Role of Crataegus (Hawthorn) Extract on Obesity in Hyperlipidemic Albino Rats

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ABSTRACT

Background: obesity is on the rise globally and needs measures to maintain optimal body weight as to avoid complications such as diabetes mellitus, hypertension, dyslipidaemia, ischaemic heart disease infertility, sleep aponea, cancer and osteoarthritis. Crataegus monogyna can help in losing weight by reversing metabolic alterations that cause increased synthesis and storage of fat.

Study design: It is a case-controlled interventional study of eight weeks.

Sample: 60 adult male albino rats weighing about 250-300g divided randomly into three groups A, B, and C.

Result: Crataegus is effective in lowering body weight.

Conclusion: Crataegus shows tremendous potential as natural weight lowering agent, devoid of side effects. There is scope of further study and use of this ‘miracle herb’ as anti obesity agent.

Key words: Crataegus monogyna, obesity, BMI

INTRODUCTION

Obesity is from the Latin Obesitas, which means stout, fat or plump1. The Greeks were the first to recognize obesity as a medical disorder2. According to A.D.A.M medical encyclopedia, obesity means having too much body fat. Excess weight of muscles, bone, fat and water in the body is overweight. These two can be differentiated by calculating body mass index; BMI (weight in kg/height in meter2). BMI = 25-30 kg/m2 is overweight and BMI ≥ 30 kg/m2 is obese3. Obesity is on the rise globally reason being consumption of unhealthy foods and lower levels of physical activity. According to the centre for disease control, as of 2009, 49 states have a prevalence of obesity of 20% or greater and nine states have a prevalence of over 30%. Obesity is associated with increased risk of type II diabetes, cardiovascular disease and several forms of cancer4. In Pakistan the overall prevalence of obesity and overweight in educated population is 8 and 29.6% respectively and together with overweight this prevalence is found to be sufficiently high5.

The WHO International Agency for Research on Cancer has estimated that overweight and poor physical activity accounts for quarter to one third of all cancers of breast, colon, endometrium, kidney and esophagus.6 There is a marked increase in osteoarthritis in obese, in a study it was noted that each one kg increase in weight was associated with an increased risk of radiographic features of osteoarthritis at the knee and carpometacarpal joint7. Obesity during pregnancy is associated with an increased risk of complications and is now estimated to be responsible for 6% primary infertility8.

Researchers from UCLA discovered that as many as two thirds of all dieters end up weighing more than they did before their diet within two years9. This indicates the need of other interventions as some forms of drugs or herbal medicines which supplement dieting and weight loss may be sustained. Different weight reducing and dieting agents were reviewed for potential toxicity, these included: syrup of ipecac, cathartics 2,4 Dinitrophenol, guar gum, phenylpropanolamine, mahuang/e phedra, caffeine, clenbuterol, fenfluramine, sibutramine, thyroid hormone, orlistat and cannabinoid antagonists10. These weight reducing agents should be potentially non toxic. One of such weight reducing agent is found in crataegus monogyna. Cartages monogyna has acquired a prominent status in modern herbal literature. The common name is Hawthorn, Extracts of both flowers and berries contain mixtures of chlorogenic acid and flavonoids such as querin hyperoside, vitexin and vitexin 4 rahmnoside. Other flavonoids identified are luteolin, apigenin-7-o-glucoside and rutin. It also contains other major constituents which have anti inflammatory and antihyperlipidemic properties11. Hawthorn has also been shown to lower body weight significantly by reversing metabolic alterations that drive increased creation and storage of fat12. The present study was conducted to find out effect of crataegus monogyna on body weight of albino rats fed high fat diet.
MATERIALS AND METHODS

It is a case controlled interventional experimental study that took 8 weeks for completion. 60 adult, male albino rats weighing about 250-300 grams were purchased and kept in PGMI animal house. Two hundred gram of good quality well dried berries of *crataegus monogyna* were purchased and ethanolic extract was prepared in PCSIR laboratories. Extract was administered in a dose of 0.5 ml /100 g of body weight per day by gavage. The dose was calculated on basis of flavonoid content which is 2.2%. Normal rat chow contains wheat starch, casein, glucose, choline/methionine, mineral mixture, vitamin mixture and fat in quantities of 62.10, 20, 10, 0.50, 3.50, 1 and 2.90 grams to make total 100 g of the diet as basic constituents. High fat diet (HFD) contained 2g vegetable oil, 1g cholesterol and 0.3 g bile salt in 100g of normal diet.

Sixty male albino rats were divided randomly into three groups (A,B,C). Initially all the groups were fed on normal rat chow for the first two weeks for acclimatization, then high fat diet was started to B and C groups. A group remained on normal diet for the whole study period of 8 weeks. Group B remained on high fat diet while group C received *crataegus* extract from 4th-8th week along with high fat diet. Rats were weighed at 0, 4 and 8 weeks by digital scale.

**Parameter:** Body weight of rats.

**Data analysis:** All numerical variables were represented as mean+standard deviation. The individual comparison between any two groups was analyzed by t-test. ANOVA test was used for comparison of all groups simultaneously. P-value ≤0.05 were considered significant. All analysis was done through the statistical package SPSS Version 12.

