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Nutritional and Health Status among Young Indian Adults in Malaysia

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ABSTRAK

Satu kajian hirisan lintang untuk menentukan kaitan di antara status pemakanan dan kesihatan telah dijalankan ke atas 80 orang dewasa muda India (16 lelaki dan 64 wanita). Pengukuran antropometri seperti berat, tinggi, ukurlilit pinggang dan pinggul dilakukan. Pengambilan makanan, glukosa darah dan tekanan darah juga ditentukan. Berat lahir diperolehi dari sijil kelahiran atau proksi subjek. Hasil menunjukkan min berat, tinggi, indeks jisim tubuh (IJT) dan nisbah pinggang pinggul adalah masing-masing 64.9 ± 9.1 kg, 1.7 ± 0.1 m, 21.6 ± 2.6 kg/m² dan 0.9 ± 0.1 untuk lelaki. Keputusan antropometri yang diperolehi untuk wanita adalah lebih rendah secara signifikan ($p < 0.05$) kecuali untuk IJT (50.7 ± 9.9 kg, 1.6 ± 0.1 m, 20.4 ± 3.5 kg/m², 0.8 ± 0.1. Min pengambilan tenaga untuk lelaki ialah 2215 ± 323 kcal per hari dan lebih tinggi dengan signifikan ($p < 0.05$) daripada wanita (1594 ± 292 kcal per hari). Lelaki dan wanita memenuhi hanya 88% dan 80% dari saranan pengambilan tenaga untuk Malaysia masing-masing. Nutrien yang perlu diberi perhatian di kalangan wanita adalah ferum, di mana hanya mencapai 46% RDA. Min glukosa darah adalah 4.7 ± 0.9 mmol/l untuk lelaki sementara 4.4 ± 0.6 mmol/l untuk wanita. Tekanan darah sistolik (SBP) dan diastolik (DBP) ialah 112 ± 8 mm Hg dan 76 ± 7 mm Hg di kalangan lelaki dan lebih tinggi secara signifikan ($p < 0.05$) daripada wanita (103 ± 10 mm Hg SBP, 70 ± 8 mm Hg DBP). Terdapat perkaitan yang positif di antara berat lahir dan glukosa darah, SBP DBP dan IJT, walau bagaimanapun kaitan ini tidak signifikan.

Kata kunci: antropometri, pengambilan makanan, status pemakanan dan kesihatan, dewasa muda India, tekanan darah

ABSTRACT

A study was carried out to determine the relationship between nutritional status and health status among 80 young Indian adults (16 men and 64 women). Anthropometric measurements such as weight, height, waist and hip circumference were taken. Food intake, blood glucose and blood

pressure were also evaluated. Birth weight was obtained from birth certificates or proxy. Results showed that mean weight, height, body mass index (BMI) and waist to hip ratio (WHR) for men were 64.9 ± 9.1 kg, 1.7 ± 0.1 m, 21.6 ± 2.6 kg/m² and 0.9 ± 0.1, respectively. The anthropometric results reported for women were significantly ($p < 0.05$) lower than men except for BMI (50.7 ± 9.9 kg, 1.6 ± 0.1 m, 20.4 ± 3.5 kg/m², 0.8 ± 0.1). Mean energy intake for men was 2215 ± 323 kcal per day and was significantly ($p < 0.05$) higher than women (1594 ± 292 kcal per day). Men and women fulfilled only 88% and 80% respectively of the energy recommendation for Malaysia. The nutrient of concern among women was iron, meeting only 46% of RDA. Mean blood glucose was 4.7 ± 0.9 mmol/l in men while 4.4 ± 0.6 mmol/l in women. Systolic (SBP) and diastolic blood pressure (DBP) was 112 ± 8 mm Hg and 76 ± 7 mm Hg in men and significantly higher than in women (103 ± 10 mm Hg SBP, 70 ± 8 mm Hg DBP). Positive associations were observed between birth weight and blood glucose, SBP DBP and BMI, however, the associations were not significant.

Key words: anthropometric, food intake, nutritional status, young Indian adults, health status, blood pressure.

