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Age Specific Relation of Blood Pressure with Anthropometric Variables among 19-24 years Punjabi Female Youth of Amritsar City in Punjab, India

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ABSTRACT A total of 800 urban Punjabi female youth aged 19-24 years in Amritsar city, Punjab were measured for blood pressure, height, weight, waist and hip circumferences. Mean arterial blood pressure (MBP), body mass index (BMI) and waist hip ratio (WHR) were also calculated through standard equation. The present results bring out (i) a systematic indicator of linear effect and strong positive correlation of age and other anthropometric variables with blood pressures, (ii) the trend of systolic and diastolic blood pressures among Punjabi female youth in Amritsar city in North India.

INTRODUCTION

Large numbers of correlative studies on the various etiological factors for cardiovascular diseases like age, sex, weight, height, ethnicity, socio-economic status and psychological factors have been done among western and Indian population (Kotchen et al. 1982; Labarthe 1982; Voors et al. 1982; Sharma et al. 1991; Badaruddoza and Afzal 1999, 2000; Sidhu et al. 2004). Different anthropometric measurements such as height, weight, BMI, waist and hip circumferences, waist hip ratio, waist to height ratio and thickness of different skinfold were overwhelming used in present day as a risk factor for cardiovascular disease (Mirmiran et al. 2004; Yalcin et al. 2005). The other relative risk factors of cardiovascular diseases such as cholesterol levels, alcohol intake, stress and smoking have significant and similar effect for both men and women (Willett et al. 1987). The male predominate for coronary disease is well recognized, however, these risk factors tend to cluster between women especially younger age groups due to quick adoption of westernized and urban industrial culture.

Punjab is one of the affluent states in India and a greater penetration of industrialized lifestyle and prosperity have found in this region. This epidemiological transition has imposed a heavy burden on cardiovascular disease. Therefore, the present study was undertaken among Punjabi females in between 19-24 years of age in the University campus in Amritsar city to study the relationship of age, height, weight, BMI, waist circumference, hip circumference and WHR with blood pressure (systolic and diastolic) measures.

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MATERIALS AND METHODS

The present study was conducted on 19 to 24 years old females from urban section of society in Amritsar, a North Indian city. The environmental characteristics of the city are fairly typical like extreme hot and cold that of unlikely prevailing in other city of India. A total of 800 college/university going girls between aged 19 to 24 years have been purposively chosen for the present study. The subjects were recruited from the residents of University campus girls' hostel and nearby colleges. The subjects were purposively selected on the basis of the following criteria: i) similar food habit ii) socioeconomic status iii) born and brought up in Punjab (same gene pool) and fluent in the dialect of the region. All the participants were subjected to sign the consent form for the present study. The age was determined to nearest birth date from the school-leaving certificate. The measurements were taken during the college hours in the leisure periods and sometimes also, at home/hostel through subsequent visits. All the measurements were collected by the second female author. The subjects suffering from any tension and psychological stress like preceeding of the date of college/ university examination or marriage of her or of immediate family members

were excluded from the study (Badaruddoza and Afzal 2000). Tension and psychological stress were a personal assessment of the respondents. We assessed it through questionnaire with some questions regarding tension and stress. The measured physiometric phenotypes are systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial blood pressure (MBP), the latter defined as the average pressure level during the cardiac cycle. MBP is simply estimated as DBP + (SBP-DBP)/3 (Perusse et al. 1989). Blood pressure measured with a mercury sphygmomanometer and stethoscope by the following recommendations of American Heart Association (1981). The means of two consecutive measurements were used in this analysis. A cross-test study conducted in 100 subjects showed that the intraclass reliability coefficients are 0.93 to 0.91 for SBP and DBP respectively the procedure was quite reliable. The anthropometric measurements were made following the standard procedure and anthropometric tools recommended by Lohman et al. (1998) and Weiner and Lourie (1981). The measurements included height, weight, waist and hip circumferences. The waist hip ratio (WHR) was calculated through following the equation: waist circumference/hip circumference. The body mass index (BMI) was also calculated using the standard equation: BMI = Weight (Kg)/ (Height in meter)^2.

