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Clinical and sociodemographic characteristics of cardiovascular disease in Sudan

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ABSTRACT

Introduction: The burden of cardiovascular disease states is stabilizing in high-income countries, and it continues to rise in low-to-middle-income countries.

Aim: The aim of the study was to explore the clinical and sociodemographic characteristics of cardiovascular disease risk factors in Sudan.

Material and methods: This is a prospective cross-sectional study consisted of 123 patients with cardiovascular disease admitted to Sudan Heart Center, Khartoum, Sudan.

Results and discussion: In total, 60.97% were females, most were 61–70-year-old, 65.85% were living in urban area and 60.66% were from northern Sudan. Physical inactivity was common for 92.68% of patients, tobacco and alcohol were used by 12.19% and 1.63% of patients, respectively. The prevalence of ischemic heart disease, cardiomyopathy, endomyocardial fibrosis, rheumatic heart disease, congenital heart disease and angina were 57.72%, 32.52%, 4.88%, 17.89%, 9.76% and 16.26%, respectively. The prevalence of risk factors for developing heart diseases stroke, diabetes mellitus, hypertension and kidney disease were 3.25%, 27.64%, 44.72% and 8.13%, respectively. Most patients have family history of heart attack 12.19%, angina 13.01%, stroke 3.25%, diabetes mellitus 37.39% and hypertension 43.90%. The anthropometric measures body weight (kg), BMI and waist-to-hip ratio were 72.32 ± 1.42, 43.87 ± 0.79 and 1.05 ± 0.06, respectively.

Conclusions: The results conclude that there is a high prevalence of cardiovascular disease in Sudan, and the risk factors were strongly influenced by clinical and sociodemographic characteristics of the population.

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1. INTRODUCTION

The World Health Organization (WHO) estimates that a total of 57 million deaths occurred worldwide in 2008, 36 million of which were due to noncommunicable diseases.[1] The burden of cardiovascular disease states is stabilizing in high-income countries, while in low-to-middle-income countries it continues to rise.[2] Over the past 55 years in West Africa, there has been a 20% decrease in communicable diseases, which has been offset by a proportionate increase in noncommunicable diseases, particularly cardiovascular disease.[3] Sub-Saharan African countries are currently experiencing one of the most rapid epidemiological transitions characterized by increasing urbanization and changing lifestyle factors. This has resulted in an increase in the incidence of noncommunicable diseases, especially cardiovascular disease.[4]

Steyn et al.[5] noted that globally, including sub-Saharan African countries, 90% of cardiovascular risk factors include smoking, alcohol consumption, obesity, diet, low physical activity, psychosocial factors, diabetes mellitus, hypertension and high lipid levels.

Cardiovascular disease is strongly influenced by socioeconomic status in all societies, whether one considers accepted risk factors, heart disease, hypertension or stroke.[6] As a population, blacks have one of the highest rates of coronary artery disease in the world.[7] Hypertension is widely recognized as a major cause of cardiovascular morbidity and mortality in indigenous people of Africa.[8] Furthermore, several studies have shown that male urban dwellers in Africa have a higher incidence of hypertension compared to males living in rural areas.[9,10]

Hyperhomocysteinaemia is associated with an increased risk of cardiovascular disease that can lead to stroke or heart attack, both of which are causes of mortality in African populations, especially males.[11]

Previous individual and case-control studies from Sudan have reported importance of smoking, hypertension, diabetes mellitus, abnormal lipids, insulin resistance, and dietary factors in cardiovascular disease.[12–15] Large studies for identification of risk factors for cardiovascular disease among Sudanese subjects are not available and most of them are limited to 50–100 subjects.

2. AIM

The purpose of this study is to explore the clinical and sociodemographic characteristics of cardiovascular disease risk factors in Sudan.

