Carotid artery screening in asymptomatic individuals of different ethnic origins

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SOUHRN

Kontext a cíle: Některá chronická onemocnění jako hypertenze, diabetes mellitus (DM), hypercholesterolemie a kuřáctví jsou již delší dobu považována za rizikové faktory vzniku stenóz karotických tepen. Zatím však nebyl publikován žádný rozsáhlejší výzkum zaměřený na otázku zúžení karotických tepen u různých etnických skupin. Cílem této studie je zhodnotit tento jev u pacientů různých etnik.
Metody: Do naší prospektivní studie, která se prováděla v Istanbulu v době mezi březnem a zářím 2018, bylo zařazeno 246 (61,2 %) rodilých Turků a 153 (39,8 %) syrských imigrantů. Všech 399 účastníků studie bylo ve věku od 50 do 65 let a byl u nich diagnostikován alespoň jeden rizikový faktor v podobě hypertenze, hyperlipidemie, DM, obezity, tíživé socioekonomické situace a kuřáctví. Pacienti absolvovali vyšetření celého karotického povodí dopplerovským ultrazvukem.
Výsledky: Průměrný věk pacientů byl 54,2 ± 7,2 roku; žen bylo ve studii 50,4 %. Nejčastějším rizikovým faktorem v obou skupinách byla hypertenze (41,1 % vs. 47,7 %; p = 0,596). Více kuřáků bylo mezi rodilými Turky (p = 0,022). Přítomnost hyperlipidemie, DM i stresu z tíživé socioekonomické situace byla podobná v obou skupinách (p > 0,05). I výskyt nadváhy a obezity mezi rodilými Turky a syrskými imigranty byl podobný (p = 0,071 a p = 0,279). Lehká (< 50 %), středně těžká (50–70 %) a významná stenóza karotických tepen (> 70 %) byla zjištěna u 332 (83,2 %), resp. 33 (8,3 %) a 34 (8,6 %) pacientů. Žádný statisticky významný rozdíl v závažnosti stenózy karotid mezi oběma etniky nebyl zjištěn (p > 0,05).
Závěr: Výskyt středně těžkých a významných stenóz karotid u syrských imigrantů a rodilých Turků je podobný, což lze vysvětlit etnickou podobností a sdílením podobného rizikového faktoru.

ABSTRACT

Background and aims: Certain chronic conditions such as hypertension, diabetes mellitus (DM), hypercholesterolemia, and smoking were well defined as a risk factor for carotid stenosis. However, the development of carotid stenosis in different ethnic groups has not been researched adequately. This study aims to evaluate the carotid artery stenosis in patients of different ethnic origins.
Methods: This prospective study included 246 (61.2%) Turkish natives and 153 (39.8%) Syrian immigrants, and carried out during March and September 2018 in Istanbul. All of the 399 participants were between the age of 50 and 65 years, and have at least one of the risk factors of hypertension, hyperlipidemia, DM, obesity, heavy socio-economic stress, and smoking. Patients were examined for bilateral carotid arterial system with Doppler ultrasound.
Results: The mean age of the patients were 54.2±7.2, and there were 50.4% of women. Hypertension was the foremost risk factor of both groups (41.1% vs. 47.7%, p = 0.596). Smoking was higher among Turkish natives (p = 0.022). Hyperlipidemia, DM, and stress were similar between the groups (p >0.05). The overweight and obesity rates were also similar among Turkish natives and Syrian immigrants (p = 0.071 and p = 0.279). Patients with mild (<50%), moderate (50–70%) and severe (>70%) carotid stenosis were 332 (83.2%), 33 (8.3%) and 34 (8.6%). No statistical significance was found between the two ethnic groups in terms of the severity of carotid stenosis (p >0.05).
Conclusion: Syrian immigrants and Turkish natives have a similar rate of moderate and severe carotid artery stenosis. It can be explained by racial similarity and having a similar risk factor.

