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Effect of Deep sea water, Activated Charcoal on Cholesterol in Hyperlipidemic subjects

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Abstract

This research was designed to study the effect of deep sea water (DSW) and activated charcoal (AC) on hyperlipidemic subjects. Levels of cholesterol, HDL, LDL, and triglycerides were tested at the beginning and end of 14 days. The subjects were divided into three groups.The first group was asked to consume deep sea water which had mild traces of magnesium (2% in a 240ml serving; 1800ml to be consumed per day); the second group was asked to consume charcoal capsules (260 mg three times a day), and a third group was the control group. The groups consumed deep sea water and activated charcoal for 14 days. Cholesterol pre- and post-examination revealed that deep sea water or activated charcoal had no significant effect on reduction or regulation of cholesterol levels.

Key words: Hyperlipidemia, Deep sea water (DSW), Activated charcoal (AC)

Introduction

In 2011, an estimated 55 million people died worldwide. Non-communicable diseases were responsible for two-thirds of all deaths globally in 2011, up from 60% in 2000 (Middle East Health, 2013). Cardiovascular disease and cerebrovascular disease are major causes of mortality in developing countries and the second highest cause of mortality in Thailand. According to Bangkok Adventist Hospital statistics in 2012, the highest cause of patient disease was hyperlipidemia. These statistics show a need to challenge this growing epidemic.

Deep sea water (DSW), when purified, is rich in minerals such as magnesium (Mg), calcium (Ca), potassium (K), carbon (C) and other trace elements. The composition of blood is similar to that of sea water which gives the perception that due to the lack of balance in our diet, the composite balance has been altered which results in lack of optimum health conditions. Sea water could serve as a balancing agent to bring about a natural curing effect to the life-giving fluid of the human body. Research suggests that though their composition is almost the same seawater has a higher concentration and will need dilution for its consumption.

According to the Taiwan Yes Deep Ocean Water Co., Ltd. (2013), there are more than 70 minerals required by the human body; and, according to recommended daily intake, these minerals are differentiated into two categories: macro minerals and trace elements. Minerals are essential for life and to maintain healthy skeleton, teeth, muscles and nerves. Unfortunately, natural mineral content found in soil is getting seriously depleted due to overuse and chemical fertilizers. In 1914, one apple grown in the USA could provide almost 50% of the iron for daily needs. In 1992, it took 24 apples to provide equivalent content. The increasing occurrence of disease is part of the consequence of mineral deficiency. “Vitamin and mineral deficiency harm one-third of the world’s population.” said Carol Bellamy, the Executive Director of the United Nations Children’s Fund. “You can trace every sickness, every disease and every ailment to a mineral deficiency,” stated Dr. Linus Pauling, the only person in history who was awarded two unshared Nobel prizes (Reference).

Yoshiok, et al. (2003) concluded that the treatment effect of deep-sea water on hyperlipidemia is very small compared with commercial hyperlipidemia improvement agents. However, it is considered that deep-sea water has a useful preventive effect when used as healthy drinking water. Furthermore, in the prevention of

hyperlipemia, the combined use of deep-sea water and other hyperlipidemia improvement agents or health foods should also be considered, and their interactions studied.

Ming-Jyh Sheu, et al. (2013) in their research demonstrated that DSW supplement can attenuate mild hypertension, reduce serum TC, decrease lipid accumulation in tissues, and diminish aortic fatty streak lesions. On the other hand, researchers who studied the effect of activated charcoal (AC) on patients with hypercholesterolaemia showed that plasma total cholesterol decreased by 25% and LDL cholesterol decreased by 41% whereas HDL cholesterol increased by 8% (Kuusisto , et al., 1986).

In the study by Neuvonen, et al. (1989) the decrease of serum cholesterol concentration had significant negative correlations with serum lathosterol and delta 8 lathosterol, and significant positive correlations with serum cholestanol and beta-sitosterol. These observations suggest an increased cholesterol synthesis upon treatment with activated charcoal, probably caused by the interference with the enterohepatic circulation of bile acids.

Magnesium (Mg) is a cofactor in more than 300 enzyme systems that regulate diverse biochemical reactions in the body, including protein synthesis, muscle and nerve function, blood glucose control, and blood pressure regulation. The effect of Mg in regulating cholesterol is vital in triggering any form of regulation in serum cholesterol levels. There is less than 1% magnesium in blood serum and a supplement of magnesium will be used in those parts of the body that have a deficiency. But blood is the medium of transport and therefore would be the primary recipient and magnesium would infuse into the blood composition.

The effects of natural resources such as DSW and AC on subjects that have a known history of hyperlipidemia have been investigated. The uniqueness of this study is in comparing the two natural resources as a parallel study in regulating cholesterol.

The objective for this research was to study the effect of deep sea water (DSW) and activated charcoal (AC) on hyperlipidemic subjects.

