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Cardiovascular risk and physical activity in Syrians living in England compared with the population of North West England: a cross-sectional study

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ABSTRACT

Objective This study aims to assess the 10-year cardiovascular risk and physical activity among Syrians residing in England and compare them with the North West England population.

Design Cross-sectional study.

Setting Bilingual online questionnaire distributed through social media platforms from 21 June to 23 July 2023.

Participants Syrian individuals in England (aged 25–69, migrated post-2010) and residents of North West England within the same age bracket. All participants had no history of cardiovascular disease (CVD).

Primary and secondary outcome measures Primary outcome measures included differences in QRISK3 score, 10-year relative risk (RR), metabolic equivalent of task (MET) and self-reported physical activity between the two groups. Secondary outcome measures included subgroup analyses based on sex and age.

Results Of the 273 eligible participants (137 in the Syrian group and 136 in the Northwest England group), the QRISK3 score was twofold higher in the Syrian group (2.20, 5.50) than in the North West England group (1.20, 3.15) (p=0.042). The 10-year RR was approximately three times higher in the Syrian group (p<0.001), while MET was about twice as high in the Northwest England group (p<0.001).

Conclusions Despite relocating to England, Syrians face substantially elevated cardiovascular risks attributed to an unhealthy lifestyle, including smoking, reduced physical activity, increased body mass index and diabetes, coupled with a strong family history of CVD in first-degree relatives under the age of 60. The study underscores the need for early assessment, risk factor identification and tailored interventions for this population. Raising awareness, particularly in the context of smoking, and promoting physical activity are crucial for mitigating cardiovascular risks. The findings emphasise the importance of culturally sensitive interventions to address the unique health challenges of Syrians in the UK.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Unique topic exploration: this study pioneers cardiovascular risk assessment among Syrians in England, contributing novel insights to an unstudied immigrant population.
⇒ QRISK3 score utilisation: the study employs QRISK3 for precise 10-year cardiovascular risk evaluation, enhancing result robustness.
⇒ Inclusive bilingual approach: the bilingual questionnaire, available in English and Arabic, promotes inclusivity in data collection.
⇒ Potential bias: self-reporting and online recruitment may introduce inaccuracies, recall bias and selection bias, impacting sample representativeness.
⇒ Age restriction: focused on ages 25 to 69, limiting insights into cardiovascular risk for those above 69 years.

INTRODUCTION

Cardiovascular disease (CVD) is a pervasive global health challenge, claiming approximately 17.9 million lives annually and constituting 32% of worldwide fatalities.[1] Within the landscape of non-communicable diseases, CVD holds a dominant position, representing over half of these cases on a global scale.[2] Studies specific to Syria reveal an elevated prevalence of CVD, surpassing global averages; an estimated 49% of cardiovascular-related deaths occur before the age of 65 years, accompanied by a notable deficit in awareness regarding CVD and its risk factors among the Syrian population.[3] The WHO underscores the significant impact of CVD, attributing 44% of all deaths in Syria in 2011.[4] The UK grapples with a substantial burden of CVD, contributing to a quarter of total deaths, translating to 460 fatalities daily or one death every 3 min.[5]

Numerous risk factors have been identified as predisposing elements for CVD. While some, such as age and ethnicity, are non-modifiable, others, including high blood pressure, smoking, obesity and diabetes, can be modified.[6] Consequently, in response to chronic CVD and the limited efficacy of available treatments, healthcare systems globally have increasingly emphasised prevention over the past two decades. In the UK, the

QRISK3 score, an advanced cardiovascular risk assessment tool, has been developed and validated based on a diverse cohort study encompassing 1.28 million participants.[7] Distinguishing from other tools, QRISK3 boasts higher accuracy and can be used as a self-reporting assessment tool. Recommended by the National Institute for Health and Care Excellence (NICE), QRISK3 computes the 10-year cardiovascular risk, aiding primary prevention treatment decisions.[7] NICE recommends starting pharmaceutical primary prevention, like statins and antihypertensive medications, when the QRISK3 score surpasses 10%; this threshold identifies individuals at higher cardiovascular risk, prompting preventive measures through medication.[8]

Assessing physical activity holds particular significance within the realm of CVD prevention, given the prevalence of sedentary lifestyles. A comprehensive understanding of physical activity levels within populations, particularly those deemed to be at high risk for CVD, is of paramount importance. This understanding facilitates the tailored development of interventions and policies aimed at mitigating the CVD burden. Physical activity engagement, recognised as a fundamental contributor to cardiovascular health, plays a central role in reducing CVD risks.[9] Recognising these associations and using tools such as the International Physical Activity Questionnaire Short Form (IPAQ-sf) are essential for crafting interventions that promote physical activity, harness the unique benefits of sports and alleviate the CVD burden in vulnerable populations.[10] Furthermore, it's crucial to acknowledge that while the IPAQ-sf can provide insights into physical activity levels, its precision may vary among individuals with disabilities.[11 12]

