

Effects of Hawthorn on HbA1C and lipids levels in Jordanian diabetic patients (Type2)

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ABSTRACT

The current research was intended to elucidate the effects of supplementation of hawthorn on the plasma level of glucose, glycosylated hemoglobin HbA1C and lipidemic parameters which include triglyceride (TG), total cholesterol (TC), low density lipoprotein (LDL) and high density lipoprotein (HDL) among type 2 diabetic patients. Fifty five diabetic type 2 patients were encountered and received 3 grams dose of hawthorn powder administered orally in the form of 500 mg capsules 3 times daily at breakfast, lunch and dinner meals for 12 weeks. Measurements of fasting blood glucose, HbA1C and lipid parameters before and after treatment showed significant effects at $P < 0.05$ were recorded due to hawthorn treatment. In brief, glucose level dropped from 223.6 mg/dl to 186.34 mg/dl HbA1C decreased from 8.5% to 7.2%, TG was reduced from 235.5 mg/dl to 160 mg/dl, TC was declined from 310 mg/dl to 187.6 mg/dl, LDL was decreased from 155.2 mg/dl to 115.5 mg/dl and lastly high HDL increased from 52.4 mg/dl to 69.2 mg/dl. It was concluded that hawthorn may be one of the future optimizing medicinal plants that shows dual effect against hyperglycemia and hyperlipidemia.

KEY WORDS: Hawthorn, HbA1C, blood glucose, lipids level, type2 diabetes.

1. INTRODUCTION

Diabetes mellitus is a serious global health problem with an estimated 1700 new cases diagnosed daily. The W.H.O. estimate of diabetes prevalence for all age-groups worldwide was 2.8% in 2000 and is expected to become 4.4% in 2030. Estimated number of people with diabetes is subjected to upsurge to 366 million in 2030 (Wild, 2004). As a matter of fact, prevalence of diabetes mellitus in the Arab countries, ranges from 3% in Sudan to 35% in Bahrain (Ajlouni, 2008). Among Arab countries, Jordan as our concern, showed an overall prevalence of diabetes among adult was 17.1 (Ajlouni, 2008). It is well-known that the most common cause of death in industrial countries is cardiovascular diseases which is strongly associated with hyperlipidemia and hyperglycemia. Hyperlipidemia is an important risk factor for cardiovascular disease in which raised LDL with low HDL is strongly associated with coronary heart disease risk. The other window associated to cardiovascular diseases is hyperglycemia where plasma glucose level became threatening to blood vessels physiology. 'Glycosylated hemoglobin' molecule, known as hemoglobin A1C is a measurable reflect that implies the abnormality of hyperglycemia (Lai, 2004). Nevertheless, controlling both lipid and glucose levels will impede the incidence of morbidity and mortality of cardiovascular diseases.

Traditionally, hawthorn was used since long ago and became even more popular among European and American herbalists in the late 19th century (Hobbs, 1990). Recently, it is used as a cardio tonic in various functional heart disorders (Duke, 1985; Mills, 2000). Hawthorn is a member of the Rosaceae family described as thorny deciduous tree bears large bunches of fragrant white to pink flowers bud develop into small, bright red, apple-shaped fruit (Weihmays and Ernst 1996). Reports about toxicity in animal studies beside human announced that hawthorn has very low toxicity with minimal side effects and no drug-herb interaction in clinical trials (Mills and Bone, 2005; Tankanow, 2003).

Extracts of both flowers and berries of hawthorn are among the most prevalent products of medicinal plants in many countries including the United States and Germany and recommended in treatment of cardiac failure, atherosclerosis, hyperlipidemia, hypertension, angina and variety of geriatric conditions (Brevoort, 1998; Blumenthal, 2001; Ernst, 2000). Analytical phyto chemistry of hawthorn extract deduced chlorogenic acid, various classes of flavonoids and other constituents such as triterpenoids which have anti-inflammatory and anti-hyper lipidemic properties (Szapary, 2004; Wu, 2014). In this research we tried to explore the effect of powdered-hawthorn on hyperlipidemia and hyperglycemia among human diabetic type 2 patients.

2. MATERIALS AND METHODS

Data collection: Prior to implementation of the training program, an official permission was obtained from the supervisors of the selected units to facilitate data collection and to explain study purpose. The researcher explained the study purpose and procedures for the randomly selected sample. Potential subjects were further informed that their participation was voluntary and study findings will be presented confidentially as group wise without naming recognition.

Randomized study was designed to show the effect of hawthorn supplementation contains the powder of the fruit, and leaf of hawthorn on glucose and lipid parameter levels; cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL) and triglyceride among type2 diabetic patients. Blood sampling was conducted in Al Mafrq Governmental Hospital in Jordan and out patients in private Albaian laboratory. The sample included 55 individuals with type 2 diabetes of both sexes (30 males and 25 females) of age > 45 years whose fasting blood glucose were in the range of 170 – 300 mg/dl and with high lipids level. Patients were allowed to take their routine diet and usual diabetic medicine. They were told to take 2 grams three times daily of capsulated whole hawthorn powder (500 mg/capsule) immediately after breakfast, lunch and dinner for 12 week.

