

TREATMENT MANNERS, GLYCEMIC CONTROL, AND C-REACTIVE PROTEIN IN PATIENTS RECEIVING ANTI-DIABETIC OR ANTI-DIABETIC WITH ANTIHYPERTENSIVE DRUGS IN BASRA

ABDULLAH S ASIA¹, KADHIM N SHEIMA¹, WREWISH S ZAINAB²

¹Department of Pharmacology and Toxicology, Institute of Pharmacy, Basra, Iraq. ²Department of Laboratory, Institute of Pharmacy, Basra, Iraq. Email: asia_abdullah65@yahoo.com

Received: 10 September 2018, Revised and Accepted: 16 October 2018

ABSTRACT

Objective: This study aimed to investigate the association between treatment manners, glycemic control, and C-reactive protein (CRP) serum level in patients in receipt of anti-diabetic drugs (ADM) alone or ADM by means of antihypertensive (AHT) drugs in Basra.

Methods: Patients in receipt of ADM or ADM with AHT drugs, not suffering from complications, were recruited from Al-Mawane General Hospital in Basra. Socioeconomic characteristics, blood pressure (BP), and treatment tactics were recorded. Blood sample was obtained to gauge glycated hemoglobin (HbA1c), lipids profile, and high responsive (high-sensitive CRP [hs-CRP]).

Results: A total of 26 men and 50 women were involved. Lower mean HbA1c was found in patients in receipt of ADM with AHT drugs compared with those on ADM drugs merely ($p=0.0013$). Lower denote systolic BP ($p<0.0001$) and diastolic BP ($p=0.0078$) were established in patients receiving ADM drugs only compared with persons receiving ADM with AHT drugs. Lower denote hs-CRP was found in women receiving ADM with AHT drugs compare with those on ADM drugs only. Treatment manners had no effect on denote hs-CRP in men and women receiving ADM with AHT drugs; however, there was a significant direct association of hs-CRP with HbA1c ($p=0.002$) and triglycerides ($p=0.009$), but inversely with high-density lipoprotein cholesterol ($p=0.011$) in women receiving ADM drugs merely.

Conclusion: High level of hs-CRP is associated with poor glycemic manage and dyslipidemia, therefore, consequently greater than before cardiovascular risk. Due to its value as a danger predictor, hs-CRP be supposed to be included in custom monitoring of type 2 diabetic patients.

Keywords: Anti-diabetic drugs, Antihypertensive drugs, C-reactive protein.

© 2020 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2020.v13i11.29588>

INTRODUCTION

In Iraq, the high rate of occurrence of diabetes and hypertension has been documented. Diabetes plus hypertension is the two main risk factors in the growth of ischemic heart disease, cardiac hypertrophy, and cardiac failure. Cardiovascular disease is the most common cause of mortality in the world. Previous studies have demonstrated that persons with diabetes [1] and hypertension [2,3] have higher levels of C-reactive protein (CRP) compare with individuals without these conditions in the general population. Increased risk of cardiovascular disease has also be associated with an increased level of CRP [4,5]. CRP mixture and secretion are mainly in hepatic cells [6]. It is regulated by the action of lots of activated cytokines such as interleukin-6 (IL-6), IL-1, and tumor necrosis factor-alpha [7]. CRP is a sign of universal inflammation in the blood [8]. The normal plasma level of CRP in a fit inhabitants without proof of acute inflammation is 2 mg/L or less [9]. There is a rapid rise in the circulating CRP by as much as 3000-fold in answer to inflammation, infection, or acute hankie injuries, which drop rapidly at what time inflammation or injury is determined [10]. Many studies are focused on the association of chronic elevation of CRP with an increased risk of cardiovascular disease and atherosclerosis [11-14]. If CRP is worried about the pathophysiology of cardiovascular illness, it could be accepted that lower CRP levels would reduce the development of the disease and its complications. CRP causes atherosclerosis by various mechanism, such as the release of reactive oxygen species (ROS), CRP increases the generation of ROS by monocytes and neutrophils [15,16] directly. ROS have been concerned in the beginning and continuance of atherosclerosis [17]. Furthermore, CRP increases the look of adhesion molecules [18]. Furthermore, CRP has been worried about the destabilization of atherosclerotic plaques [19]. Moreover, CRP can arbitrate the uptake of low-density lipoprotein into macrophages to form foam cell [20].

