
Chinese	4	3.3
Marital status		
Never married	48	39.4
Currently married	67	54.9
Divorced/widowed	7	5.7
Educational level		
Primary school	4	3.3
Secondary school	109	89.3
Pre-university/diploma	9	7.4
Monthly salary		
- RM500	12	9.8
RM500 - RM750	28	23.0
RM751 - RM1000	49	40.2
RM1001 - RM1250	21	17.2
> RM 1250	12	9.8
Shiftwork		
Yes	92	75.4
No	30	24.6

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Overtime work in the past month		
Yes	102	83.6
No	20	16.4
Living in hostel		
Yes	32	26.2
No	90	73.8
Adequate exercise		
Yes	36	29.5
No	86	70.5
Trying to lose weight		
Yes	86	70.5
No	36	29.5

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Among the women, only 29.5% had adequate exercise. For those who had adequate exercise, the type of exercise most often undertaken was walking (88.9%). Fewer women undertook other types of exercise such as jogging (13.9%) and badminton playing (11.1%). For the 70.5% who either did not exercise or had inadequate exercise, the reasons given were lack of time (27.9%), lazy (25.4%), no friends (16.4%), not interested (15.6%), shy (11.5%), and not allowed by the family (7.4%).

A high percentage of the women (70.5%) reported that they did try to lose weight in the past 12 months prior to the study. The methods they used to lose weight were taking slimming products (23.8%), reducing overall food intake (21.3%), exercising (20.5%), skipping meals (14.8%), and eating less fatty foods (9.8%). Apart from these methods, a few also resorted to rather unconventional methods of drinking 'sunquick' (an orange drink), drinking Chinese tea, drinking lime juice, and eating either biscuits, *mee* or *mee hoon* instead of rice during meals.

Besides using western slimming products, the women in this study also used traditional Malay slimming products. The common products used were *jamu Nona Roguy* and *pil susut perut Mustika Ratu*. *Jamu* was taken for the purpose of reducing body fat (*kurangkan lemak*), and to maintain a healthy body (*badan sihat*). *Pil susut perut*, as its name connotes, was taken for the purpose of trimming the abdomen.

### Anthropometric characteristics

The women's mean weight and height were  $64.3 \pm 15.8$  kg and  $152.9 \pm 5.2$  cm, respectively (Table 2). Mean BMI was  $27.4 \pm 6.2$  kg/m<sup>2</sup>, and the range was from 16.2 to 51.3 kg/m<sup>2</sup>. The average waist and hip circumferences for this sample of women were  $78.2 \pm 13.9$  cm and  $101.1 \pm 13.8$  cm, respectively. Their mean WHR value was  $0.77 \pm 0.1$ , and their WHR ranged between 0.52 and 0.96.

Table 3 shows that 29.5% of the women was within the normal range and an equal percentage (29.5%) was within the pre-obese range. Another one-third of the women were obese (23.0% class I, 9.0% class II, 2.5% class III). Slightly more than one-tenth of the women (11.5%) had a WHR of above 0.85.

### Dietary knowledge, attitude and practice

The knowledge items numbered 1, 2, 4, 7, 9, 10, and 12 were positive statements while the remaining five were negative statements (Table 4). Nearly all women in the study gave the correct response for the statements “Vegetables and fruits are good sources of vitamin C” (99.2%), “Excessive salt intake can lead to high blood pressure” (97.5%), and “Excessive sugar intake can cause diabetes mellitus” (97.5%). However, only 21.3% of the women gave the correct response to the statement “White meat has more fat than red meat.”

Attitude items numbered 1, 2, 3, 5, 7, and 8 were in the positive direction while the others were negative (Table 5). The women’s attitude towards diet and disease, and balanced diet was satisfactory. For example, in terms of attitude towards diet and disease, a high percentage had a positive attitude towards the statements “I feel that a healthy and balanced diet can reduce my risk of getting diseases” (91.8%), and “All women should reduce their intake of foods that are high in sugar content” (82.0%). For balanced diet, 95.1% of them expressed a positive attitude for the statement “I feel that it is important for me to eat a healthy and balanced diet,” and 82.8% expressed a negative attitude for the statement “Each person can eat whatever and however much she likes.” Their attitude towards diet in general is, however, less than satisfactory. For example, 36.1% had a desirable attitude for the statement “It is difficult for me to change my current dietary habit to a healthier one.”

