DOI: 10.24996/ijs.2024.65.10.10

ISSN: 0067-2904

Estimation of Some Antioxidant Factors in Postmenopausal Iraqi Women with Hypertension

Abeer Mohammed Jassim*, Zainab Khidhair Hussain
Department of Biology, College of Science, University of Baghdad, Baghdad, Iraq

Received: 22/5/2023 Accepted: 25/8/2023 Published: xx

Abstract
Postmenopausal women with hypertension may be linked with cardiovascular risk factors like visceral obesity. Changes in antioxidant levels and lipid profile are considered risk factors concerning heart disease that arises during postmenopausal. Ninety Iraqi women aged between 53-70 years, sixty women with postmenopausal hypertension, and thirty healthy postmenopausal women were selected as control for this study. Blood samples were taken to measure some antioxidants through enzyme-linked immune sorbent assay (ELISA) and lipid profile by enzymatic technique. Results showed that the mean of catalase levels was significantly lower in patients (257.62±6.99) compared towith the control group (499.30±13.08). Glutathione results were significantly lower in patients (10.99±0.26) compared with the healthy control (39.32±2.03). Cholesterol levels were significantly higher in patients (236.09±1.91), while lower levels were observed in the control group (172.67±4.92). Triglyceride levels were significantly higher both in patients (182.10±2.68) and the healthy group (145.92±5.85). HDL levels were significantly lower in patients (29.91±0.37) compared with the control group (43.02±1.38). VLDL levels were significantly higher in patients (36.49±0.54) compared with the control (29.16±1.17). LDL levels were significantly higher in patients (169.74±2.20) than in the control group (1 00.48±5.41). It can be concluded from the results that antioxidant levels decreased in postmenopausal women than in the control group. Elevation in lipid profile of postmenopausal women was observed compared with the control group.

Keywords: Hypertension, Postmenopausal, Antioxidant, Lipid profile.

تقدير بعض العوامل المضادة للأكسدة لدى النساء العراقيات بعد سن اليأس المصابات بارتفاع ضغط الدم

عبير محمد جاسم*, زينب خضير حسين
قسم علوم الحياة، كلية العلوم، جامعة بغدا، بغداد، العراق

الخلاصة
أن ارتفاع ضغط الدم هو أكثر اضطرابات القلب والأوعية الدموية شيوعًا ، كما انه سرعان ما أصبح يمثل تحديًا للصحة العامة في مناطق من العالم خاصة البلدان النامية ، حيث توقعت الدراسات زيادة بنسبة 80 ٪ في عدد ارتفاع ضغط الدم بحلول عام 2025 بسبب التغيير في مستويات مضادات الأكسدة ، وتناوب يزيد ملف الدهون كعامل خطر متعلق بأمراض القلب خلال فترة ما بعد انقطاع الطمث. تم اختيار 90 امرأة عراقية تراوحت