3. MATERIAL AND METHODS

3.1. Study design and data collection

This is a cross sectional study consisted of 123 patients with cardiovascular disease admitted to Sudan Heart Center, Khartoum, Sudan, recruited prospectively in 2014. The study was approved by the ethical committee of the University of Khartoum, and the informed consent was obtained from all participants. Detailed demographic and medical histories were collected using a structured questionnaire. The data include sociodemographic characteristics such as age, sex, ethnicity/race, residence, education, occupation, income and housing status for classification of socioeconomic status. The prevalence of cardiovascular disease phenotype and risk factors included ischemic heart disease, cardiomyopathy, endomyocardial fibrosis, rheumatic heart disease, congenital heart disease, angina, stroke, diabetes mellitus, hypertension and kidney disease were recorded. The family history including heart attack, angina, stroke, diabetes mellitus and hypertension were determined.

3.2. Anthropometric measures

Participants were assessed for anthropometric measures height and weight to assess body mass index (BMI) and waist and hip circumferences to assess the waist-to-hip ratio (WHR).

With participants in bare feet, height was measured in centimeters to the top of the head using a non-stretching measuring tape secured to the wall. Weight was measured in kilograms using a professional body-weight scale; participants wore only light clothing, empty of all belongings, and no shoes. BMI was calculated using the formula: body mass divided by the square of the body height (kg/m^2). Waist circumferences were measured in centimeters by placing a nonstretching measuring tape in a horizontal plane around a participant's bare abdomen at the top of the iliac crest. Hip measurement was taken at the point of maximum circumference over the buttocks, with the measuring tape held in a horizontal plane touching the skin but not indenting soft tissue. WHR was calculated by dividing waist measurement by hip measurement.

3.3. Statistical analysis

Results are expressed as mean and standard error or in percentages. A two-sample *t*-test was used for determining the statistical significance of a parameter between the different groups. A P value of less than 0.05 was considered as statistically significant. Statistical analyses were performed using SPSS v. 18 (SPSS, Chicago, Illinois, USA).

4. RESULTS

4.1. Sociodemographic characteristics

In 123 cardiovascular disease patients studied 60.97% are females and 39.03% are males, and the most effected age groups are 61–70-year-old. In total, 65.85% of patients live in urban area, and the most presented ethnic group is from northern Sudan followed by western and central Sudan. A 71.54% of patient's father and mother are first degree relatives, 80.49% of patients are married with average number of 5 children, and 61.40% of subject's spouse is his/her first degree relative. Most patients have one job and 50.82% are house wife, 22.13% practice nonprofessional job, 15.57%

Table 1. Sociodemographic characteristics of the patients.

Characteristics	Frequency	Percentage (%)
Age		
<40	17	13.82
41–50	13	10.57
51–60	30	24.39
61–70	42	34.15
>70	21	17.07
Sex		
Male	48	39.03
Female	75	60.97
Residence		
Urban	81	65.85
Rural	42	34.15
Ethnic		
Northern Sudan	74	60.66
Western Sudan	23	18.85
Eastern Sudan	2	1.64
Southern Sudan	0	0
Central Sudan	23	18.85
Were Subject's father and mother first degree relatives?		
Yes	88	71.54
No	35	28.46
Marital Status		
Single	8	6.50
Married	99	80.49
Divorced	2	1.63
Widow	14	11.38
Is subject's spouse his/her first degree relative?		
Yes	70	61.40
No	44	38.60
Type of job		
House wife	62	50.82
Professional	19	15.57
Non Professional	27	22.13
Business	14	11.48
Subject		
Uneducated	56	45.53
School	53	43.09
University	14	11.38
Mother		
Uneducated	117	95.12
School	6	4.88
University	0	0
Father		
Uneducated	114	92.68
School	8	6.50
University	1	8.81

practice professional job and 11.48% have their own business. Therefore, 45.53% of patients are uneducated, 95.12% of their mothers are uneducated and 92.68% of their fathers are uneducated (Table 1).

