ORIGINAL ARTICLE

CONTENTS

Adenosine triphosphate binding cassette transporters G5 and G8 early diagnostic tools for cardiovascular disease in human

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ABSTRACT

Aim: The current study was designed to investigate the role of ABCG5 and ABCG5 in serum with normal and expected cardiac complaints with CVDs as individual early diagnostic tools.

Materials and Methods: Data was collected in paper form and recorded from 100 healthy personals and 100 personals suspected with CVS after take the case history and clinical signs in private clinical hospital and the serum was collected for measurements the activity of ABCG5 and ABCG5 by used ELISA reader and the results illustrated that activity of ABCG5 and ABCG5 in all aged groups.

Results: Activity of ABCG5 and ABCG5 in all aged groups periods in patient person male and female significant decrease as compared with same age in same period of live, so that the researched depicted that can used the serum activity of ABCG5 and ABCG5 as a diagnostics tools for atherosclerotic cardiovascular disease.

Conclusions: We identified areas of further exploration on cholesterol transport related with CVD risk and concluded that changes in the Adenosine Triphosphate Binding Cassette transporters mainly G5 and G8 early diagnostic tools for cardiovascular disease in Human. We correlated areas of farther disquisition on nutrient cholesterol and CVD threat, in the included trials, healthy grown-ups consumed high doses of dietary cholesterol.

KEY WORDS: Cardiovascular diseases, ABCG5, ABCG8

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INTRODUCTION

Cardiovascular disease (CVD) is the most important prevalent disease in character in determining the general factors of movement in nature, disability and profitable loss, especially in advanced industrial countries. It has been proven that dyslipidemia, such as high serum total cholesterol and triglyceride level [1], is one of the most important risk factors for cardiovascular disease. Serum dyslipidemia is thought to result from the relationship and overlap between environmental and genetic factors [2]. There are many research evidence in clinical trials and molecular biology in selective susceptibility to cardiovascular diseases consistent with life-scales, such as excessive smoking [3], health and age status [4], exercise [5], obesity [6] and psychological effects [7]. Groups of transport proteins such as adenosine triphosphate (ATP) – binding cassette (ABC) have been investigated and found to have a critical role in cardiovascular diseases such as high blood pressure caused by atherosclerosis and heart attacks as a result of excessive smoking. These proteins play a role in regulating cholesterol level, blood pressure regulation, physiological activity of endothelial cells, inflammatory reaction of blood vessels, and platelet production, it also has the effect of ABC cassette carrier having similar effects to transporter groups. Of the most famous types are ABCA1, ABCG5 and ABCG8, those were originally responsible for genetic disorders e.g. Tangiers conditions and sitosterolemia [8]. These disorders have helped to understand the role of these transporters in regulating cholesterol flow and its relationship to heart disease including atherosclerosis and cardiovascular disorders [9]. Lots of data have shown that the family of ABC transporters including ABCG5 and ABCG8 has a close relationship with thermodynamic processes in living bodies by altering the metabolic activity of sterols in the blood. Genetically, ABCG5 and ABCG8 are found on chromosome 2p21, each encoding a 'semi-carrier' protein with nonfunctional activity in the monomeric state [10]. Both genes interfere with adipocytes by regulating the activity of Leptin leading to the complete downregulation of the ABCG5/G8 transporter as a positive feedback mechanism, and historically the first study on cytosterolemia showed that mutation in both ABCG5 and ABCG8 interfered with this disorder in vivo. A rare mutation in these genes results in a loss of function resulting in increased production of sitosterol from dietary intestinal absorption. Clinically it has been investigated that the ABCG5 and ABCG8 transporters are closely related to the incidence of atherosclerotic cardiovascular disease,