*Email: abeermohammed9595@gmail.com

أعمارهن بين 53−70 سنة. تم تقسيمهمن إلى مجموعتين: 60 امرأة بعد سن اليأس مصابات بارتفاع ضغط الدم في حين شملت المجموعة الثانية 30 امرأة بعد سن اليأس من الاصحاء ظاهريا كمجموعة سيطرة .
جمعت عينات الدم لتقدير بعض متغيرات مضادات الأكسدة عن طريق مقايسة الامتزاز المناعي المرتبط بالإنزيم (ELISA) وقياس الدهون باستخدام التقنية الأنزيمية.
أظهرت نتائج الدراسة أن مستويات كاتالاز (CAT) كانت أقل بشكل ملحوظ في المرضى (257.62 ± 6.99) مقارنة بالنساء السليمات. (499.30 ± 13.08). كانت نتائج الجلوتاثيون (GSH) أقل بشكل ملحوظ في المرضى
(10.99 ± 0.26) مقارنة مع النساء السليمات كمجموعةسيطرة (39.32 ± 2.03). كانت مستويات الكوليسترول أعلى بشكل ملحوظ في المرضى (236.09 ± 1.91) بينما كانت في المجموعة السليمة من النساء (172.67 ± 4.92). كانت مستويات الدهون الثلاثية أعلى بشكل ملحوظ في المرضى (182.10 ± 2.68) مقارنة بالنساء السليمات (145.92 ± 5.85). مستويات البروتين الدهني العالي الكثافة (HDL) أقل بشكل ملحوظ في المرضى (0.37±29.91) مقارنة بالمجموعة السليمة (43.02 ± 1.38). كانت مستويات كوليسترول البروتين الدهني منخفض الكثافة (VLDL) أعلى بشكل ملحوظ في المرضى (36.49 ± 0.54) مقارنة بالمجموعة السليمة (29.16 ± 1.17). كانت مستويات كوليسترول البروتين الدهني منخفض الكثافة (LDL) أعلى بشكل ملحوظ في المرضى (169.74 ± 2.20) مقارنة بمجموعة النساء السليمات (100.48 ± 5.41). وفقًا لهذه الدراسة ، تم التوصل إلى نتيجة مفادها أن هناك انخفاضًا في مستوى مضادات الأكسدة للمصابات بارتفاع ضغط الدم بعد سن اليأس مقارنةً بالنساء الغير مصابات من ذات الفئة وكذلك نستنتج ازدياد في مستويات الدهون للنساء المصابات بارتفاع ضغط الدم بعد سن اليأس مقارنة بالغير مصابات منهن .

Introduction

Postmenopausal women with hypertension may be linked with cardiovascular risk factors like visceral obesity, dyslipidemias, chronic low-grade inflammation, oxidative stress, endothelial dysfunction, and cardiac remodeling. Henceforth, population at high risk of cardiovascular disease must be protected by expanding the research for appropriate treatment and finding solutions [1]. Hypertension is one of the most prevalent cardiovascular disorders (CVD), CVD and is becoming a state problem worldwide, predominately in sophisticated regions. Studies expect 80% increase in the hypertension by the year 2025 [2]. Hypertension is considered as a sign of metabolic syndrome [3]. Due to turnover in society's economy with populations in recent decades, changing habits along with invalid diet types, smoking, alcoholism, and sedentary behavior, have an overall impact on people. Recognition of risk factors supports health actions such as lessening the risk factors and changing habits, can direct the initial avoidance of hypertension [4]. Besides this, it has been recorded that older women may be more vulnerable to cardiovascular diseases, perhaps due to impaired dipping patterns [5]. Alteration in heart morphology, action and compliance of arterial blood vessels all have been identified and reported for postmenopausal hypertension. Postmenopausal women have a vast extent of left ventricular hypertrophy and, hence, are at a significant risk of increased diastolic dysfunction compared to young adult women [6]. Shift in the autonomic nervous system and age can also boost postmenopausal hypertension [7]. It is known that hypertension may possibly be considered a sign of heart failure. Cross-sectioning archive shows a four-time rise in hypertension in postmenopausal women compared to the premenopausal women [8].

Antioxidants are materials that are effective in catching reactive oxygen species (ROS), and, therefore, they could be capable of lowering oxidative damage and high blood pressure. Antioxidants are used as therapeutic agents for arterial hypertension, though it has not been proven that taking antioxidants reduces arterial blood pressure, plus the description of antioxidant compounds alone or in combination under specific circumstances has no side

effects or reverse effects on the development of cardiovascular disease. There are optimal advanced antioxidants that have been tried, but to do this, a certain clinical condition with patients must be obvious as a key element. To make any advice within the context of antioxidant therapy, this is necessary rather than relying on alternate parameters [9].

Various data sources has showed that patients with hypertension have more accumulation of ROS [10]. Lately studies have determined a strong relationship between high blood pressure and some other parameters linked to ROS. Also, patients have an inadequate antioxidant status which adds more signs that oxidative damage may be involved in the pathophysiology of hypertension [11]. Oxidative stress, accompanied by its markers and parameters, is considered a chemical sign of hypertension [12]. Although some people with hypertension are not aware of their condition. As stated by the Indonesian National Institute of Heart, Lung and Blood, cholesterol levels may increase due to an inactive state which is a risk factor for heart and blood vessel disease [13].