The aim of this study was to investigate the association between drug treatments, glycemic manage, and serum height of CRP in Iraqi patients receiving anti-diabetic drugs (ADM) drugs or ADM with antihypertensive (AHT) drugs.

METHODS

This study was conducted during the era as of February to May 2018, and the patients were selected during their visit to Diabetes Endocrine and Metabolism Center in Al-Mawane all-purpose Hospital in Basra. The Institutional Ethical Committee accepted the study, and informed consent was obtained from the subjects. Patients getting ADM drugs or ADM with AHT drugs, not suffering from complications, were recruited. A total of 76 diabetic patients aged between 42 and 67 years were included in this study, 50 patients were female and 26 were male. Forty-two patients using ADM with AHT drugs, from which 30 were female and 12 were males. The other 34 patients are using ADM drugs only. Patients were excluded as of the learn if they were type 1 diabetic patients or if they have any cognitive problems. Socioeconomic characteristics, blood pressure (BP), and treatment plans were recorded. Fasting blood sample be obtained to measure glycated hemoglobin (HbA1c), lipids profile, and high-sensitive CRP (hs-CRP). HbA1c up to 7% reflected adequate glycemic control, as HbA1c >7% reflected poor glycemic manage, as optional by the American Diabetic Association rule [21]. Hypertension was distinct as a systolic BP >140 mmHg or diastolic BP >90 mmHg, or modern use of AHT drug treatment [22].

Laboratory investigations

HbA1C was measured by D-10 double Program Bio-Rad Laboratories, Inc., Hercules, CA 94547, 220-020, California, USA. D-10 Dual Program is based on chromatographic separation of the analytes by ion-exchange (high-performance liquid chromatography). Hs-CRP was measured by

Table 1: Measured hs-CRP, HbA1c, and BP according to treatment manner (Mean±STDEV) of type 2 diabetic patients or type 2 diabetes with hypertension patients

Variables	Mean±STDEV users of ADM only ^A	Mean±STDEV users of ADM and AHT ^B	p value
Age (years)	54.1±6.3	56.6±5.7	0.0738
HbA1C (%)	10.36±2.3	8.86±1.6	0.0013
Systolic BP (mmHg)	122.7±6.7	149.5±18.8	<0.0001
Diastolic BP (mmHg)	80.59±7.3	85.2±7.3	0.0078
hs-CRP (mg/L)			
Male	2.00±0.9	1.8±0.8	0.3089
Female	6.7±4.5	2.6±1.4	<0.0001

^ATotal number=34, men (14), women (20), ^BTotal number=42, men (12), women (30). ADM: Anti-diabetic, AHT: Antihypertensive; STDEV: Standard deviation, HbA1c: Glycated hemoglobin, hs-CRP: Highly sensitive, CRP: Statistically significant values are shown in bold font (significance p<0.05), BP: Blood pressure

Table 2: Correlations between hs-CRP with HbA1c, lipid profile, and BP in men and women of type 2 diabetic patients or type 2 diabetes with hypertension patients

	HbA1c	Cholesterol	TG	HDL-C	SBP	DBP
hs-CRP (DM group) male (n=14)	r=-0.328 p=0.147	r=-0.043 p=0.852	r=-0.052 p=0.823	r=0.01 p=0.965	r=-0.045 p=0.845	r=0.142 p=0.538
Female (n=20)	r=0.537 p=0.002	r=0.329 p=0.147	r=0.466 p=0.009	r=-0.455 p=0.011	r=-0.104 p=0.584	r=-0.132 p=0.487
hs-CRP (DM +HT group) male (n=12)	r=0.314 p=0.320	r=-0.310 p=0.326	r=0.150 p=0.643	r=-0.370 p=0.236	r=0.023 p=0.943	r=0.002 p=0.994
Female (n=30)	r=0.043 p=0.822	r=0.215 p=0.254	r=-0.044 p=0.818	r=0.357 p=0.053	r=-0.078 p=0.682	r=-0.043 p=0.821

DM: Diabetes mellitus, HT: Hypertension, HbA1c: Glycated hemoglobin, TG: Triglyceride, HDL-C: High-density lipoprotein cholesterol, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, hs-CRP: Highly sensitive, CRP: Statistically significant values are shown in bold font (significance p<0.05)

Cobas Integra 400. Serum lipids (cholesterol, triglycerides, and high-density lipoprotein cholesterol [HDL-C]) were assayed using automated enzymatic methods (Dimension Vista 1500T Intelligent Lab System from Siemens Company-Germany) at the biochemistry laboratory.