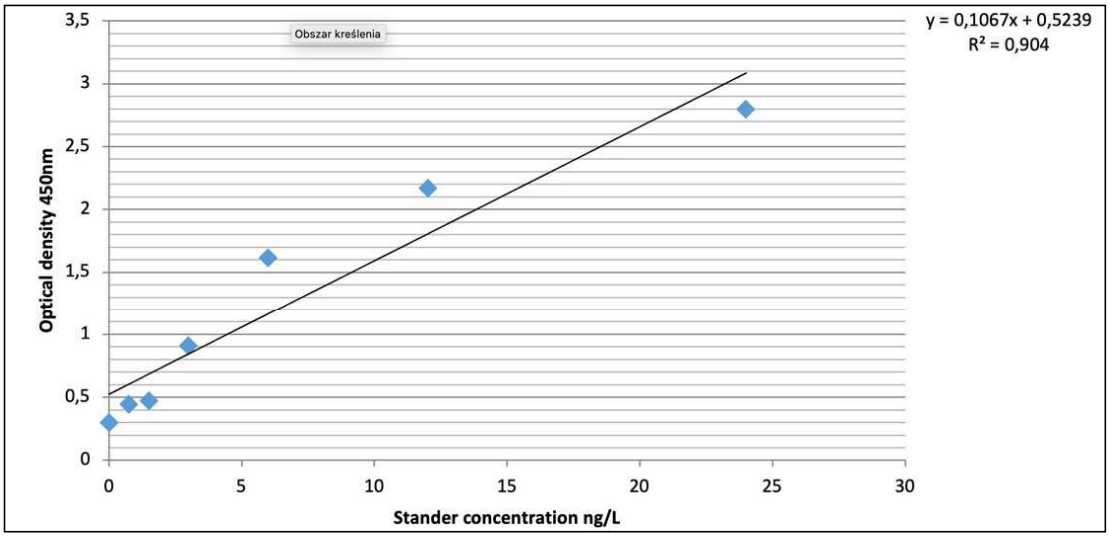

Fig. 1. Standard curve: Human ATP-binding cassette, Sub-family G, Member 5.

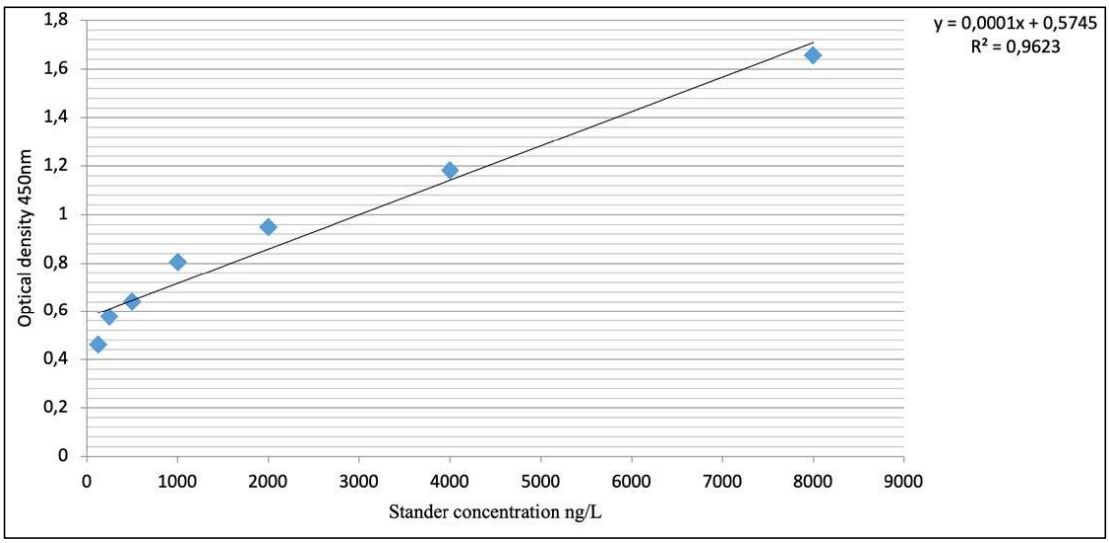

Fig. 2. Standard curve: Human ATP-binding cassette Sub-family G Member 8.

angina pectoris and myocardial infarction. ABCG5/G8 protein physiologically as expressed in enterocytes especially enterocytes and hepatocytes [11]. These transport processes are responsible for the synthesis of cholesterol sterols that flow into living cells and then are excreted with the disposable faces. Experimentally, the ABCG5/G8 transporter knockout model showed an increase in plasma cholesterol concentration within 2-3 above the normal range. However, the gene overexpression of these transporters takes on potentially lethal roles in lowering the cholesterol level and then lowering the lesion of aortic atherosclerosis [12]. Therefore, the current study was designed to investigate the role of ABCG5 and ABCG5 in serum with normal and expected cardiac complaints with CVDs as individual early diagnostic tools.

AIM

The current study was designed to investigate the role of ABCG5 and ABCG5 in serum with normal and expected cardiac complaints with CVDs as individual early diagnostic tools.