Some studies found that low-density lipoprotein cholesterol (LDL) and triglyceride levels alter due to parasitic infections like *T. gondii* with elevation in the high-density lipoprotein (HDL) cholesterol levels [14]. To add diagnostic data set by healthcare providers in the clinical process lipid profile test has been added [15]. The aim of this study was to estimate the changes in lipid profile and some antioxidants in postmenopausal women with hypertension.

Material and Methods

Ethics and Subject Recruitment: The study was directly achieved after gaining ethical approval (0922/0106/on /28/9/2022) from the Scientific Research Committee at the University of Baghdad in Iraq. It was done in the Department of Biology, College of Science, University of Baghdad.

Experimental Design: The blood samples used for trial were taken from 90 females between 53_70 years in Baghdad Teaching Hospital. First group had sixty postmenopausal women with hypertension and the second group had thirty healthy postmenopausal subjects.

Collection of Blood Specimens: Venous blood was obtained from women of the experimental groups by syringes into gel tubes. Blood serum was obtained after allowing the blood to clot in the tube without anticoagulant for 10-20 min at room temperature. All samples serum separation was done by a centrifuge machine at 3000 rpm for five minutes.

Hematological Test: Complete blood count (CBC) was obtained by syringes and then kept into an EDTA tubes. Whole blood is needed to count CBC as only then the results appear on the screen of the hematology analyzer.

Biochemical Test: The antioxidant test involved human catalase (CAT) and human glutathione (GSH) by using the enzyme linked immunosorbent assay (ELISA) technique, according to the manufacturer's instructions(MyBioSource, USA). Lipid profile included levels of cholesterol [16], levels of triglyceride [17], HDL [18] and LDL [19], Also including VLDL [20] that was determined by enzymatic colorimetric method using a specified device (Human Reader HR , Germany).

Statistical Analysis: The Statistical Analysis System (SAS 2018) program was used to anlayze the effects of different groups (patients and control) on the studied parameters. T-test was used to compare between means.

Results and Discussion

Significant changes in the body mass index (BMI) in postmenopausal women (p<0.01) were observed between the mean of patients (28.19±0.59) and the control group (25.65±0.19). Significant differences were also detected in catalase levels in postmenopausal women (p<0.01) between patient women with a mean (of 257.62± 6.99) and control with a mean (of 99.30±13.08). Regarding glutathione levels for postmenopausal women, the result showed significant changes (p<0.01) between patients with a mean of 10.99± 0.26, while healthy women had a mean of 39.32±2.03.

A significant difference (p<0.01) in the mean value of cholesterol (236.09±1.91), triglycerides (182.10±2.68), and HDL (29.91±0.37) in postmenopausal patient women was detected as compared with the control group with a mean of 172.67±4.92, 145.92±5.85 and 43.02±1.38 respectively. Significant change (p<0.01) in VLDL was recorded between patients with a mean of 36.49±0.54, while healthy control group had a mean of 29.16±1.17. Significant change (p<0.01) in the mean value of LDL (169.74±2.20) level of patients was observed while the mean of control level was 100.48±5.41.

Also, a significant change (p<0.01) in the mean of diastolic blood pressure (8.76±0.06) and systolic blood pressure (16.00±0.15) was observed in hypertensive women compared with the control group with mean values of 7.73±0.12 and 11.60±0.14 sequentially.

A significant difference (p<0.01) between the mean value of HB patient women (12.89±0.16) was detected compared to the healthy women (12.32±0.24). No significant changes in mean values of platelets (253.90±970) and WBCs (7.97±0.39) were observed in postmenopausal women patients compared with the control group values (251±12.34),(7.87±0.32) (Tables 1 & 2) and (Figures 1 & 2).

Table 1: Levels of antioxidants parameters in postmenopausal women with hypertension and control group.

