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Waist Circumference, Blood Pressure and Lifestyle of Sudanese Population, Khartoum Locality, Sudan 2016

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Authors' contributions

This work was carried out in collaboration among all authors. Author AAA designed the study and wrote the protocol. Authors AAA, AAB, SAM and RAOK trained the data collectors and supervised the data collection. Author SAB performed the statistical analysis, Authors AAA and SAB manage the literature search and Author AAA wrote the first draft of the manuscript. Author SAB revised the first draft. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: To measure the waist circumference of Sudanese adults in Khartoum Locality and its relationship to blood pressure and lifestyle during celebration of international day of hypertension in May 2016 .
Study Design: It was a descriptive cross-sectional study.
Place of the Celebration: Khartoum Locality at Alsahaa Alkhadraa (The Green Park).
Methodology: A total of 364 adult participants, 196 men and 168 women were interviewed using structured questionnaire. Blood pressure (BP) was measured considering hypertension as ≥ 140

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mmHg and ≥ 90 mmHg for systole and diastole BP respectively. Waist circumference was measured using an anthropometric measuring tape at cut-off point of 94 cm and 80 cm for men and women respectively. Data was managed by SPSS version 20 and Chi-square test at 95% CL was used to test the association between waist circumference, blood pressure and life style characteristics.

Results: Age distribution of the study population showed 48.2% females and 45.4% males in the middle age group (38-57 years). Two thirds of the study population were hypertensive, 62.8% of males and 64.3% of females. The mean waist circumference of men was 97.82 cm ± 16.7, mean Systolic BP was 127 ± 22 and mean Diastolic BP was 85 ± 15. The mean waist circumference of women was 99.31 ± 16.2, mean Systolic was 128 ± 24 and mean Diastolic BP was 84 ±17.

Abnormal waist circumference was found in 61.2% of males and 86.9% of females. Fifty nine (30.1%) of the males and 86 (51.2%) of the females with abnormal waist circumference were hypertensive. The association between abnormal waist circumference and high blood pressure was significant among both sexes, P value = 0.001.

Physical exercise and fat and salt foods were not significantly associated waist circumference in both men and women.

Conclusion: Two thirds of women and men in the celebrating areas were hypertensive. Half of women and one third of men were significantly hypertensive and having abnormal waist circumference. Doing physical exercise, avoiding fat and salt foods was insignificantly associated with normal waist circumference. Large survey with representative sample is needed to estimate the real Sudanese waist circumference.

Keywords: Waist circumference; blood pressure; lifestyle.

1. INTRODUCTION

Waist circumference (WC) is a marker of visceral adipose tissue of abdomen and it is an important anthropometric measure that predict hypertension and coronary artery diseases of adults as well as of children, [1-3]. Waist circumference is a good predictor than BMI because it does not influenced by height; however, in meta- analysis of 23 longitudinal observation studies, waist circumference is not a predictor for hypertension except in some Hispanic/Latinos [4].The optimal cut-off points of waist circumference varies between countries due to ethnicity, it ranged from 102/40 to 88/34.6 (cm/inch) in men and 88/34.6 to 79/31 (cm/inch) in women [5]. The heart foundation defined normal waist circumference as less than 94 cm (37 inches) in men and less than 80 cm (31.5 inches) in women, above which both will be at risk of cardiovascular diseases including hypertension [6]. Women have substantially more total adipose tissue than men with more peripheral distribution of fat in early adulthood [7]. The hormonal effect and parity in women contribute to abnormal fat distribution and to the increase of waist circumference compared to men [7,8]. Modification of life style including diet control and exercise contribute to reduction of waist circumference [9]. Usually; obesity is a strong predictor of abnormal waist circumference. The prevalence of obesity has increased across the globe, particularly in Africa including Sudan [10]. Obesity has been studies thoroughly in Sudan [10], while studies regarding relationship of lifestyle, waist circumference and blood pressure are not abundant; therefore this study was aiming to measure the waist circumference of Sudanese adults in Khartoum Locality and its relationship to blood pressure and lifestyle.

2. POPULATION AND METHODS

2.1 Study Design

This was a cross-sectional descriptive study carried in May 2016 during the celebration of international day of hypertension.

2.2 Study Area

The study area was Khartoum locality, which consists of six local administrative units and 157 quarters. This area covers a population of 639,598 people, spread across an area of approximately 176 square kilometers. The celebration days was carried out in the centre of Khartoum locality, Alsahaa Alkhadraa (The Green Park).

2.3 Study Population

The target population was adult males and females aged 18 years and above who attended

the celebration and came from the six local administrative units of Khartoum locality.