Practice items numbered 1, 4, 6, 9, 10, and 12 were positive while the others were negative (Table 6). A large proportion of the women reported desirable practices such as discarding the chicken skin and fat before cooking or eating it (85.2%) and reducing the use of salt when cooking (78.7%). Most of the women also reported not practising negative practices such as usually putting extra sugar into their drinks (77.0%), and disagreed that they do not have appetite to eat breakfast in the morning (72.1%) (Table 6). However, a smaller percentage of them reported not practising negative practices such as always dieting in order to reduce their body weight (45.1%) and liking fried food

Table 2. Anthropometric characteristics (N=122)

	Mean ± SD	25th percentile	Median	75th percentile
Weight (kg)	64.3 ± 15.8	50.8	62.8	75.3
Height (cm)	152.9 ± 5.2	149.0	152.0	156.0
BMI	27.4 ± 6.2	22.4	27.2	31.4
Waist (cm)	78.2 ± 13.9	67.0	80.0	86.1
Hip (cm)	101.1 ± 13.8	91.8	102.0	107.3
WHR	0.77 ± 0.1	0.72	0.77	0.81

Table 3. Distribution of respondents by body mass index (BMI) and waist hip ratio (WHR) (N=122)

	No.	%
BMI		
Underweight	8	6.5
Normal	36	29.5

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Overweight		
Pre-obese	36	29.5
Obese class I	28	23.0
Obese class II	11	9.0
Obese class III	3	2.5
WHR		
- 0.85	108	88.5
> 0.85	14	11.5

Table 4. Dietary knowledge (N=122)

Items	% of women who answered correctly	
	No.	%
1. Excessive salt intake can lead to high blood pressure.	119	97.5
2. A balanced diet should consist of carbohydrate, protein, fat, vitamin, mineral and fibre.	109	89.3
3. The food group that should be eaten the least is vegetables and fruits.	107	87.7
4. Nutrients needed by the body can be obtained easily if we consume a variety of foods.	86	70.5
5. The food group that should be eaten the most is meat.	103	84.4
6. Consumption of foods low in cholesterol level can increase a person's risk of getting heart disease.	67	54.9
7. Fruits are food that have high content of fibre.	82	67.2
8. Excessive vitamin intake can increase the risk of heart disease.	50	41.0
9. A balanced diet can reduce the risk of diseases.	107	87.7
10. Vegetables and fruits are good sources of vitamin C.	121	99.2
11. White meat has more fat than red meat.	26	21.3
12. Excessive sugar intake can cause diabetes mellitus.	119	97.5

Table 5. Dietary attitude (N=122)

Items	% of women with desirable attitude	
	No.	%
<b>Attitude towards diet and disease</b>		
1. All women should reduce their intake of foods that are high in sugar content.	100	82.0
2. Even though I am thin, I still need to reduce my intake of foods that are high in fat.	96	78.7
3. I feel that a healthy and balanced diet can reduce my risk of getting diseases.	112	91.8
4. I feel that there is no relationship between diseases and what one eats or drinks.	86	70.5
5. If my body weight increases, my risk of getting diseases will also increase.	89	72.9
<b>Attitude towards balanced diet</b>		
6. Each person can eat whatever and however much she likes.	101	82.8
7. I feel that it is important for me to eat a healthy and balanced diet.	116	95.1

8.	Even though my body weight is normal, I should still eat everything in moderation.	94	77.0
9.	Only people who are overweight should practice eating a healthy and balanced diet.	90	73.8
<b>Attitude towards diet in general</b>			
10.	'Healthy foods' do not taste nice.	64	52.5
11.	It is difficult for me to change my current dietary habit to a healthier one.	44	36.1
12.	I wish to practise eating a healthy and balanced diet, but it is too expensive.	67	54.9

Table 6. Dietary practice (N=122)

Items	% of women with desirable practice	
	No.	%
1. I eat my meals at regular times everyday.	47	38.5
2. I like fried food.	43	35.2
3. I do not have appetite to eat breakfast in the morning.	88	72.1
4. I eat all kinds of foods, but in small quantities.	80	65.6
5. I prefer snacks/junk food to rice and dishes.	97	79.5
6. I eat more white meat than red meat.	72	59.0
7. I rarely eat fresh fruits.	86	70.5
8. I always diet in order to reduce my body weight.	55	45.1
9. I discard the chicken skin and fat before cooking or eating it.	104	85.2
10. I reduce the use of salt when cooking.	96	78.7
11. I usually put extra sugar into my drinks.	94	77.0
12. I eat vegetables/fruits more than 5 times per week.	85	69.7

Table 7. Categorization of respondents' dietary knowledge, attitude, and practice (N=122)

	No.	%
<b>Dietary knowledge</b>		
Good (score 10-12)	59	48.4
Poor/moderate (score 1-9)	63	51.6
<b>Dietary attitude</b>		
Good (score 7-12)	60	49.2
Poor/moderate (score 1-6)	62	50.8
<b>Dietary practice</b>		
Good (score 7-12)	54	44.3
Poor/moderate (score 1-6)	68	55.7