Statistical analysis

Statistical analysis was performed by GraphPad Prism software (version 7.0, GraphPad Software, Inc., San Diego, CA). Descriptive statistics, such as mean ± standard deviation, were calculated for all estimated parameters. Comparison between two means was performed using unpaired Student t-test for normally distributed parameters. Associations between variables were examined using Pearson's correlation coefficients. All p values that were <0.05 were considered significantly different.

RESULTS

A total of 26 men and 50 women be recruited. Inferior mean HbA1c was found in patients receiving ADM with AHT drugs compare with those on ADM drugs only (p=0.0013). Lower denote systolic BP (p<0.0001) and diastolic BP (p=0.0078) were found in patients receiving ADM drugs only compared with patients receiving ADM with AHT drugs. Lower mean hs-CRP was found in women in receipt of ADM with AHT drugs compared with those on ADM drugs only (Table 1). Furthermore, the main AHT drugs used by the patients involved in this study were angiotensin receptor blockers (losartan and candesartan), angiotensin-converting enzyme inhibitors (captopril and enalapril), calcium channel blockers (CCBs) (amlodipine and diltiazem), and β-blocker drug carvedilol. Furthermore, the main ADM drugs used by the patients involved in this study were glibenclamide, glimepiride, metformin, and insulin.

Treatment manner had no effect on mean hs-CRP in men; however, there was a significant direct correlation of hs-CRP with HbA1c (p=0.002) and triglycerides (p=0.009), but inversely with HDL-C (p=0.011) in women receiving ADM drugs only. Furthermore, the treatment manner had no effect on mean hs-CRP in men and women receiving ADM with AHT drugs (Table 2).

DISCUSSION

This study be designed to investigate the association between drug treatments, glycemic control, and serum level of CRP in Iraqi patients receiving ADM drugs or ADM with AHT drugs.

Diabetes mellitus is associated with numerous complications. Hyperglycemia increased BP, dyslipidemia, oxidative stress, and inflammation are all characteristics of type 2 diabetes mellitus and are concerned in the development of vascular complications [23,24] so that control of diabetes leads to decreased risk of these complications. Most of the diabetic patients involved in our study were uncontrolled regardless of which ADM drug treatment was used. This study revealed that the lower mean of HbA1c was found in patients receiving ADM with AHT drugs compared with those on ADM drugs only. Few studies are found concerned with the combined effects of ADM with AHT drugs on the HbA1c level.

The previous study revealed that the adverse effect of some AHT drugs on blood glucose homeostasis may influence their cardiovascular protection role. Different classes of AHT drugs have different effects on blood glucose homeostasis. Some of the AHT drugs such as angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, some of the CCBs such as azelnidipine and manidipine, and some of the β-blockers such as carvedilol and nebivolol revealed to have advantageous effects on glucose metabolism. Conversely, diuretics and other β-blockers have an unfavorable effect on glucose metabolism [25].

Lower mean hs-CRP be found in women receiving ADM with AHT drugs compared with those on ADM drugs only. Treatment manners had no effect on mean hs-CRP in men; however, there was a significant direct correlation of hs-CRP with HbA1c and triglycerides, but inversely with HDL-C in women receiving ADM drugs only. Furthermore, the treatment manners had no effect on mean hs-CRP in men and women receiving ADM with AHT drugs.

CONCLUSION

These results indicated that high levels of hs-CRP are associated with poor glycemic control and dyslipidemia, therefore, consequently increased cardiovascular risk.

Due to the valuable effect of hs-CRP as a cardiovascular risk predictor, it should be included in routine monitoring of type 2 diabetic patients.