Student's t-test was used in the comparison of data and the significance level was accepted at $p < 0.05$. In the case of age we grouped it in approximately 11 months interval and weighted means were used for t-test. The relationship among anthropometric measurement and blood pressure are assessed by product-moment correlation coefficients. Finally, a stepwise multiple regression analysis was conducted with individual mean levels of blood pressure as the dependent variables and all other measured variables as independent variables.

RESULTS

Age specific descriptive statistics for blood pressure measurements with other anthropometric variables of the 19-24 years old Punjabi females are presented in table 1. Consistent increase of mean values of SBP, DBP and MBP with the increase of age has been observed. The increasing age trend has also been noticed in other anthropometric variables. The mean and standard deviations of SBP, DBP, MBP, height, weight, BMI, waist and hip circumferences and WHR increased significantly from 111.45 mmHg, 72.94 mmHg, 85.63 mmHg, 157.65 cm, 48.28 kg, 19.32 kg/m^2, 73.63 cm, 88.30 cm and 0.82 to 120.89 mmHg, 80.55 mmHg, 92.05 mmHg, 161.85 cm, 54.50 kg, 21.75 kg/m^2, 80.43 cm, 96.30 cm and 0.84 respectively between ages 19-24 years.

Pearson product moment correlation coefficient for blood pressure, age and anthropometric variables among urban Punjabi female youth are shown in table 2. The age, height, weight, BMI, waist and hip circumferences and WHR were found significantly ($p<0.001$) correlated with SBP and DBP.

Since each of the variables studied is known to be positively correlated with blood pressures and move together. It was felt desirable to correct the measurement for the effect of blood pressure

Table 1: Age specific descriptive statistics for blood pressure and anthropometric variables among urban Punjabi females of Amritsar city in Punjab. n= number of individuals, m= mean; SD = Standard deviation.

Variable	*Age in years*											
	19.0-19.9 (n=146)		*20.0-20.9 (n=130)*		*21.0-21.9 (n=135)*		*22.0-22.9 (n=137)*		*23.0-23.9 (n=125)*		*24.0-24.9 (n=127)*	
	m	*SD*	*m*	*SD*	*m*	*SD*	*m*	*SD*	*m*	*SD*	*m*	*SD*
SBP(mmHg)	111.45	7.33	113.33	8.06	114.85	8.66	116.75	9.05	118.35	10.40	120.89	10.85
DBP(mmHg)	72.94	6.15	74.33	6.85	75.89	7.33	76.95	7.97	78.30	8.05	80.55	9.95
MBP(mmHg)	85.63	6.33	86.33	6.85	87.81	7.50	88.76	7.78	90.66	7.77	92.05	7.89
Height(cm)	157.65	4.86	157.82	4.93	158.24	5.97	159.76	6.22	161.57	6.32	161.85	6.82
Weight(kg)	48.28	5.05	50.75	5.55	51.12	6.07	52.55	6.69	53.79	6.86	54.50	7.03
BMI(kg/m^2)	19.32	2.15	20.50	2.42	20.57	2.46	20.76	2.92	21.21	2.91	21.75	3.07
Waist circumference (cm)	73.63	5.99	75.55	6.51	76.59	6.89	77.93	7.15	78.53	7.33	80.43	7.42
Hip circumference (cm)	88.3	6.38	91.45	6.67	92.35	6.89	94.33	7.30	95.69	7.77	96.30	6.92
WHR	0.82	0.05	0.83	0.05	0.84	0.06	0.84	0.05	0.83	0.05	0.84	0.06

Table 2: The correlation coefficients of systolic and diastolic blood pressure in relation to age and anthropometric variables among urban Punjabi females of Amritsar city in Punjab.

Variables	*Systolic blood pressure*			*Diastolic blood pressure*		
	r	*t*	*p values*	*r*	*t*	*p values*
SBP	-	-	-	0.66	24.81	<0.001
Height	0.22	6.37	<0.001	0.16	4.57	<0.001
Weight	0.28	8.23	<0.001	0.20	5.76	<0.001
BMI	0.25	7.06	<0.001	0.18	5.16	<0.001
Waist circumferences	0.33	9.32	<0.001	0.14	3.99	<0.001
Hip circumferences	0.17	4.80	<0.001	0.11	3.12	<0.001
WHR	0.19	5.36	<0.001	0.15	4.28	<0.001
Age	0.31	9.20	<0.001	0.21	6.06	<0.001

Table 3: Stepwise multiple regression analysis for blood pressure: significant predictor variables and regression coefficients among urban Punjabi females of Amritsar city in Punjab.