INTRODUCTION

Malnutrition in Malaysia, whether undernutrition or overnutrition, coexisted together as reported in the Nutrition and the Malaysian Healthy Lifestyle Programme (Abu Bakar & Tee 1998). Overnutrition particularly obesity, usually relates to chronic diseases such as hypertension, coronary heart disease, diabetes and various types of cancers. Like many other developed countries, obesity is becoming a growing problem in Malaysia. Ismail et al. (1995) reported that the prevalence of obesity was 29% in men and 26% in women in the urban setting. The prevalence of obesity although lower in the rural areas, demonstrated 15% prevalence among men while 20% among women. However in the last five to ten years, Barker et al. (1993) and Clausen et al. (1997) have shown that low birth weight was associated with risk factors of cardiovascular diseases such as increased blood pressure, triglyceride, body mass index (BMI), waist to hip ratio (WHR) and decreased high density lipoprotein (HDL). This phenomenon is better known as syndrome X.

Most nutritional status studies in the last decade have focused on various age groups ranging from infants to the elderly, mostly among the Malay communities (Wan Manan 1995; Poh et al. 1999; Norimah & Mohd Riza 1999; Suriah et al. 1998; Suzana et al. 1999) Due to the scarcity of nutritional status studies within the Indian community, the present study on these young Indian adults was carried out with two objectives. The first objective was to determine the nutritional status among these young Indian adults and second

to determine the relationship of birth weight and biochemical parameters such as blood glucose and blood pressure during adulthood. Earlier studies among young Chinese and Malay adults have shown decreasing glucose and blood pressure with increasing birth weight (Norimah & Mimi, 1999; Teh 1999). Barker et al. (1989) demonstrated a relationship between foetal growth and adult diseases. Other studies reported that low birth weight babies had a higher tendency to develop diabetes, hypertension and cardiovascular disease as adults (Barker et al. 1993; Philips et al.1994).

MATERIALS AND METHODS

SUBJECTS

Subjects consisted of young Indian adults, who were defined as adults between the ages of 18-30 yrs old (Eschleman 1990). A briefing to explain the objectives of the research to be undertaken and the research protocol was carried out between June 1999 and December 1999 at three campuses which were the Kuala Lumpur campus of Universiti Kebangsaan Malaysia, TAFE College in Seremban and Maktab Perguruan Raja Melewar in Seremban. The students attending these institutions of higher learning were invited to participate in the study. A group of 80 young adults consisting of 16 men and 64 women agreed to participate in this study.

ANTHROPOMETRIC MEASUREMENT

Anthropometric measurements taken were weight, height, waist and hip circumference. Weight of subjects were measured using the weighing scale Seca Model 761 and recorded to the nearest $\pm$ 0.1 kg. Height was taken using a Seca Microtoise Bodymeter 208 and recorded to the nearest 0.1 cm. The waist circumference was measured using a flexible tape at the mid section between the last rib cage and iliac crest while the hip circumference was taken at the widest circumference of the hip. Body mass index (BMI) and waist to hip ratio (WHR) were calculated for each subject. WHR of greater than 0.95 in men and greater than 0.85 in women was indicative of increased risk of cardiovascular disease (Jones et al. 1986) while BMI of greater than 25 was the cut-off point taken as an index of preobesity or overweight while 30 was cut off point for obesity (WHO 1998).

FOOD INTAKE ASSESSMENT

The food intake of the subjects was evaluated using a 3-day dietary record. Subjects were given a form to record all foods and drinks consumed for 3 days (2 weekdays and 1 week end). Subjects were given a briefing on how to

record their food intake. They were requested to estimate the foods consumed based on household measurements such as cups, tablespoon and teaspoons etc. Food intake estimated for each subject was then converted to energy and nutrient content using the Diet 4 computer package based on the Food Composition Table of Malaysian Foods (Tee et al. 1997).

BLOOD GLUCOSE AND BLOOD PRESSURE ASSESSMENT

Determination of blood glucose of subjects was carried out after an overnight fast of at least 10 hrs. 32 ul blood was taken from a finger prick and analyzed using a Reflotron (Boehringer Manheim). The evaluation criteria for glucose was based on standard provided by Boehringer Mannheim. Blood pressure measurement was taken using the sphygmomanometer. Subjects were requested to rest for 15 min before blood pressure measurement was taken on the left arm twice and the mean was recorded. Blood pressure classification was based on the Joint National Committee (1993).

