AJWA DATE SEED IMPROVES LIPID PROFILE OF DIET INDUCED HYPERLIPIDEMIC RABBITS

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ABSTRACT

***Background*:** Date seeds contain such constituents which can improve lipid profile. There is no study to show this effect, so it was planned to evaluate the antihyperlipedemic effect of Ajwa date seed on serum lipid levels of diet induced hyperlipidemic rabbits.

***Methodology*:** Male rabbits, 32 in number weighing between 0.9-1.3 kg were divided into four groups NC, HFD, HFD+2%A and HFD+4%A having 8 rabbits each. Group NC took normal diet while all other groups were given high fat diet for whole 12 weeks. After 4 weeks groups HFD+2%A and HFD+4%A; were given diet containing Ajwa date seed powder 2gm and 4gm per 100 gm of high fat diet respectively for next 8 weeks. Lipid profile was done at 0, 4, 8 and 12 weeks.

***Results*:** serum cholesterol, triglycerides, LDL-C, AIP and LDL/HDL ratio decreased significantly in both treatment groups along with rise in HDL-C. Initially 4% Ajwa date seed powder was more effective than 2% but at the end both were equally effective.

***Conclusion*:** Ajwa date seeds are effective in lowering lipid levels despite high intake of fat.

KEY WORDS: High Fat Diet, Lipid Profile, Ajwa Date Seed

INTRODUCTION: Dyslipedemia is a metabolic disorder, characterized by increase in total cholesterol, low-density lipoprotein (LDL) cholesterol, triglyceride concentrations, and a decrease in high-density lipoprotein (HDL) cholesterol concentration in the blood. Low levels of HDL-cholesterol and increase in LDL-cholesterol and triglycerides will increase the fat deposition in arteries which is an important cause of ischemic heart disease[1]. Other complications include acute pancreatitis[2] and insulin resistance, which ultimately leads to development of diabetes mellitus[3].

Control of lipid level is more important than control of hypertension in prevention of cardiovascular diseases[4]. The latest recommendation by Adult Treatment Panel III (ATP III) of the National Cholesterol Education Program is non pharmacologic approach in hyperlipidemic individuals including modification in diet and physical activity[5]. It is observed that plant based natural products have minimum side effects and affect multiple targets for preventing and treating hyperlipidemia[6]. In recent years, an explosion of interest in the numerous health benefits of dates has led to many in vitro and animal studies as well as identification and quantification of various classes of phytochemicals. Dates are helpful in the treatment of obesity[7], atherogenesis and control of diabetes[8].

Ajwa date seed contains dietary fiber (73.1 g/100 g), fifteen salts and minerals like Ca, Mg, K and P at higher concentrations, as compared to the flesh[9, 10]. It also contains phenolics (3942 mg/100 g), antioxidants (80400 µ mol/100 g) and carotenoids. High concentration of antioxidants can be very much effective against hyperlipidemia and atherosclerosis[11, 12]. Objective of this study was to evaluate the effects of Ajwa date seed powder on lipid profile of hyperlipidemic rabbits.

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METHODOLOGY: This experimental study was conducted at Post Graduate Medical Institute, Lahore. Sampling was done from April to July; 2013.Sample size was 32 rabbits divided into four groups by lottery method having 8 in each group.

Animal Selection: Adult healthy male rabbits weighing 0.9-1.3 kg were purchased from local market and kept in cages in well ventilated rooms with ample space. During the one week p period of adaptation, the rabbits were fed standard rabbit chow and water ad libitum. After acclimatization the rabbits were divided into 4 groups, each group containing 8 rabbits as follows:

Group NC: Rabbits fed on normal chow throughout 12 weeks.

Group HFD: Rabbits received high fat diet for 12 weeks.

Group HFD+2%A: Rabbits received high fat diet for 12 weeks and 2 % Ajwa date seed powder was added after 4 weeks for next 8 weeks. .

Group HFD+4%A: Rabbits received high fat diet for 12 weeks and 4%Ajwa date seed powder was added after 4 weeks for next 8 weeks.

Preparation of Diet Pellets: To prepare rabbit chow following ingredients were mixed: Split chick peas (*Cicer arietimumb*) 500grams, dry fodder (*Elusinae coracana*) 500grams, jawar (*Sorghum bicolor*) 500grams and plain flour (*Triticum astivum*) 300 gram used with water to bind all these ingredients in pellet form, dried and kept in refrigerator.

Preparation of High Fat Diet: High fat diet contained, cholesterol 1g and coconut oil 4 ml per 100 g of normal rabbit diet[13]. All the ingredients were mixed thoroughly to make diet pellets. Diet was prepared fresh at one week interval and stored in refrigerator.

Preparation of Ajwa Date Seed Powder: Ajwa dates were purchased from Aseel date factory of Madina-tul-Munawarra and 2.8 kg seeds were taken out of 20 kg dates, washed, air dried and finely ground in a

powder form and kept in refrigerator. Date seed powder was mixed in high fat diet; 2% and 4% for group HFD+2%A and group HFD+4%A respectively.