Biochemical analysis was done after obtaining approximately 5-6 ml of blood intravenously directly into lithium-heparinized vacuum tube. Following centrifugation at 1000 x g for 10 min at 4°C, the plasma was transferred immediately in ice-cold boxes to the Albaian laboratory at Almafra city.

Biochemical measurements of blood plasma were achieved by using an auto analyzer (Dimension RXL clinical chemistry system, Dade Behring, USA).

Statistical analysis: Collected data were analyzed by ANOVA and SPSS, version 14. Results are regarded as statistically significant at probability value (P) of < 0.05.

3. RESULTS

Examining fasting blood glucose, HbA1C and lipid levels changes across time is shown in Table 1. Comparing values before and after hawthorn administration revealed that hawthorn has potentially a significant effect on experimental parameters. The mean fasting blood glucose levels, were changed from 223.6 mg/dl to 186.34 mg/dl in a reduction percentage 17%. HbA1C decreased 15% (8.5 to 7.2). Triglyceride dropped 32% (235.5 mg/dl to 160 mg/dl), Total cholesterol declined 40% (310 to 187.6 mg/dl). LDL reduced 26% (155.2 to 115.5 mg/dl). HDL was elevated positively 25% (52.4 to 69.2 mg/dl).

Table.1. Effect of hawthorn administration on fast blood glucose, HbA1C and lipids parameters level of human diabetic patients type 2 after 12 weeks duration

Test	before hawthorn administration	after hawthorn administration	% of changes after hawthorn administration
	Mean± SD(mg/dl)	Mean± SD(mg/dl)	
FBG	223.6± 12.7	186.34±16.9*	17%
HbA1C	8.5±1.3%	7.2±0.9% *	15%
Triglycerides	235.5±11.3	160±5.2**	32%
Cholesterol	310± 21.2	187.6±8.5**	40%
HDL	52.4± 4.2	69.2± 5.1**	25%
LDL	155.2± 9.3	115.5±22**	26%

* Significant, ** highly significant

(HbA1c) glycosylated hemoglobin, (HDL) high density lipoprotein, (LDL) low-density lipoprotein

DISCUSSION

This is the first study in Middle East to show the effect of hawthorn on type 2 diabetic human patients taking prescribed medication. This study also provides further evidence for the safe use of hawthorn as a whole herb with no restrictions on its long-term use (Mills, 2000). Our results showed a significant change in all tested parameters due to hawthorn treatment. This could be attributed to its high variety of flavonoid compounds content (Wu, 2014). Previous studies elucidated that hawthorn extracts has significant antioxidant activity demonstrated as a reduction of oxidative stress in re-perfused myocardium resulting in a cardio protective effect, increase coronary blood flow, inotropic effect on the contraction amplitude of myocytes (Popping, 1995; Schussler, 1995; Jayalakshmi, 2006). Experiments on hyper lipid emic-diet rats described that hawthorn possessed significant effects on lipid parameters due to the flavonoid content, which may exert considerable collagen stabilizing effects that enhances integrity of blood vessels (Gabor, 1972). It was also found that hyper lipid emic diet rats fed by extracts of Crataegus, showed no longer elevation of plasma lipids, including total cholesterol, triglycerides, and LDL- and VLDL- fractions (Shanthi, 1994). Our data clearly display that hawthorn has a hypolipidemic effect in human diabetic patients. It could be suggested that it prevents oxidation of LDL that prohibits the formation of free radicals which are attributed to distort the integrity of cardiovascular system i.e. blood vessels (Leskovac, 2007; Tadic, 2008).

The decrease in LDL and cholesterol plasma level in our study is in agreement with the result of Rajendran and Deepalakshmi (1996). They demonstrated that Crataegus exerts controlling of hepatic LDL-receptors, which enhances influx of plasma LDL-cholesterol into the liver and cholesterol degradation to bile acids, released within bile so overwhelming biosynthesis of cholesterol (Rajendran and Deepalakshmi 1996). On the other hand, hawthorn in the current work showed anti hyperglycemic effect appeared in the reduction of fast blood glucose and Hb A1C

in patients involved in the study, As other medicinal herbs that showed the same effect, we proposed that the presence of flavonoids has a vital role in regulating the level of glucose in plasma as deduced in lowering enzymes activities that convert starch into free glucose (Al-Hallaq, 2013).

4. CONCLUSIONS

Powdered hawthorn could be promising as anti-hyper lipid emic and anti-hyperglycemic use in human diabetic type 2 patients.

Conflict of Interest: The authors declare that there is no conflict of interests regarding the publication of this article

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