Effect of Nicotinic Acid (Niacin) on Body Weight in New Zealand White Rabbits on Atherogenic Diet

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Abstract

Background: To study the effect of Nicotinic acid (Niacin) on body weight in NZW rabbits on atherogenic diet.

Methods: In this experimental study, forty adult male New Zealand White (NZW) rabbits were randomly assigned to four groups A, B, C and D, each comprising ten rabbits. Group A served as Pure Control and received standard animal house diet (concentrated diet). Group B as treated control was given atherogenic diet (concentrated diet + 0.5% cholesterol), Group C as an experimental group was given Niacin in a dose of 15mg/kg b.w mixed in atherogenic diet (concentrated diet + 0.5% cholesterol) for two months. Group D served as an experimental group received atherogenic diet (concentrated diet + 0.5% cholesterol) for two months then was shifted to standard animal house diet (concentrated diet) mixed with Niacin in a dose of 15mg/kg b.w. Rabbits were weighed at the beginning of the experiment and then before their sacrifice.

Results: - The mean initial body weight (W_i) of rabbits in group A, B, C and D was 1.875±0.094, 1.670±0.067, 1.660±0.085 and 1.805±0.038 kg respectively. The mean final body weight (W_f) of rabbits was 1.850±0.099, 1.920±0.046, 1.695±0.069 and 1.745±0.052 kg respectively. ANOVA showed significant (p<0.05) difference in mean values of body weight among the groups. Post Hoc test using Least Significant Difference (LSD) showed significant difference (p<0.05), when weight change was compared among the groups.

Conclusions: - Atherogenic diet produced increase in body weight of rabbits. Less weight gain was seen in rabbits on atherogenic diet with niacin supplementation. Marked response to reduction in body weight was observed in rabbits with cholesterol restriction and niacin supplementation.

Key Words: Atherogenic diet, Niacin

Introduction

Atherosclerotic disease is projected to become the leading cause of global morbidity and mortality by 2020. Cardiovascular disease (CVD) is a major global health problem reaching epidemic proportions in middle income countries including South Asian countries (Pakistan and India). A cross-sectional descriptive study carried out at Aga Khan University Hospital (a teaching hospital) in Karachi, among 370 ambulatory Pakistani adults (18-60 years), showed the populations of major risk factors for CAD were sedentary lifestyle (72%), family history (42%), dyslipidemia (31%), obesity (24%), hypertension (19%), and diabetes mellitus (15%). Non quantified risks with weak association include obesity, type A personality, post-menopausal estrogen deficiency, contraceptive pills, high carbohydrate intake, lack of exercise, hardened unsaturated fat intake, heavy alcohol consumption and chlamydia pneumonia.

With drugs like Statin, risk of CVD can be reduced by about 30%. Newer drugs are being researched and introduced in the treatment of hyperlipidemia in humans. Niacin has been used for many years to treat hyperlipidemia and shown to reduce coronary death. Investigations have shown that combining Statin therapy with Niacin results in additive improvement in the major lipids and lipoproteins and thus improve clinical outcome. Niacin lowers concentration of all atherogenic plasma lipids and at the same time raises the level of protective HDL-C. The pharmacological dosage (0.5-4.5 gm/day) influences the plasma lipids and lipoprotein concentration.
animal house diet for 2 months. Group B served as treated control and received atherogenic diet (concentrated diet + 0.5 % cholesterol) for 2 months. Group C an experimental group was given Niacin in a dose of 15 mg/kg b.w mixed in atherogenic diet for 2 months. Group D was an experimental group received atherogenic diet for 2 months and these rabbits were shifted to routine animal house diet with Niacin for another 2 months. Animals were weighed at the start of experiment and at the time of sacrifice. Mean scores were calculated and results were analyzed using SPSS version 15. Statistical analysis was performed using ANOVA for comparison of four groups. Difference among the groups was regarded statistically significant at p<0.05.

Results

General condition of all animals was observed and weight recorded at the start of experiment and before the sacrifice of rabbits. The mean initial body weight (W) of rabbits in Group A, B, C and D was 1.875±0.094, 1.670±0.067, 1.660±0.085 and 1.805±0.036 kg respectively (Table 1). The mean final body weight (Wf) of rabbits in Group A, B, C and D was 1.850±0.099, 1.920±0.046, 1.695±0.069 and 1.745±0.052 kg respectively (Table 1). Mean change in body weight in Group A was 0.025±0.03 kg decreased (Fig. 1). The difference between the mean body weight found statistically highly significant ( p=0.001) in Group B rabbits and mean change in body weight in this group was 0.250±0.052 kg increased (Fig. 1). Post Hoc test using Least Significant Difference (LSD) showed statistically significant difference ( p=0.002), when this weight change was compared with pure control group A (Table 2). Mean change in body weight in Experimental Group C was 0.035±0.086 kg increased (Fig. 1). Statistically this weight change compared with Group B, difference was found significant ( p=0.014) but insignificant with group A ( p=0.474) (Table 2).Mean change in body weight of rabbits in Experimental Group D was 0.060±0.050 kg decreased (Fig. 1). Statistically when this weight change was compared with Group B, significant difference was found (P=0.001) but was insignificant with group A (P=0.675) and group C (P=0.259) (Table 2).

