PREVALENCE OF HYPERTENSION AND OTHER ASSOCIATED FACTORS AMONG INDIVIDUALS AGING 15 YEARS AND ABOVE, IN FEDERALLY ADMINISTERED TRIBAL AREAS OF PAKISTAN

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ABSTRACT

OBJECTIVE: To determine the prevalence of hypertension and associated factors among age 15 years and above in federally administered tribal areas (FATA) of Pakistan.

METHODS: This cross-sectional study was conducted from July 2016 till August 2017 among 729 individuals including both males and females of age 15 years and above were randomly selected from FATA. FATA was divided into 7 areas (Khyber, Mohmand, Bajaur, Orakzai, Kurram, North and south Waziristan). A pre-tested questionnaire in local language with informed consent was taken from 729 respondents who were selected for the study after sample size calculation. Fasting blood was analyzed for sugar, cholesterol. Blood pressure was recorded among both gender.

RESULTS: Among 729 individual prevalence of hypertension ($\geq$140/90 mm Hg) was 49.1% (n=358). The prevalence of blood cholesterol 200 mg/dl and above was 156(21.4%). Fasting blood glucose $\geq$126 mg/dl was 4.7% (n=134). Anxiety and depression was 50.3% (n=367). BMI $\geq$25 kg/m^2 was 47.7% (n=347). Current smoker were 19.8% (n=144). Snuff user were 180 (24.7%). Cannabis user were 4.8% (n=35). Family history of Hypertension, increase BMI and male or female age more than 40 years were significantly associated factors for hypertension.

CONCLUSION: There was a high prevalence of elevated blood pressure in FATA above the age of 15 and above when compared with local data. Both male and female with age more than 40 years, increase BMI and family history of hypertension were significant associated with hypertension in FATA population.

KEYWORDS: Hypertension (MeSH); FATA (Non-MeSH); Family History (Non-MeSH); Body Mass Index (MeSH); Blood Pressure (MeSH); Smokers (MeSH); Blood Glucose (MeSH); Cholesterol (MeSH); Pakistan (MeSH).

INTRODUCTION

Hypertension is a leading attributable risk factor for cardiovascular and kidney disease and premature death globally.[1] Currently, over 1.1 billion people are affected with hypertension globally, and this number is expected to increase to more than 1.5 billion by 2025.[2] The rise in with hypertension and projected to be particularly steep in South Asia where population has shown to be at high risk.

Trends in age related standardized BP levels over the past 4 decades show persistent rise, and the prevalence of hypertension is already 40%.[3]

According to global and regional projections of mortality and burden of disease, coronary artery disease will remain the leading cause of death for the next 20 years.[4] Evidence of increased risk of CVD in the presence of specific risk factors has been documented in a large number of hallmark epidemiological studies, such as the Framingham Heart Study,[5] the Multiple Risk Factor Intervention Trial and others.[6] There is significantly higher prevalence of cardiovascular disease risk factors in Pakistani adults, where 29% of men are smokers, 18% suffer from hypertension and 13% have elevated cholesterol levels.[7] Moreover, in Pakistan over 10% of people age group 25 years and above have type 2 diabetes Mellitus and an equal number are suffering from impaired glucose tolerance.[8]

The total population of the Federally Administered Tribal Areas (FATA) was estimated in 2000 to be about 3,341,080 people, or roughly 2% of Pakistan's population. Only 3.1% of the population resides in established townships. It is thus the most rural administrative unit in Pakistan. According to 2011 estimates FATA gained 62.1% population over its 1998 figures totaling up to 4,452,913. This is the fourth highest increase in population after Baluchistan, Sindh and Gilgit-Baltistan. About 99.1% of population speaks the Pashto language.[9] There is one hospital bed for every 2,179 people in the FATA, compared to one in 1,341 in Pakistan as a whole. There is one doctor for every 30000 people in FATA compared to one doctor per 1,226 people in Pakistan as a whole.[10]

Although no formal strategy to control hypertension has yet started but government while realizing the projected epidemic has decided to launch an effective awareness programs

for prevention and control of hypertension. For planning preventive and treatment strategies, the prevalence of the disease and its risk factors must be known because risk modification is the foundation of cardiovascular disease prevention, it is essential to estimate the risk factors in population sub-groups to identify those at high risk.