Parameters	Patients	Control	T-test
Age (Years)	59..45±0.68	57.50±0.97	**2.348NS**
BMI (kg/m²)	28.19±0.59b	25.65±0.19	**0.989****
Diastolic B.P (mmHg)	8.76±0.06b	7.73±0.12a	**0.253****
Systolic B.P (mmHg)	16.00±0.15a	11.60±0.14b	**0.476****
Catalase (µmol/L)	257.62±6.99c	499.30±13.08b	**26.878****
Glutathione (µmol/L)	10.99±0.26b	39.32±2.03a	**2.936****
HB (g/dl)	12.89±0.16a	12.32±0.24b	**0.574****
PLT*109 (cell/cu³)	253.90±9.70	251±12.34	**32.328NS**
WBCs*109 (cell/cu³)	7.97±0.39	7.87±0.32	**1.195NS**

Mean with different letters in the same row differ significantly.
**** (p≤0.01)**

Table 2: Levels of lipid profile parameters in postmenopausal women with hypertension and control group.

Parameters	Patients	Control	Normal Range	T-test
Cholesterol (mg/dl)	236.09±1.91a	172. 67±4.92c	< 200mg/dl	**8.747****
Triglyceride (mg/dl)	182.10±2.68b	145.92±5.85a	< 150mg/dl	
HDL (mg/dl)	29.91±0.37a	43.02±1.38b	45-65mg/dl	**11.149****
VLDL (mg/dl)	36.49±0.54c	29.16±1.17a	2-30mg/dl	
LDL (mg/dl)	169.74±2.20b	100.48±5.41c	130-159mg/dl	**2.200**** **2.242**** **9.782****

Mean with different letters in the same row differ significantly.
**** ($p \leq 0.01$)**

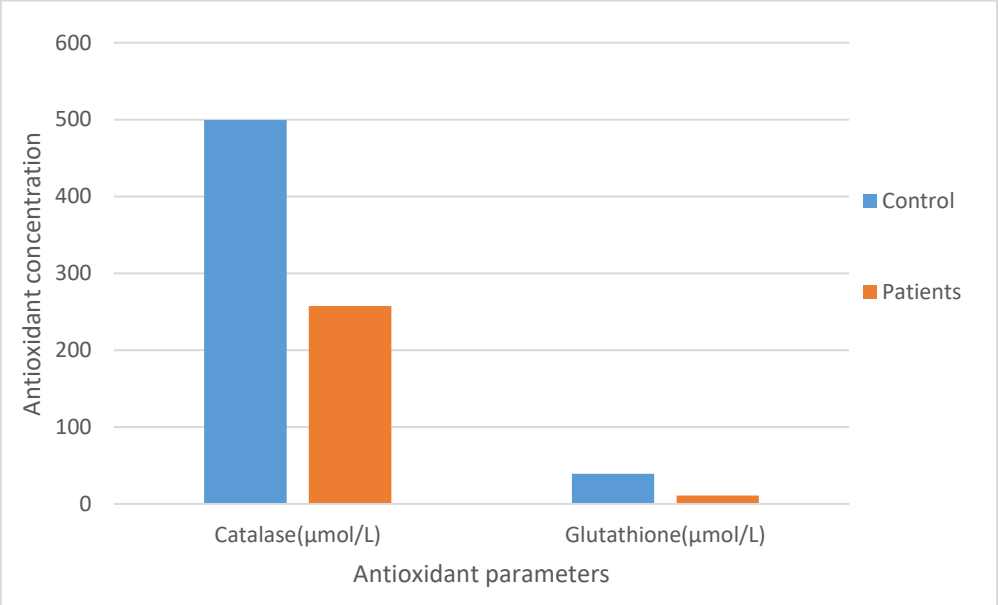

Figure1: Levels of antioxidant parameters in postmenopausal women with hypertensive and control groups.