## **Factors associated with overweight**

The variables age, marital status, educational level, monthly salary, living arrangement, shiftwork, and trying to lose weight were significantly associated with BMI (Table 8). The prevalence of overweight was found to be significantly higher among older women (OR=4.9, 95% CI=2.2–10.9), ever married women (OR=7.1, 95% CI =3.1–16.3), women who had lower educational level (OR=2.6, 95% CI =1.2–5.7), women who had higher monthly salary (OR=7.9, 95% CI =3.4–18.6), and women who were not living in the hostel (OR=8.4, 95% CI =3.4–20.9). The prevalence of overweight was also significantly higher among those who were involved in shiftwork (OR=7.0, 95% CI =2.8–17.4), and those who were trying to lose weight in the 12 months prior to the study (OR=12.2, 95% CI =4.8–30.6).

Table 8 also shows that after adjusting for age, the prevalence of overweight remained significantly higher among ever married women (age adjusted OR = 3.6, 95% CI = 1.2–10.1), those with higher monthly salary (age adjusted OR = 3.8, 95% CI = 1.2–11.8), those not living in the hostel (age adjusted OR = 3.6, 95% CI = 1.1–12.2), women involved in shiftwork (age adjusted OR = 4.0, 95% CI = 1.5–10.7), and women who were trying to lose weight (age adjusted OR = 13.5, 95% CI = 4.7–38.8). Educational level was not found to be significantly associated with overweight after adjusting for age.

Multivariate logistic regression, which included the variables age, marital status, educational level, monthly salary, shiftwork, living arrangement, and trying to lose weight, was run (the results are not shown). In this analysis, only one significant association was found, that is between overweight and trying to lose weight (adjusted OR = 18.3, 95% CI = 5.4–62.6). However, the precision of the study was low since the 95% CI was very wide.

## **Food intake**

### *Cereals and grain products*

Rice was the food most frequently consumed by the women, with women in the overweight group scoring 95.2 and the non-overweight group scoring 95.5 (Table 9a). It was consumed 2–3 times daily by 67.9% of the overweight women and 70.5% of the non-overweight women. Other foods moderately consumed, that is, 2–3 times per week, were bread (a score of 56.7 for overweight, 55.8 for non-overweight) and *mee hoon* (overweight 50.5, non-overweight 52.9).

### *Meat, meat product, fish, shellfish and products*

Hen's egg was the meat product most frequently consumed by the women (a score of 63.5 for overweight, 68.5 for non-overweight) (Table 9a). Chicken appeared to be a popular food among both overweight and non-overweight women, while mutton was seldom taken. Anchovies (a score of 63.3 for overweight, 68.4 for non-overweight) and *kembong* fish (a score of 48.8 vs. a score of 49.7) were foods most often consumed by both groups of women (Table 9a). Women in the overweight group rarely consumed *cencaru* fish (a score of 19.0) and *tongkol* fish (a score of 17.9), whereas women in the non-overweight group rarely consumed *selar* fish (a score of 23.1) and clams (a score of 20.1).

Table 8. Factors associated with overweight (N=122)

	Overweight		OR <sup>1</sup>	95% CI	Adjusted OR <sup>2</sup>	95% CI
	Yes (%)	No (%)				
Age						
≥ 35 years	56 (78.9)	15 (21.1)	4.9	2.2-10.9	-	-
< 35 years	22 (43.1)	29 (56.9)	1.0			
Ethnicity						
Non-Malay	22 (75.9)	7 (24.1)	2.1	0.8-5.4	0.9	0.3-2.7
Malay	56 (60.2)	37 (39.8)	1.0		1.0	
Marital status						
Ever married	60 (81.1)	14 (18.9)	7.1	3.1-16.3	3.6	1.2-10.1
Never married	18 (37.5)	30 (62.5)	1.0		1.0	
Educational level						
Form 3/lower	45 (75.0)	15 (25.0)	2.6	1.2-5.7	1.5	0.6-3.6
Above Form 3	33 (53.2)	29 (46.8)	1.0		1.0	
Monthly salary						
> RM700	65 (79.3)	17 (20.7)	7.9	3.4-18.6	3.8	1.2-11.8
- RM700	13 (32.5)	27 (67.5)	1.0		1.0	
Shiftwork						
Yes	69 (75.0)	23 (25.0)	7.0	2.8-17.4	4.0	1.5-10.7
No	9 (30.0)	21 (70.0)	1.0		1.0	
Overtime work						
Yes	66 (64.7)	36 (35.3)	1.2	0.5-3.3	1.6	0.5-4.7
No	12 (60.0)	8 (40.0)	1.0		1.0	
Living in hostel						
No	69 (76.7)	21 (23.3)	8.4	3.4-20.9	3.6	1.1-12.2
Yes	9 (28.1)	23 (71.9)	1.0		1.0	
Adequate exercise						
No	58 (67.4)	28 (32.6)	1.7	0.8-3.7	2.4	1.0-6.0
Yes	20 (55.6)	16 (44.4)	1.0		1.0	
Trying to lose weight						
Yes	69 (80.2)	17 (19.8)	12.2	4.8-30.6	13.5	4.7-38.8
No	9 (25.0)	27 (75.0)	1.0		1.0	
Dietary knowledge						
Good	40 (66.7)	20 (33.3)	1.3	0.6-2.7	1.0	0.5-2.3
Poor/moderate	38 (61.3)	24 (38.7)	1.0		1.0	
Dietary attitude						
Poor/moderate	40 (64.5)	22 (35.5)	1.1	0.5-2.2	0.8	0.4-1.9
Good	38 (63.3)	22 (36.7)	1.0		1.0	
Dietary practice						

