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Carotid Doppler-Related Risk Factors in Ischemic Stroke Patients Admitted to Al-Sadder Teaching Hospital, Al-Najaf Province, Iraq

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Abstract: The World Health Organization (WHO) has reported an increase in the number of deaths among Iraqi citizens due to strokes. This paper aims to assess and discuss the use of Doppler imaging in radiological evaluations, with a particular focus on the identification of risk factors. The risk factors associated with stroke in the current cohort of patients were compared with those identified in a previous study conducted in Iraq.

The research comprised in-patients from 4 February 2022 to 20 May 2023, with stroke diagnostic tests including ECG (electrocardiogram), 2D-M mode echocardiography, brain CT scan, and carotid Doppler. The male gender exhibited a higher mean age than their female counterparts ($p < 0.01$). Among male patients, 28 (43.75%) were above 70 years old, while among women, 20 (41.67%) were.

The most common risk factors for older patients (≥70 years) are hypertension, diabetes, and dyslipidemia. In the event that abnormalities were identified, patients underwent a carotid Doppler ultrasound scan. The results indicated that 75.71% of patients exhibited one-sided stenosis, while the remaining patients exhibited bilateral stenosis. Obesity, hypertension, and diabetes were specifically associated with the presence of a hetero-plaque, whereas stenosis type was associated with age, body mass index (BMI), hypertension, diabetes, and dyslipidemia.

Keywords: Ischemic Stroke, Carotid Doppler, Risk Factors, Stroke Death, Al-Najaf Province, Iraq.

Introduction

According to the Global Burden of Disease Report II, strokes are a major cause of global death after heart disease. As noted in the World Health Organization (WHO) factsheet on cerebrovascular diseases published on January 26th,2021, stroke was responsible for 8% of all deaths globally last year, making it the second most common cause among cardiovascular conditions. Brain thromboembolism leading to ischemic stroke may result from vascular disease affecting blood supply within this organ by internal carotid and vertebral arteries.[1,2]

modifiable risk factors for stroke comprise hypertension, dyslipidemia, diabetes mellitus, atrial fibrillation, and being a smoker; non-modifiable risks may stem from gender, age, ethnicity, heredity, or some race. [3]. According to WHO data, the number of deaths in Iraq attributable to stroke has increased substantially over time. The proportion of deaths due to stroke increased from 6.53% to 14.19% from 2018 to 2020. In 2018, Iraq had an age-standardized stroke death rate of 75.79 per 100,000 population, where it ranked 85th in the world. This figure will more than doubled by 2020, reaching 128.44 per 100,000 population, thus placing it at position 31 worldwide. Henceforth, Iraq marked stroke mortality in the form of the third most leading cause of mortality.[4]. Limited research has focused on ischemic stroke in various Iraqi cities, including Duhock [5-7], Baghdad [4,8,9], Erbil [10,11], Basrah [12], Al-Diwanya [13], Diala [14] and Babylon [15]. The aim of this study carried out in the Iraqi-Najaf Province is to analyze the radiological findings and the Colored Doppler images for detecting the potential risk factors and comparing them with what previous studies in Iraq had recorded for those who have been suffering from a stroke.

Patients & methods

Researchers conducted a study on 120 patients with clinical ischemic stroke at Al-Sadder Teaching Hospital in Al-Najaf Province, Iraq, from April 2022 to May 2023. All the patients were diagnosed with carotid-ischemic infarction verified by CT/MRI scan, and echocardiogram excluded cardioembolism. Out of this number, 68 were men, while the rest were women, making them 52 years of age or older each. The people included in our survey were older than 41 years but younger than 85 years; their information regarding whether they suffered from high blood pressure, whether they had diabetes, or smoked tobacco products. High perplexity is characterized by redundancy of sentences and ideas, resulting in difficult-to-understand or redundant content. High burstiness occurs when sentences have a variation between short, concise phrases and long, complex ones, which helps to capture the reader's attention. BMI was categorized as underweight (<18.5 kg/m2), normal weight (18.5-24.9 kg/m2), overweight (25.0-29.9 kg/m2), and obese (≥30.0 kg/m2) based on Iraqi population data. Blood biochemistry, lipid profiles, glucose levels, HbA1C liver and kidney function tests were conducted. Radiological assessments included ECG echocardiography, CT scan, and carotid Doppler. CT scan was crucial for stroke diagnosis. TOAST criteria were used for lacunar infarction assessment. Carotid Doppler with color Doppler image was used to determine stenosis degree and plaque morphology (hetero homo indeterminate). Hetero-plaque had a complex echo pattern with focal anechoic areas, while homo-plaque had a uniform echo pattern with a smooth surface.