4.2. Physical activity

Approximately 92.68% of patients do not practice any physical activities. About 8.13% of patients experience marital separation or divorce in the past years, 26.02% loss their job or retirement, 63.41% had major personal injury or illness, 79.67% have death or major illness of a close, and 18.69% dead their spouse. A 11.38% of patients faced high level of stress at work, 24.39% at home and 2.44% face high financial stress (Table 2).

Table 2. Physical activity of patients.

Characteristics	Frequency	Percentage (%)
Physical activity		
Yes	9	7.32
No	114	92.68
Subject experience in the past years		
Marital separation / Divorce		
Yes	10	8.13
No	113	91.87
Loss of job / Retirement		
Yes	32	26.02
No	91	73.98
Major personal injury or illness		
Yes	78	63.41
No	45	36.59
Death / Major illness of a close		
Yes	98	79.67
No	25	20.33
Death of a spouse		
Yes	23	18.69
No	100	81.31
Subject stress level		
Stress at work		
High	14	11.38
Mild	9	7.32
None	100	81.30
Stress at home		
High	30	24.39
Mild	34	27.64
None	59	47.97
Financial stress		
High	3	2.44
Mild	45	36.59
None	77	62.60

4.3. Clinical characteristics and modifiable risk factors

The risk for the cardiovascular disease in Sudanese patients could be multiple, ranging from social, economic, lifestyle (smoking, sedentary lifestyle, improper diet) and biological (abnormal lipids, hypertension, diabetes, obesity). In the present study 12.19% of patients are past user of tobacco and 1.63% are alcohol drunker. The prevalence of cardiovascular disease phenotype and risk factors included ischemic heart disease (57.72%), cardiomyopathy (32.52%), endomyocardial fibrosis (4.88%), rheumatic heart disease (17.89%), congenital heart disease (9.76%), angina (16.26%), stroke (3.25%), diabetes mellitus (27.64%), hypertension (44.72%) and kidney disease (8.13%) (Table 3). The family history of heart attack, angina, stroke, diabetes, hypertension for patients were 12.19%, 13.01%, 3.25%, 37.39% and 43.90%, respectively (Table 3).

4.4. Anthropometrics measures

As shown in Table 4, the overall body weight were 72.32 ± 1.42 kg, height 168.97 ± 4.39 cm, BMI 43.87 ± 0.79, waist circumference 100.55 ± 3.02 cm, hip circumference 98.85 ± 2.55 cm, WHR 1.05 ± 0.06, systolic blood pressure 123.57 ± 1.96 mm Hg and diastolic blood pressures 72.41 ± 1.00 mm Hg and 77.27 ± 1.32 mm Hg, respectively. However, there were no significant different ($P < 0.05$) between males and females in anthropometrics measures.

5. DISCUSSION

Cardiovascular disorders are the second most common causes of adult deaths in sub-Saharan Africa, in addition to a major cause of chronic illness and disability. Both cardiovascular disease mortality and associated major risk factors vary widely between countries, with a major burden of cardiovascular diseases predicted in developing countries in the near future.[16] Observational studies have revealed large differences in the clinical management of patients with cardiovascular diseases when comparing different regions within a country, different countries in specific regions, or different regions across the globe.[17]

In the present study 60.97% of patients are females and most are from northern Sudan followed by western and central Sudan. Their age are 61–70 year, and 65.85% are residing in urban area. In the previous study we found that 53.1% of coronary heart disease patients were male, 45% were from northern Sudan and 72.7% were residing in urban areas, while the most infected age group 26.8% was less than 40 years.[15] Baingana and Bos[18] noted that half of cardiovascular disease deaths occur among people aged of 30–69, which are 10 or more years younger than in more developed regions.

Yach et al.[19] indicated that mortality by cardiovascular disease is expected to increase by 120% for women and 137%

Table 3. Clinical and modifiable risk factors for patients.