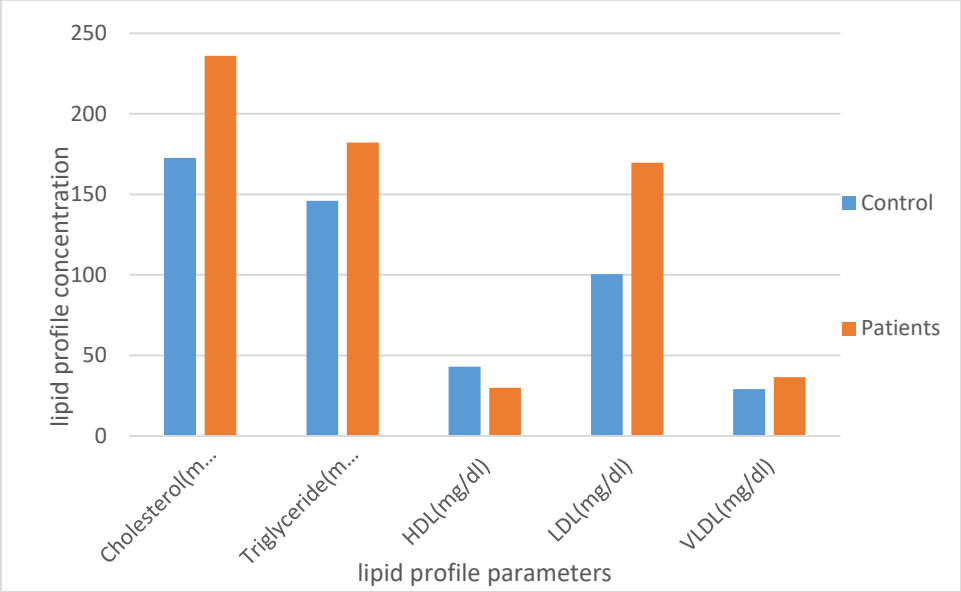

Figure 2: Lipid profile levels in postmenopausal women with hypertensive and control groups.

The older women are more likely to develop hypertension [21, 22]. In numerous studies, elevated triglycerides level has been indicated as a risk factor for hypertension [23, 24].

In other similar studies, triglycerides have been linked to a higher risk of prehypertension in skinny females but not males [25]. They demonstrated hypercholesteremia and high BMI (for example, being overweight or obese) as potentiated hypertension. Increased risk of metabolic syndrome and insulin resistance (IR) in overweight and obese individuals have been observed as having an interaction between BMI and hyperlipidemia [26]. This increases the likelihood of overweight and obese individuals developing hypertension. Postmenopausal women had a lower BMI than premenopausal women, but a higher percentage wwas either pre-hypertensive or hypertensive. This may be because postmenopausal women had a higher fat percentage and were more obese in their region, according to the findings of this study. Asian Indians have a lower BMI than Caucasians which is associated with lower cardiovascular disease risk [27].
Cholesterol is a changeable sign of hypertension, and there is likelihood of developing it with increased cholesterol level [13].

The body's cholesterol level can increase due to inactivity which is considered a risk factor for heart and blood vessel disease [28]. LDL cholesterol and triglyceride levels are elevated in the blood. In contrast, decrease in HDL levels may lead to an increase in the rate of CVD combined with hypertension [29]. According to clinical data, MDA and lipid peroxides indicate oxidative stress that elevates in patients with essential hypertension and congestive heart failure [10, 30].

Whereas those patients have significantly lower levels of endogenous antioxidants [31]. CAT activity decreases in untreated hypertensive patients, although antihypertensive medication can also increase it [32].

Conclusion

Through this study we concluded that antioxidant levels (GSH & CAT) elevated in hypertensive postmenopausal women. Also, lipid profile levels in hypertensive women showed decrease in HDL level, on the other hand cholesterol, triglycerides, VLDL, and LDL levels increased.

Acknowledgment

I express my utmost respect and gratitude to Baghdad Teaching Hospital and the dedicated laboratory personnel for their invaluable assistance towards the successful completion of this work..

References

[1] V. Guetta and R. O. Cannon III, "Cardiovascular effects of estrogen and lipid-lowering therapies in postmenopausal women," *Circulation*, vol. 93, no. 10, pp. 1928-1937, 1996.