Parameters and Sampling

Collection of Blood Samples: Blood samples were taken at 0, 4, 8 and 12 weeks. Before taking sample animals were deprived of food for 14 hours[14] but had free access to water. One and half to 2 ml blood sample was drawn from marginal ear vein of each rabbit using 23 gauge needles. Blood was allowed to clot in centrifuge tube at room temperature for one hour and then centrifuged at 3000 revolutions per minute for ten minutes to separate serum which was stored at -20°C until analyzed for lipid profile.

Estimation of Lipid Profile: lipid profile was done by enzymatic end point method using commercially available kits (Human Company) with spectrophotometer. Serum triglycerides, total cholesterol, high density lipoproteins cholesterol and low density lipoproteins cholesterol were measured. LDL/HDL ratio and Atherogenic index of plasma=log (serum triglyceride/HDL) were calculated[15].

DATA ANALYSIS: After collecting the data it was transcribed into SPSS 17. To see the significance of outcome in 4 study groups ANOVA, followed by Tukey's test was applied. Paired sample t-test was used to check change over study period within groups. P-value $\leq$ 0.05 was considered significant. Graph Pad Prism 5 was used for graphical presentation of data.

RESULTS: Baseline data was checked for normal distribution. Serum triglyceride, total cholesterol and LDL-cholesterol were normally distributed, while HDL-cholesterol and its derived parameters LDL/HDL ratio and AIP were not normally distributed. Their baseline values were taken as 100% and change was calculated as percentage of baseline.

Serum triglyceride (TG), total cholesterol, LDL-cholesterol levels, LDL/HDL and AIP increased in all high fat diet (HFD) groups at 4^{th} week. They kept on increasing in group HFD and decreased in group HFD+2% A and HFD+4% A at 8^{th} and 12^{th} week (Fig I - V). HDL-cholesterol level decreased in all HFD groups at 4^{th} week. It further decreased in group HFD at 8^{th} and 12^{th} week, while increased in group HFD+2% A and HFD+4% (Fig VI). Comparison between groups and end of study level with baseline is shown in table 1.

DISCUSSION: This study was conducted on diet induced hyperlipidemic rabbits to see the effects of Ajwa date seed powder on lipid profile. Animals selected were rabbits because they have close resemblance with human lipid metabolism. In both species apoB-48 is a major apolipoprotein of chylomicrons and chylomicrons remnants which carry exogenous lipids derived from food. ApoB-100 is a major apolipoprotein of VLDL, IDL and LDL, which are endogenous lipoprotein derived from liver[16]. Only male rabbits were selected to avoid any variation in lipid levels due to gonadal hormones. High fat diet markedly impaired lipid profile after four weeks. Other studies also demonstrate development of hyperlipidemia in same time period[17]. After the administration of Ajwa date seed powder there was a significant decrease in serum triglyceride, total cholesterol, LDL-C, LDL/HDL and AIP, while HDL-C increased in both treatment groups.

Highlights of the study were the effect on TG, AIP and HDL-C level. Decrease in TG level near NC in both treated groups and insignificant difference from baseline in 4% treated group at the end of study was observed. Lowering of TG level is good prognostic factor for atherosclerosis[18]. At the end of study lowering of AIP to baseline in 2% treated group and less than baseline in 4% treated group is an important finding. Had the study been continued, it would have been improved further. Atherogenic index of plasma is good predictor of cardiovascular risk even in the presence of co-morbid conditions[19].

Increase in HDL-C level above baseline in both treated groups and above NC in 4% treated group is hallmark of the study. Statins, the most commonly used antihyperlipedemic agents, do not raise HDL-C effectivly[20]. Only niacin has been shown to be effective in this regard[21] but it has low tolerability.

Comparison of both these groups revealed that difference at the 8th week was minimized at 12th week indicating that lower dose for prolonged time was equally effective as high dose. No study has been conducted previously on effect of Ajwa date seed powder on hyperlipidaemia, which could be used for comparison. In a study on lipid profile of diabetic rats, seed extract lowered total cholesterol and TG close to normal control with insignificant difference[22].

Possible mechanism of action of lowering lipids is the presence of some active constituents of date seed such as antioxidants like polyphones and flavonoids which are highest in Ajwa date seed as compared to other date variety[23]. Presence of fiber in date seed[9] may also reduce absorption of dietary fats leading to improvement in lipid profile.

Finally it can be summarized that Ajwa date seed had antihyperlipidemic effect. Initially this effect was dose dependent but with continued treatment effect of low and high dose had same beneficial effect.

CONCLUSION: Ajwa date seed powder has anti-atherogenic potential based on antidyslipidemic effects observed in this study and may be recommended as dietary modification in hyperlipidemia.

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