Statistical Analysis

The IBM SPSS V.28 software was employed in the processing of the data for this study. A series of statistical analyses were conducted in order to ascertain the relationship between risk factors and the various components of ischemic stroke. The statistical analyses employed were both univariate and multivariate logic regression analyses. In conducting this analysis, the criterion of a p-value of less than 0.05 was employed.

Results:

"Tables 1 and 2 display the demographic profile of the study's patients. The male population was of a greater average age compared to the female group (<0.01), but most of them were old, having ≥70 years- 30/68.18% male patients, including 40 patients among them who had attained 45 years old while 49 other patients were just above this age category…)" In respect to body mass index (BMI), both men and women showed higher prevalence rates among those who are overweight.".

Table 1: Age records of patients

Gender	Min.	Max.	Mean ±SD
Males	44	85	68.10±9.80
Females	41	81	55.34±10.16

Table 2: Gender distribution of patients concerning age groups and BMI (n=120)

Parameters	Males(68)	Females (52)	Total (120)
Age (years)			
<50	12(17.65)	12(23.08)	24(20.00)
50-69	26(38.24)	18(34.62)	44(36.67)
≥70	30(44.12)	22(42.31)	52(43.33)
BMI			
Underweight	12(17.65)	9(17.31)	21(17.50)
Normal weight	13(19.12)	8(15.38)	21(17.50)
Overweight	18(26.47)	15(28.85)	33(27.50)
Obese	25(36.76)	20(38.46)	45(37.50)

Table 3 provides an overview of the risk factors for ischemic stroke with respect to age and BMI. For older individuals (aged 70 or over), the main risks were hypertension, diabetes, and dyslipidemia, while smoking accounted for a large part of the risk associated with strokes in the younger population (50–69 years). In obese individuals, all these risks are much higher.

Table 3: Stroke risk factors concerning age and BMI

Parameters	Hypertension	Diabetes	Dislipidemia	Smoking	p-value
Age (years)					
<50 (n=24)	14(58.33)	16(66.67)	9(37.50)	18(75.00)	<0.01
50-69(n=44)	35(79.55)	32(72.73)	33(75.00)	38(86.36)	
≥70(n=52)	48(92.31)	42(80.77)	39(75.00)	34(65.38)	
Total (n=120)	97(80.83)	90(75.00)	81(67.50)	90(75.00)	
BMI					
UW(n=21)	10(47.62)	11(52.38	12(57.14)	10(47.62)	<0.01
NW(n=21)	16(76.19)	13(61.90)	18(85.71)	13(61.90)	
Ow(n=42)	38(90.48)	36(85.71)	26(61.90)	35(83.33)	
O (n=45)	33(73.33)	32(71.11)	32(71.11)	32(71.11)	
Total (n=120)	97(80.83)	92(76.67)	88(73.33)	90(75.00)	

The study performed carotid Doppler ultrasound for one hundred and twenty individuals, of which carotid stenosis was observed in seventy-six subjects (63.33%), who were found to have ipsilateral stenosis in sixty-four cases (84.21%) (fig 1). In relation to types of stenosis, there were five determinants, as outlined in Table 5. Patients with ipsilateral stenosis were 2.29 times more likely to have obesity than those without it. The chances of developing high blood pressure were 4.13 times higher among those suffering from hypertension in comparison with bilateral stenosis sufferers. Diabetes was the main predictor variable(Random Sampling).