Poor/moderate	46 (67.6)	22 (32.4)	1.4	0.7-3.0	1.9	0.8-4.3
Good	32 (59.3)	22 (40.7)	1.0		1.0	

\* p < .05

<sup>1</sup> The reference category is the last row within each factor.

<sup>2</sup> Odds ratios were adjusted for age.

### *Vegetables and fruits*

The common vegetables consumed by the overweight group were cabbage (a score of 56.3), Chinese mustard leaves (a score of 53.9), tomato (a score of 51.5), cauliflower (a score of 51.3), and spinach (a score of 50.0) (Table 9a). For the non-overweight group, they usually consumed tomato (a score of 58.0), cabbage (a score of 56.5), long bean (a score of 55.3), cucumber (a score of 52.9), and Chinese mustard leaves (a score of 50.6). Fruits normally consumed by the women were apples (a score of 60.3 for overweight, 55.2 for non-overweight) and oranges (52.7 for overweight, 55.9 for non-overweight) (Table 9b). Pineapple, starfruit, and guava (a score of 26.3) were seldom consumed.

### *Bought cooked foods*

Bought cooked foods commonly eaten by the women were *nasi lemak* (overweight women scoring 55.7, non-overweight scoring 54.3), fried rice (overweight 52.7, non-overweight 59.5), and currypuff (overweight 52.0, non-overweight 51.6) (Table 9b). Nearly half of the women took *nasi lemak* and fried rice 2–3 times a week. *Nasi minyak* (a score of 17.8) and *popiah goreng* (a score of 16.3) were rarely eaten by the overweight women, while *apam balik* (a score of 18.8) and *nasi minyak* (a score of 18.2) were rarely eaten by the non-overweight women.

## **DISCUSSION**

### **Socio-demographic and background Characteristics**

The general characteristics of women workers in this study were more similar to that of their counterparts studied in the 1980s than in the 1970s (Fatimah, 1983; Lin, 1991; Xavier, 1994; Ng & Maznah, 1997). The women production workers in the 1980s, apart from being mainly Malays, were older, married, had attained at least secondary school education, and had worked for a longer duration. The monthly salary of the women in this study ranged widely from RM415 to RM1700. Apart from their basic monthly pay, women with longer working duration, and those who achieved their production targets and worked more overtime hours would receive a higher pay.

Most of the married women did not stay in hostels, which were usually provided by factory managements for single women workers who were from other states in Malaysia. The majority of the respondents in this study were involved in shiftwork (75.4%) and overtime work (83.6%). Most women production workers in the electronics factories in Malaysia are involved in

shiftwork and overtime work because their factories usually have shift and overtime systems in order to maximise production and reduce labour costs (Chee & Ng, 1997).

The National Health and Morbidity Survey (NHMS) II, reported that the rate of adequate exercise among Malaysian women was 7.7% (Siti *et al.*, 1999). For women workers in this study, the rate of exercise (29.5%) was higher than that of the NHMS II. The exercise rate in the NHMS II and this study are not directly comparable as the definition of adequate exercise in NHMS II was exercise undertaken for a minimum of 15 min per session and at a frequency of more than three times a week, whereas, for this study, it was exercise undertaken for a minimum of 30 min per session and at least three times a week. The NHMS II had also identified women, older people, and those employed in the production sector as specific groups in the population who were leading a sedentary lifestyle and least involved in any exercise.

