Energy, protein, fat and carbohydrate intakes of underweight, normal weight and obese government office workers in an urban area

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Diet is one of the major factors contributing to the development of obesity, apart from heredity and energy balance. The objective of this cross-sectional study is to assess energy, carbohydrate, protein and fat intakes in relation to body weight status among government office workers in Kuala Lumpur. A total of 185 Malay men and 196 Malay women aged 18 and above were randomly selected as the respondents. Height and weight were taken to determine body mass index (BMI). The dietary profile was obtained by using 24-hour dietary recalls and food frequency methods. This was analysed to determine average nutrient intake per day. Other information was ascertained from tested and coded questionnaires. The subjects were categorised into three groups of body weight status namely underweight (BMI < 20 kg/m²), normal weight (BMI 20-25 kg/m²) and obese (BMI > 25 kg/m²).

The prevalence of obesity was 37.8%. The study showed that the mean energy intake of the respondents was 1709 ± 637 kcal/day. The energy composition comprised of 55.7 ± 7.6% carbohydrates, 29.7 ± 2.7% fats and 15.6 ± 3.8% protein. There was no significant difference in diet composition among the three groups. The findings indicate that normal weight and overweight individuals had intakes of calories and carbohydrates than the underweight individuals (p<0.05). However, there were no significant differences in fat intakes.

Introduction

There is evidence that the prevalence of obesity in many developing countries including Malaysia is on the increase. Among urban subjects, the available studies show an average of one quarter to one third of the men and women are overweight3.

Weight gain is associated with decreased physical activity and a progressive decline in caloric requirements for weight maintenance. Obesity has been regarded as a problem of nutrient imbalance. Initially it was thought that excessive energy intake was the primary cause of obesity among obese individuals. However, some studies report that obese individuals consume smaller minimal amount of energy per day. In some cases, obese individuals consumed less and expended more energy in resting metabolic rate and physical activity than normal weight individuals1.

Other factors than total energy value of food cause obesity. The total energy content of obese individuals is not the main cause of obesity. Other aspects, like the dietary composition of fat, protein and carbohydrate may be contributing factors. A study done by the U.S. Government that adults, the percentage of fat as a source of energy, increases when there is an increase in body fat. He also reports that there is no relation between energy intake and body fitness even though underweight individuals were found to exercise more than the obese individuals. There is evidence suggesting that obesity is not associated with overeating, but with a high dietary fat to carbohydrate intake ratio3.

The objective of this study is to assess energy and nutrient intake associated with obesity among obese, normal weight and underweight individuals. The diet composition of 381 government office workers will be reported. The variables mentioned and their association with body weight status will be discussed.

This paper will only report parts of the findings of a larger study entitled "The Construction and Evaluation of a Health Education Package to Overcome Obesity Problem" which involved urban and rural subjects.

Methods

This cross-sectional study focuses on subjects from two governmental departments in the Federal Territory, the Prime Minister’s Department and Ministry of National Unity and Community Development. A total of 385 adults (aged 18 and above) were randomly selected among Malay workers in the two departments. For the purpose of analysis, pregnant women and invalids were excluded. On the basis of Garvow’s classification, three groups of workers were identified for the study: obese, body mass index (BMI) of greater than 25 kg/m²; normal weight, BMI of 20 to 25 kg/m²; underweight, BMI 20 kg/m² or less. This study was conducted as a part of an obesity prevention and the preparation and evaluation of a Health Education Package to Overcome Obesity Problem"

Heights and weights of each subject were measured and a carefully prepared questionnaire was administered. Subjects were interviewed individually in the office meeting room by trained interviewers. Information on socioeconomics status, income and expenditure, education level, source of

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Table 1: Prevalence of underweight, normal weight and obese among 381 government office workers in Kuala Lumpur.

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI&lt;20)</td>
<td>29.17</td>
<td>23.11</td>
<td>52.48</td>
</tr>
<tr>
<td>Normal weight (BMI 20-25)</td>
<td>81.76</td>
<td>79.9</td>
<td>161.66</td>
</tr>
<tr>
<td>Obese (BMI&gt;25)</td>
<td>18.16</td>
<td>18.14</td>
<td>36.3</td>
</tr>
</tbody>
</table>

The average age and body mass index (BMI) of the subjects by sex and body weight status, are described in Table 2. There were significant differences in age and BMI between the underweight, normal weight and obese groups for both men and women. The obese men and women had a higher average age than the other two groups.