BIRTH WEIGHT DATA

Birth weight data of the subjects were obtained from their birth certificates. For subjects whose birth weight was not recorded on the birth certificate, the birth weight was acquired from a proxy, usually their mothers.

STATISTICAL ANALYSIS

The collected data was analyzed using the SPSS programme version 10.01. The results were presented as mean and standard deviation. Independent t-test was used to determine differences between gender for anthropometric measurements and the blood profile. Pearson correlation test was carried out to examine the relationship between blood profile and anthropometric measurements as well as birth weight and blood profile and anthropometric measurement.

RESULTS AND DISCUSSIONS

The physical attributes of the subjects are described in Table I. The mean age of men and women were 21.3 $\pm$ 1.3 yrs and 20.5 $\pm$ 1.5 yrs respectively and there was no significant difference between gender. Significant differences were shown for weight, height and WHR ($p < 0.05$). Between genders however, no significant difference was observed for BMI. Mean body mass index (BMI) was 21.6 $\pm$ 2.6 kg/m^2 for men and 20.4 $\pm$ 3.5 kg/m ^{2} for women, and this showed that on average subjects in this study were in the normal weight classification. Further analysis of BMI showed 6% men and 34% women were

TABLE 1. Age and anthropometric measurements (mean ± std dev) according to gender

Anthropometric Measurements	Men (n=16)	Women (n=64)
Age (years)	21.3 ± 1.3	20.5 ± 1.5
Weight (kg)	64.9 ± 9.1	50.7 ± 9.9*
Height (m)	1.7 ± 0.1	1.6 ± 0.1*
BMI (kg/m^2)	21.6 ± 2.6	20.4 ± 3.5
WHR	0.9 ± 0.1	0.8 ± 0.1*

*significant at $p < 0.05$

underweight, 75% men and 55 % women had normal body weight (Figure 1). The prevalence of preobesity (overweight) was 19% among men and 9% among women, while obesity was absent in men and present only 2% among women. Mean waist to hip ratio (WHR) for men was 0.9 ± 0.1 while 0.8 ± 0.1 for women.

Anthropometric parameters measured such as BMI and WHR index indicated that the majority of subjects had normal body weight and a low risk of developing heart disease. However, underweight was quite prevalent among women. One study among university students a decade ago reported 34% men and 59% women to be underweight (Wan Noor Izah & Norimah 1991). More recent studies among young Malay adults demonstrated a much similar finding with the present study in that underweight was observed in 3% men and 23% women (Norimah & Mimi 1999). Among the young Chinese adults, Norimah and Leong (2000) reported 28% men and 39% women were found to be underweight. In comparison, an increasing prevalence of obesity was

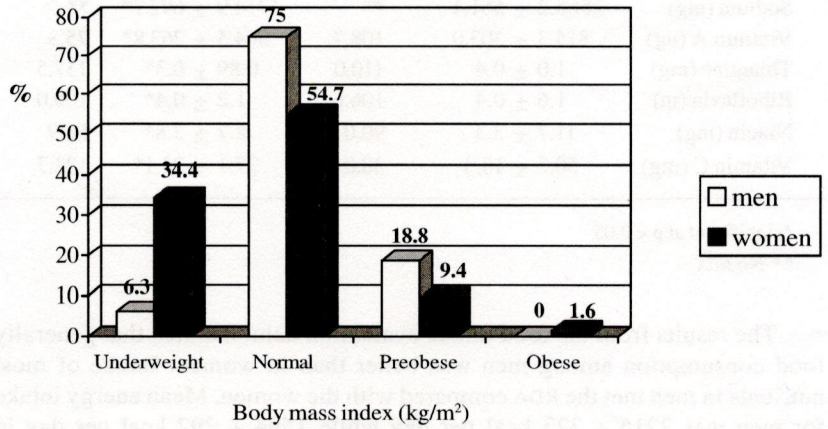

FIGURE 1. Body mass classification according to gender

reported by Ismail et al. (1995) who studied adults between ages 18-60 yrs from the three main ethnic groups. Other studies also reported increasing prevalence of obesity with age in both genders (Norimah et al.1999; Hapizah et al. 2002). These studies would suggest that the older adults were moving towards a nutritional trend whereby there was an increase in BMI. However among the younger adults as in this study, underweight was more of an apparent problem.