Table 9a. Food use frequency for overweight and non-overweight respondents

Overweight (n=78)		Non-overweight (n=44)	
Food	Score	Food	Score
<b>Cereals and grain products</b>			
Rice	95.2	Rice	95.5
Bread	56.7	Bread	55.8
Mee hoon	50.5	Mee hoon	52.9
Mee	37.7	Mee	41.5
Kueh teow	32.1	Instant noodles	40.9
Instant noodles	29.2	Kueh teow	31.8
<b>Vegetables</b>			
Cabbage	56.3	Tomato	58.0
Chinese mustard leaves (Sawi)	53.9	Cabbage	56.5
Tomato	51.5	Long bean	55.3
Cauliflower	51.3	Cucumber	52.9
Spinach	50.0	Chinese mustard leaves (Sawi)	50.6
Cucumber	49.8	Cauliflower	46.7
Lady's finger	49.1	Swamp cabbage (Kangkung)	45.8
Carrot	48.5	Spinach	44.5
Long bean	48.1	Lady's finger	41.6
French bean	43.6	Carrot	39.0
Swamp cabbage (Kangkung)	42.0	French bean	38.3
Four-angled bean	35.3	Four-angled bean	35.4
Chinese kale (Kailan)	28.5	Chinese kale (Kailan)	25.3
<b>Meat and meat products</b>			
Hen's egg	63.5	Hen's egg	68.5
Chicken wing	41.1	Chicken breast	52.0
Chicken breast	40.7	Chicken wing	49.9
Beef	37.8	Chicken thigh	46.8
Chicken thigh	33.3	Chicken liver	43.5
Chicken burger	32.1	Beef	42.6
Beef burger	31.1	Chicken burger	38.6
Chicken liver	26.2	Salted egg	34.1
Salted egg	23.6	Beef burger	29.2
Ox liver	18.0	Ox liver	20.1
Mutton	17.6	Mutton	19.1
Quail's egg	14.8	Quail's egg	19.1

*Dietary and Other Factors Associated with Overweight Among Women Workers*

Fish, shellfish and products			
Anchovies	63.3	Anchovies	68.4
Kembong fish	48.8	Kembong fish	49.7
Tenggiri fish	44.7	Prawns	42.5
Prawns	43.6	Cuttlefish	40.0
Cuttlefish	39.5	Fishball	33.1
Fishball	30.6	Cockles	29.9
Selar fish	27.1	Tenggiri fish	28.9
Cockles	23.3	Cencaru fish	27.3
Clams	20.7	Tongkol fish	23.7
Cencaru fish	19.0	Selar fish	23.1
Tongkol fish	17.9	Clams	20.1

Table 9b. Food use frequency score for overweight and non-overweight respondents

Overweight (n=78)		Non-overweight (n=44)	
Food	Score	Food	Score
<b>Fruits</b>			
Apple	60.3	Orange	55.9
Orange	52.7	Apple	55.2
Banana	49.4	Banana	51.6
Watermelon	44.7	Watermelon	47.7
Papaya	44.7	Papaya	36.1
Guava	36.6	Pineapple	27.3
Pineapple	28.3	Guava	26.3
Starfruit	26.8	Starfruit	22.4
<b>Cooked foods</b>			
Nasi lemak	55.7	Fried rice	59.5
Fried rice	52.7	Nasi lemak	54.3
Currypuff	52.0	Currypuff	51.6
Fried mee	45.2	Fried mee	42.6
Pisang goreng	42.5	Cokodok pisang	38.0
Fried kueh teow	35.4	Chicken rice	36.7
Chicken rice	33.1	Pisang goreng	36.1
Cokodok pisang	31.6	Lepat pisang/ubi	32.8
Lepat pisang/ubi	29.0	Doughnut	32.5
Cucur badak	27.7	Fried kueh teow	31.8
Kuih apam	26.8	Cake	30.9
Cake	26.0	Chicken satay	29.2
Doughnut	25.1	Beef satay	25.7
Chicken satay	25.0	Sri muka	24.7
Kuih lapis	24.7	Curry mee	24.1
Curry mee	24.2	Kuih apam	23.7
Sri muka	23.6	Beriyani rice	21.7
Apam balik	21.6	Kuih lapis	21.4
Beriyani rice	19.8	Cucur badak	19.8
Beef satay	19.6	Popiah goreng	19.4
Nasi minyak	17.8	Apam balik	18.8
Popiah goreng	16.3	Nasi minyak	18.2

Types of exercise reported in this study were similar to those reported in the NHMS II as exercise most commonly engaged by Malaysians, that is brisk walking, jogging, and racket sports (Siti *et al.*, 1999). In this study, walking was the preferred exercise among the women, just as in the South Australian Study (Booth *et al.*, 1997) and the Nurses' Health Study in the United States (Hu *et al.*, 2003), which also found that walking was the most preferred physical activity among their women respondents. The South Australian study was conducted among 1,232 less active (being engaged in less than 30 minutes of moderate-intensity activity) men and women, while the Nurses' Health Study, a prospective cohort study, was conducted among 50,277 female registered nurses. Reasons for not exercising mentioned by the women in this study, such as lack of time, laziness, and not interested were also common reasons reported by women in the South Australian study (Booth *et al.*, 1997). The Australian study also found that women in the 18–39 year age group were more likely to mention the lack of time (because they have to take care of children) and no motivation as the major barriers preventing them from being physically active compared to women who were older.

