Abstract

**Background:** We tried to understand possible effects of physical inactivity and an excessive eating habit on excess weight.

**Methods:** We took consecutive patients between the ages of 35 and 70 years to be able to see possible consequences of excess weight on health and to avoid debility induced weight loss in elder individuals.

**Results:** The study included 270 cases (145 females) with normal weight, 270 cases with overweight, and 270 cases with obesity. Female ratio was 53.7% in the three groups. Mean ages were 47.1, 46.3, and 48.9 years in the three groups, respectively (p>0.05 for both). As a pleasure point in life, smoking did not show higher prevalences in the overweight or obesity groups, and its prevalences were similar in the three groups (35.9%, 32.9%, and 33.7%, respectively, p>0.05 for both). On the other hand, prevalences of hypertension (HT) (8.1%, 13.7%, and 21.8%), diabetes mellitus (DM) (9.6%, 20.0%, and 28.5%), and dyslipidemia (19.2%, 32.5%, and 40.3%) showed highly significant increases from the normal weight towards the overweight and obesity groups, respectively (p<0.001 nearly for all).

**Conclusion:** Parallel to its severity, excess weight is associated with greater prevalences of HT, DM, and dyslipidemia. As a pleasure point in life, smoking may also show the weakness of volition to control eating in cases with excess weight. But excess weight may actually be a consequence of physical inactivity instead of an excessive eating habit because prevalences of smoking were similar in the normal weight, overweight, and obesity groups in the present study.

**Key words:** Physical inactivity, excessive eating habit, excess weight, smoking, metabolic syndrome

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Introduction

Due to the prolonged survival of human being, systemic atherosclerosis may be the major health problem in this century, and its associations with some metabolic disorders and smoking are collected in the box of metabolic syndrome in the literature (1, 2). The syndrome is characterized by a chronic low-grade inflammatory process on vascular endothelium all over the body (3). The inflammatory process is exaggerated by some factors including aging, physical inactivity, excess weight, smoking, alcohol, chronic infection and inflammations, and cancers (4, 5). The inflammation can be slowed down with lifestyle changes, diet, and exercise (6). The syndrome contains some reversible indicators including overweight, white coat hypertension (WCH), impaired fasting glucose (IFG), impaired glucose tolerance (IGT), hypertriglyceridemia, hyperbetalipoproteinemia, dyslipidemia, alcohol, and smoking for the development of irreversible consequences including obesity, hypertension (HT), type 2 diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), cirrhosis, chronic renal disease (CRD), peripheral artery disease (PAD), coronary artery disease (CAD), and stroke (7). The syndrome has become increasingly common all over the world, and 50 millions of people in the United States were affected (8). The inflammation induced accelerated atherosclerosis all over the body may be the leading cause of early aging and premature death for both genders all over the world. Similarly, smoking kills one in every ten adults globally, and if the current trend continues, it will kill one in every six adults by 2030 (9). Some studies revealed that the increase in body weight by aging was found as lower in smokers (10), and there was an increase in body weight after smoking cessation (11). As a pleasure point in life, smoking may also show the weakness of volition to control eating in the metabolic syndrome. We tried to understand possible effects of physical inactivity and an excessive eating habit on the development of excess weight in the present study.

Material and methods

The study was performed in the Internal Medicine Polyclinic of the Dumlupinar University between January and October 2006. We took consecutive patients between the ages of 35 and 70 years to be able to see the possible consequences of excess weight on health. Cases above the age of 70 years were excluded to avoid debility induced weight loss in elder individuals. Their medical histories including smoking habit and already used medications were learnt, and a routine check up procedure including fasting plasma glucose (FPG), low density lipoproteins (LDL), triglycerides, and high density lipoproteins (HDL) was performed. Current daily smokers for the last 12 months, and cases with a history of smoking for five pack-years were accepted as smokers. Cigar or pipe smokers were excluded. Insulin using diabetics and patients with devastating illnesses including malignancies, acute or chronic renal failure, chronic liver diseases, hyper- or hypothyroidism, and heart failure were excluded to avoid their possible effects on weight. Body mass index (BMI) of each case was calculated by the measurements of the Same Internist instead of verbal expressions. Weight in kilograms is divided by height in meters squared, and obesity is defined as a BMI of 30 kg/m2 or greater, overweight between 25.0 and 29.9 kg/m2, and normal weight between 18.5-24.9 kg/m2 (12). Cases with a BMI of less than 18.5 kg/m2 were excluded. Office blood pressure (BP) was checked after a 5-minute of rest in the seated position with the mercury sphygmomanometer on three visits, and no smoking was permitted during the previous 2-hour. A 10-day twice daily measurement of blood pressure at home (HBP) was obtained in all cases due to the risk of masked HT after a 10-minute education about proper BP measurement techniques (13). The education included recommendation of upper arm while discouraging wrist and finger devices, using a standard adult cuff with bladder sizes of 12 x 26 cm for arm circumferences up to 33 cm in length and a large adult cuff with bladder sizes of 12 x 40 cm for arm circumferences up to 50 cm in length, and taking a rest at least for a period of 5-minute in the seated position before measurements. HT is defined as a BP of 135/85 mmHg or greater on average HBP measurements (14). Cases with an overnight FPG level of 126 mg/dL or greater on two occasions were defined as diabetics. An oral glucose tolerance test with 75-gram glucose was performed in cases with a FPG level between 100 and 125 mg/dL, and diagnosis of cases with a 2-hour plasma glucose level of 200 mg/dL or greater is DM. Additionally, dyslipidemia is diagnosed if the level of LDL is 160 mg/dL or greater and/or a triglyceride level of 200 mg/dL or greater and/or a HDL level of lower than 40 mg/dL (12). We detected cases with normal weight initially, and then age and sex-matched cases with overweight and obesity were included into the study. Prevalences of smoking, HT, DM, and dyslipidemia were detected in each group, and results were compared in between. Mann-Whitney U Test, Independent-Samples T Test, and comparison of proportions were used as the methods of statistical analyses.