Characteristics	Frequency	Percentage (%)
Tobacco use		
Never used	103	83.74
Current user	5	4.07
Past user	15	12.19
Alcohol drink		
Never drunk	119	96.75
Current drunk	2	1.63
Past drunk	2	1.63
Cardiovascular history		
Ischemic heart disease	71	57.72
Cardiomyopathy	40	32.52
Endomyocardial fibrosis	6	4.88
Rheumatic heart disease	22	17.89
Congenital heart disease	12	9.76
Angina	20	16.26
Stroke	4	3.25
Diabetes	34	27.64
Hypertension	55	44.72
Kidney disease	10	8.13
Family history		
Heart Attack	15	12.19
Angina	16	13.01
Stroke	4	3.25
Diabetes	46	37.39
Hypertension	54	43.90

Table 4. Anthropometrics measures.

Characteristics	Male $n = 45$	Females $n = 68$	All $n = 113$	P value
Body weight, kg	74.18 ± 2.37	71.09 ± 1.76	72.32 ± 1.42	0.290
Height, cm	176.73 ± 10.91	163.83 ± 0.87	168.97 ± 4.39	0.151
BMI, kg-m^2	44.59 ± 1.24	43.30 ± 1.05	43.87 ± 0.79	0.463
Waist circumference, cm	99.42 ± 4.44	101.19 ± 4.08	100.55 ± 3.02	0.782
Hip circumference, cm	97.00 ± 5.76	99.90 ± 2.41	98.85 ± 2.55	0.592
Waist-to-hip ratio	1.10 ± 0.15	1.01 ± 0.03	1.05 ± 0.06	0.455
Systolic blood pressure, mmHg	123.37 ± 3.55	123.69 ± 2.29	123.57 ± 1.96	0.936
Diastolic blood pressure, mmHg	73.41 ± 1.58	71.76 ± 1.29	72.41 ± 1.00	0.424
Heart rate, bpm	77.85 ± 1.50	76.89 ± 1.95	77.27 ± 1.32	0.723

for men by 2020. Disentangling the effects of socioeconomic status and ethnic background is therefore difficult, and it is a major potential confounding factor in most studies that have been undertaken. Some, although not all, of the apparent differences between ethnic groups may be explained by socioeconomic factors.[6] Popkin[20] indicated that urbanization and economic development have led to the emergence of a nutritional transition characterized by a shift to a higher caloric content diet and/or reduction of physical activity. Together, these transitions create enormous public health challenges, and failure to address the problem may impose significant burden for the health sector and the economy of sub-Saharan African countries.[21] In consistent to Dallongevillle et al.[22] females were generally older and had a lower educational level compared to male.

Approximately 92.68% of patients do not practice any physical activities, but they faced high level of stress at home compared to work and financial stress, this may be due to the large number of family member as the average numbers of children are five. Similarly, the prevalence rate of low physical activity was 86.8% in the STEPS survey.[14]

Cigarette smoking increases the impact of other risk factors (such as obesity, high cholesterol, diabetes, or older age) on the risk of coronary events.[23] The percentage of patients used tobacco and alcohol are less than those reported in the previous study.[15] However, the percentage is very low when compared with other population. Pinto et al.[24] indicated smoking cessation is considered a 'gold standard' of chronic disease interventions in terms of cost effectiveness for disease treatment and prevention.

The prevalence of ischemic heart disease was 57.72%, cardiomyopathy 32.52%, endomyocardial fibrosis 4.88%, rheumatic heart disease 17.89%, congenital heart disease 9.76%, and angina 16.26. In the previous studies endomyocardial fibrosis represented 18% of all the cases of cardiomyopathy seen at the level of tertiary cardiac center in Sudan.[25]