Keywords:
Carotid artery
Carotid stenosis
Doppler ultrasound
Racial difference

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Introduction

The Syrian refugee crisis has developed over the past decade due to political problems in the Middle East. Millions of Syrians were forced to flee from their family to neighboring countries such as Turkey, Iraq, and Jordan. Host countries have been exposed to increasing demands in the field of health, as in all areas of life since then. There are about 3,587 million Syrian refugees in Turkey.[1–3] Although there is no scientific study, cardiovascular disease (CVD) is estimated to be very common among Syrian refugees, just like the post World War II population who suffered heavy stress. It can be explained by the high blood cortisol level and low cortisol response of Syrian refugees.[4,5]

Stroke is defined as a neurological deficit of vascular origin, which can result in death within 24 hours. The severity of the syndrome varies widely, including the possibilities of complete recovery, partial recovery, disability, and death. Transient ischemic attacks (TIA) refer to episodes of loss of focal cerebral function, which are thought to be of ischemic origin, usually localized to a vascular area, lasting a maximum of 24 hours.[6] The prevalence of stroke is around 6/1 000. Stroke is the third leading cause of morbidity and mortality worldwide.[7] Strokes are in the form of the first ischemic attack at the rate of 80%. Studies have shown that stroke incidence can be reduced by up to 40% when primary protection is provided.[8,9]

The well-documented modifiable risk factors for stroke include hypertension, diabetes mellitus (DM), hypercholesterolemia, smoking, and sedentary life.[10] There are also non-modifiable factors such as age, gender, low birth weight, and genetic history which can also directly affect the prevalence of stroke.[11] Racial differences are the latest accepted important risk factors.[6,11] Studies have shown that the interactions between racial differences and different risk factors can affect people at different rates.[12]

This prospective study aimed to compare the incidence of carotid artery stenosis between the Syrian immigrants and Turkish natives, and present the risk factors of the two different ethnic origin by performing carotid artery screening with Doppler ultrasound (DUS).

Materials and methods

Ethical disclosure

This prospective study was approved by the Ethics Committee of Istanbul University Medical Faculty (number: 157319). The hospital authority and all the authors approved the submission and publication of this study. After explaining the interventions, informed consent was obtained from each participant before the screening procedures.

Study design

This prospective study conducted during March and September 2018 included 399 registered patients of Istanbul Gaziosmanpaşa Recep Sağlam No. 7 Family Health Center, a facility that has 55–60 thousand of the registered population. Participants selected by telephone call or face-to-face interviews. The willing participants signed informed consent before the investigation. All the participants underwent bilateral carotid artery evaluation by two independent radiologists who are highly proficient in DUS.

Inclusion and exclusion

All the participants were asymptomatic and at the age between 50 and 65 years, and had at least one of the risk factors of hypertension, hyperlipidemia, DM, obesity, and smoking. Participants were also asked about socio-economic stress during the screening test. Turkish natives and Syrian immigrants were 246 (61.2%) and 153 (39.8%), respectively. Patients were examined for a bilateral carotid arterial system with Doppler ultrasound (DUS) in terms of carotid artery stenosis.

Patients ages out of the range of 50–65 years, with a previous diagnosis of carotid arterial stenosis, and without any pre-defined risk factors were not included in the study.

Patient management

Clinical examination was performed and peripheral pulse and blood pressure were recorded. Laboratory evaluations were peformed in terms of fasting lipid profile, glucose, and coagulation profile. Computerized tomography (CT) angiography was performed in patients who had >70% carotid stenosis in the internal carotid artery with the ECST evaluation system (estimated bulbus diameter in the region where the stenosis was located) by DUS. Carotid intervention (endarterectomy or stenting) was recommended to the patients with a confirmed >70% stenosis. Patients who had 50–70% stenosis in the internal carotid artery and whose carotid plaque surface was assessed irregular with the DUS were also recommended to undergo carotid intervention. Patients with a <50% stenosis were educated to reduce the modifiable risk factors.

Statistical analysis

Statistical analysis was performed with the SPSS version 24.0 program (SPSS Inc. Chicago IL, USA). The normal distribution of the variables was examined by histogram graphs and the Kolmogorov–Smirnov test. Mean ± standard deviation values were used to present descriptive analyses. Pearson chi-square and Fisher's exact tests were compared with 2×2 tables. While normally distributed (parametric) variables were evaluated among the groups, Student T-test was used. Mann–Whitney U test was used to evaluate nonparametric variables. *P*-values below 0.05 were evaluated as statistically significant results.