2.4 Sampling and Sample Size

2.4.1 Sample size

Sample size was calculated according to the binomial equation:

$$n = \frac{Z^2 pq}{d^2}$$

Where;

n is the desired sample size
z is standard normal deviate=1.96
p is the prevalence of occurrence. It is considered 0.5% to obtain the maximum sample size.
q is (1- p) = 0.5
d is the desired margin of error = 0.05

The calculated sample size was 384 and 364 individuals were responding leaving 5% non-response rate.

2.4.2 Sampling technique

The sampling technique was a purposive convenient sampling based on the agreement of the eligible adults to participate in the study during the celebration days until the sample size was completed.

2.5 Tools and Data Collectors

Data collection tool were structured close ended questionnaire, sphygmomanometers and measuring tapes. The questionnaire was composed of three parts; the first part composed of population characteristics; age, sex, education, marital and working status. The second part was about life style characteristics; physical exercise, fat and salt foods consumption. The third part was the measurement section for recording the systole and diastole blood pressure (BP) and the waist circumference.

Hypertension was defined as systolic BP ≥140 mm Hg and diastolic BP ≥90 mm Hg. Blood pressure was measured by calibrated mercury sphygmomanometers before and after the interview. The first measurement was taken after 5 minutes rest while the participant in quiet sitting position with legs uncrossed and the arm at the level of the heart. Systolic blood pressure (SBP) taken upon hearing the first sound, and DBP upon the complete disappearance of Korotkoff sounds. The second BP measurement was taken after the interview with the similar resting position. The range of interview time was estimated to 5-6 minutes. The averages of the two measurements were used for further analysis.

For accurate measurement of WC, the data collector asked the respondent to stand with arms at the sides, feet positioned close together so that the weight evenly distributed across the feet [11]. The WC measurement was done twice after the end of a normal expiration. The elastic measuring tape was adjusted at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest [11]. The two measurements were averaged and the WC cut-off points used for male and females were 94 cm and 80 cm respectively [6].

Data collectors were the medical doctors with membership in the Sudanese Society of Hypertension (SSH) and semi-final medical students from the Faculties of Medicine in University of Khartoum, International Africa University and Alneelain University. They were trained on data collection, calibration of sphygmomanometers and the skills of measuring BP. They were also trained on how to measure WC using measuring tape. Data collection took about six days from 17th to 22nd of May 2016.

2.6 Data Management and Analysis

Data was cleaned, entered and managed in SPSS version 20. Descriptive statistics in terms of frequency counts and percentages were used for qualitative variables. Mean WC was calculated as well as the mean systolic and diastolic BP for both sexes. Chi-square test at 95% CL was used to test the association between waist circumference and blood pressure, physical exercise, fat and salt foods consumption. P value equal to or less than 0.05 is considered as significant.

Authorization was obtained from the ethical committee of SSH. An informed consent was signed by the individuals who agreed to participate before filling in the questionnaire and all personal information and measurements were kept confidential.

3. RESULTS

Age distribution of the study population showed 48.2% were females and 45.4% were males in the middle age group (38-57 years). Females and males in the age group of 18-37 years accounted to 38.7% and 29.1% respectively [Table 1]. The married population was 144 (73.5%) and 103 (61.3%) for males and females respectively [Table 1].Almost half of males and females had university education and above, 111(56.6%) and 90 (53.6%) respectively [Table 1].The majority of males were working, 132 (67.3%) and the majority of females were not, 124 (73.8%) [Table 1].

Almost two third of the study population were hypertensive, 62.8% of males and 64.3% of females [Fig. 1].

The mean waist circumference of men was 97.82 cm ± 16.7, the mean Systolic BP was 127 ± 22 and the mean Diastolic BP was 85 ± 15 [Table 2]. The mean waist circumference of women was 99.31 ± 16.2, the mean Systolic was 128 ± 24 and the mean Diastolic BP was 84 ±17 [Table 2].

Abnormal waist circumference was found in 61.2% of males and 86.9% of females [Fig. 2]. Fifty nine (30.1%) of the males and 86 (51.2%) of the females with abnormal WC were hypertensive [Fig. 3]. The association between abnormal waist circumference and high blood pressure was significant among both sexes, P value = 0.001 [Fig. 3].

Being practicing exercise and avoiding fat and salt foods was not significantly associated with waist circumference measure among men and women [Table 3 and Table 4].