Fig 1: Doppler findings of present patients

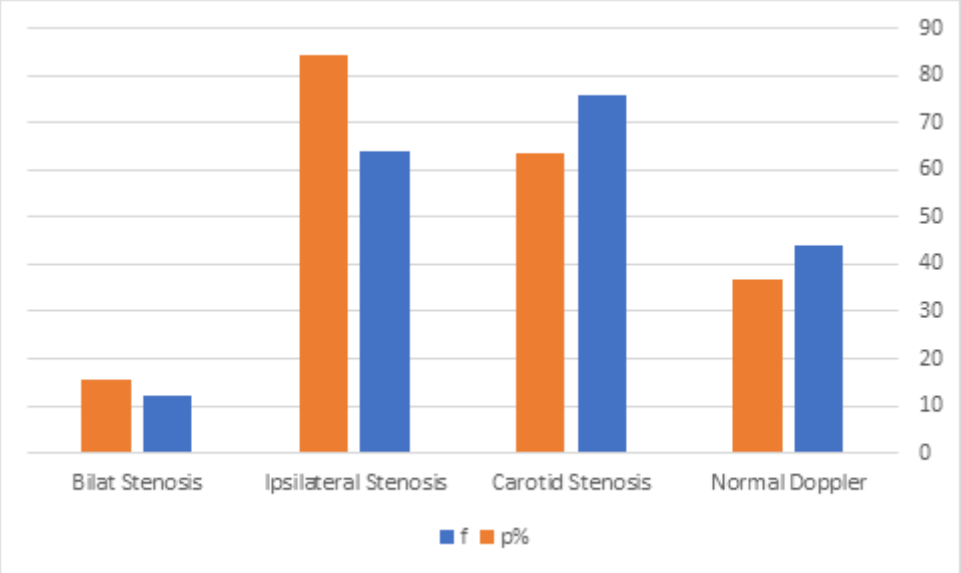


Table 4: Risk factors concerning type of stenosis

Variables	Ipsilateral Stenosis	Bilateral Stenosis	Univariate Analysis P value	Multivariate Analysis		
				β	OR (95%CI	P value
Age (Mean±SD)	60.53±10.47	68.13±8.32	0.045	0. 34		
Sex(M/F), %	28/25	9/8	0.132	0.29	1.07(0.82-1.91)	NS
BMI(Obese), %	59.82	46.14	0.011	0.22	2.29(1.71-3.11)	0.000
HT, %	82	56	<0.001	0.59	4.13(2.2-6.41)	0.000
D.M, %	53	32	<0.001	0.82	3.22(1.3-4.36)	0.000
DL, %	74	34	<0.001	0.51	2.18(1.31-2.41)	0.002
SM	43	48	0.62	0.13	0.91(0.7-1.2)	0.66 NS

The result of univariate and multivariate logistic regression analysis concerning the type of Plaque is shown in Table 6. Three factors significantly associated with hetero-plaque were obesity (OR 2.39, 95% CI 1.82-3.45), HT (OR 3.61, 95% CI 1.1-5.32), and D.M (OR, 3.32 95% CI 1.4-4.96). There were no significant differences in age, sex, Dl, and smoking distributions.

Table (5) Risk factors concerning the type of Plaque

Variables	Hetero-plaque	Homo-plaque	Univariate Analysis P value	Multivariate Analysis		
				β	OR(95%CI	P value
Age (Mean ±SD)	66.12±9.61	62.23±9.81	0.13NS	0.02		
Sex(M/F), %	58/42	41/59	0.16NS	0.97	1.30(1.4-2.6)	0.30NS
BMI(Obese) ,%	69.23	34.24	0.003	0.79	2.39(1.82-3.45)	0.000
HT, %	87	52	<0.001	0.43	3.61(1.1-5.32)	0.000
D.M, %	76	43	<0.001	0.72	3.32(1.4-4.96)	0.000
DL, %	45	42	0.72 NS	0.26	1.12(0.81-1.41)	0.63 NS
SM	35	33	0.55NS	0.11	0.96(0.3-1.4)	0.32NS