The selection of the Syrian population for this study is motivated by the limited research on Syrians, particularly those who relocated abroad after the 2010 war in Syria. Despite the presence of approximately 32 000 Syrians in the UK in 2021,[13] mainly in England, there exists a substantial gap in our understanding of their cardiovascular risk. This study is pioneering in its examination of cardiovascular risk among Syrians in the UK. North West England was chosen as a comparative group due to its representative nature of the typical English lifestyle.[14]

This research aims to investigate the cardiovascular health of Syrian immigrants in England, comparing them with a demographically similar group from North West England to discern differences and similarities in cardiovascular risk profiles. By elucidating the cardiovascular risk profile of Syrian immigrants and understanding how it differs from the general population, the study seeks to inform targeted interventions and healthcare strategies tailored to the specific needs of this immigrant group. The primary goal is to identify cardiovascular risks and related factors, facilitating the implementation of suitable management and prevention strategies aimed at improving cardiovascular health outcomes for Syrians in England. This endeavour is crucial for promoting equality, equity and inclusive healthcare support, in alignment with the NHS Equality, Diversity and Inclusion Improvement Plan. Moreover, this comparative approach enhances our understanding of CVD risk factors in diverse populations.

MATERIALS AND METHODS

Study design and participants

A cross-sectional study was conducted online. The investigation encompassed two cohorts: the Syrian populace in England (those who migrated post-2010, aged 25–69 years, given the validity of the QRISK3 score for individuals aged 25 to 84,[7] and the IPAQ-sf score for individuals aged 15 to 69[10]) and residents of North West England within the same age bracket. All participants had no CVD history. The study adhered to the STROBE guidelines for the reporting of observational studies.[15]

Study setting

An online bilingual questionnaire, available in both English and Arabic, was employed for data collection. The Arabic translations were conducted by the principal author and subsequently reviewed by the second author, both of whom are native Arabic speakers. The online survey was disseminated through prominent social media platforms, primarily Twitter and Facebook, from 21 June to 23 July 2023. Measures to ensure participant anonymity and confidentiality included strict protocols and the use of Microsoft Forms. No personal identifiers were employed, and the questionnaire was presented in participants' native languages, aiming to minimise biases, foster trust and enhance data reliability for robust research findings.

Sample size

A sample size of 105 participants in each group was calculated using G*power 3.1.9.4 software, considering an effect size (d) of 0.5, an alpha error probability of 0.05 and a power of 0.95.

Measures and variables

In the study, participants provided self-reported data for calculating the QRISK3 score, including sociodemographic variables (age, gender, ethnicity and region of residence). Information on smoking status and medical history conditions such as diabetes, chronic kidney disease, atrial fibrillation, migraines, rheumatoid arthritis, lupus, erectile dysfunction and severe mental illnesses. Participants also disclosed medication history for hypertension, antipsychotics and oral corticosteroids. Family history of CVD in first-degree relatives younger than 60 years was self-reported. Optional inquiries related to height (cm), weight (kg) (used for body mass index (BMI) estimation) and recent measurements of blood pressure (mm/Hg), cholesterol (mmol/l) and high-density lipoprotein (HDL) (mmol/l) levels were also obtained. These details, if known to the participants, could be included in calculating the QRISK3 score, considering their non-mandatory status within the QRISK3 score framework.[7]

Participants who reported a previous CVD diagnosis, including any cardiac or arterial diseases, were excluded from the study. Additionally, the questionnaire included inquiries about physical activity, covering time spent sitting, walking and engaging in moderate to vigorous activities over the past 7 days to calculate the IPAQ-sf score.

The study manually computed the 10-year QRISK3 score, the QRISK3 score of an equivalent healthy individual sharing the same age, sex and ethnicity, devoid of any morbidities, and with specific baseline values of a cholesterol ratio of 4.0, a stable systolic blood pressure of 125 mmHg, and a BMI of 25 (referred to as healthy QRISK3), 10-year relative risk (RR) and heart age using the official QRISK3 website. To minimise computational errors, these calculations were independently performed by the researcher on two occasions. The IPAQ-sf score, measuring physical activity, was determined using a dedicated spreadsheet for automated scoring. The results are presented as daily sitting time (min/day), and total activity (min/week), which are classified into self-reporting and truncated scores, with the latter used to normalise activity distribution. Additionally, the metabolic equivalent of task (MET) per week, representing energy expenditure during activity, was calculated.[16]

The primary outcome measures focused on detecting differences in QRISK3 score, RR, MET and self-reporting physical activity between the two groups. The secondary outcome explored subgroup analyses based on sex and age.