Results

The study included 270 cases (145 females) with normal weight, 270 cases with overweight, and 270 cases with the obesity. Female ratio was the same (53.7%) in the three groups. Mean ages were similar in them (47.1, 46.3, and 48.9 years, respectively, p>0.05 for both). As a pleasure point in life, smoking did not show higher prevalences in the overweight and obesity groups, and its prevalences were similar in the three groups, too (35.9%, 32.9%, and 33.7%, respectively, p>0.05 for both). On the other hand, prevalences of HT (8.1%, 13.7%, and 21.8%), DM (9.6%, 20.0%, and 28.5%), and dyslipidemia (19.2%, 32.5%, and 40.3%) showed highly significant increases from the normal weight towards the overweight and obesity groups, respectively (p<0.001 nearly in all steps) (Table 1).
Discussion

A chronic low-grade inflammation on vascular endothelium may actually be exaggerated by some metabolic factors for the development of systemic atherosclerosis, and the symptomatic atherosclerosis may be the leading cause of early aging and premature death for both genders all over the world. Aging, physical inactivity, excess weight, smoking, alcohol, chronic infection and inflammations, and cancers may be the most common causes of the systemic vascular endothelial inflammation at the moment (15). Definition of the metabolic syndrome or aging syndrome or accelerated endothelial damage syndrome includes reversible risk factor and indicators such as physical inactivity, overweight, smoking, alcohol, WCH, IFG, IGT, hypertriglyceridemia, hyperbetalipoproteinemia, and dyslipidemia for the development of irreversible consequences such as obesity, HT, DM, COPD, cirrhosis, CRD, PAD, CAD, stroke, early aging, and premature death (16, 17). In the previous study (18), prevalences of hypertriglyceridemia, hyperbetalipoproteinemia, dyslipidemia, IGT, and WCH had parallel fashions to excess weight by increasing until the seventh decade and decreasing afterwards (p<0.05 nearly in all steps). On the other hand, prevalences of HT, DM, and CAD always continued to increase without any decrease by decades (p<0.05 nearly in all steps) indicating their irreversible properties (18). After development of one of the terminal consequences, the nonpharmaceutical approaches will probably provide little benefit to prevent development of the others due to cumulative effects of the factors on the vascular endothelium for a long period of time all over the body (19, 20).

Obesity may also be found among one of irreversible consequences of the metabolic syndrome because after the development of obesity, nonpharmaceutical approaches provide limited success to heal obesity. Excess weight may also lead to a chronic low-grade inflammation on vascular endothelium all over the body, and risk of death from all causes including cardiovascular diseases and cancers increases parallel to severity of excess weight in all age groups (21). The chronic low-grade inflammation on vascular endothelium may even cause genetic changes in the cells, and the systemic atherosclerosis may decrease clearance of malignant cells by the immune system, effectively (22). Effects of excess weight on BP were shown previously that the prevalence of sustained normotension (NT) was significantly higher in the underweight (80.3%) than the normal weight (64.0%) and overweight cases (31.5%, p<0.05 for both) (23), and 52.8% of cases with HT had obesity against 14.5% of cases with sustained NT (p<0.001) (24). So the major component of the metabolic syndrome appears as excess weight, which is probably the main cause of insulin resistance, dyslipidemia, IGT, and WCH by means of a chronic low-grade inflammatory process on vascular endothelium (6). Stopping of weight gaining with physical activity or diet, even in the absence of a prominent weight loss, probably results with resolution of many parameters of the syndrome (25, 26). But according to our opinion, limitation of excess weight as an excessive fat tissue in or around abdomen under the heading of abdominal obesity is meaningless instead it should be defined as overweight or obesity by means of BMI since adipocytes function as an endocrine organ by producing a variety of cytokines and hormones in everywhere of the body (6). The resulting hyperactivities of sympathetic nervous system and renin-angiotensin-aldosterone system are probably associated with the chronic low-grade inflammation on vascular endothelium terminating with insulin resistance and an elevated BP. Similarly, the Adult Treatment Panel III reported that although some people classified just as overweight with a large muscular mass, most of them actually have excessive fat tissue, too (12).