FATA consist of seven agencies, mostly hilly areas bordering Afghanistan and due to scarcity of land and job opportunities, people move to different areas of the country and abroad in search of food, which in turn has brought a change in lifestyle of the people. Although no study on cardiovascular risk factors has been carried out in FATA, certain factors like eating diet, poor socioeconomic conditions, smoking, intake of snuff, illiteracy, stressful life behavior, and augment the impression of local physicians that people of tribal areas are more prone to risk factors and cardiovascular diseases.

Hypertension and other risk factors as a major health problem regarding cardiovascular mortality and morbidity. No data is available in tribal areas regarding prevalence of hypertension in FATA of Pakistan. We presumed prevalence of hypertension will be high. Objective of study was to see the prevalence of hypertension and associated risk factor among individuals aging 15 years and above, living in FATA. Our study will highlight this important issue and help the authorities to devise plans for the underprivileged community of FATA. It will also be a source of data for different agencies and organizations who work for the awareness of the community regarding hypertension and its associated factors.

METHODS

This cross-sectional study was conducted from July 2016 till August 2017 among 729 individuals from July 2016 till August 2017 from seven different Agencies (areas) of FATA, Pakistan. The study was conducted before FATA was merged in to Khyber Pakhtunkhwa province of Pakistan as merged districts in 2018.[11]

Formal approval was taken from the Director FATA Health Services and all the elders of the village were taken into confidence. Two-stage cluster sampling was done. From various strata (each strata comprising of two villages from each agency) i.e. seven different Agencies of FATA namely Khyber Agency, Mohmand Agency, Bajaur Agency, Orakzai Agency, Kurram Agency, North Waziristan and South Waziristan, villages were selected randomly from the list used for the Census of Pakistan. A cross-sectional study with two-stage cluster sampling strategy was selected,[12] as it could meet all the study objectives. For estimation of the prevalence of elevated blood pressure, within a bound on error of estimation of 0.04 (or 4%), with a 95% Confidence interval, we needed to interview at least 729 individuals, as no estimate was available for prevalence of elevated blood pressure in FATA so the prevalence of hypertension of 25%[13] was considered.

Measurements were taken followed by questionnaire in local language (Pushto). Fasting blood samples were taken from the respondents on allotted day by the survey team along with the help of local paramedics assigned by district health officer.

Standard mercury sphygmomanometer was used with cuff size of 14.5 cm. A comparative large cuff size was used in severely obese persons when cuff size of 14.5 cm was difficult to be tied. BP cut-off at least 140/90 mm Hg was considered in the study for elevated BP, which has been adopted from The National Health Survey of Pakistan 1990-94.[14]

Height was measured in cm with participants standing bare foot on a hard floor against a wall. An individual was requested to stand straight, both feet together, hands by the side, and head, back, buttocks and heals in contact with the wall.[15] Weight was measured to nearest 100 grams on bathroom scale.[16] Height in meter and weight in kilogram is recorded to get BMI. BMI greater than 25 kg/m² is graded as overweight.[12,17]

The smoking status was assessed as current smokers and chronic smokers. The subjects were asked about the

previous use of snuff and the duration and quantity of snuff used. The study subjects were asked whether they add cannabis to their cigarettes and how many cigarettes of cannabis per day they smoke.

Anxiety and depression status of the study subjects were assessed by The Aga Khan Anxiety and Depression Scale (AKUADS), it is a screening scale developed at the Aga Khan University (AKU), Karachi, Pakistan.[17] The family history of cardiovascular disease was assessed by asking the study subjects if they have history of cardiovascular disease in the family and to specify the person.

The initial questionnaire was in English. Later for the local adaptation it was translated into Pashto. It was translated back in English to check the similarity of direction and message of both versions of questionnaire.

Data analysis was done through two Softwares SPSS 8 and Epi info version 6.04. Frequency rates were in percent Mean value with 1 standard deviation was calculated. Analysis to determine significant association of hypertension with associated risk factors was done with logistic regression. The dependent variable was presence or absence of hypertension. The independent variable was age ≥ 40 years, fasting serum cholesterol ≥ 200 mg/dl, fasting blood sugar ≥ 126 mg/dl, BMI 25 kg/m². Anxiety and depression 19, smoker, current snuff user and cannabis, illiterate (uneducated), marital status and family history of HTN in first degree relative. Odds ratio and 95% confidence interval were determined on Univariate analysis and multivariate analysis. The independent t test was applied for continuous variable and chi square test was used for discrete variables. P value of 0.05 or less was deemed significant.