Method

The experimental design was conducted for 14 days using double-blind, randomized controlled DSW supplementation. This study began with 60 subjects randomly divided into three groups, but thirteen participants did not complete the study. The 47 subjects were as follows:

Group 1 consists of the Deep sea water (DSW) group. The 19 subjects who were in this group were expected to drink three bottles of deep sea water (600 mL/bottle) daily, for a total individual daily volume of 1800 ml. They were advised to consume the three bottles by drinking from each bottle several times rather than all at once in order to keep an elevated level of magnesium in the blood. The amount of Mg in the water was equivalent to the recommended daily allowance (RDA) of 2% based on a 2,000 calorie diet. Ocean deep water is rich in Mg at a degree of hardness of 1400 ppm prepared from concentrated DSW, with a serving size of 600 ml. per bottle of 4.02 6.6 mg. of Mg.

Group 2 consists of the Activated Charcoal (AC) group. The 16 subjects were instructed to consume two 260 mg. capsules of Activated Charcoal daily, one in the morning and one in the evening two hours after their meal.

Group 3 was made up of the Mineral water (MSW) control group. The 12 subjects were instructed to consume a minimum of two bottles of mineral water daily.

Participants

The subjects were chosen from Seventh-day Adventist institutions in Bangkok, Thailand – Thailand Adventist Mission (TAM), Ekamai International School (EIS), Mission Faculty of Nursing (MFON), and Bangkok Adventist Hospital (BAH). There were a total of 47 subjects.

The criteria for selection of these subjects were:

1. Serum total cholesterol > 200 mg/dl and LDL mg/dl.
2. Above 30 years of age.

3. No chronic diseases other than *hyperlipidemia*.
4. None of the subjects use herbal medicines or take supplements such as Monascus, phytosterils, or fish oil, which are known to affect blood lipid levels.
5. Information provided to the subjects was:
6. The subjects are expected to fast for a period of 8-10 hours before the cholesterol test is conducted.
7. The volunteers are informed about the content and detailed procedures of the study and required to sign an informed consent form prior to the participation in the study.
8. The study was conducted according to the guidelines laid down by the Ranking, Research, and Development Committee (RRDC) and the protocols approved by Asia Pacific International University's Institutional Review Board.
9. The subjects accepted into the study are requested to maintain their regular diet and exercise regimen.
10. A simple healthy breakfast is provided to them after the procedure is completed.

Materials

Blood samples were collected from the finger tip and were tested through a cholesterol analyzer which gave the cholesterol readings. The Cardio check analyzer was purchased from a registered company. The machine analyzes serum total cholesterol, low density lipoprotein-cholesterol (LDL-C), high-density lipoprotein-cholesterol (HDL-C) and triglycerides.

The three variables collected from questionnaires after the post test were:

1. Stress indications developed from NSAD Stress Questionnaire (the International Stress Management Association-ISMA^{UK}), which was a 25-item questionnaire with yes-no answer. The analysis will be in 3 levels: ≤ 4 = low, 5-13 = moderate and ≥ 14 = high.
2. Godin Leisure-Time Exercise Questionnaire and its formula were used for the exercise survey: two items ask for frequency of exercise per week and leisure time in any regular activity long enough to work up a sweat (heart beats rapidly). Gaston G. (2011)
   ≥ 24 scores = Active (*Substantial benefits*),
   14 - 23 = Moderately active (*Some benefits*),
   < 14 Insufficiently active (Less substantial or low benefits)
3. Fat intake questionnaire by Di Santo (n.d.) was used for the survey of saturated fat intake of the subjects in this research. The score is calculated on the frequency of fat intake from various foods per week and analyzed by:
   0-10 = low fat
   11-17 = low to moderate fat
   18-25 = moderate fat
   26-39 = moderate to high fat
   40+ = high fat.

The Minitab Statistic program was used for analysis. The data reported are mean, percentage, P-value of 0.05 and one way ANOVA.

Result

A random design was prepared to evaluate the claim that there is a positive effect on the regulation of cholesterol levels with the consumption of DSW, AC or MW.

Descriptive statistics:

Table 1 *Demographic Characteristics*

Demographic Variable	**n**	**%**
Institution		
TAM	20	42.5 %
EIS	3	6.4%
BAH	14	29.8%
MFON	10	21.3%
Religion		
Christian	30	63.8%
Others	17	36.2%
Gender		
Male	12	25.5%
Female	35	74.5%
Age		
30-40 yrs	20	42.5%
41-50 yrs	10	21.3%
51-60 yrs	11	23.4%
>60 yrs	6	12.8%
Family History of Hyperlipidemia		
Yes	18	38.3%
No	20	42.6%
Don't Know	9	19.1%

The demographic characteristics (Table 1) show that most participants were from Thailand Adventist Mission 41.5%. The subjects were 63.8% Christian, 74.5% female and the largest age group was 30-40 years of age (42.5%). Almost half reported no family history of hyperlipidemia.

Table 2 *Cholesterol, HDL, LDL and Triglyceride Levels*

Product	Cholesterol (mg/dl)		HDL (mg/dl)		LDL (mg/dl)		Triglyceride (mg/dl)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DSW	228	224	66	60	134	138	147	127
AC	212	221	53	55	120	130	148	147
MW	217	220	62	59	120	129	134	130

Table 2 shows that for those subjects taking deep sea water the cholesterol, HDL, and triglyceride levels were reduced, but LDL increased. The group who took activated charcoal and the control group had an increase in cholesterol and LDL. For the activated charcoal group HDL increased and triglyceride decreased, and for the control group HDL decreased and trigoyceride decreased.