Results

The mean age of the patients was 51.2±11.2, and the female represented 50.4%. Hypertension was the foremost risk factor of both Turkish and Syrian populations. A total of 174 (43.6%) patients (41.1% vs. 47.7%, $p = 0.235$) were taking at least one antihypertensive medication during the last one year. Of 73 (18.3%) patients' (19.1% vs. 17%, $p = 0.596$) blood LDL level was determined as >130 mg/dl. There were 161 (40.4%) patients with DM in to-

tal who have HbA_{1c} >6.0%. The difference between the Turkish and Syrians was not significant (39.0% vs. 42.5%, p = 0.494). The number of smokers (at least 1 pack/day, and for 5 years) was found to be higher in the Turkish natives than in Syrian ones (36.6% vs. 25.5%, p = 0.022). Participants with BMI <25 kg/m^2 were more common among Turkish (p = 0.004), whereas overweight and obesity were similar between the groups (p >0.05). On the contrary to expectations, the two groups were similar when asked about socio-economic stress (22.8% vs. 20.3%, p = 0.556). The result showed that the Syrian immigrants in Turkish society were not under more socio-economic burden than the Turkish natives. When the risk factors of each patient were analyzed, those with one and more than two risk factors were similar in both groups, while patients with two different risk factors were higher in the Syrian (12.6% vs. 21.6%, p = 0.019) (Table 1).

During the carotid artery screening, mild (<50%), moderate (50–70%), and severe (>70%) carotid stenosis was found in 332 (83.2%), 33 (8.3%), and 34 (8.6%) patients among general cohort. When comparing between the groups, no significance was found (85.8% vs. 79.1%, p = 0.084; 7.4% vs. 10.8%, p = 0.382; 6.9% vs. 11.1%, p = 0.147) (Table 2).

The most common risk factors for >50% carotid stenosis were different among the groups. In Turkish natives, smoking was at the top of the list, and more common than in Syrians (62.9% vs. 25.0%, p = 0.004). DM was the second most common risk factor in both groups, and similar in rates (35.0% vs. 25.5%, p = 0.294). In Syrian immigrants, obesity (40.6%) was the most common among

Table 1 – Patient characteristics of the two ethnic groups

	Turkish N = 246 (%)	Syrian N = 153 (%)	*p*-value
Age	53.7±7.1	55.1±7.4	0.147
Female	123 (50)	78 (51)	0.849
Smoker	90 (36.6)	39 (25.5)	0.022
Diabetes mellitus	96 (39.0)	65 (42.5)	0.494
Hypertension	101 (41.1)	73 (47.7)	0.235
Hyperlipidemia	47 (19.1)	26 (17.0)	0.596
Socio-economic stress	56 (22.8)	31 (20.3)	0.556
BMI (kg/m^2)			
<25	81 (32.9)	30 (19.6)	0.004
25–30	130 (52.9)	95 (62.1)	0.071
>30	35 (14.2)	28 (18.3)	0.279
Single risk factor	159 (64.6)	93 (60.8)	0.789
Two risk factors	31 (12.6)	33 (21.6)	0.019
More than two factors	56 (22.8)	27 (17.6)	0.221

Table 3 – Risk factors of >50% carotid stenosis

	Turkish N = 35 (%)	Syrian N = 32 (%)	*p*-value
Diabetes mellitus	21 (60.0)	12 (37.5)	0.068
Hypertension	9 (25.7)	11 (34.4)	0.661
Hyperlipidemia	6 (17.1)	7 (21.9)	0.625
Smoker	22 (62.9)	8 (25.0)	0.003
Obesity (BMI >30)	12 (34.3)	13 (40.6)	0.763
Socio-economic burden	8 (22.9)	6 (18.8)	0.680
Single factor	10 (28.6)	8 (25.0)	0.742
Two factors	7 (20.0)	11 (34.4)	0.189
More than two factors	18 (51.4)	13 (40.6)	0.377