Statistical methods

The data were analysed using GraphPad Prism 7 (GraphPad Software, CA, USA) and Jamovi 2.3.18. Normality was assessed using the Kolmogorov–Smirnov test. Given the non-normal distribution of the data, the Mann–Whitney U test was employed to ascertain any significant differences in continuous variables between the two groups, such as QRISK3 and RR. The disparities in categorical variables between the two groups were evaluated using the X^2 test, for instance, smoking and ethnicity. The differences between dependent variables such as heart age and real age, and QRISK3 and equivalent healthy QRISK3, were determined using the Wilcoxon signed-rank test. Quantitative data were presented as frequency (percentages) and mean±SD Numerical variables were expressed as the median and IQR. The statistical analysis was conducted at a significance level of p=0.05.

In our analyses, we also accounted for confounding variables such as MET, diabetes, BMI and smoking status. These variables were considered to ensure that our results were not unduly influenced by factors unrelated to the primary focus of our study, allowing for a more accurate assessment of the relationships between cardiovascular risk factors and demographic characteristics.

Patient and public involvement

Although direct participation of the public in the study's design was not implemented, we made a concerted effort to ensure that our study design and procedures were culturally sensitive and accessible to individuals from diverse backgrounds. Throughout the study, we maintained a steadfast commitment to transparency and responsiveness to public concerns and expectations.

RESULTS

A total of 273 participants were enrolled in this study (figure 1). In the Syrian group, 155 responses were received by the end of the recruitment period, with 18 participants excluded (two declined the PIS, three were not residing in England, three had migrated to England

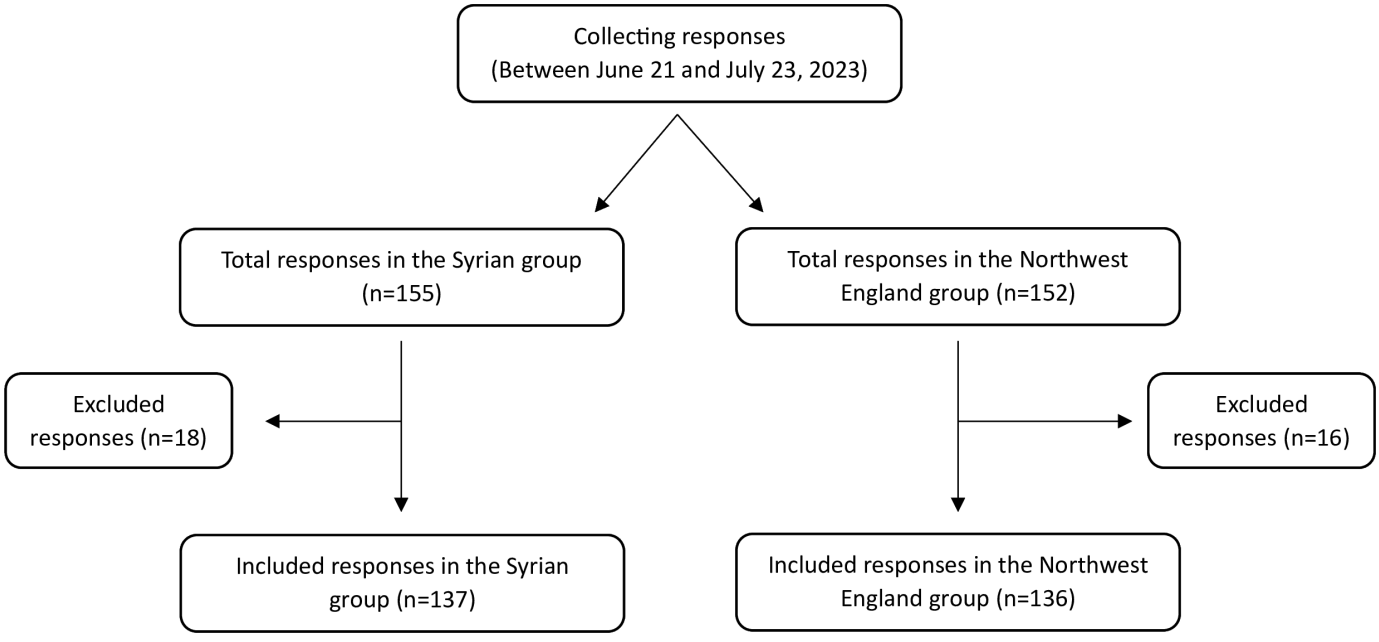

Figure 1 The flow chart of the study.