RESULTS

Descriptive analysis for socio-demographic and biochemical characteristics of respondents:

The result of 729 respondents showed that the prevalence of elevated blood pressure having the cutoff rate of $\geq /90140$ mm Hg among age 15 and

TABLE I: PHYSICAL AND BIOCHEMICAL CHARACTERISTIC OF ALL STUDY RESPONDENTS (N=729)

Characteristics	Males Mean (SD)	Females Mean (SD)	Total Mean (SD)	P Value
Systolic Blood Pressure (mm Hg)	131.7 (18.9)	136.70 (18.9)	134.79 (19.8)	0.004
Diastolic Blood Pressure (mm Hg)	85.02 (10.71)	84.03 (10.70)	84.10 (10.90)	0.21
Height (cm)	164.3 (20.5)	149.6 (17.5)	156.2 (20.3)	0.30
Weight (kg)	68.2 (13.3)	62.0 (14.0)	64.8 (14.1)	0.001
Body Mass Index (kg/m²)	28.4 (22.8)	30.0 (19.5)	29.3 (21.0)	0.30
Fasting Cholesterol (mg/dL)	177.85 (29.8)	180.5 (32.0)	179.3 (31.0)	0.25
Fasting Blood Glucose (mg/dL)	87.9 (22.9)	89.0 (25.6)	88.5 (24.4)	0.54
High Density Lipoprotein (mg/dL)	45.9 (08.13)	45.4 (07.6)	45.6 (07.8)	0.39
Low Density Lipoprotein (mg/dL)	100.2 (22.2)	102.9 (22.1)	101.7 (22.2)	0.10

above in FATA of Pakistan was 49.1% (n=358). Mean Systolic blood pressure was significantly more in female as compared to male 131.79±18.9 mm Hg vs 136.70±19 mm Hg (p=0.0004). The mean age was 41.10±15.10 years. The median family income of the respondents was Pakistani Rs. 3000 and the mean household size was 13.54 persons, literacy rate was only 29.05 in FATA population. The mean BMI of the respondents was 29.3±21.0 kg/m². Female were more significantly overweight (p=0.001). Fasting cholesterol and its sub fraction, blood sugar was significantly not different among gender (Table I). Bivariate analysis of dependent and independent showed that anxiety/depression was significantly more prevalent in female as compared to male (p=0.01) smoking habits, use of snuff and cannabis use was more significant in male (Table II).

Univariate analysis for the factors associated with elevated blood pressure: The Univariate analysis of the factors associated with elevated blood pressure is summarized in Table III. Analysis highlights association of age, sex, high BMI, high cholesterol, diabetes, anxiety and depression and family history of hypertension among first-degree relatives with elevated BP on univariate analysis.

Among elevated BP group, there were 48.0% males while 52.0% of female constituted elevated BP group [OR 1.2, 95% CI (95, 1.71)]. Result shows that elevated blood pressure group were

more likely to have age greater and equal to forty years as compared to normal blood pressure group [OR 5.4,

95% CI (3.9, 7.4)]. Analysis shows that the prevalence of BMI ≥ 25 kg/m² among elevated BP individuals was