Table 2 – Results of carotid artery screening

Types of stenosis	Turkish N = 246 (%)	Syrian N = 153 (%)	Total N = 399 (%)	*p*-value
Mild stenosis (<50%)				
Type 1	211 (85.8)	121 (79.1)	332 (83.2)	0.084
Moderate stenosis (50–70%)				
Type 2	10 (4.1)	12 (7.8)	22 (5.5)	0.114
Type 3	8 (3.3)	3 (2.0)	11 (2.8)	0.449
Subtotal	18 (7.4)	15 (10.8)	33 (8.3)	0.382
Severe stenosis (>70%)				
Type 4	6 (2.4)	9 (5.9)	15 (3.8)	0.088
Type 5	8 (3.3)	7 (4.6)	15 (3.8)	0.501
Type 6	3 (1.2)	1 (0.6)	4 (1.0)	0.587
Subtotal	17 (6.9)	17 (11.1)	34 (8.6)	0.147
>50% stenosis				
Subtotal	35 (14.3)	32 (20.9)	67 (16.9)	0.084

Type 1: Patients with unilateral or bilateral <50% stenosis
Type 2: Patients with unilateral 50–70% stenosis
Type 3: Patients with bilateral 50–70% stenosis
Type 4: Patients with unilateral >70% stenosis
Type 5: Patients with one side of 50–70%, and the other side of >70% stenosis
Type 6: Patients with bilateral >70% stenosis

patients with carotid stenosis >50%, but not statistically significant (p = 0.763). Homesickness, concerns of native families, and unhealthy diet are the main causes of obesity and social stress among Syrians. The other risk factors were similar between the groups (Table 3).

Discussion

The main findings of the study are that the carotid stenosis of >50% is similar between the Turkish natives and Syrian immigrants, but the main risk factors are shown somehow different.[13,14] The high rates (16.9%) of carotid stenosis (>50%) found in our study can be partly explained by that all of the participants have single or multiple comorbid factors. Asymptomatic individuals who have two or more risk factors are at a high risk of >50% carotid artery stenosis due to additive effects of the different risk factors combination. The other reason is the heavy smoker, uncontrolled DM (HbA_{1c} >8%) and morbid obesity (BMI >40 kg/m^2) are common among two neighboring countries in the middle east.[15] Reducing smoking habits among Turkish natives, and the development of nutritional habits and improvement in social concerns among Syrian immigrants is necessary to prevent cerebrovascular accident associated carotid artery disease.

Several studies suggest that the risk of stroke is aging, hypertension, diabetes, hyperlipidemia.[13] Tobacco use has also been shown to be related to the carotid disease.[13] Many studies examining racial differences have been done between African Americans and Caucasian races. The study results revealed that regardless of racial differences, blood pressure directly affects stroke. The most important risk factor for stroke is hypertension, and hypertension regulation is the most important parameter to prevent CVD.[17]

In our study, a total of 73 (18.3%) patients were diagnosed with hyperlipidemia (LDL >130 mg/dl) who were at a high risk of cerebrovascular as well as cardiovascular disease. Studies showed that high blood lipid levels are more common in urban life.[18,19] According to the results of our study, the Syrian immigrants have as high blood lipid levels as Turkish natives which were similar to the study performed in Switzerland.[20] It is a known fact that high blood lipid levels increase the risk of cardiovascular and cerebrovascular disease. In addition to the effect of the blood lipid level itself, it contributes to an increase in cardiovascular disease and cerebrovascular disease in conjunction with DM, a parameter of the metabolic syndrome.[20,21]

Almost half (45%) of deaths in Syria have been reported to be caused by cardiovascular disease (CVD) before the beginning of the Syrian conflict and mass migration.[4] The fact is that the number of registered and informal refugees living outside the camps is much higher than the number of those living in refugee camps and often have more difficulty in receiving health care.[22] This special condition raises major concern among the majority of unregistered immigrants about accessing healthcare. According to a recent report of the World Health Organisation, Syrian refugees die from more non-communicable diseases (infections) which were unlike previous refugee crises.[23] Our study results indicate that the Syrians are living under similar cardiovascular risk conditions in Turkey in spite of the adversity of the migration itself and the post-immigration lifestyle.[21,24] The existence of similar results in similar risk groups in immigration societies can be considered as an indication that the native population and immigrants live in similar conditions.

In conclusion, the study shows that similarities in race and risk factors may have similar results in similar societies, not in terms of ethnic segregation. In addition, all the individuals who have any risk factors should be considered as high-risk in terms of cardiovascular and cerebrovascular disease regardless of the fact whether they are native or immigrant.

Conflict of interest
We declare no conflict of interest in this study.