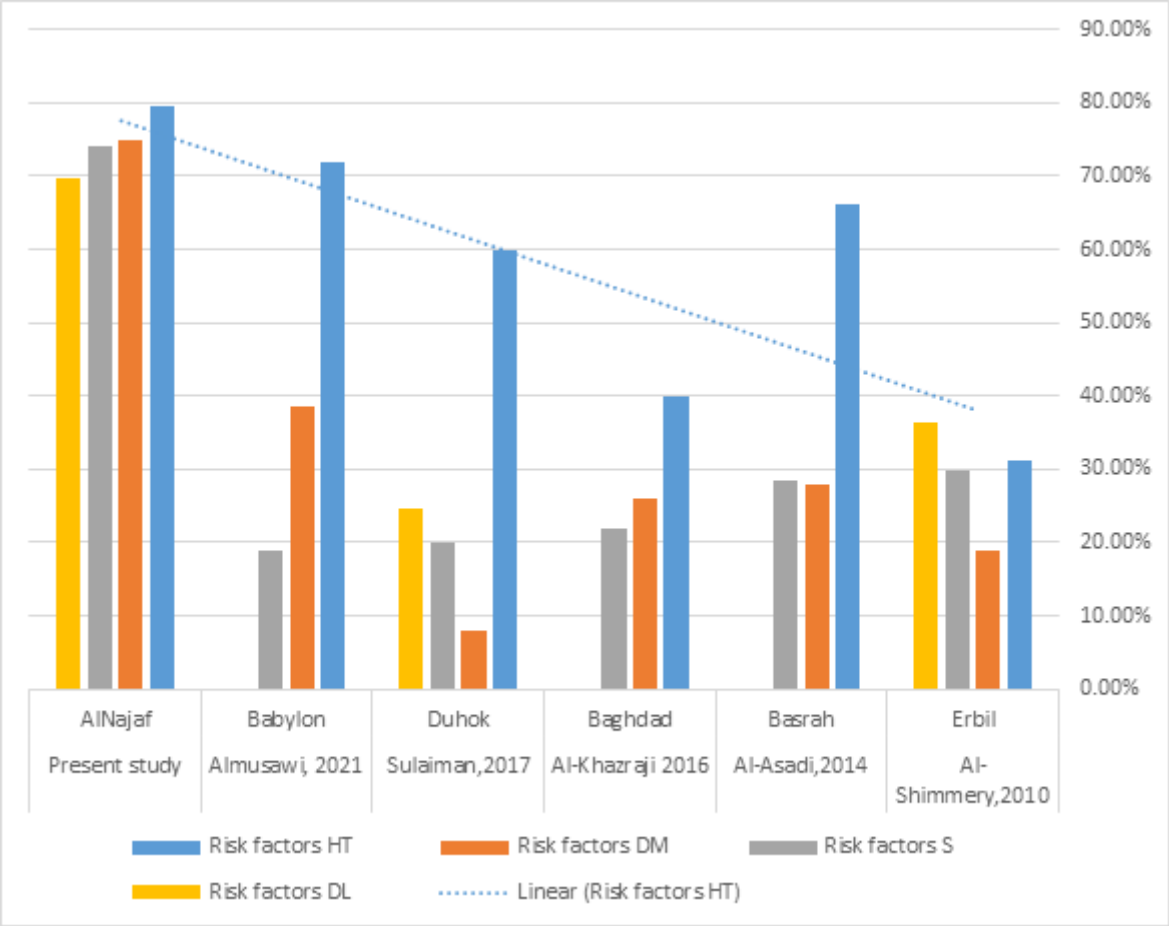
Discussion:

Several research findings suggest several risks that lead to ischemic stroke those, include age, gender, obesity, hypertension, diabetes, hypercholesterolemia, and smoking [16-23]. Per our study, we found out that males have an average age of 68.10±9.80 years as opposed to 55.34±10.16 years among females, with the majority of cases happening in individuals who are 70 years or older. This is consistent with what has been demonstrated through some previous investigations where the number of patients keeps increasing as they grow older, leading to more cases being reported over time [22-26]. In our study, over 70% of the patients were either overweight or obese, and it was found that obesity was one of the main reasons for the disease. Additionally, other studies have shown obesity to be an important predictor in cases of ischemic stroke". [23,27,28]

Diabetes has also been highlighted as a predictor of different types of strokes [29], along with traditional risk factors like hypertension, diabetes, smoking, and high cholesterol [20, 30-32]. These traditional risk factors were still prevalent among the patients in our study.

It can be observed that strokes were found in varying proportions among Iraqi patients living in various cities as a result of certain risk factors. Among these, hypertension, notably in the case of elderly people, was found to be a significant risk factor. Furthermore, it was epidemic in several parts of Iraq (Table 6).

Fig 2: Ischemic stroke risk factors in different Iraqi regions.



Among Iraqi patients, varying incidence rates of strokes were linked to different risk factors, with hypertension being identified as the most dangerous factor, especially among older patients aged [33-35]. A comprehensive analysis of the causes and factors associated with occlusive peripheral arterial disease (PAD) revealed a number of significant risk factors, including obesity (a BMI over 30), hypertension, diabetes, and hyperlipidemia. Our findings indicate that obesity, hypertension, and diabetes represent major risk factors for ipsilateral stenosis, with this risk being particularly pronounced in individuals with a BMI over 30. This association has been observed in over 80 years of clinical studies, as evidenced by a recent analysis of 13 clinical factors in a Cox regression model. [36].