4. DISCUSSION

The population in this study were voluntary came to the celebration of hypertension days. This is

Table 1. Socio-demographic characteristics of study population

Characteristics of study population (total n = 364)		Males (n = 196)	Females (n = 168)
Age in years	18-37	57(29.1%)	65(38.7%)
	38-57	89(45.4%)	81(48.2%)
	58 and above	50(25.5%)	22(13.1%)
Marital status	Married	144(73.5%)	103(61.3%)
	not married	52(26.5%)	65(38.7%)
Educational status	Basic education*	85(43.4%)	78(46.4%)
	University and above	111(56.6%)	90(53.6%)
Working status	Working	132(67.3%)	44(26.2%)
	Not working	64(32.7%)	124(73.8%)

**Basic education includes Khalwa, primary and secondary schools*

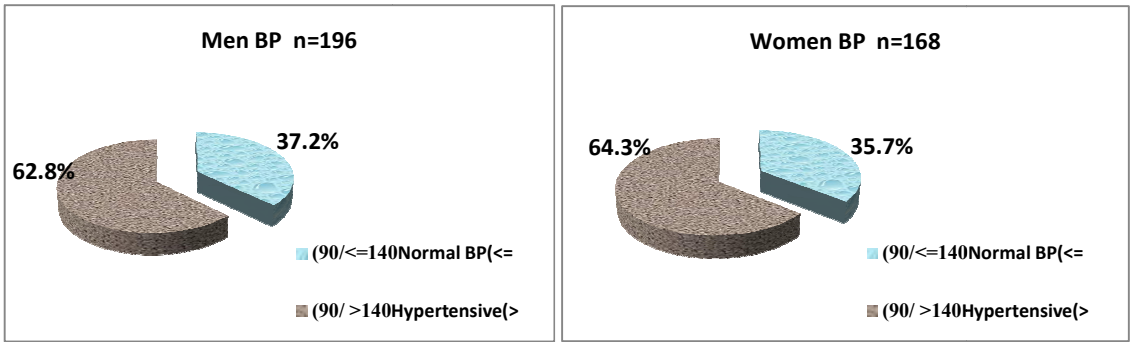

Fig. 1. Number distribution of study population by blood pressure and sex

Table 2. Measurement of waist circumference and blood pressure of study population

Measurement	Men	Women
Mean waist circumferance	97.82 cm ± 16.7	99.31 ± 16.2
Mean Systolic BP	127 ± 22	128 ± 24
Mean Diastolic BP	85 ± 15	84 ± 17

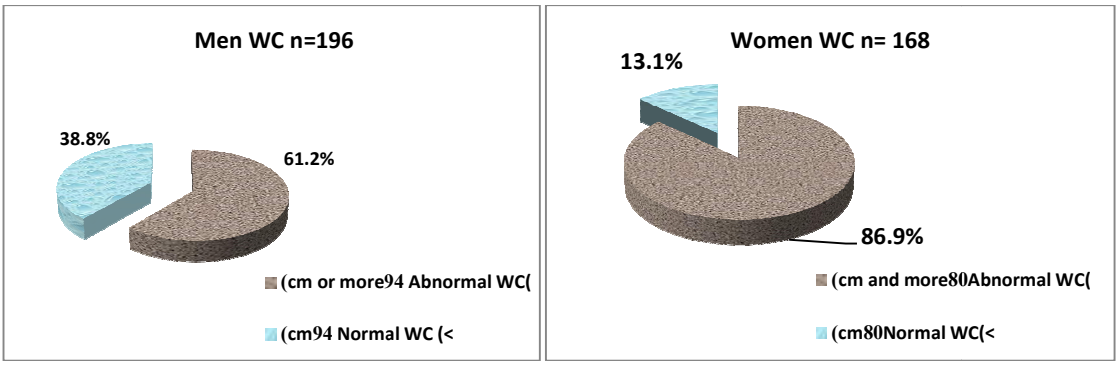

Fig. 2. Number distribution of study population by waist circumference and sex

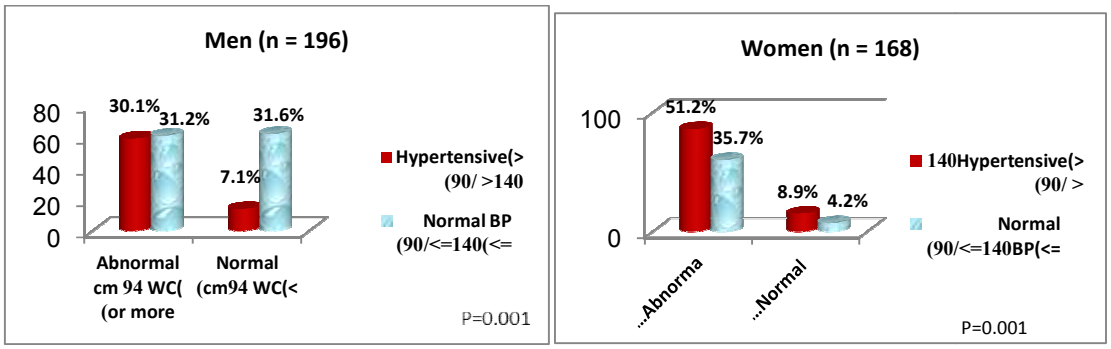

Fig. 3. Association of waist circumference and blood pressure among study population