The average daily energy intake of the total sample was 1709.2 ± 637.3 Kcal. The diet consisted of 55.7 ± 7.6% carbohydrates, 15.6 ± 3.8% protein and 29.7 ± 2.1% fat. Table 3 describes energy and nutrient intakes by study group. The underweight ate a greater proportion of energy, carbohydrate, protein and fat than the normal weight and obese subjects. The overweight consumed slightly higher intake (1667 kcal) than the normal weight (1669 kcal). However, they consumed significantly lower energy than the underweight subjects (1912 kcal). Similar differences were observed between the three groups regarding carbohydrate and protein intakes. There are no significant differences in fat intakes between the obese, normal weight and underweight subjects. However, the obese consumed more fat than the underweight subjects.

Table 2: Average age and body mass index by sex and body weight status

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI&lt;20)</td>
<td>32.81</td>
<td>37.74</td>
<td>60.54</td>
</tr>
<tr>
<td>Normal weight (BMI 20-25)</td>
<td>37.74</td>
<td>37.74</td>
<td>75.48</td>
</tr>
<tr>
<td>Obese (BMI&gt;25)</td>
<td>19.01</td>
<td>21.13</td>
<td>40.14</td>
</tr>
</tbody>
</table>

Table 3: The daily energy, carbohydrate, protein and fat intakes of the underweight, normal weight and overweight government office workers in Kuala Lumpur.

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI&lt;20)</td>
<td>22.8</td>
<td>29.2</td>
<td>52.0</td>
</tr>
<tr>
<td>Normal weight (BMI 20-25)</td>
<td>25.64</td>
<td>29.2</td>
<td>54.84</td>
</tr>
<tr>
<td>Obese (BMI&gt;25)</td>
<td>35.14</td>
<td>36.98</td>
<td>72.12</td>
</tr>
</tbody>
</table>

Discussion

Several studies (eg. Booth) have attempted to determine the relationship between adiposity, diet composition and energy intake. Typically, obese individuals are reported to have lower energy intakes than non-obese individuals. The obese subjects in this study had less daily energy intake than the underweight subjects, but more daily energy intake than the normal weight subjects (Table 3). However, the difference is not significant.
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Introduction

There is evidence that the prevalence of obesity in many developing countries including Malaysia is on the increase. Among urban subjects, the available studies show an average of one quarter to one third of the men and women are overweight¹. Weight gain is associated with decreased physical activity and a progressive decline in caloric requirements for weight maintenance. Obesity has been regarded as a problem of nutrient imbalance. Initially it was thought that excessive energy intake was the primary cause of obesity among obese individuals. However, some studies report that obese individuals consume a minimal amount of energy per day. In some cases, obese individuals consumed less food and expended more energy in resting metabolic rate and physical activity than normal weight individuals².

Other factors than total energy value of food cause obesity. The total energy content of obese individuals is not the main cause of obesity. Other aspects, like the dietary composition of fat, protein and carbohydrate may be contributing factors. A study done by Hoddie and coworkers among adults, the percentage of fat as a source of energy, increases when there is an increase in body fat. He also reports that there is no relation between energy intake and body fitness even though underweight individuals were found to exercise more than the obese individuals. There is evidence suggesting that obesity is not associated with overeating, but with a high dietary fat to carbohydrate intake ratio³.

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Height and weight of each subject were measured and a carefully prepared questionnaire was administered. Subjects were interviewed individually in the office meeting room by trained interviewers. Information on socioeconomic status, income and expenditure, education level, source of income, smoking habits and physical activity were obtained.

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Table 1: Prevalence of underweight, normal weight and obese among 381 government office workers in Kuala Lumpur.

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>172</td>
<td>106</td>
<td>278</td>
</tr>
<tr>
<td>Normal weight</td>
<td>113</td>
<td>112</td>
<td>225</td>
</tr>
<tr>
<td>Obese</td>
<td>96</td>
<td>77</td>
<td>173</td>
</tr>
</tbody>
</table>

The average age and body mass index (BMI) of the subjects by sex and bodyweight status, are described in Table 2. There were significant differences in age and BMI between the underweight, normal weight and obese groups for both men and women. The obese men and women had a higher average age than the other two groups.