The rate of ever trying to lose weight among the women in this study (39.3%) was comparable to the rate (42.4%) in the study conducted by Nakamura *et al.* (1999) among 406 Japanese women aged 20 to 39 years who worked in a computer factory. The Japanese women preferred to use slimming products instead of exercising to lose weight. In the current study, a similar preference was found, although the difference was not large.

In a cross sectional study conducted by Sherwood, Harnack & Story (2000) among 203 urban American Indian women, with an average age of 33.8 years, it was found that the desirable methods used by most of them to lose weight were eating more fruits and vegetables (78.6%), reducing the total amount of food consumed (69.8%), increasing physical activity (57.6%), and cutting down on eating high fat foods (57.4%). Less desirable methods used by them were skipping meals (64.5%) and taking diet pills (14.3%). Less women in this study used undesirable methods such as skipping meals (14.8%) and taking slimming products (23.8%) to lose weight compared to the American Indian women. Likewise, the use of desirable methods such as reducing the total amount of food consumed (21.3%), exercising (20.5%) and eating less fatty foods (9.8%) to lose weight was also lower among women in this study compared to the American Indian women.

### **Anthropometric characteristics**

In the current study, the problem of undernutrition (6.5%) was low compared to the problem of overnutrition (64.0%) among the women workers. The prevalence of pre-obesity (29.5%) and obesity (34.5%) was considerably higher than the prevalence reported in previous studies. This is because the respondents in the current study were volunteers, and those who were invited to participate were not selected at random, but based upon their weight categories. Therefore, these proportions should not be taken as representative of the population of electronics women workers. Nevertheless, it should be noted that in the NHMS II, the prevalence of overweight (25.0–29.9 kg/m<sup>2</sup>) among Malaysian women aged 20 and above was 17.2%, and for obesity (≥30.0 kg/m<sup>2</sup>), it was 5.3% (Fatimah *et al.*, 1999). In another study, the prevalence of overweight (>25.0 to <30.0 kg/m<sup>2</sup>) and obesity (>30.0 kg/m<sup>2</sup>) among urban women was 18.1% and 7.9%, respectively (Ismail *et al.*, 1995).

In contrast, the pre-obesity and obesity prevalence reported by Ng *et al.* (1995) in 1992 was 32.4% and 13.6%, while those reported by Khor *et al.* (1999) in 1992-1995 was 28.0% and 11.1%. These two studies were carried out among the rural women in Peninsular Malaysia. In the study by Ng *et al.* (1995) the sample comprised 237 healthy and non-pregnant women from the Malay, Chinese and Indian ethnic groups, aged 18–80, from three villages in Perak, who were a sub-group of the women in the study of Khor *et al.* (1999). In the study by Khor *et al.* (1999) the sample consisted of 2,751 women aged 18 and above from 69 villages and seven estates in Peninsular Malaysia. The average WHR value of the women in the current study ( $0.77 \pm 0.1$ ), however, was lower than the values reported by Ng *et al.* (1995) ( $0.83 \pm 0.1$ ) and Khor *et al.* (1999) ( $0.80 \pm 0.1$ ).

### **Dietary knowledge, attitude, and practice**

In terms of nutritional knowledge, although the women had some dietary knowledge, their knowledge was limited in certain areas. For instance, the majority answered correctly for statements related to salt intake, balanced diet, the food pyramid, and basic nutrients. However, their knowledge was limited when it pertained to cholesterol, fat, and causes for specific diseases. The dietary knowledge of a studied population reflects either the priorities of a government when educating its population on healthy eating, or the culture of the studied population (Girois *et al.*, 2001).

While some of the women's dietary attitudes were satisfactory, others, especially in their attitude towards diet in general, were not. Women who agreed that healthy foods do not taste nice (47.5%), and affirmed that they wish to practise eating a healthy and balanced diet, but that it is too expensive (45.1%) were higher than in the study by Thompson *et al.* (1999). Thompson *et al.* (1999) studied 5,553 English respondents of both sexes, aged 16 to 74 years and found that only 8.7% disagreed with "Healthy foods are enjoyable," and 39.2% agreed with "Eating healthy food is expensive." Their study also found that respondents who consumed less fruits and vegetables (eight or fewer times a week) were less likely to agree that "Healthy foods are enjoyable" (66.6% of low fruit and vegetables consumers), and more likely to agree that "Eating healthy food is expensive" (53% of low fruit and vegetables consumers). The study by Thompson *et al.* (1999) showed that a person's dietary attitude affects his/her dietary habit of fruit and vegetable consumption. However, this study may not be directly comparable to that of Thompson *et al.* (1999) since it included 2,740 male respondents.