Table 2 shows the energy and nutrient intakes and comparison of selected nutrients with RDA according to gender. There was a significant difference ($p < 0.05$) in energy and all nutrients between men and women except iron. In men, all the nutrient intake except niacin and energy fulfilled the RDA, while in women, nutrients not meeting the RDA were energy, iron, vitamin A, calcium and niacin. Minerals such as iron and calcium were poorly consumed among women as the mean intake only fulfilled 46% and 76% of RDA respectively.

TABLE 2. Energy and nutrient intake (mean ± std dev) and comparison with RDA according to gender

Nutrient	Men (n=16)	%RDA	Women (n=64)	%RDA
Energy (kcal)	2215 ± 323	87.5	1594 ± 292*	79.7
Protein (g)	82.2 ± 16.8	**	52.0 ± 20.2*	**
Fat (g)	69.9 ± 19.9	**	52.6 ± 16.1*	**
CHO (g))	314.4 ± 71.1	**	228.7 ± 46.6*	**
Calcium (mg)	538.6 ± 171.5	119.7	343.4 ± 142.7*	76.3
Iron (mg)	16.1 ± 5.9	178.9	12.9 ± 6.0	46.1
Sodium (mg)	2565.2 ± 661.4	**	1714.9 ± 692.7*	**
Vitamin A (ug)	815.3 ± 303.0	108.7	564.5 ± 263.8*	75.3
Thiamine (mg)	1.0 ± 0.4	110.0	0.89 ± 0.3*	137.5
Riboflavin (m)	1.6 ± 0.4	106.6	1.2 ± 0.4*	100.0
Niacin (mg)	11.7 ± 3.3	90.0	8.7 ± 2.8*	66.9
Vitamin C (mg)	50.2 ± 18.3	30.0	37.1 ± 23.1*	123.7

*significant at $p < 0.05$

** No RDA

The results from the food intake evaluation demonstrated that generally food consumption among men was better than in women. Intake of most nutrients in men met the RDA compared with the women. Mean energy intake for men was 2215 ± 323 kcal per day while 1594 ± 292 kcal per day in women, which were lower than the RDA. These energy intakes were

comparable with other studies among young adults (Norimah & Riza 1999; Norimah & Leong 2000). The inadequate energy intake among these young adults should be of concern as low energy in the diet could cause poor consumption of other essential nutrients in the diet.

The inadequate intake of energy in both men and women and insufficient iron and calcium intake especially among women had also been reported in university students of all ethnic groups (Norimah & Riza 1999). Comparison of mean calcium and iron intake of the various studies indicated that the Indian women in this present study had the lowest mean intake (Table 3). A possible reason for the inadequate intake of these nutrients was due to low consumption of foods such as meat, organ meats and green leafy vegetables which were rich sources of these nutrients. Furthermore, the energy intake of most subjects did not meet the suggested requirement, indicating poor intake of foods in general. The low energy intake of subjects in the study could also be contributed to their poor eating habits. There were 46%, 19% and 23% subjects who skipped (intake frequency of less than 3 times per week) breakfast, lunch and dinner respectively.

TABLE 3. Comparison of mean iron and mean calcium intake among women with various other studies

Studies	Ethnic	Calcium (mg)	Iron (mg)
Norimah and Mimi (1999)	Malay	408.3 ± 176.6	16.1 ± 6.3
Teh (1999)	Chinese	443.4 ± 116.7	14.1 ± 3.9
Mona (1999)	Sabah B*	393.1 ± 176.4	14.0 ± 5.2
Ngu (2000)	Sarawak B*	440.3 ± 226.9	21.9 ± 33.2
Norimah and Riza (1999)	Malay	369.5 ± 28.2	17.0 ± 5.5
	Chinese	469.5 ± 170.6	17.9 ± 6.5
	Indian	468.9 ± 111.6	16.6 ± 5.5
This study (2003)	Indian	343.4 ± 142.7	12.9 ± 6.0