MATERIALS AND METHODS

The research was conducted with case-control study design. At the appointment of patients, written informed consent was obtained, a standardized medical history was taken, and clinical examinations were performed. Data was collected in paper form and recorded from 100 healthy personals regarded as control groups and 100 personals suspected with CVS after take the case history and clinical signs in private clinical hospital regarded as a patient group and the serum was collected for measurements the activity of ABCG5 and ABCG5 by used enzyme-linked immunosorbent assay, technique used Human research kit from Bioassay technology laboratory (Korain Biotech Co., Ltd, Shanghai), and later the concentration was calculated using the standard curve for ABCG5 and ABCG5 respectively (Fig.1., Fig.2.).

STATISTICAL ANALYSIS

Statistical analysis of the experimental results was conducted using SPSS version 13.00. The data were expressed as mean ± standard errors (SE) and P value<0.01 was considered statistically among means of group.

Table 1. The mean±SEM values of level of Human ATP-binding Cassette Sub-family G Member 5

Parameters (Gender) Groups (Years)	Human ATP-Binding cassette sub-family G member 5	
	Female (ng/l)	Male (ng/l)
15-30 patient	11.99±0.23 [c]	15.58±0.31 [c]
31-45 patient	11.78±0.34 [c]	14.86±0.34 [c]
46-60 patient	9.71±0.60 [bc]	11.21±0.24 [b]
61-75 patient	8.68±0.57 [ab]	9.96±0.41 [b]
75- above patient	6.60±0.36 [a]	7.51±0.83 [a]
15-30 control	15.10±1.06 [d]	19.04±0.91 [d]
31-45 control	17.22±0.91 [d]	19.17±0.45 [d]
46-60 control	15.53±2.49 [d]	20.33±0.86 [d]
61-75 control	15.70±0.77 [d]	15.81±1.53 [c]
75- above control	16.94±0.68 [d]	10.90±0.89 [b]

[a, ab, b, bc, c, d] - significance ($p \geq 0.01$) within same gender.

Table 2. The mean±SEM values of level of Human ATP-binding Cassette Sub-family G Member 8

Parameters (Gender) Groups (Years)	Human ATP-Binding cassette sub-family G member 8	
	Female (ng/l)	Male (ng/l)
15-30 patient	1096.80±45.13 [cd]	1390.00±64.59 [c]
31-45 patient	1011.62±13.30 [c]	1207.57±59.48 [bc]
46-60 patient	956.22±18.86 [bc]	1250.00±77.74 [bc]
61-75 patient	780.60±22.89 [b]	989.40±20.96 [b]
75- above patient	558.80±34.89 [a]	646.80±91.82 [a]
15-30 control	4213.40±21.94 [h]	7866.25±94.10 [h]
31-45 control	3155.60±57.72 [g]	7247.40±216.76 [g]
46-60 control	2385.00±37.85 [f]	4068.33±277.77 [f]
61-75 control	1645.00±104.08 [e]	3376.50±106.54 [e]
75- above control	1290.00±41.88 [d]	2197.75±95.93 [d]

[a, b, bc, c, cd, d, e, f, g, h] – significance ($p \geq 0.01$) within same gender.

RESULTS

The results in tables 1 and 2 and in figures 3 (A-B) and 4 (A-B) show the concentration of human ABCG5 and ABCG8 activity in serum, respectively. The results illustrated that the activity of ABCG5 and ABCG8 in all age groups showed a significant decrease in all female and male patient groups as compared with all ages of control groups, additionally, the results showed a significant graded decrease in female and male patient groups within increase the older ages when compared with same gender.

DISCUSSION

Cholesterol is one of the main chemical compounds involved in the normal physiological function in living bodies, and also plays a major role in the development of vascular and vascular problems such as high blood pressure and atherosclerosis. Chylomicron is the main carrier of cholesterol lipoprotein in the bloodstream because of its lipid solubility and cannot be carried by the blood. It is also an important component of the cell membrane and is a precursor to most steroid hormones in living organisms [13]. Cholesterol cannot be metabolized to carbon dioxide and water in humans. Instead, the entire cycle of sterols is eliminated from the body [14] by converting to corrosive acids, which are excreted in the stool or erode cholesterol, which transports it to the intestines for disposal. Bile salts are mainly used to emulsify fatty acids and monoacylglycerols and package them into micelles [15], along with fat-soluble vitamins, phospholipids and cholesteryl esters, to reabsorb the villi in the small intestine. The end products of cholesterol utilization are bile acids [16], ABCG5/8 ATP and Mg2 were used as cofactors in the active transport of sterol-carrying across cell membranes [17]. However, it plays an important role in the tissue transport of phytosterols and cholesterol between the extracellular and intracellular fluid in the intestinal and hepatic cells and the secretion of sterols with bile [18]. Later any disturbance in the mechanism of cholesterol metabolism leads to a disturbance in the transport of cholesterol and phytosterols in the intestinal cells [19], and this causes an imbalance in the process of secretion of dietary