[2] P. M. Kearney, M. Whelton, K. Reynolds, P. Muntner, P. K. Whelton, and J. He, "Global burden of hypertension: analysis of worldwide data," *The lancet*, vol. 365, no. 9455, pp. 217-223, 2005.

[3] E. A. Hassan, W. S. Al-Zuhairi, and M. A. Ahmed, "Serum Cortisol and BMI in Chronic Diseases and Increased Early Cardiovascular Diseases," *Baghdad Science Journal*, vol. 13, no. 2.2 NCC, pp. 0399-0399, 2016.

[4] W. H. Organization, "Non-communicable diseases in South-East Asian Region-A Profile. 1998," ed: WHO.

[5] P. Di Giosia, P. Giorgini, C. A. Stamerra, M. Petrarca, C. Ferri, and A. Sahebkar, "Gender differences in epidemiology, pathophysiology, and treatment of hypertension," *Current atherosclerosis reports*, vol. 20, pp. 1-7, 2018.

[6] S. M. McBride, F. W. Flynn, and J. Ren, "Cardiovascular alteration and treatment of hypertension: do men and women differ?," *Endocrine*, vol. 28, pp. 199-207, 2005.

[7] W. Vongpatanasin, "Autonomic regulation of blood pressure in menopause," in *Seminars in reproductive medicine*, 2009, vol. 27, no. 04: © Thieme Medical Publishers, pp. 338-345.

[8] J. Staessen, H. Celis, and R. Fagard, "The epidemiology of the association between hypertension and menopause," *Journal of human hypertension*, vol. 12, no. 9, pp. 587-592, 1998.

[9] H. H. Schmidt *et al.*, "Antioxidants in translational medicine," *Antioxidants &redox signaling*, vol. 23, no. 14, pp. 1130-1143, 2015.

[10] R. Rodrigo, H. Prat, W. Passalacqua, J. Araya, C. Guichard, and J. P. Bächler, "Relationship between oxidative stress and essential hypertension," *Hypertension Research*, vol. 30, no. 12, pp. 11.2007 ,1167-59

[11] R. M. Touyz and E. L. Schiffrin, "Increased generation of superoxide by angiotensin II in smooth muscle cells from resistance arteries of hypertensive patients: role of phospholipase D-dependent NAD (P) H oxidase-sensitive pathways," *Journal of hypertension*, vol. 19, no. 7, pp. 1245-1254, 2001.

[12] Y. M. Aldeen, P. Habeeb, and A. H. Jawad, "Study Oxidative Stress Statues In Hypertension Women," *Baghdad Sci J*, vol. 13, no. 2, pp. 407-13, 2016.

[13] H. Maryati, "Hubungan Kadar Kolesterol Dengan Tekanan Darah Penderita Hipertensi Di Dusun Sidomulyo Desa Rejoagung Kecamatan Ploso Kabupaten Jombang the Correlation of Cholesterol Levels with Blood Pressure Hypertension Patients in Sidomulyo Rejoagung Village Distric," *Jurnal keperawatan*, vol. 8, no. 2, pp. 127-137, 2017.

[14] H. Z. Ali and H. S. Al-Warid, "Changes in Serum Levels of Lipid Profile Parameters and Proteins in Toxoplasma gondii Seropositive Patients," *Iraqi Journal of Science*, pp. 801-810, 2021.

[15] H. R. Baqi, T. H. Abdullah, D. A. Ghafor, and S. H. Karim, "Establishment of Lipid Profile Reference Intervals in a Sample Population of Halabja City, Kurdistan Region of Iraq," *Iraqi Journal of Science*, pp. 2855-2861, 2021.

[16] J. D. Griffin and A. H. Lichtenstein, "Dietary cholesterol and plasma lipoprotein profiles: randomized controlled trials," *Current nutrition reports*, vol. 2, pp. 274-282, 2013.

[17] Z. K. Hussain, "Study of Possible Changes in Lipid Profiles between Premenopausal and Postmenopausal Women with Hyperthyroidism and Others with Hypothyroidism," *Iraqi Journal of Science*, vol. 63, no. 12, pp. 5139-5146, 2022.