Discussion

Pure Control Group A rabbits (fed on standard animal house diet) were weighed in the beginning and at the end of experiment 1.875±0.094 kg and 1.850±0.099 kg respectively. Statistically no difference was found with respect to the weight gain. These results were similar to the one for control group NZW rabbits in a study conducted by Quiles et al. to see the effects of curcuma longa extract on aortic fatty streak development. This finding is also in accordance with findings of control groups observed by Sekalska et al.

Table 1: Body weight of rabbits in control and experimental groups*

<table>
<thead>
<tr>
<th>Group</th>
<th>Body Weight(W) Kg</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial (Wi) Mean ± S.E</td>
<td>Final (Wf) Mean ± S.E</td>
</tr>
<tr>
<td>A</td>
<td>1.875 ± 0.094</td>
<td>1.850 ± 0.099</td>
</tr>
<tr>
<td>B</td>
<td>1.670 ± 0.067</td>
<td>1.920 ± 0.046</td>
</tr>
<tr>
<td>C</td>
<td>1.660 ± 0.085</td>
<td>1.695 ± 0.069</td>
</tr>
<tr>
<td>D</td>
<td>1.805 ± 0.036</td>
<td>1.745 ± 0.052</td>
</tr>
</tbody>
</table>

*Group A Pure Control (Standard animal house diet 2 months); Group B Treated Control (Atherogenic diet 2 months); Group C Experimental Group (Atherogenic diet + Niacin 2 months); Group D Experimental Group (Atherogenic diet 2 months followed by standard animal house diet + Niacin 2 months)

Table 2: Comparison of body weight change in rabbits (control and experimental groups)*

<table>
<thead>
<tr>
<th>Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A v B</td>
<td>0.002</td>
</tr>
<tr>
<td>A v C</td>
<td>0.474</td>
</tr>
<tr>
<td>A v D</td>
<td>0.675</td>
</tr>
<tr>
<td>B v C</td>
<td>0.014</td>
</tr>
<tr>
<td>B v D</td>
<td>0.001</td>
</tr>
<tr>
<td>C v D</td>
<td>0.259</td>
</tr>
</tbody>
</table>

*Group A Pure Control (Standard animal house diet 2 months); Group B Treated Control (Atherogenic diet 2 months); Group C Experimental Group (Atherogenic diet + Niacin 2 months); Group D Experimental Group (Atherogenic diet 2 months followed by standard animal house diet + Niacin 2 months)

Discussion

Pure Control Group A rabbits (fed on standard animal house diet) were weighed in the beginning and at the end of experiment 1.875±0.094 kg and 1.850±0.099 kg respectively. Statistically no difference was found with respect to the weight gain. These results were similar to the one for control group NZW rabbits in a study conducted by Quiles et al. to see the effects of curcuma longa extract on aortic fatty streak development. This finding is also in accordance with findings of control groups observed by Sekalska et al.
mean body weight 0.250±0.052 kg in these animals. Similar findings were observed by Sekalska et al in their study on NZW rabbits fed on atherogenic diet.  

When comparison of mean body weight was done within group, no difference was found statistically with respect to the weight gain at end of experimental time. This finding is in accordance with Quiles et al who also found no difference among the experimental groups with respect to weight gain in NZW rabbits fed on atherogenic diet. 

Experimental Group C rabbits (fed on atherogenic diet + Niacin 15 mg/kg b.w) weighed before start as W1.660±0.085 kg and at the end of 2 months of experimental duration as W1.695±0.069 kg. Statistically the difference between weight gain was insignificant within the group and among the groups. This finding is in accordance with results seen in a study on Ibuprofen in NZW rabbits (on atherogenic diet) conducted by Sekelska et al. 

In the beginning of present study Experimental Group D animals were weighed as W1 1.805±0.038 kg and at the end of experiment after four months as W1 1.745±0.052 kg. Thus statistically mean change in body weight was decreased 0.060±0.050 kg (Fig. 1). This reduction in weight could be due to the restriction of cholesterol in the diet and supplementation of Niacin as seen in group C. This finding is contrary to one seen by Jeremy et al in a study conducted on NZW rabbits for atherosclerosis, where rabbits in each treatment group gained weight with an average gain of 4% of base line after seven weeks supplementation of L-Arginine. 

Weight reduction in the present study in this group is in accordance with description given by Grundy, that weight reduction in people helps to keep serum LDL-C level at a lower range.

References

8. Yu Bi and Zhao S. Anti-inflammatory effect is an important property of niacin on atherosclerosis beyond its lipid altering effects. Medical Hypotheses 2007; 69: 90-94.