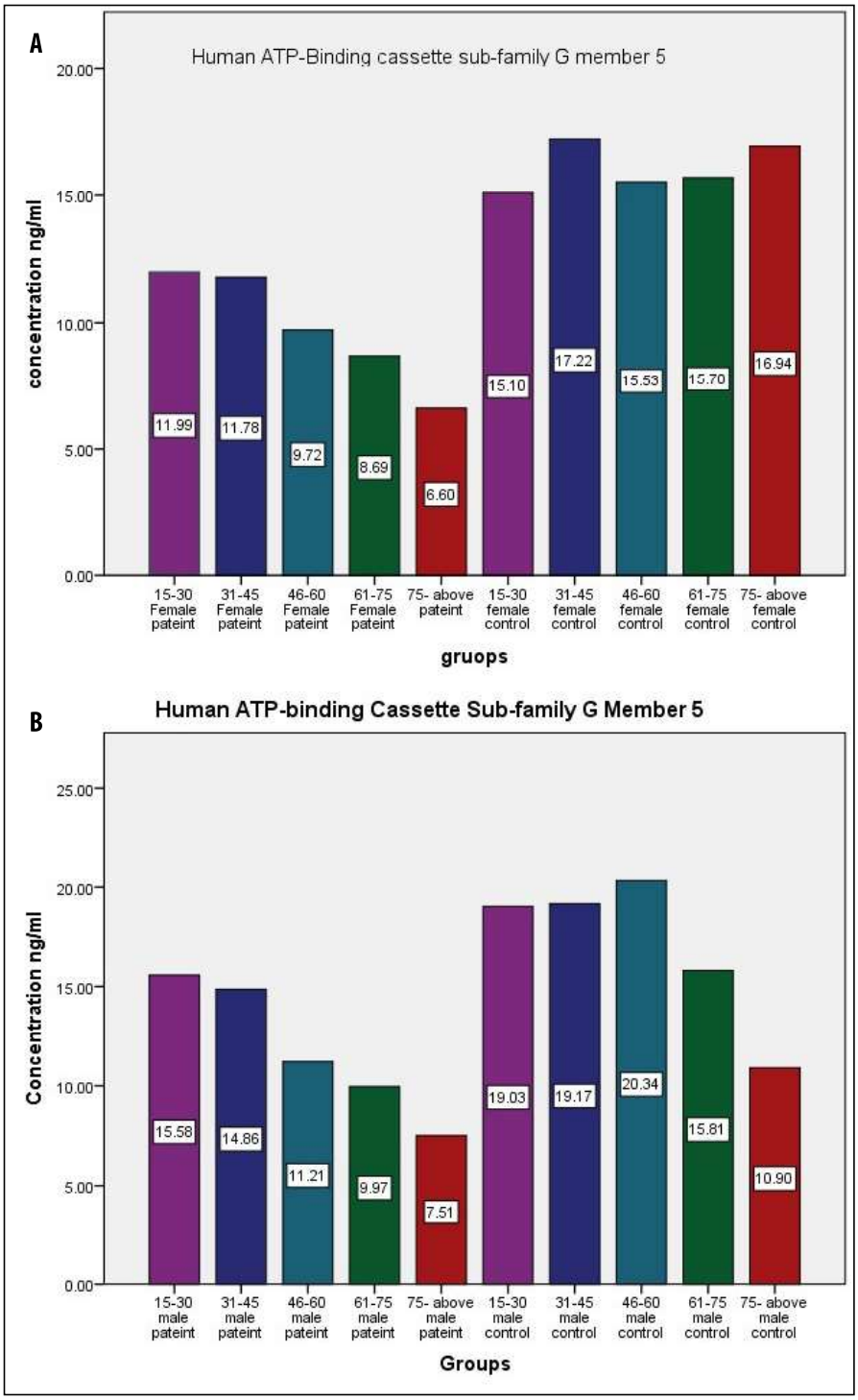

Fig. 3. Human ATP-binding Cassette Sub-family G Member 5 (A: in Female; B: in Male).

sterols leading to the development of hypercholesterolemia, a significant increase in phytosterols in the blood stream and acceleration of the development of cardiovascular diseases blood vessels such as atherosclerosis and coronary artery disease. Various studies have shown that any disturbances in ABCG5/8 gene expression in BCG5/8 mice in the cell membrane of enterocytes and hepatocytes will reverse the synthesis of the ABCG5/8 transporter and the development of cytosterols, a condition in which cholesterol and sterols are increased. Which leads to a problem with the heart and blood vessels [20].