RDA for calcium, 450 mg; iron, 28 mg
* Bumiputera

The results of blood glucose and blood pressure are described in Table 4. The mean blood glucose were 4.7 ± 0.9 mmol/l in men and 4.4 ± 0.6 mmol/l in women and there was no significant difference between gender. Systolic and diastolic blood pressure were 112 ± 8 and 76 ± 7 in men and were significantly higher than in women (103 ± 10 SBP, 70 ± 8 DBP). Comparison of these two blood parameters with the reference level indicated that the values were within the normal range. Similar findings were also

TABLE 4. Blood glucose and blood pressure (mean ± std dev) according to gender

Blood parameters	Men (n=16)	Women (n=64)
Glucose (mmol/l)	4.7 ± 0.9	4.4 ± 0.6
Systolic blood pressure (mm Hg)	111.7 ± 7.9	102.7 ± 10.3*
Diastolic blood pressure (mm Hg)	76.5 ± 7.5	70.2 ± 7.6*

*significant at $p < 0.05$

shown in studies among young Chinese and Malay adults. (Norimah & Mimi 1999; Teh 1999). This could possibly be due to the young age of the subjects. Increasing blood pressure and blood glucose with age has been reported in older adults (Norimah et al. 2001). Correlations between blood glucose and macronutrient intake as well as anthropometry and biochemical parameter were carried out. Despite showing a positive association , the correlation was not significant.

The mean birth weight of men and women were 3.1 ± 0.9 kg and 2.7 ± 0.7 kg respectively and ranging from 1.5 kg to 4.5 kg (data not shown). 38% subjects were categorized into the low birth weight category of below 2.5 kg (Ebrahim 1992). Table 5 shows the mean blood glucose, SBP, DPB, BMI and WHR according to birth weights. Correlations between birth weights and blood parameters as well as WHR and BMI were weak and not significant (Table 6).

This study attempted to explore the relationship between birth weight and blood parameters such as blood glucose and blood pressure as well as

TABLE 5. Blood parameters, BMI and WHR (mean ± std dev) according to birth weight

Blood parameters	Birth Weight		
	< 2.5 kg (n=30)	2.5-3.5 kg (n=37)	> 3.5 kg (n=13)
Glucose (mmol/l)	4.4 ± 0.8	4.4 ± 0.7	4.7 ± 0.5
Systolic blood pressure	103 ± 12	105 ± 10	108 ± 8
Diastolic blood pressure	70 ± 11	71 ± 6	75 ± 4
BMI	20.1 ± 2.8	21.2 ± 3.9	20.6 ± 2.7
WHR	0.8 ± 0.1	0.8 ± 0.1	0.8 ± 0.1

BMI, body mass index
WHR, waist to hip ratio

TABLE 6. Correlation between blood parameters, BMI and WHR with birth weight

Parameter	Variable	Correlation	p value
Birth weight (n=83)	Glucose	0.095	0.403
	Systolic blood pressure	0.199	0.076
	Diastolic blood pressure	0.203	0.071
	BMI	0.005	0.965
	WHR	-0.005	0.962

BMI, body mass index
WHR, waist to hip ratio

BMI and WHR in these young adults. The results showed that the parameters were positively correlated with birth weight except for WHR. In this cohort there was no general trend shown in the association between birth weight and blood and anthropometric parameters. Data from similar studies among young Malay and Chinese adults showed contrasting results in that decreasing blood glucose and blood pressure were observed with increasing birth weight (Norimah & Mimi 1999; Teh 1999). This relationship has also been shown in a cohort study in United Kingdom (Barker et al. 1993). For the present study no relationship was observed between birth weight and biochemical parameters, probably due to the small sample size.

CONCLUSIONS

A majority of the young Indian adults studied were deficient in their energy intake. Nutrients of concern were iron, vitamin A, calcium and niacin, particularly among women. The inadequate energy intake was reflected in the apparent problem of underweight among women. Eating habits among young adults have not changed over the years as shown by the persisting inadequacy of energy, iron and calcium intake. A more concerted effort must be made to alleviate this problem. Biochemical data showed satisfactory health status among these adults. Despite more than a third of the subjects having low birth weight, the relationship between birth weight and adult diseases as hypothesized by Barker et al. (1989) was not shown in this study. More studies are required to further investigate this relationship.

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