AUTHORS' CONTRIBUTION

None.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

- King DE, Mainous AG 3rd, Buchanan TA, Pearson WS. C-reactive protein and glycemic control in adults with diabetes. *Diabetes Care* 2003;260:1535-9.
- Yamada S, Gotoh T, Nakashima Y, Kayaba K, Ishikawa S, Nago N, et al. Distribution of serum C-reactive protein and its association with atherosclerotic risk factors in a Japanese population: Jichi medical school cohort study. *Am J Epidemiol* 2001;153:1183-90.
- Bautista LE, López-Jaramillo P, Vera LM, Casas JP, Otero AP, Guaracao AI, et al. Is C-reactive protein an independent risk factor for essential hypertension? *J Hypertens* 2001;19:857-61.
- Gayathri B, Vinodhini VM. High sensitive C-reactive protein and its relationship with other cardiovascular risk variables in obese, overweight and healthy individuals. *Asian J Pharm Clin Res* 2018;11:194-8.
- Senghor A, William E. Non-HDL and AIP compared to Hs-CRP in hypertriglyceridemic diabetics-a better cardiovascular risk marker? *Asian Pharm Clin Res* 2013;6:128-30.
- Hurlimann J, Thorbecke GJ, Hochwald GM. The liver as the site of C-reactive protein formation. *J Exp Med* 1966;123:365-78.
- Volanakis JE. Human C-reactive protein: Expression, structure, and function. *Mol Immunol* 2001;38:189-97.
- Prasad K. C-reactive protein and cardiovascular diseases. *Int J Angiol* 2003;12:1-12.
- Gabay C, Kushner I. Acute-phase proteins and other systemic responses to inflammation. *N Engl J Med* 1999;340:448-54.
- Anderson HC, McCarty M. Determination of C-reactive protein in the blood as a measure of the activity of the disease process in acute rheumatic fever. *Am J Med* 1950;8:445-55.
- Morrow DA, Ridker PM. C-reactive protein, inflammation, and coronary risk. *Med Clin North Am* 2000;84:149-61.
- Ridker PM, Cushman M, Stampfer MJ, Tracy RP, Hennekens CH. Inflammation, aspirin, and the risk of cardiovascular disease in apparently healthy men. *N Engl J Med* 1997;336:973-9.
- Ridker PM, Glynn RJ, Hennekens CH. C-reactive protein adds to the predictive value of total and HDL cholesterol in determining risk of first myocardial infarction. *Circulation* 1998;97:2007-11.
- Ridker PM, Hennekens CH, Buring JE, Rifai N. C-reactive protein and other markers of inflammation in the prediction of cardiovascular disease in women. *N Engl J Med* 2000;342:836-43.
- Prasad K. C-reactive protein increases oxygen radical generation by neutrophils. *J Cardiovasc Pharmacol Ther* 2004;9:203-9.
- Zeller JM, Sullivan BL. C-reactive protein selectively enhances the intracellular generation of reactive oxygen products by igG-stimulated monocytes and neutrophils. *J Leukoc Biol* 1992;52:449-55.
- Prasad K, Lee P. Suppression of oxidative stress as a mechanism of reduction of hypercholesterolemic atherosclerosis by aspirin. *J Cardiovasc Pharmacol Ther* 2003;8:61-9.
- Pasceri V, Cheng JS, Willerson JT, Yeh ET. Modulation of C-reactive protein-mediated monocyte chemoattractant protein-1 induction in human endothelial cells by anti-atherosclerosis drugs. *Circulation* 2001;103:2531-4.
- Lagrand WK, Visser CA, Hermens WT, Niessen HW, Verheugt FW, Wolbink GJ, et al. C-reactive protein as a cardiovascular risk factor: More than an epiphenomenon? *Circulation* 1999;100:96-102.
- Zwaka TP, Hombach V, Torzewski J. C-reactive protein-mediated low density lipoprotein uptake by macrophages: Implications for atherosclerosis. *Circulation* 2001;103:1194-7.
- American Diabetes Association. Standards of medical care in diabetes--2014. *Diabetes Care* 2014;37:S14-80.
- Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr., et al. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: The JNC 7 report. *JAMA* 2003;289:2560-72.
- Boyle PJ. Diabetes mellitus and macrovascular disease: Mechanisms and mediators. *Am J Med* 2007;120:S12-7.
- Beckman JA, Creager MA, Libby P. Diabetes and atherosclerosis: Epidemiology, pathophysiology, and management. *JAMA* 2002;287:2570-81.
- Rizos CV, Elisaf MS. Antihypertensive drugs and glucose metabolism. *World J Cardiol* 2014;6:517-30.