RESULTS

Table 1 shows weight of different groups at zero week, 4th week and 8th week. Mean weight of all groups at the start of study ranged from 219.75 to 222.75. At 4th week mean weight of all groups increased. At 8th week, in group A and B there was an increase in mean weight. While in group C, treated with *crataegus*, there was decrease in mean weight.

Table 2 shows pair-wise comparison of weights of all groups at 0, 4 and 8 weeks. It shows that at zero week difference in weights of all groups is insignificant which means that at start of study the weight of rats of all groups was same. At 4th week, weight of animals in group B and C (HFD) increased significantly as compared to that of group A (normal diet). Results of B versus C are insignificant showing that the weight gain in group C is close to group B. At 8th week, weight of animals in group B is significantly high as compared to that of group A while weight of group C animals is significantly low as compared to group B and close to group A. In fact weight of group C animals is less than that of group A although not significant statistically. This data suggests that *crataegus* is effective in lowering body weight in presence of high fat diet.

<table>
<thead>
<tr>
<th>Groups</th>
<th>0 week</th>
<th>4 weeks</th>
<th>8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D</td>
<td>Min.</td>
</tr>
<tr>
<td>&quot;A&quot; Normal diet</td>
<td>222.75</td>
<td>15.26</td>
<td>190</td>
</tr>
<tr>
<td>&quot;B&quot; High fat diet</td>
<td>222.25</td>
<td>14.00</td>
<td>200</td>
</tr>
<tr>
<td>&quot;C&quot; High fat diet + Crataegus</td>
<td>219.75</td>
<td>15.26</td>
<td>195</td>
</tr>
</tbody>
</table>

**Table 2:** Pair-wise comparison of body weight (Grams) of different groups at 0, 4 and 8 weeks

<table>
<thead>
<tr>
<th>I) Groups</th>
<th>(J) Groups</th>
<th>0 week</th>
<th>4 Weeks</th>
<th>8 Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot; Normal diet</td>
<td>&quot;B&quot; High fat diet</td>
<td>0.500</td>
<td>1.000</td>
<td>-21.800(*)</td>
</tr>
<tr>
<td>&quot;A&quot; Normal diet</td>
<td>&quot;C&quot; High fat diet + Crataegus</td>
<td>3.000</td>
<td>1.000</td>
<td>-43.050(*)</td>
</tr>
<tr>
<td>&quot;B&quot; High fat diet</td>
<td>&quot;C&quot; High fat diet + Crataegus</td>
<td>2.500</td>
<td>1.000</td>
<td>-21.250(*)</td>
</tr>
</tbody>
</table>
DISCUSSION

The prevalence of obesity and overweight is increasing worldwide. Obesity and overweight have many causes including genetic, metabolic, behavioral and environmental. A comparison of data from 1960-1994 with that from 1999-2000 shows that the prevalence of overweight increased from 46% to 64.5% and the prevalence of obesity doubled to 30.5%. The rapid increase in prevalence suggests that environmental influences predominate, rather than biological changes. Obesity is directly associated with many metabolic and cardiovascular diseases. Several weight lowering measures are being used including the use of herbs. Crataegus monogyna has acquired a prominent status in herbal medicine. Extract of both flowers and berries have been recommended to treat cardiac failure, atherosclerosis, hyperlipidemia, hypertension, angina and variety of geriatric conditions. It is also found to have weight lowering effect in the present study. Previous studies have revealed that crataegus is a rich source of flavonoids which confer anti oxidant property to the plant. Antioxidants are substances that scavenge free radicals damaging compounds in the body that alter cell membranes, tamper with DNA and even cause cell death. Free radicals occur naturally in the body, but environmental toxins (including ultraviolet light radiation, cigarette smoking and air pollutants) can also increase the number of these damaging particles. While oxidation is part of a normal biological reaction, over loading the cells with free radicals could initiate the pathogenesis of many diseases. Phenolic compounds of crataegus also have antioxidant activity. Crataegus causes significant decrease in blood levels of lipid. Part of mechanism for antihyperlipidemic effects of hawthorn fruit might involve the direct protection to LDL from oxidation. In the present study obesity was induced in albino rats by giving high fat diet. Then effect of extract of crataegus berries was observed on the weight of rats. It was found that crataegus has significant weight lowering effect. This study is in agreement with previous study conducted in Department of Pharmacy Tajen University, Taiwan. in which overweight hamsters treated with crataegus extract for a period of seven days were found to have significant loss of total body weight. Size of white fat cells were markedly reduced in treated hamsters, it also lowered total cholesterol, triglycerides, low density lipoprotein and elevated HDL levels. In a related study crataegus was shown to exert impressive metabolic and anti obesity benefits by acting on a family of receptors called Peroxisome Proliferators-Activated Receptors (PPARs). In that study effects of crataegus were found to be inhibitory for triglycerides and glucose absorption in vivo. In vitro it suppressed the gene expressions of PPARs.

CONCLUSION

Obesity is linked with a large range of medical complications. Weight reduction has beneficial effects and an integral part of treating these morbidities. The current study shows that crataegus is an effective anti obesity agent, further work can unravel its underlying biological mechanism and unique properties that may prove useful to those seeking to manage weight gain.

REFERENCES