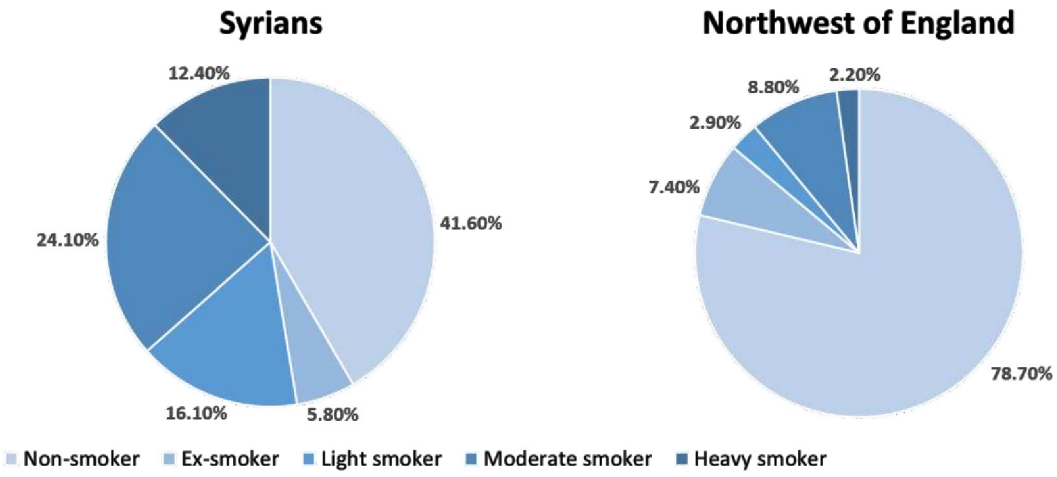

Figure 2 Smoking prevalence in the two groups.

before 2010, three had a medical history of CVD, and seven provided incomplete responses). For the North West England group, 152 responses were obtained, and 16 participants were excluded (one declined the PIS, three did not reside in North West England, two had a medical history of CVD, and 10 provided incomplete responses).

The final number of participants in the Syrian group amounted to 137, comprising 62 females (45.3%) and 75 males (54.7%). The mean age (±SD) was (39.5±9.05) years. A total of 118 participants (86.1%) identified themselves as belonging to other ethnic groups, 72 (52.6%) were smokers (figure 2) and 31 (22.6%) had a history of CVD in a first-degree relative younger than 60 years. In the North West England group, the final participant count was 136, including 65 females (47.8%) and 71 males (52.2%). The mean age (±SD) was (39.32±10.694) years. A total of 116 participants (85.3%) identified as White, 29 (21.3%) were smokers (figure 2) and 8 (5.9%) had a history of CVD in a first-degree relative younger than 60 (table 1).

The calculated QRISK3 score, RR, heart age, BMI, MET, truncated and self-reporting total activity and daily sitting time for both groups are summarised in table 2. After controlling for confounding variables, the QRISK3 score in the Syrian group (2.20, 5.50) was found to be significantly higher than in the North West England group (1.20, 3.15) (p=0.042). The Syrian group exhibited significantly higher RR and BMI, along with increased daily sitting time (p<0.001). Additionally, the heart age was significantly higher in the Syrian group (p=0.002). The analysis indicated a significant difference in MET, with higher values observed in the North West England group (5115, 4474) compared with the Syrian group (2460, 3162) (p<0.001). Furthermore, self-reported physical activity and truncated physical activity were also significantly higher in the North West England group (p<0.001).

The subgroup analysis based on age revealed that in the Syrian group, there was no statistically significant difference in RR between individuals aged 40 and above and those aged 39 or younger (p=0.054) (figure 3A). However, participants aged 40 and above exhibited notably higher QRISK3 scores (figure 3B), heart age and BMI (p<0.001). Moreover, MET (figure 3C) and truncated total activity (figure 3D) were significantly higher in participants under the age of 40.

In contrast, in the North West England group, no significant difference in RR was observed between individuals aged 40 and above and those aged younger than 40 years (p=0.202) (figure 3A). Similar to the Syrian group, the QRISK3 score (figure 3B), heart age and BMI were significantly higher in the over-40 age group (p<0.001). However, no significant differences were observed in MET (figure 3C) and truncated total activity (figure 3D) between the two age groups, with p values of 0.201 and 0.535, respectively. Additionally, in both age groups, Syrians exhibited significantly higher RR and QRISK3 scores compared with North West England, while MET and truncated physical activity were higher in North West England.