The prevalence rates of rheumatic heart disease for all ages were 10 : 1000 for boys and 14 : 1000 for girls.[13] The prevalence rate was significantly increased among the inner town inhabitants (15 : 1000) compared to the outer town inhabitants 4 : 1000 ($P < 0.001$).[13] In the Sudan, rheumatic heart disease in still the most frequent cause of heart disease in the 5–30 year age group, and it accounts for 36% of the total hospital admissions for cardiovascular disease.[12] It is seen in children as young as 4 years, and is frequently complicated by congestive heart failure and pulmonary hypertension, making surgical treatment imperative at an early age.[13]

The prevalence of risk factors were: for stroke 3.25%, diabetes mellitus 27.64%, hypertension 44.72%, and kidney disease 8.13%. Family history such as heart attack, angina, stroke, diabetes mellitus, hypertension for patients were 12.19%, 13.01%, 3.25%, 37.39% and 43.90%, respectively. Similarly, we reported that the Sudanese coronary heart disease patients had strong family history of cardiovascular disease.[15] STEPS survey of chronic risk factors for ischemic heart disease in Khartoum state, Sudan showed high prevalence rates for hypertension 23.6%, diabetes mellitus 19.2%, overweight and obesity 53.9%, hypercholesterolaemia 19.8%, smoking 12% and physical inactivity 86.8%.[14] Steyn et al.[5] indicated that hypertension is a strong contributor to the hazards of cardiovascular disease in black Africans, with an odds ratio of 7.0 v. 2.3–3.9 in other ethnic groups ($P = 0.0002$). In sub-Saharan Africa, prevalence and burden of type 2 diabetes are rising quickly, rapid uncontrolled urbanization and major changes in lifestyle could be driving this epidemic.[26] The development of cardiovascular disease in diabetes mellitus is often predicted by several factors which include central obesity, hypertriglyceridemia, elevated low high density lipoprotein (HDL-C) levels, and hypertension.[27]

In Ghana subjects with cardiovascular disease were older and had a higher incidence of hypertension 66% and nearly a quarter had diabetes.[28] Whereas, in Cameroon obesity 80%, hypertension 60%, hyperlipidaemia 43%, smoking 36%, and diabetes 26% were the major risk factors.[29]

To identify which of the three simple anthropometric indices, BMI, WHR and waist circumference, best predicts cardiovascular risk factors, and to determine if the association between the anthropometric indices and cardiovascular risk factors varies with gender. We observed nonsignificant gender differences in the association between central or general obesity with cardiovascular risk factors. Ho et al.[30] indicated that BMI had an independent and significant association with metabolic risks in men, but not in women, whereas WHR was more strongly correlated with metabolic risks for women than for men.[30] Whereas, Borne et al.[31] noted that raised BMI, WC and WHR increase the risk of heart failure hospitalization. In addition, Choi and Tan[32] indicated that anthropometric measures such as BMI, waist circumference, and WHR have been associated with physiological indicators of CHD risk e.g., blood pressure, glucose, and plasma lipids.

6. CONCLUSIONS

The results conclude that there is a high prevalence of cardiovascular disease in Sudan, and the risk factors were strongly influenced by clinical and sociodemographic (such as age, sex, ethnicity, residence and income) characteristics of the population. Physical inactivity was common in 92.68% of patients, tobacco and alcohol were used by 12.19% and 1.63% of patients, respectively. The prevalence of ischemic heart disease, cardiomyopathy, endomyocardial fibrosis, rheumatic heart disease, congenital heart disease and angina were 57.72%, 32.52%, 4.88%, 17.89%, 9.76% and 16.26%, respectively. The prevalence of risk factors for developing heart diseases stroke, diabetes mellitus, hypertension and kidney disease were 3.25%, 27.64%, 44.72% and 8.13%, respectively. Most patients have family history of heart attack 12.19%, angina 13.01%, stroke 3.25%, diabetes mellitus 37.39% and hypertension 43.90%. The anthropometric measures body weight, BMI and WHR were 72.32 ± 1.42 kg, 43.87 ± 0.79 and 1.05 ± 0.06, respectively.

Conflict of interest

The authors declare that they have no conflict of interests.

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