Conclusions:

Identifying the risk factors for ischemic stroke patients is essential in identifying those at higher risk. An evaluation should take into account factors that can be changed, such as high blood pressure, diabetes, smoking, high cholesterol, and atrial fibrillation, as well as factors that cannot be changed, like age, gender, and family history of stroke. Researchers used logistic regression analyses to assess risk factors related to stenosis and plaque type. Recent studies indicate that advanced-age obesity, high blood pressure, diabetes, and dyslipidemia are the most significant risk factors for different types of ischemic stroke. A recent study with Iraqi patients found that obesity, high blood pressure, and diabetes are more common in hetero-plaque types.

References

1. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990– 2019: A systematic analysis for the Global Burden of Disease Study 2020, 396, 1204– 1222.

2. World Health Organization (WHO). WHO Methods and Data Sources for Global Burden of Disease Estimates 2000–2019; Global Health Estimates Technical Paper 2020, WHO/DDI/DNA/GHE, WHO: Geneva, Switzerland.

3. Touboul, J. et al. Carotid Intima-Media Thickness, Plaques, and Framingham Risk Score as Independent Determinants of Stroke Risk. Stroke 2005, 36, 1741.

4. Baktash, M. Q.; Ali, M. M.; Hassan, A. A.; Aziz. A. A. Iraqi Adults Individuals Attending AL-Sheikh Zayed Hospital in Baghdad City. Advances in Health Sciences Research 2021, vol. 38.

5. Nasir, A. S.; Arteen SA; Jaladet MS. Methylenetetrahydrofolate reductase C677T polymorphism in Iraqi patients with ischemic stroke. Neurology India 2009, 57, 5, 631-636.

6. Sulaiman, M. A.; and Al-Rawi, W. W. Profile of stroke patients admitted to Azadi Teaching Hospital in Duhok. Duhok Medical Journal 2017, 11, 2, 46-58.

7. Sulaiman, M. A. Metabolic syndrome among stroke patients in Duhok Kurdistan/Iraq. Duhok Medical Journal 2018, 12, 2, 102-111.

8. Hasan, Z. N; Hussein, M. Q; Haji, G. F. Hypertension as a risk factor: Is It Different in Ischemic Stroke and Acute Myocardial Infarction Comparative Cross-Sectional Study? International Journal of Hypertension 2011, 2011.

9. Al-Khazraji, A. K. Hyponatremia in a Group of Iraqi Patients with Stroke. Iraqi JMS 2016, 14, 2, 191-196.

10. Ismail, K. H.; Al-Tawil, N. G.; Al-Hadithi, T. S. Case fatality rate of the first stroke in Erbil city. Zanco J. Med. Sci. 2010, 14, 1, 14-19.

11. Al-Shimmery, E. K; Amein, S. H; Al-Tawil, N. G. Prevalence of silent stroke in Kurdistan, Iraq. Neurosciences Medical Journal, 2010, 15, 3, 167-171.

12. Al-Asadi, J. N.; Habib, H. A. Risk factors and 30-day case fatality of first-ever stroke in Basrah, Iraq. Nigerian Medical Journal 2014, 55, 3, 209-213.

13. Kadhim, M. M.; Shakir, A. Serum macrophage migration inhibitory factor level in a patient with ischemic stroke in Iraqi population. Medico-Legal Update 2020, Vol. 20, 4, 1729-1734.

14. Basee, H. H.; Lateef, I. A.; Wissam, F.; Hassan, W. F. Review of stroke in Diyala-Iraq. Int. J. Adv. Res. Biol. Sci. 2018, 5, 3, 15-19.

15. Almusawi, A. A.; Ebdan, H. A.; Fadhil, A. S; Alnasrawy, J. K; Al-Tharwanee, Q. M.; Al-Duhaimi M. M. Stroke Characteristics Among Patients Admitted to Al-Sadiq Teaching Hospital. International Journal of Drug Delivery Technology 2021, 11, 2, 379-382.

16. Pengpid, S.; Peltzer, K. Overweight and Obesity Among Adults in Iraq: Prevalence and Correlates from a National Survey in 2015. Int. J. Environ. Res. Public Health 2021, 18, 4198, DOI:10.3390/ijerph180 84198.

17. Gyawali, M.; Sharma, P.; Karki, D. Study of Carotid Doppler in Patients with Ischemic Stroke. Journal of Brain and Spine Foundation Nepal 2021, 2, 1, 24-30.

18. Pathak, V.; Kanth, R.; Pant, H. Stroke: A Case Series Study in Nepal Medical College Teaching Hospital. Nepal Med Coll J. 2006, 8, 3, 180-185.