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Ethical statement
This prospective study was approved by the Ethics Committee of Istanbul University Medical Faculty (number: 157319). The hospital authority and all the authors approved the submission and publication of this study.

References

1. United Nations High Commissioner for Refugees (UNHCR). Syrian Regional Refugee Response.
2. Jordan Population and Housing Census. Global Health Data Exchange. 2015.
3. U.S and Jordan in a Dispute over Syrian Refugees. https://www.bloomberg.com/view/articles/2015-1006.
4. Maziak W, Rastam S, Mzayek F, et al. Cardiovascular health among adults in Syria: A model from developing countries. Ann Epidemiol 2007;17:713–720.
5. Kristenson M, Kucinskiene Z, Bergdahl B, Orth-Gomér K. Risk factors for coronary heart disease in different socioeconomic groups of Lithuania and Sweden – the LiVicordia Study. Scand J Public Health 2001;29:140–150.
6. Mukherjee D, Patil CG. Epidemiology and the global burden of stroke. World Neurosurg 2011;76:85–90.
7. Towfighi A, Saver JL. Stroke declines from third to fourth leading cause of death in the United States: historical perspective and challenges ahead. Stroke 2011;42:2351–2355.
8. Paciaroni M, Bogousslavsky J. Primary and Secondary Prevention of Ischemic Stroke. Eur Neurol 2010;63:267–278.
9. Goldstein LB, Bushnell CD, Adams RJ, et al. Guidelines for the Primary Prevention of Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke 2011;42:517–584.
10. Lackland DT, Elkind MSV, D'Agostino R, et al. Inclusion of Stroke in Cardiovascular Risk Prediction Instruments: A Statement for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke 2012;43:1998–2027.
11. Boehme AK, Esenwa C, Elkind MS. Stroke Risk Factors, Genetics, and Prevention. Circ Res 2017;120:472–495.
12. Howard G, Goff DC. Population shifts and the future of stroke: forecasts of the future burden of stroke. Ann NY Acad Sci 2012;1268:14–20.
13. Woo SY, Joh JH, Han SA, Park HC. Prevalence and risk factors for atherosclerotic carotid stenosis and plaque: A population-based screening study. Medicine (Baltimore) 2017;96:e5999.
14. de Weerd M, Greving JP, de Jong AW, et al. Prevalence of asymptomatic carotid artery stenosis according to age and

sex: systematic review and metaregression analysis. Stroke 2009;40:1105–1113.
15. Zlatko N, Gemma W. Obesity in the Middle East. In: Ahima RS (eds.). Metabolic Syndrome. Springer, Cham. https://doi.org/10.1007/978-3-319-11251-0_6
16. Yang D, Iyer S, Gardener H, et al. Cigarette Smoking and Carotid Plaque Echodensity in the Northern Manhattan Study. Cerebrovasc Dis 2015;40:136–143.
17. Öztürk Ş. Serebrovasküler Hastalık Epidemiyolojisi Ve Risk Faktörleri-Dünya ve Türkiye Perspektifi. Turk Geriatri Derg 2009;13:51–58.
18. Mbalilaki JA, Hellenius ML, Masesa Z, et al. Physical activity and blood lipids in rural and urban Tanzanians. Nutr Metab Cardiovasc Dis 2007;17:344–348.
19. Abdul-Rahim HF, Husseini A, Bjertness E, et al. The metabolic syndrome in the West Bank population: an urban–rural comparison. Diabetes Care 2001;24:275–279.
20. Taloyan M, Wajngot A, Johansson SE, et al. Cardiovascular risk factors in Assyrians/Syrians and native Swedes with type 2 diabetes: a population-based epidemiological study. Cardiovasc Diabetol 2009;8:59.
21. Choi S, Rankin S, Stewart A, Oka R. Perceptions of coronary heart disease risk in Korean immigrants with type 2 diabetes. Diabetes Educ 2008;34:484–492.
22. Kohler JJ. Syrians flee violence and disrupted health services to Jordan. Bull World Health Organ 2013;91:394–395.
23. World Health Organization. The impact of chronic disease in the Syrian Arab Republic.
24. Martinez-Gonzalez MA, de la Fuente-Arrillaga C, Nunez--Cordoba JM, et al. Adherence to Mediterranean diet and risk of developing diabetes: prospective cohort study. BMJ 2008;336:1348–1351.