Table 3 *Fat intake estimates, physical activity and stress variables*

HighVariables	**n**	**%**
Fat intake estimates		
Low	4	8.5%
Low-Moderate	6	12.8%

Moderate	19	40.4%
Moderate - High	17	36.2%
High	1	2.1%
Phsical Activity/Exercise		
Active	14	29.8%
Moderately active	12	25.5%
Insufficiently active	21	44.7%
Stress		
Low	8	17.0%
Moderate	24	51.1%
High	15	31.9%

n = 47

Almost eighty percent of the participants had moderate to high fat intake, almost half were insufficiently active in exercise (44.7%), and more than half had moderate to high stress (83%).

Table 4 *Independent T-Test for cholesterol, HDL, LDL, and Triglycerides*

Independent T-Test	CHOL			HDL			LDL			TRI		
	DSW (Pre-Post)	AC (Pre-Post)	MSW (Pre-Post)	DSW (Pre-Post)	AC (Pre-Post)	MSW (Pre-Post)	DSW (Pre-Post)	AC (Pre-Post)	MSW (Pre-Post)	DSW (Pre-Post)	AC (Pre-Post)	MSW (Pre-Post)
t	.46	-.82	-.29	1.03	-.29	.55	-.41	-0.93	-.79	.91	0.02*	.10
Sig.	.65	.43	.77	.31	.77	.59	.69	.37	.44	.37	0.02*	.92

*P- value

According to Table 4, results show that in the case of triglycerides, participants that consumed activated charcoal had a significant decrease at a 5% significance level.

Table 5 *One way ANOVA for cholesterol, HDL, LDL, and Triglycerides*

ANOVA	CHOL			HDL			LDL			TRI		
	Between Groups	Within Groups	Total	Between Groups	Within Groups	Total	Between Groups	Within Groups	Total	Between Groups	Within Groups	Total
df	2	44	46	2	44	46	2	44	46	2	44	46
F	.694			.777			.145			.532		
Sig.	.505			.466			.866			.591		

According to Table 5, results show that the consumption of DSW, AC or MW did not have any significant effect on the serum cholesterol levels.

Discussion

The purpose of this study was to determine if deep sea water and activated charcoal would help regulate cholesterol levels. After consuming DSW, AC or MW for 14 days, blood samples were taken to determine if there were any changes in the cholesterol profile. For those subjects taking deep sea water the cholesterol, HDL, and triglyceride levels were reduced, and LDL increased. The triglyceride decrease was significant. The group who took activated charcoal had an increase in cholesterol, HDL, and LDL; and triglycerides also decreased but not significantly. In the control group cholesterol and LDL increased and HDL and triglyceride levels decreased. HDL, which needed to go up, only went up slightly with activated charcoal and went down in the DSW and control group. The increase or decrease in the cholesterol, HDL, LDL, and triglyceride levels was not significant for any of the three groups except the decrease in triglycerides in the DSW group.

A questionnaire completed by the subjects at the end of the 14 day experiment revealed that there was over 78% intake of fatty food and over 44% had insufficient physical activity or exercise. These variables may have influenced the effect of the products. There was 83% moderate to high level of stress among the subjects which also is an indicator of resistance to the helpful effects of the product.

The expected results of the effect of the high mineral supplements were not observed. Possible reasons that this study did not demonstrate DSW or AC would decrease cholesterol, LDL, HDL and triglycerides at a significant level might be that the amount of magnesium in the DSW was not a large amount. The DSW had 4.02 – 6.6 mg of Mg in a 600 ml bottle therefore the total quantity of Mg consumed by a person was in the range of 12.06 – 19.8 mg per day. This amount is very small compared to the recommended daily intake of 420 mg for male and 320 for female. The 12–19 mg supplement was not enough to show a significant effect.

Also, the total time for the study was only 14 days. A 14-day study is a short time and not long enough to make a significant change in the serum cholesterol profile. Minerals from DSW or AC may take a longer time to have a significant effect. For change to occur there may need to be a more prolonged administration of the product even though there was a significant decrease in triglycerides in the DSW group at the end of the 14 days.

The survey at the end of the research period showed that 75% of the subjects expressed that they were on a moderate to high fat intake diet. The results of the exercise survey suggest that because over 70% of the subjects were insufficiently to moderately active, their life style may have had a direct influence on their cholesterol profile.

Conclusion

Even though some studies indicated that both deep sea water (DSW) and activated charcoal (AC) showed significant reduction in the serum total cholesterol and LDL-C in hypercholesterolemia subjects, this was not confirmed in this study. It is possible there might be a positive effect with prolonged use and increased dosage of these products. In conducting research on similar lines one needs to keep in mind the fact that variables such as exercise, fat intake, and stress need to be controlled rather than allowing the subjects to go on a routine diet as per their choice.

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