In this study, some of the women practised good dietary habits that are essential for the prevention of future health problems, such as eating a variety of foods in small quantities, eating fresh fruit and vegetables, reducing fat intake, and reducing the use of salt and sugar. Some practices, on the contrary, may be detrimental to their health. The majority (61.5%) tended to eat their meals at irregular hours, which may result from their work schedule that involved shiftwork and overtime work. Most also liked fried foods (64.8%) and practised dieting for weight-loss purpose (54.9%).

The Framingham Nutrition Studies carried out among 737 non-overweight women ( $<25.0 \text{ kg/m}^2$ ) found that women who consumed higher amounts of animal and vegetable fats, sweets

and desserts, and meats were 40% more likely to have an increased overweight risk compared to women who consumed more servings of vegetables, fruits, low-fat milk, and other low-fat and fiber-rich foods such as fish, lean poultry and legumes (Quatromoni *et al.*, 2002).

The 1994-1996 Continuing Survey of Food Intake by Individual (CSFII 1994-1996) conducted among a nationwide representative sample of American adults found that those who were dieting had a lower intake of vitamin E and calcium compared with the non-dieters (Paeratakul *et al.*, 2002). Hence, the authors point out that “there are nutritional and health risks associated with dieting,” and cautioned that dieting should not be the sole method one uses to lose weight.

### **Factors associated with overweight**

In this study, no significant associations were found in the binary logistic regression model that used all significant variables as covariates. This was probably because of the small sample size which did not allow multivariate analysis with so many variables. Nevertheless, from the bivariate analysis, the findings from this study were consistent with the NHMS II (Fatimah *et al.*, 1999), where the prevalence of overweight for Malaysian adults was significantly higher among those who were older, ever married, had lower educational level, and had higher monthly salary. In the NHMS II, the prevalence of overweight ( $>25.0-29.9$  kg/m<sup>2</sup>) and obesity ( $>30.0$  kg/m<sup>2</sup>) increased with age, up to 50 years old, and the prevalence of overweight was higher for those who were ever married compared to those who were never married, for those with secondary and tertiary educational level compared to those with primary educational level, and for those having higher personal monthly salary compared to those who earned less. However, after adjusting for age, the association between overweight and educational level was no longer significant in the current study.

Women workers who were not living in hostels faced about eight times higher risk of being overweight compared to those who were living in hostels. This finding is possible as women who were not living in the hostel were mainly women who were ever married (only 6.3% of women staying in hostels were ever married), and it is noted earlier in this paper that the ever married women in this study had a significantly higher risk of being overweight than the never married women. Age adjusted OR showed that women who were not living in the hostel faced 3.6 times higher risk of being overweight and the association remained significant.

In addition, when adjusted for age, involvement in shiftwork remained significantly associated with overweight, while involvement in overtime work continued to be not significantly associated with overweight. One possible explanation for this is that the prevalence of overweight may not be associated with long working hours (overtime), but, is associated with irregular working hours (shiftwork). Shiftwork has a different impact on the workers' lifestyle and well-being, either for better or worse (Colligan & Rosa, 1990). The finding in this study shows that shiftwork may be detrimental to the women's health as it contributes to their poor dietary practices in terms of irregular meals.

The current study noted a significantly higher prevalence of overweight among women who were trying to lose weight in the 12 months prior to the study, and this remained so after adjusting for age. This finding is similar to the findings of the study by Sherwood *et al.* (2000)

study. The study by Sherwood *et al.* among 203 urban American Indian women found that women who were overweight ( $>27.3 \text{ kg/m}^2$ ) were more likely to report that they were trying to lose weight compared with their non-overweight ( $<27.3 \text{ kg/m}^2$ ) counterparts.

The NHMS II found a higher prevalence of overweight among the Indians compared to the Chinese and Malays (Fatimah *et al.*, 1999). However, no significant association was found between overweight ( $>25.0 \text{ kg/m}^2$ ) and ethnicity in this study after adjusting for age.

Adequate exercise was not significantly associated with overweight in this study. This finding differs from that of Sundquist & Johansson (1998). In their longitudinal study, among a Swedish sample of 1,972 women and 1,871 men, Sundquist and Johansson (1998) found a significant relationship between no exercise and increased BMI. Men and women who reported not exercising were more likely to have an increased BMI than those who reported otherwise. It is possible that in the current study, the exercise reported did not reach adequate intensity, and the method of measurement was not sufficiently discerning.