Table 3. Association of waist circumference and lifestyle characteristics of men (n = 196)

Characteristics		Waist circumference		Sig level
		Abnormal	Normal	
Physical exercise	Every day	30(15.3%)	22(11.2%)	0.857
	1 to 3 times a week	39(20%)	22(11.2%)	
	Never	50(25.5%)	33(16.8%)	
Rating consumption of fatty foods	Avoid fatty foods	65(33.2%)	38(19.4%)	0.283
	Don't pay attention to fatty foods	34(17.3%)	29(14.8%)	
	Use a lot of fats	21(10.7%)	9(4.6%)	
Rating consumption of salt in food	Avoid foods rich in salt	69(35.2%)	36(18.4%)	0.080
	Don't pay attention to salt in food	37(18.9%)	22(11.2%)	
	Use a lot of salt	14(7.1%)	18(9.2%)	

Table 4. Association of waist circumference and lifestyle characteristics of women (n=168)

Characteristics		Waist circumference		Sig level
		Abnormal	Normal	
Physical exercise	Every day	84(50%)	8(4.7%)	0.944
	1 to 3 times a week	10(6%)	2(1.2%)	
	Never	54(32.1%)	10(6%)	
Rating consumption of fatty foods	Avoid fatty foods	79(47.1%)	11(6.5%)	0.901
	Don't pay attention to fatty foods	46(27.4%)	8(4.7%)	
	Use a lot of fats	21(12.5%)	3(1.8%)	
Rating consumption of salt in food	Avoid foods rich in salt	70(41.7%)	7(4.2%)	0.238
	Don't pay attention to salt in foods	54(32%)	9(5.4%)	
	Use a lot of salt	22(13.1%)	6(3.6%)	

explain the skewedness of age to show two thirds above 38 years and most of them were hypertensive. Although high blood pressure is correlated positively with aging [12] but in this study the sampling methods did not represent the reference population in Khartoum Locality and specific analysis for age and hypertension were not carried out. The population came to celebration areas could be either known hypertensive they needed to check their status or unknown and undiagnosed ones. More than half of the celebrating population were having high education. Being highly educated does not affect the access and utilization of the celebration services, it is worth to know that health seeking behaviour is low among population aware of the existence of health services [13]. In this study; almost four quarters of women were having abnormal waist circumference compared to two thirds of men. The mean waist circumference was more than 80 cm among study women approximates the mean waist circumference of men. This could be due to that women living in Khartoum as urban city having access to modern fast foods would suffer from overweight and obesity. Sub-Saharan countries including Sudan showed nutritional transition of women towards obesity and overweight due to urbanization [14, 15].The global scene showed increasing prevalence trend of abdominal obesity that increases the waist circumference and positively correlated with changes in lifestyle [16-18]. In this study hypertension was significantly associated with abnormal waist circumference where one third of men and half of women were hypertensive and having large waist circumference. Several studies had shown that the waist circumference is strongly associated with the risk of developing hypertension, diabetes and other devastating physiological symptoms [19-23].

Regarding lifestyle and waist circumference, half of women with abnormal waist circumference carried out some sort of physical activities every day compared to 15.3% of men with abnormal waist circumference. This relationship was insignificant and it is not supported by the intervention study of physical activity and reduction of the central obesity and waist circumference [24]. Avoiding fatty food was found to be insignificantly related to normal waist circumference which is not supported by the evidence of reduction in fatty diet reduces body weight and central abdominal obesity [25]. Avoiding extra salt in food among celebrating population was insignificantly associated with normal waist circumference. A longitudinal study showed significant reduction of waist circumference when lowering salt in food [26].

5. CONCLUSION

Almost two thirds of women and men during the internal celebration days of hypertension in Khartoum locality were hypertensive. Four quarters of women and two thirds of men were having abnormal waist circumference with large mean WC among women. Half of women and one third of men were had hypertension that significantly associated with abnormal waist circumference. Doing physical exercise, avoiding fat and salt foods were insignificantly associated with normal waist circumference. Large survey with representative sample is needed to estimate the Sudanese waist circumference and its relationship to details of physical exercise, fat and salt food consumption.

6. LIMITATION

This study was carried out among celebrating population that gave up unrealistic association between physical activities, salt and fat foods consumption and waist circumference. This limitation was superimposed by the non-representativeness of Sudanese population in the celebration days and the missing of the types of physical activities, fat and salt foods.

CONSENT

An informed consent was signed by the individuals who agreed to participate before filling in the questionnaire and all personal information and measurements were kept confidential.

ETHICAL APPROVAL

Ethical Clearance was obtained from the ethical committee of the Sudanese Society of Hypertension.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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