The subgroup analysis based on sex revealed that RR was significantly higher in males compared with females in the Syrian group (p<0.001) (figure 3E), and the QRISK3 score also exhibited a statistically significant difference, being higher in males (p=0.003) (figure 3F). In the North West England group, a significant difference was observed in RR (p<0.001) (figure 3E) and BMI (p=0.002), with higher values in males. A comparison of males between both groups indicated that RR (p=0.038) (figure 3E), QRISK3 score (p<0.001) (figure 3F) and heart age (p=0.003) were significantly higher in Syrian males. Conversely, MET (p<0.001) (figure 3G), self-reporting (p<0.001) and truncated total activity (p<0.001) (figure 3H) were significantly higher in Northwest England males. In the female population, RR (figure 3E) and heart age were notably higher in Syrian females (p<0.001), whereas MET (figure 3G), self-reporting and truncated total activity (figure 3H) demonstrated

Table 1 Baseline clinical characteristics of the participants

		Syrians (n=137)		North West England (n=136)		P value
		N	%	N	%	
Sex	Male	75	54.70%	71	52.20%	0.674
	Female	62	45.30%	65	47.80%	
Age group	≥ 40	58	42.30%	64	47.10%	0.433
	≤ 39	79	57.70%	72	53.90%	
Ethnicity	White	7	5.10%	116	85.30%	**<0.001*** **
	Indian	0	0.00%	4	2.90%	
	Pakistani	0	0.00%	1	0.70%	
	Bangladeshi	0	0.00%	1	0.70%	
	Other Asian	3	2.20%	3	2.20%	
	Caribbean	0	0.00%	0	0.00%	
	Black African	0	0.00%	2	1.50%	
	Others	118	86.10%	3	2.20%	
	Not stated	9	6.60%	6	4.40%	
Smoking	Non-smoker	57	41.60%	107	78.70%	**<0.001***
	Ex-smoker	8	5.80%	10	7.40%	
	Heavy	17	12.40%	3	2.20%	
	Moderate	33	24.10%	4	2.90%	
	Light	22	16.10%	12	8.80%	
Morbidities	DM1	4	2.90%	1	0.70%	**.006†**
	DM2	26	19.00%	10	7.40%	
	CVD history in a first-degree relative	31	22.60%	8	5.90%	**<0.001***
	CKD	2	1.50%	4	2.90%	0.404
	AF	5	3.60%	1	0.70%	0.101
	Migraines	10	7.30%	4	2.90%	0.103
	RA	2	1.50%	0	0.00%	0.157
	SLE	0	0.00%	0	0.00%	N/A
	Severe mental illness	9	6.60%	2	1.50%	**.032‡**
	Erectile dysfunction	1	70.00%	1	0.70%	0.996
Treatments	BP treatment	22	16.10%	14	10.30%	0.159
	Atypical antipsychotics	3	2.20%	0	0.00%	0.083
	steroids	5	3.60%	1	0.70%	0.101

The differences were calculated using the Chi-square test and statistically significant associations were lined
*P-value<0.001.
†P-value<0.01.
‡P-value<0.05.
AF, atrial fibrillation; BP, blood pressure; CVD, cardiovascular disease; DM1, diabetes mellitus type 1; DM2, diabetes mellitus type 2; N/A, not applicable; RA, rheumatoid arthritis; SLE, systemic lupus erythematosus.

significant elevation in North West England females (p<0.001).

The analysis further revealed that the QRISK3 was significantly higher than the corresponding healthy QRISK3 score, and the actual age exceeded the heart age significantly in both groups (p<0.001). Moreover, the study found a significant difference in the percentage of individuals with a QRISK3 score of over 10%: 13.9% in the Syrian group compared with 6.6% in the North West of England group (p=0.046).

DISCUSSION

On scrutinising the outcomes, a discernible observation emerged, indicating that the average QRISK3 score for Syrians residing in England was approximately twice as

Table 2 Differences in age, QRISK3, RR, heart age, MET, total activity and daily sitting time between the two groups

			95% CI				
	Group	N	Lower	Upper	Median	IQR	P value
Age (y)	Northwest	136	39.32	42.95	39	16	0.326
	Syrian	137	37.98	41.04	38	12	
BMI	Northwest	117	25.01	26.41	25.99	4.836	**<0.001***
	Syrian	133	28.76	30.55	29.94	6.789	
QRISK3 (%)	Northwest	136	2.36	3.96	1.2	3.15	**.042†**
	Syrian	137	3.7	6.4	2.2	5.5	
RR	Northwest	136	1.3	1.61	1.1	0.7	**<0.001***
	Syrian	137	3.4	5.47	2.8	3.8	
Heart age (y)	Northwest	136	42.11	46.56	42	18	**.002‡**
	Syrian	137	47.54	52.68	48	24	
MET	Northwest	136	5125.15	6415.79	5115	4473.75	**<0.001***
	SYRIAN	137	2680.4	3495.79	2460	3162	
Self-reported TA (min/week)	Northwest	136	258.94	318.03	240	180	**<0.001***
	SyrianN	137	181.33	252.46	180	180	
Truncated TA (min/week)	Northwest	136	244.6	284.72	240	150	**<0.001***
	Syrian	137	166.38	202.6	180	120	
Sitting (min/day)	Northwest	136	452	516	480	240	**<0.001***
	Syrian	137	542	635	600	300	