Source	*SBP*				*DBP*			
	Regression coefficient	*SE*	*t*	*Significance contribution*	*Regression coefficient*	*SE*	*t*	*Significance contribution*
SBP	-	-	-	-	0.61	0.12	5.08	Yes
DBP	1.57	0.31	5.08	Yes	-	-	-	-
Height	0.57	0.21	2.60	Yes	-0.37	0.08	4.22	Yes
Weight	0.12	0.05	2.40	Yes	-0.07	0.05	1.40	No
BMI	-0.53	0.22	2.39	Yes	-0.21	0.12	1.75	No
Waist circumference	1.92	0.28	6.85	Yes	1.65	0.50	3.31	Yes
Hip circumference	-0.12	0.21	0.55	No	-0.28	0.22	1.27	No
WHR	-62.18	20.29	3.06	Yes	-41.80	19.50	2.14	Yes
Age	1.84	0.07	26.26	Yes	1.54	0.08	19.25	Yes

through stepwise multiple regression analysis because multivariate techniques may be revealed a different pattern of relationship between anthropometric and blood pressure than that of found in the bivariate analysis. The results of the stepwise regression analysis are presented in table 3. It is seen that height, waist circumference and age are the most common important predictors ($P< 0.05$) for both SBP and DBP. In addition to that weight and hip circumferences are also significant ($p< 0.05$) predictors for systolic blood pressure. However, the age is the strongest significant predictor ($P<0.001$) for both SBP and DBP. Therefore, the age trend is investigated by the analysis of covariance with age, age^2 and age^3 as covariates (Table 4). The covariate was found to exert significant effects on the both blood pressure variations. The age trend is primarily linear for systolic and diastolic blood pressure.

Table 4: Manova F-ratios for age and other anthropometric covariates on blood pressure readings among Punjabi females of Amritsar city in Punjab.

Source	*SBP*		*DBP*	
	F	*P*	*F*	*P*
Covariates:				
Age	60.55	<0.001	55.75	<0.001
Age^2	30.33	<0.001	27.30	<0.001
Age^3	25.75	<0.001	22.72	<0.001
All co-variables	27.80	<0.001	25.82	<0.001

DISCUSSION

In the present study, the rise in blood pressure with age is significant ($P<0.001$) among urban Punjabi females unlike other urban Indians (Rao 1980, 1983; Byard et al. 1988; Mukherjee et al. 1988; Majumder et al. 1990; Sidhu et al. 2004). The study shows that a general level of blood pressure is low (range 111 - 121 mm Hg) in this urban section of Punjabi females in Amritsar city, Punjab. In India, the urban populations generally have a higher mean blood pressure than rural populations. All anthropometric measurements were highly correlated ($p< 0.001$) with blood pressure phenotypes among Punjabi female youth. However, when blood pressure were regressed on all measured variables by using stepwise multiple regression revealed that all variables except hip circumference for SBP ; weight and hip circumference for DBP remained significant at least at the 5% level. This suggests that height, weight,

of age. This is due to the fact that first and second year of college and university life is very relaxed without mental stress with enough physical activity. Therefore, physical stress prevents increase in blood pressure, while latter stage of academic life is full of mental stress which is a known risk factor for increase in blood pressure. The current study demonstrate a significant association of blood pressure with height, weight, BMI, waist and hip circumferences, WHR and age among Punjabi college/ university going females.

Therefore, this overall finding agrees with other studies in India and elsewhere (Williams et al. 1992; Joshi et al. 1993; Gupta and Majumder 1994; Gupta and Mehrishi 1997; Dalton et al. 2003; Esmaillzadeh et al. 2004; Gupta et al. 2004; Feidstein et al. 2005 Deshmukh et al. 2006) and suggests significant prevalence of risk factors in young Punjabi women. Therefore, it may be suggested from the present study that proper population based monitoring and modified life style for cardiovascular risk will decline the cardiovascular mortality in young Indian population.

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