19. Fernandes, M.; Keerthiraj, B.; Mahale, A. R.; Kumar, A.; Dudekula, A. Evaluation of Carotid Arteries in Stroke Patients Using Color Doppler Sonography: A prospective study conducted in a tertiary care hospital in South India. Int. J. Appl. Basic Med. Res 2016, 6, 1, 38- 44.

20. Bharathi, B. M; Gullapalli, R. A Study on Prevalence of Carotid Artery Stenosis in Acute Ischemic Stroke Patients in Malappuram, Andhra Pradesh. India. J. Res. Med. Sci. 2019, 7, 6, 2146-2150.

21. BK, S. K; Baral, S.; Paudel, N.; Neupane, H. Ischemic Stroke and its Association with Risk Factors at Nepalgunj Medical College Teaching Hospital Kohalpur. JNGMC.,2020, 18, 2, 48-50.

22. Jamalpour, H., & Yaghoobi-Derabi, J. Cultural memory and neurocritical reading of Ian McEwan's atonement. Revista de Investigaciones Universidad del Quindío, 2022, 34(S2), 436-442.

23. Sherafatizangeneh, M., Farshadfar, C., Mojahed, N., Noorbakhsh, A., & Ardalan, N. Blockage of the Monoamine Oxidase by a Natural Compound to Overcome Parkinson's Disease via Computational Biology. Journal of Computational Biophysics and Chemistry, 2022, 21(3), 373-387.

24. Shariati, A., Azaribeni, A., Hajighahramanzadeh, P., & Loghmani, Z. Liquid-liquid equilibria of systems containing sunflower oil, ethanol, and water. APCBEE procedia, 2013, 5, 486-490.

25. Asadipour, A., Mehrabani, M., & Najafi, M. L. Volatile oil composition of Centaurea aucheri (DC.) Wagenitz. DARU Journal of Pharmaceutical Sciences, 2005, 13(4), 160-164.

26. Tightiz L, Yoo J. A Review on a Data-Driven Microgrid Management System Integrating an Active Distribution Network: Challenges, Issues, and New Trends. Energies. 2022 Nov 21;15(22):8739.

27. Wu, Z.; Huang, Z.; Lichtenstein, A. H; Liu, Y.; Chen, S.; Jin, Y.; Na, M.; Bao, L.; Wu, S.; Gao, X. The risk of ischemic stroke and hemorrhagic stroke in Chinese adults with low-density lipoprotein cholesterol concentration. BMC Medicine 2021, 19, 1–12.

28. Rahman, T.; Islam, M.; Masihuzzaman, S. Abdominal Obesity is a Risk Factor for Ischemic Stroke. 2011, 27, 2, 69–73.

29. Chen, Z; Iona, A.; Parish, S.; Chen, Y.; Guo, Y.; Bragg, F.; et al. Articles Adiposity and risk of ischemic and hemorrhagic stroke in 5 million Chinese men and women: a prospective cohort study. 2018, 6, 630–640.

30. Annas, S; Aswi, A; Abdy, M.; Poerwanto, B. Binary Logistic Regression Model of Stroke Patients: A Case Study of Stroke Centre Hospital in Makassar. IJSA 2022, 6, 1, 161-169.

31. Rashid, M. H.; Kashem, M.; Biswas, S.; Hoque, M. M. Risk Factors in Young Stroke. Journal of Medicine 2019, 21, 1, 26–30.

32. Dhanabalan, B.; Dutta, A.; Pegu, A. K.; et al. Study of etiological and clinical profile of stroke patients with special reference to baseline intracranial hemorrhage score in hemorrhagic stroke in North East India – a hospital-based cross-sectional study. J Evolution Med. Dent. Sci. 2021, 10, 13, 947-951.

33. Saka, M.; Shabu, S.; Shabila, N. Prevalence of hypertension and associated risk factors in older adults in Kurdistan, Iraq. Eastern Mediterranean Health Journal 2020, 26, 3, 268-275.

34. Amen, S. O.; Rasool, B. Q; Muhammad, H. M. Hypertension in Iraq. Med. J. Babylon 2021, 18, 275.

35. Hamid, M. B. Clinical characteristics and outcomes of acute coronary syndromes in a group of Iraqi patients. Iraqi JMS 2016, 14, 304-11.

36. Hammar, K; Laska, C. L.; Wester, P.; Mani, K.; Lundstrom, A.; Jonsson, M. Low Incidence of Late Ipsilateral Ischemic Stroke After Treatment for Symptomatic Carotid Stenosis in Sweden. Increased Risk in the Elderly and After Carotid Stenting. Eur J Vasc Endovasc Surg 2022, 63, 2432