The current study did not find any significant association between overweight and the women's dietary knowledge, attitude, or practice. The majority of women had similar dietary knowledge, which generally was limited; similar dietary attitude, which comprised a mixture of desirable and less desirable attitudes; and similar dietary practice, which comprised a mixture of healthy and less healthy practices. This can be attributed to the women's relatively homogenous socio-demographic and background characteristics.

Girois *et al.* (2001) compared the dietary knowledge and attitude of adults, aged 35 to 75 years, in the United States and Switzerland. Among the 10,366 American and 698 Swiss adults studied, the authors did not find any significant association between overweight ( $\geq 27.3 \text{ kg/m}^2$ ), and knowledge and attitude on diet. A significant association was found only between educational level and knowledge about diet and diseases. The more educated respondents were found to have better dietary knowledge.

### **Food intake**

The food consumption frequency score of women workers in this study showed that the frequency pattern of foods consumed by the overweight and non-overweight women were similar. Their main sources of carbohydrate were rice, bread and *mee hoon*. Rice is the staple diet for Malaysians, whereas bread is usually eaten during breakfast. Instant noodles were eaten more frequently by the non-overweight women (a food score of 40.90) compared to the overweight women (a food score of 29.17). Although its method of preparation is easy and convenient, frequent consumption of this food is not healthy and nutritious since it is a highly processed food containing preservatives and flavourings. Instant noodles were also normally eaten without any side dishes, thus making the meal imbalanced. Other sources of carbohydrate included *nasi lemak*, fried rice, currypuff, fried *mee*, and *pisang goreng*. These foods are high in fat content because they are mostly fried or deep fried, or cooked with coconut milk (such as *nasi lemak*). Vitamin and mineral sources were primarily vegetables and fruits. It was noted that most of the women took a limited variety of vegetables and fruits, which include cabbage, Chinese mustard leaves, tomato, cauliflower, spinach, long bean, cucumber, apples, oranges, and

banana. The majority reported they rarely consumed other types of vegetables and fruits listed on the food frequency questionnaire. Their protein sources were from hen's egg, chicken meat, anchovies, and fish, especially *kembong* fish. Anchovies, which is normally added into main dishes, is also an inexpensive source of calcium for the women. All the mentioned foods, except rice, were consumed by the majority of the women either 2–3 times or once a week. Rice was consumed by the women everyday, either once or 2–3 times.

In this study, the women's diet was found to be lacking in variety, be it foods that are high in carbohydrate, protein or vitamins and minerals. This could be attributed to the lack of accessibility to and availability of a wide variety of foods because of the nature of their work. Women who were not involved in shiftwork, had to work during the daytime. Therefore, they did not have the time to cook, except for dinner. On the other hand, women who did shiftwork and overtime work might be too tired to cook by the end of the day, thus preferring to buy cooked foods. This suggests that the women depended on either the factory's canteen, restaurants, or hawker stalls for their meals. Since these outlets sold the same type of foods most of the time, this could be an explanation for their monotonous diet.

The women's consumption habits revealed a high frequency of intake of foods high in fat content, which is consistent with their reported dietary practice regarding their liking for fried food. The preference for fried food might be a probable factor for the high prevalence of overweight in the study.

## **CONCLUSION**

This study was based on a small voluntary sample, and thus did not represent the general profile of women workers in the electronics factories in Malaysia. Being a voluntary sample also means that self-selection might be at work, and that women workers in this study might be either women who were more health-conscious, or those who faced health problems. Nevertheless, this study is able to provide an understanding of factors that are associated with overweight, and a dietary profile of this group of women workers.

A high prevalence of overweight compared to the national rate was found among the women workers in this study. The findings showed that women who were older, ever married, had lower educational level, had higher salary, not living in the hostel, involved in shiftwork, and trying to lose weight were more likely to be overweight. Age was a strong confounding factor in this study. Even after adjusting for age, each of the above factors, with the exception of educational level, remained significantly associated with overweight. Adequate exercise and dietary knowledge, attitude, and practice, however, were not found to be significantly associated with overweight. In sum, women in the overweight and non-overweight groups had a similar dietary practice, including food intake pattern, and sedentary lifestyle. If the non-overweight women workers continue with their current poor dietary practice and sedentary lifestyle, they might be at risk of being overweight in the future. Therefore, it is suggested that further research focusing on changing the sedentary lifestyle and poor dietary habits of the women workers is necessary to address the problem. Further research is also recommended to identify healthy weight-loss

behavior or programs, which incorporate exercise and healthy eating practices, preferably workplace based, for women workers in the overweight group.

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