The average daily energy intake of the total sample was 1702.2 ± 637.3 kcal. The diet consisted of 55.7 ± 7.6% carbohydrate, 15.6 ± 3.8% protein and 29.7 ± 2.1% fat. Table 3 describes energy and nutrient intakes by study group. The underweight ate a greater proportion of energy, carbohydrate, protein and fat than the normal weight and obese subjects. The overweight consumed slightly higher intake (1687 kcal) than the normal weight (1696 kcal). However, they consumed significantly lower energy than the underweight subjects (1912 kcal). Similar differences were observed between the three groups regarding carbohydrate and protein intakes. There are no significant differences in fat intakes between the obese, normal weight and underweight subjects. However, the obese consumed more fat than the underweight subjects.

Table 3: The daily energy, carbohydrate, protein and fat intakes of the underweight, normal weight and overweight government office workers in Kuala Lumpur.

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>59.7 ± 10.1</td>
<td>48.6 ± 9.7</td>
<td>54.2 ± 9.8</td>
</tr>
<tr>
<td>Normal weight</td>
<td>57.8 ± 10.1</td>
<td>47.5 ± 9.7</td>
<td>52.8 ± 9.8</td>
</tr>
<tr>
<td>Obese</td>
<td>63.3 ± 10.1</td>
<td>52.6 ± 9.7</td>
<td>58.0 ± 9.8</td>
</tr>
</tbody>
</table>

Table 4 describes average daily energy, carbohydrate, protein and fat intakes of the subjects and shows results from ANOVA (analysis of variance) by sex and study group. The obese men tended to consume more energy (1872 kcal) than did the normal weight (1825 kcal) but they consumed less energy than the underweight men (2100 kcal). There is a similar trend whereby the obese men had higher carbohydrate intakes than the normal weight men. They tended to consume more fat than the other two groups.

 Among women, the obese consumed less energy (1522 kcal) than normal weight (1557 kcal) and underweight women (1661 kcal). As with the men, differences in carbohydrate and protein intakes between obese, normal weight and underweight were observed among women. The obese women ate a greater proportion of fat than the other two groups. (this is not what the table says) The differences between daily energy and nutrient intakes by sex and group described were not significant. There was no significant difference of nutrient intake (expressed as percentage of energy) by sex and bodyweight status. Table 5 shows carbohydrate, protein and fat intakes expressed as percentages of energy intake. There is no significant difference between energy composition among the obese, the underweight and normal weight subjects.

Discussion

Several studies (eg. Goth) have attempted to determine the relationship between adiposity, diet composition and energy intake. Typically, obese individuals are reported to have lower energy intakes than non-obese individuals. The obese subjects in this study had less daily energy intake than the underweight subjects, but more daily energy intake than the non-obese subjects (Table 3). However, the difference is not significant.
when the energy intake is analysed by group and sex (Table 4). This could be explained by of non-homogeneity in the distribution of sex and its cross-sectional nature.

There is a similar observation regarding carbohydrate and protein intakes by sex and study group whereby obese men consumed less carbohydrate and protein than overweight men, but more than normal weight men. This is also true among the women whereby the obese women consumed less carbohydrate and protein than the overweight women.

Regarding fat intake, the obese men consumed more fat than the overweight and normal weight men. On the other hand, the obese women consumed less fat than the other two groups. However, the differences are not significant.

In conclusion, there is a trend for the obese to have energy intake less than the overweight subjects. However, this study failed to document any significant differences among the obese, overweight and normal weight subjects regarding this documentation. It could be due to the activity levels of the obese individuals.

Acknowledgments

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References


Energy, protein, fat and carbohydrate intake of underweight, normal weight and obese government office workers in an urban area

Fatimah Arshad, Idri MR, Romzi MA and Faizah H


Pengambilan tenaga, protein, lemak dan karbohidrat di kalangan kakitangan kerajaan yang
kurang berat badan, berat badan normal dan obes di satu kawan bandar.