The differences were calculated using the Mann–Whitney U test, and statistically significant associations were lined
*P value <0.001.
†P value <0.05.
‡P value <0.01.
BMI, body mass index; MET, the metabolic equivalent of task; RR, 10-year relative risk; TA, total activity.

high as that in the North West England population. The findings revealed a RR roughly three times higher in the Syrian group. The RR proves more dependable for examining cardiovascular risk within the population compared with QRISK3 alone. This is due to the variability of QRISK3 scores across different age groups irrespective of risk factors, whereas the RR mitigates the impact of age differences.[7] These outcomes align with antecedent investigations conducted in Syria, which demonstrated a remarkably high prevalence of CVD and its risk factors in the Syrian population.[3 17] Nevertheless, previous investigations solely focused on determining the prevalence of risk factors among Syrians residing in Syria. In contrast, the current study assessed the risk using the QRISK3 score for Syrians living in England and compared it with the North West England population. This juxtaposition suggests that the relocation and potential alterations in diet and lifestyle failed to yield a noteworthy reduction in cardiovascular risk within this demographic. The implications of these findings extend to clinical practice and healthcare policy, emphasising the need for tailored interventions for certain immigrant populations with elevated cardiovascular risk, the consideration of alongside traditional risk assessment tools and the importance of further research to understand the underlying factors contributing to cardiovascular disparities among immigrant communities.

The study's findings underscored notable disparities between the two groups, particularly in the prevalence of smoking, diabetes and CVD incidence among first-degree relatives aged younger than 60. These factors contribute to the higher QRISK3 score observed in the Syrian group, given their incorporation into the QRISK3 algorithm. Smoking, recognised as the most preventable cause of cardiovascular risk, is associated with a two to four times higher risk of developing CVD among smokers compared with non-smokers.[18] In the UK, there has been a discernible decrease in smoking prevalence over the past decade, with an estimated 13.3% of the population being smokers, closely aligned with the 13.9% of smokers among North West England participants in this study.[19 20] Conversely, a 2021 study revealed a markedly higher prevalence of smoking among Syrians, accounting for 51.9% of the total population, a figure closely mirrored by the 52.6% of smokers in the Syrian group in the current study, indicating that moving to the UK has not significantly affected smoking habits.[21] The likely explanation for this variance is attributed to a lack of awareness regarding the detrimental effects of smoking in the Syrian population due to a dearth of social education on