Smoking is a major risk factor for the development of atherosclerotic endpoints such as CAD, PAD, COPD, cirrhosis, CRD, and stroke (22, 27). Its atherosclerotic effects are the most obvious in Buerger's disease which is an obliterative disease characterized by inflammatory changes in small and medium-sized arteries and veins.

Table 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Normal weight</th>
<th>p-value</th>
<th>Overweight</th>
<th>p-value</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>270</td>
<td></td>
<td>270</td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>Female ratio</td>
<td>53.7%</td>
<td></td>
<td>53.7%</td>
<td></td>
<td>53.7%</td>
</tr>
<tr>
<td>Mean age (year)</td>
<td>47.1 ± 6.3</td>
<td></td>
<td>46.3 ± 5.4</td>
<td></td>
<td>48.9 ± 6.7</td>
</tr>
<tr>
<td>(35-70)</td>
<td>(35-70)</td>
<td></td>
<td>(35-70)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence of smoking</td>
<td>35.9%</td>
<td></td>
<td>32.9%</td>
<td></td>
<td>33.7%</td>
</tr>
<tr>
<td>Prevalence of HT†</td>
<td>8.1%</td>
<td>&lt;0.001</td>
<td>13.7%</td>
<td>&lt;0.001</td>
<td>21.8%</td>
</tr>
<tr>
<td>Prevalence of DM‡</td>
<td>9.6%</td>
<td>&lt;0.001</td>
<td>20.0%</td>
<td>&lt;0.001</td>
<td>28.5%</td>
</tr>
<tr>
<td>Prevalence of dyslipidemia</td>
<td>19.2%</td>
<td>&lt;0.001</td>
<td>32.5%</td>
<td>&lt;0.01</td>
<td>40.3%</td>
</tr>
</tbody>
</table>

*Nonsignificant (p>0.05) †Hypertension ‡Diabetes Mellitus
It has never been seen in nonsmokers. Although the obvious strong atherosclerotic effects, some studies reported that smoking in human beings and nicotine administration in animals are associated with a decreased body weight (28). Evidence revealed an increased energy expenditure during smoking both on rest and light physical activity (29), and nicotine supplied by patch after smoking cessation decreased caloric intake in a dose-related manner (30). According to an animal study, nicotine may lengthen intermeal time, and simultaneously decreases amount of meal eaten (31). Additionally, body weight seems to be the highest in former, the lowest in current and medium in never smokers (32). Smoking may be associated with postcessation weight gain, but evidence suggests that risk of weight gain is the highest during the first year after quitting and declines over the years (33). Similarly, although the CAD was detected with similar prevalences in both genders (7), prevalences of smoking and COPD were higher in males with CAD against the higher prevalences of excess weight, WCH, hyperbetalipoproteinemia, hypertriglyceridemia, HT and DM in females with CAD. This result may indicate both the strong atherosclerotic and weight decreasing roles of smoking. Similarly, the incidence of myocardial infarction is increased six-fold in women and three-fold in men who smoke at least 20 cigarettes per day compared to the never smoked individuals (34). In another definition, smoking may be more harmful for women about atherosclerotic endpoints probably due to the associated excess weight. Eventually, smoking is a strong atherosclerotic risk factor with some suppressor effects on appetite.

Smoking-induced weight loss may actually be a result of the chronic low-grade inflammatory process on vascular endothelium all over the body (35) since loss of appetite is the major symptom of inflammations in the body. Physicians can even understand healing of the patients from their normalizing appetite. Several toxic substances found in cigarette smoke get into the circulation by means of the respiratory system, and they probably cause a subclinical vascular endothelial inflammation until clearance from the circulation. But due to the continuous smoking habit of the individuals, the clearance process never terminates. So the patients become ill with loss of appetite, continuously. In another definition, smoking-induced weight loss is an indicator of being ill instead of being healthy in smokers (30-32). After smoking cessation, lost appetite comes back with a prominent weight gaining in the patients but the returned weights are their physiological or actual weights. On the other hand, as a pleasure point in life, smoking may also show the weakness of volition to control eating in cases with excess weight. But excess weight may actually be a consequence of physical inactivity instead of an excessive eating habit since prevalences of smoking were similar in the normal weight, overweight, and obesity groups in the present study.

References