CONCLUSIONS

In this review, we identified areas of further exploration on cholesterol transport related with CVD risk and concluded that changes in the Adenosine Triphosphate Binding Cassette transporters mainly G5 and G8 early diagnostic tools for cardiovascular disease in Human. In this review, we correlated areas of farther disquisition on nutrient cholesterol and CVD threat, in the included trials, healthy grown-ups consumed high doses of dietary cholesterol.

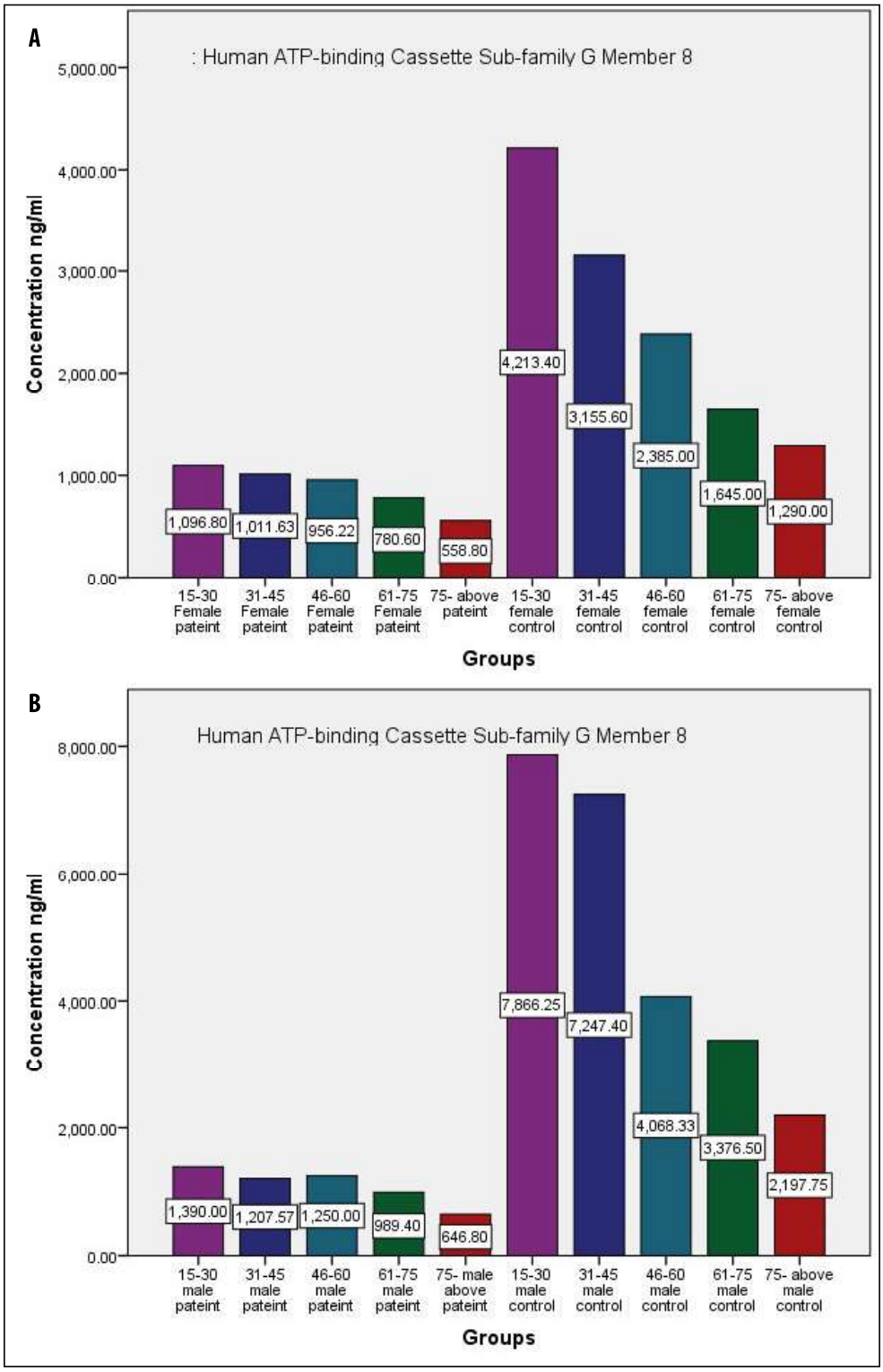

Fig. 4. Human ATP-binding Cassette Sub-family G Member 8 (A: in Female; B: in Male).

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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