Diet merupakan salah satu faktor utama yang menyumbang kepada kejadian obesiti, sebalik daripada faktor genetik dan pengeluaran tenaga. Objektif kajian garis lintang ini adalah untuk menilai hubungan di antara pengambilan tenaga, karbohidrat, protein dan lemak dengan status berat badan. Seramai 185 orang lelaki dan 196 orang perempuan Melayu berusia 18 tahun dan ke atas dipilih secara rawak sebagai sampel kajian. Tinggi dan berat badan mereka diukur untuk menentukan indeks Jisim Tubuh (BMI). Profil diet dipelajari melalui kaedah Ingatan Diet 24 jam dan Frekuensi Makanan untuk menentukan purata pengambilan nutrien sehari. Lain-lain maklumat diperolehi daripada soasilitik yang telah diprajamu dan dikodok. Subjek telah dikategorikan kepada tiga kumpulan iaitu individu yang kurang berat badan (BMI < 20kg/m²), individu berberat badan normal (BMI 20-25kg/m²) dan individu obes (BMI > 25kg/m²). Dapatapi prevalensi obesiti ialah 37.8%. Kajian ini menunjukkan bahawa min pengambilan tenaga oleh responden ialah 1709.2 ± 673.7 kkal/hari. Komposisi tenaga terdiri dari 55.7 ± 7.6% karbohidrat, 29.7 ± 21.7% lemak dan 15.6 ± 3.8% protein. Tidak terdapat perbezaan dari segi komposisi pengambilan tenaga di antara ketiga-tiga kumpulan. Hasil kajian menunjukkan pengambilan tenaga dan karbohidrat oleh kumpulan individu berberat badan normal dan obes adalah lebih tinggi dengan kumpulan individu kurang berat badan (p<0.05). Walaupun begitu, tidak terdapat perbezaan di antara status berat badan dengan pengambilan lemak.

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References


Table 4. Energy and nutrient intake by sex and bodyweight status.

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Underwt (n=29)</th>
<th>Men Normal (n=88)</th>
<th>Obese (n=68)</th>
<th>Underwt (n=23)</th>
<th>Women Normal (n=97)</th>
<th>Obese (n=76)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily energy intake (Kcal)</td>
<td>2110±792</td>
<td>1825±655</td>
<td>1872±688</td>
<td>1684±507</td>
<td>1327±528</td>
<td>1522±536</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>287.2±944</td>
<td>257.1±834</td>
<td>261.2±860</td>
<td>222.0±706</td>
<td>204.2±630</td>
<td>205.0±643</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>84.7±47.7</td>
<td>70.6±33.0</td>
<td>74.0±37.1</td>
<td>65.5±23.4</td>
<td>61.1±28.0</td>
<td>62.1±30.7</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>69.1±35.8</td>
<td>57.1±26.7</td>
<td>70.0±99.4</td>
<td>56.8±19.9</td>
<td>51.8±24.9</td>
<td>50.3±24.1</td>
</tr>
</tbody>
</table>

Table 5. The diet composition (expressed as percentage of energy) of the underweight, normal weight and overweight government office workers by sex, in Kuala Lumpur.

<table>
<thead>
<tr>
<th>Bodyweight status</th>
<th>Underwt (n=117)</th>
<th>Men Normal (n=57)</th>
<th>Obese (n=11)</th>
<th>Women Normal (n=23)</th>
<th>Women Obesity (n=76)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrate (%)</td>
<td>57.0±7.8</td>
<td>57.1±6.7</td>
<td>54.9±9.0</td>
<td>53.6±6.3</td>
<td>54.3±7.5</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>15.1±3.5</td>
<td>15.2±3.1</td>
<td>17.1±4.6</td>
<td>15.7±3.3</td>
<td>15.8±3.2</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>27.7±5.3</td>
<td>34.6±5.7</td>
<td>27.8±5.9</td>
<td>30.5±4.7</td>
<td>29.8±5.4</td>
</tr>
</tbody>
</table>

When the energy intake is analyzed by group and sex (Table 4). This could be explained by of non-homogeneity in the distribution of sex and its cross-sectional nature.

There is a similar observation regarding carbohydrate and protein intakes by sex and study group whereby obese men consumed less carbohydrate and protein than underweight men, but not more than normal weight men. This is also true among the women whereby the obese women consumed less carbohydrate and protein than the underweight women.

Regarding fat intake, the obese men consumed more fat than the underweight and normal weight men. On the other hand, the obese women consumed less fat than the other two groups. However, the differences are not significant.

In conclusion, there is a trend for the obese to have energy intake less than the underweight subjects. However, this study failed to document any significant differences among the obese, underweight and normal weight subjects regarding this documentation. It could be due to the activity levels of the obese individuals.

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Tidak terdapat perbezaan dari segi komposisi pengambilan tenaga di antara kategori-kategori kumpulan. Hasil kajian menunjukkan pengambilan tenaga dan karbohidrat oleh kumpulan individu berat berat normal dan obes adalah lebih tinggi berbanding dengan kumpulan individu kurang berat badan (p<0.05). Walabagaiamanapun, tidak terdapat perbezaan di antara status berat badan dengan pengambilan lemak.

References