[18] R. Renjith and N. Jayakumari, "A simple economical method for assay of atherogenic small dense low-density lipoprotein-cholesterol (sdLDL-C)," *Indian Journal of Clinical Biochemistry*, vol. 26, pp. 385-388, 2011.

[19] S. S. Martin *et al.*, "Comparison of a novel method vs the Friedewald equation for estimating low-density lipoprotein cholesterol levels from the standard lipid profile," *Jama,* vol. 310, no ,19 .pp. 2061-2068, 2013.

[20] A. Vujovic *et al.*, "Evaluation of different formulas for LDL-C calculation," *Lipids in health and disease,* vol. 9, no. 1, pp. 1-9, 2010.

[21] O. A. Sanuade, S. Boatemaa, and M. K. Kushitor, "Hypertension prevalence, awareness, treatment and control in Ghanaian population: Evidence from the Ghana demographic and health survey," *PloS one,* vol. 13, no. 11, p. e0205985, 2018.

[22] J. Kishore, N. Gupta, C. Kohli, and N. Kumar, "Prevalence of hypertension and determination of its risk factors in rural Delhi," *International journal of hypertension,* vol. 2016, 2016.

[23] B. Zhu *et al.*, "A high triglyceride glucose index is more closely associated with hypertension than lipid or glycemic parameters in elderly individuals: a cross-sectional survey from the Reaction Study," *Cardiovascular diabetology,* vol. 19, no. 1, pp. 1-16, 2020.

[24] F. Zhang *et al.*, "The association of triglyceride and glucose index, and triglyceride to high-density lipoprotein cholesterol ratio with prehypertension and hypertension in normoglycemic subjects: A large cross-sectional population study," *The Journal of Clinical Hypertension,* vol. 23, no. 7, pp. 1405-1412, 2021.

[25] Z. Y. Zeng, S. X. Liu, H. Xu, X. Xu, X. Z. Liu, and X. X. Zhao, "Association of triglyceride glucose index and its combination of obesity indices with prehypertension in lean individuals: A cross-sectional study of Chinese adults," *The Journal of Clinical Hypertension,* vol. 22, no. 6, pp. 1025-1032, 2020.

[26] A. Rao, V. Pandya, and A. Whaley-Connell, "Obesity and insulin resistance in resistant hypertension: implications for the kidney," *Advances in chronic kidney disease,* vol. 22, no. 3, pp. 211-217, 2015.

[27] M. A. Banerji, N. Faridi, R. Atluri, R. L. Chaiken, and H. E. Lebovitz, "Body composition, visceral fat, leptin, and insulin resistance in Asian Indian men," *The journal of clinical endocrinology & metabolism,* vol. 84, no. 1, pp. 137-144, 1999.

[28] L. M. Amanda, S. Sholihin, and E. Toga, "Relationship between cholesterol levels and anxiety levels among hypertension patient in the community setting," *The Journal of Palembang Nursing Studies,* vol. 2, no. 1, pp. 75-82, 2023.

[29] S. Mora, R. J. Glynn, and P. M. Ridker, "High-density lipoprotein cholesterol, size, particle number, and residual vascular risk after potent statin therapy," *Circulation,* vol. 128, no. 11, pp. 1189-1197, 2013.

[30] M. Keith *et al.*, "Increased oxidative stress in patients with congestive heart failure," *Journal of the American College of Cardiology,* vol. ,31no. 6, pp. 1352-1356, 1998.

[31] J. Pedro-Botet, M. Covas, S. Martin, and J. Rubies-Prat, "Decreased endogenous antioxidant enzymatic status in essential hypertension," *Journal of human hypertension,* vol. 14, no. 6, pp. 343-345, 2000.

[32] D. Simic *et al.*, "Byproducts of oxidative protein damage and antioxidant enzyme activities in plasma of patients with different degrees of essential hypertension," *Journal of human hypertension,* vol. 20, no. 2, pp. 149-155, 2006.