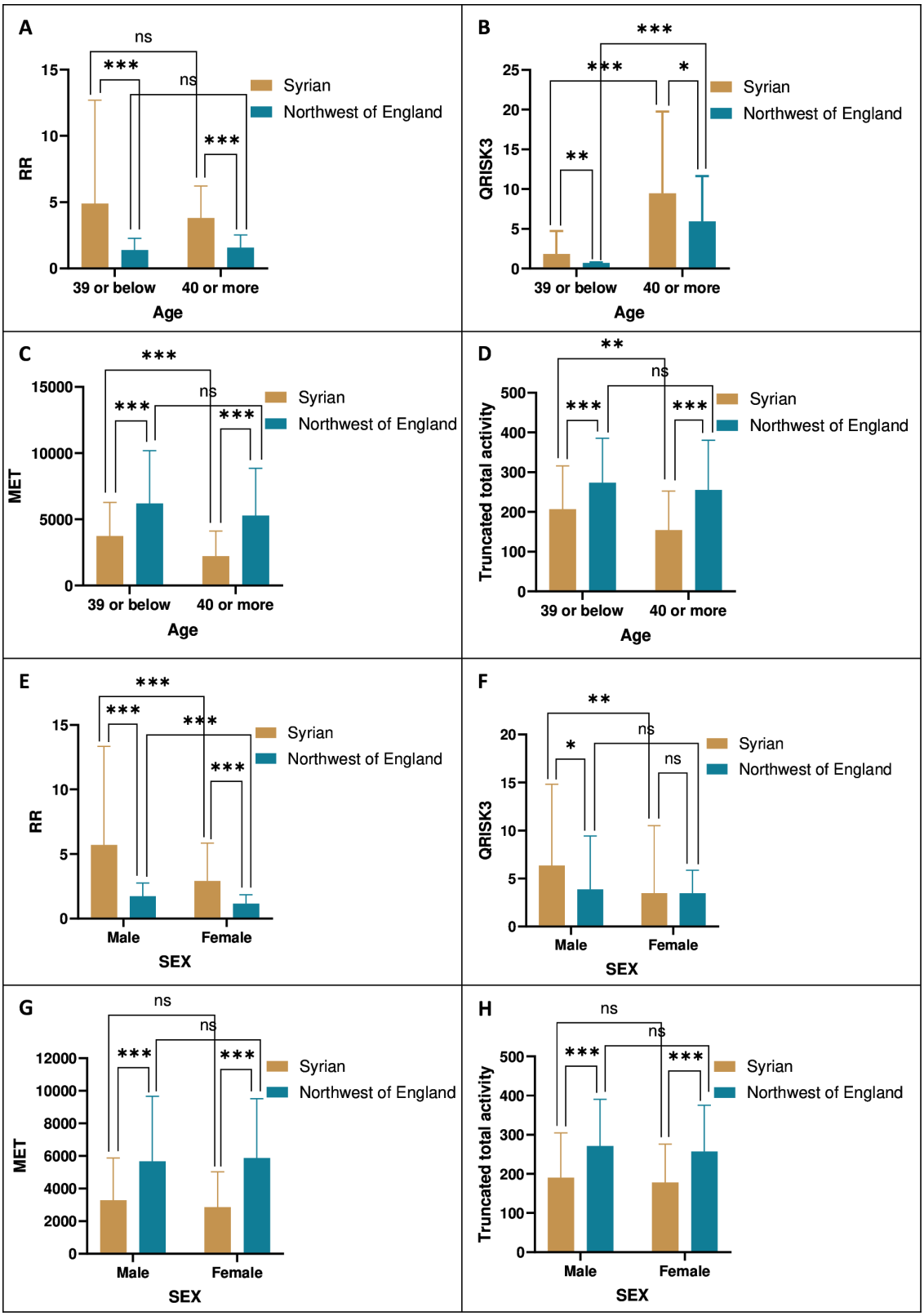

Figure 3 Subgroup analysis based on age groups and sex. (A) The difference in relative risk (RR) between the two groups according to age groups. (B) The difference in the QRISK3 score between the two groups according to age groups. (C) The difference in MET between the two groups according to age groups. (D) The difference in truncated total activity between the two groups according to age groups. (E) The difference in RR between the two groups according to sex. (F) The difference in QRISK3 between the two groups according to sex. (G) The difference in MET between the two groups according to sex. (H) The difference in truncated total activity between the two groups according to sex. The differences were calculated using the Mann–Whitney U test, and statistically significant associations were lined (*: P value <0.05, **: P value <0.01, ***: P value <0.001, ns: not significant).

the subject.[22] Stress emerges as a significant factor influencing smoking prevalence among Syrians, as stress has been identified as a leading cause of smoking, with recent studies documenting a notable increase in stress levels among Syrians, particularly those who have relocated to the UK.[23] This information underscores the importance of tailoring interventions and policies to address smoking cessation, particularly among vulnerable populations like Syrian immigrants. Healthcare providers must prioritise culturally sensitive education, screening and intervention strategies, while policymakers should focus on enhancing community engagement and access to cessation services to reduce smoking prevalence and cardiovascular risk.

The occurrence of CVD was markedly elevated among first-degree relatives under the age of 60 in the Syrian group. Additionally, both RR and QRISK3 score were significantly higher in individuals aged 39 and below in the Syrian group compared with the population in North West England. This observation may imply a potential genetic influence on the heightened cardiovascular risk among Syrians. While specific studies on the genetic underpinnings of CVD in the Syrian population are lacking, an earlier investigation highlighted that 49% of CVD in Syrians manifest before the age of 65,[5] a prevalence significantly higher than that observed in other developing nations.[24] Numerous studies and laboratory experiments have identified potential associations between premature CVD incidence and specific genetic variants, including but not limited to apolipoprotein A-V, proprotein convertase subtilisin/kexin type 9, guanylate cyclase 1 soluble subunit alpha 1, nitric-oxide synthase 3, angiopoietin-like 4, low-density lipoprotein receptor, apolipoprotein C3, lipoprotein lipase and lipoprotein(A). These variants play pivotal roles in modulating blood lipid levels, inflammation, vascular endothelial migration, vascular tone, blood pressure and smooth muscle hyperplasia.[25] Furthermore, additional risk factors likely contribute to the heightened occurrence of CVD among young adults, encompassing factors such as smoking, dietary patterns and obesity.[26] Nevertheless, further studies are imperative in this domain to elucidate the precise causes behind this abnormal elevation in CVD incidence among Syrian individuals under the age of 60. Integrating this knowledge into clinical practice and policy can help address the unique challenges and needs of the Syrian population regarding cardiovascular health, emphasising the importance of early detection of risk factors and assessment of CVD risk to enable timely interventions and personalised management strategies.

The Syrian group exhibited a significantly higher diabetes prevalence, aligning with a previous study in Syria that projected the prevalence to reach 21% in the Syrian population by 2022.[27] In contrast, North West England reported a diabetes diagnosis rate akin to other studies, estimated at 7%.[28] Previous studies exploring the heightened prevalence of diabetes in certain countries, including Syria, have identified contributors such as obesity, rapid urbanisation and insufficient physical activity, consistent with the present study's findings.[27 29] Additionally, although both groups exhibited an average BMI indicative of overweight, the Syrian cohort demonstrated a significantly higher BMI, closely aligning with a previous study reporting mean Syrian BMI values of 27.4±5.1 in men and 30.0±7.0 in women.[30] In contrast, the English group's average BMI in this study was lower than the reported UK average of 27.4 for both sexes.[31] The observed high BMI in the Syrian group corresponds with an unhealthy lifestyle and inadequate physical activity, further supporting the current study's findings. In regions with a high prevalence of metabolic issues among Syrian immigrants in the UK, interventions target obesity, urbanisation and inactivity through public health campaigns, lifestyle programmes and access to healthier food options. Allocating resources based on prevalence rates enhances diabetes prevention, screening and treatment, particularly among Syrian communities. Emphasising prevention, early screening and cultural sensitivity improves effectiveness and patient outcomes, reducing the burden of diabetes and promoting public health among Syrian immigrants in the UK.

Furthermore, the RR demonstrated a significant male predominance compared with females in both groups, corroborating earlier studies highlighting a higher CVD risk in males. Genetic disparities between genders contribute to this heightened CVD risk among males, with several risk factors, such as smoking and high blood pressure, being more prevalent in males, aligning with the findings of the current study.[32]

The study reveals no statistically significant difference in RR between participants aged below and above 40 in both groups. This contrasts with findings in several earlier studies that focused on individuals aged 25 and above. It's crucial to highlight that our study specifically examined individuals up to 69 years, distinguishing it from previous investigations. The absence of a significant difference may be attributed to our exclusion of individuals beyond the age of 70, a group in which RR tends to notably increase.[33] However, concerning the QRISK3 score, a noteworthy increase was observed in individuals over 40 years in both groups. This discrepancy can be attributed to how age is incorporated into the QRISK3 algorithm, as QRISK3 explicitly considers age in determining cardiovascular risk, whereas RR calculates this risk without accounting for age.[7]

The levels of MET and total physical activity were notably higher in the North West England group. This agrees with previous research that has indicated that the diminished physical activity observed in Syrians living in other countries may stem from factors such as a lack of awareness regarding the significance of physical activity, time constraints, and elevated associated costs.[34]

While this study has indicated an elevated cardiovascular risk within the Syrian cohort, it is noteworthy that the QRISK3 score was notably higher than the projected healthy QRISK3 and heart age exceeded real age in both cohorts. This suggests that individuals from both groups

exhibit a high risk for the development of CVD, necessitating proper detection and modification.

Based on the findings of this study, several recommendations can be made for future research and healthcare practice. Longitudinal studies are needed to elucidate the long-term impact of cardiovascular risk factors among immigrant populations and evaluate the effectiveness of interventions over time. Additionally, efforts should be made to improve access to healthcare services and health education among immigrant communities to facilitate early detection and management of cardiovascular risk factors. Furthermore, interventions targeting lifestyle modifications, such as smoking cessation programmes and initiatives promoting physical activity, should be developed and evaluated within these populations to mitigate the CVD burden. Additionally, considering the provision of health education materials in different languages, including Arabic, would be beneficial to assist minority groups in the UK who do not speak or understand English. This would enable them to comply with NHS recommendations, understand how to reduce their cardiovascular risk and identify steps they can take to reduce risk factors and increase their physical activity levels.

This study is subject to several limitations. The data collection relied on a self-reporting online questionnaire, introducing potential inaccuracies as responses are contingent on participants' recollections, and there is a risk of participants providing incorrect information. Online surveys are also susceptible to bias and may exclusively capture responses from literate individuals with technological proficiency and a specific interest in the survey topic, thereby limiting the generalizability of findings. Moreover, the iPAQ-Sf may not fully capture the diverse range of physical activities undertaken by individuals with disabilities, potentially leading to an underestimation of their activity levels.

When assessing the external validity of our study, it is crucial to acknowledge that our sample comprises Syrians who migrated to the UK after the 2010 war. Despite efforts to represent Syrians in the UK, findings may not fully generalise due to socio-economic, cultural differences and reliance on internet access and social media. Nonetheless, our research is pioneering in exploring cardiovascular risk within this immigrant group, offering valuable insights for addressing health disparities in this minority community and promoting healthcare equality.

CONCLUSION

Despite relocating to England, Syrians still face significantly elevated cardiovascular risks. This is attributed to an unhealthy lifestyle, including smoking; reduced physical activity; metabolic issues like increased BMI and diabetes; and a strong family history of CVD. Early assessment, risk factor identification and tailored intervention plans are essential for this group. Raising awareness among Syrians and other foreign groups in England about CVD and the benefits of physical activity is crucial. Communication in their languages is vital for effective compliance. Additionally, the study highlights the importance of increasing physical activity to reduce cardiovascular risk, emphasising the need to encourage an active lifestyle.

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