TABLE II: DISTRIBUTION OF DEPENDENT AND INDEPENDENT VARIABLES BY GENDER

Characteristics		Male (n=328) n (%)	Female (n=401) n (%)	Total (n=729) N (%)	P Value
Blood Pressure (mm Hg)	<140/90	156 (47.6)	215 (53.6)	371 (50.9)	0.103
	≥140/90	172 (52.4)	186 (46.4)	358 (49.1)	
Fasting Cholesterol* (mg/dl)	<200	260 (79.8)	310 (77.5)	570 (78.5)	0.461
	≥200	66 (20.2)	90 (22.5)	156 (21.5)	
Fasting Blood Sugar* (mg/dl)	<126	312 (95.5)	380 (95.0)	692 (95.3)	0.654
	≥126	14 (04.3)	20 (05.0)	34 (04.7)	
Body Mass Index (kg/m²)	<25	198 (60.6)	182 (45.5)	380 (52.3)	0.22
	≥25	129 (39.4)	218 (54.5)	347 (47.7)	
Anxiety & Depression (score)	<19	234 (71.3)	128 (45.5)	362 (49.7)	<0.01
	≥19	94 (28.7)	273 (68.5)	367 (50.3)	
Ever Smokers	Non-Smoker	190 (57.9)	395 (98.5)	585 (80.5)	<0.01
	Smoker	138 (42.1)	06 (01.5)	144 (19.8)	
Current Snuff Users	Non-Users	178 (54.3)	371 (92.5)	549 (75.3)	<0.01
	Users	150 (45.7)	30 (07.5)	180 (24.7)	
Cannabis Users	Non-Users	295 (89.9)	398 (99.5)	693 (95.2)	<0.01
	Users	33 (10.1)	02 (0.5)	35 (4.8)	
Family History of Hypertension in first degree relative	Yes	211 (58.9)	230 (62.0)	1	0.84-1.5
	No	147 (41.1)	141 (38.0)	1.1	

*3 values are missing, as these three were not fasting. $ 2 values are missing, as measurement were not taken.

TABLE III: FACTORS ASSOCIATED WITH ELEVATED BP BASED ON UNIVARIATE ANALYSIS

Variables		Elevated BP (358) n (%)	Normal BP (371) n (%)	Odds Ratio (OR)	95 % CI for OR
Age (years)	<40	118 (33.0)	270 (72.8)	1	3.9 -7.4
	≥40	240 (67.0)	101 (27.2)	5.4	
Gender	Female	186 (52.0)	215 (58.0)	1	0.95-1.7
	Male	172 (48.0)	156 (42.0)	1.2	
Body Mass Index (kg/m²)	<25	158 (44.1)	222 (60.2)	1	1.4 -2.5
	≥25	200 (55.9)	147 (39.6)	1.2	
Fasting Cholesterol* (mg/dl)	<200	262 (73.4)	308 (83.5)	1	1.2 -2.6
	≥200	95 (26.6)	61 (16.5)	1.8	
Low Density Lipoprotein (mg/dl)	<130	312 (87.5)	323 (87.5)	1	0.65-1.57
	≥130	45 (12.6)	46 (12.5)	1.01	
High Density Lipoprotein (mg/dl)	≥35	345 (96.6)	357 (96.7)	1	0.45 -2.3
	<35	12 (03.4)	12 (03.3)	1.3	
Fasting Blood Sugar* (mg/dl)	<126	334 (93.6)	358 (97.0)	1	1.07 -4.6
	≥126	23 (06.6)	11 (03.0)	2.2	
Anxiety & Depression (score)	<19	164 (45.4)	198 (53.4)	1	1.01 -1.8
	≥19	194 (54.2)	173 (46.6)	1.3	
Educational Status	Educated	89 (24.9)	123 (33.1)	1	1.08-2.07
	Uneducated	269 (75.1)	248 (66.8)	1.5	
Marital Status	Single	18 (05.5)	57 (15.4)	1	1.9 -5.9
	Marital	330 (92.2)	307 (82.7)	3.4	
	Widow/Widower / Separated	10 (02.8)	07 (01.9)	4.5	1.5 -13.6
Snuff Users	Non-Users	256 (71.5)	293 (79.0)	1	1.06-2.10
	Users	102 (28.5)	78 (21.0)	1.4	
Cannabis Users	Non-Users	342 (95.5)	351(94.9)	1	0.43 -1.7
	Users	16 (04.5)	19 (05.1)	0.86	

significantly higher than the normal blood pressure group [OR 1.9, 95% CI (1.4, 2.5)]. It was noted that the elevated blood pressure group were more likely than normal blood pressure group to have fasting cholesterol 200 mg/dl [OR 1.8, 95% CI (1.2,2.6)], The elevated blood pressure group were more likely to have anxiety and depression as compared to normal blood pressure group [OR 1.3, 95% CI (1.01 ,1.8)]. The elevated blood pressures group was more likely to have family history of elevated blood pressure in first degree relatives as compared to normal blood pressure group [OR 1.1, 95% CI (.84-1.5)].

Multivariate analysis for the factors associated with elevated blood pressure in FATA: The final model (Table IV) included the independent effects of factors associated with elevated blood pressure. It was seen that gender, age, BMI and family history of hypertension in first degree relatives were significantly associated with elevated blood pressure in the multivariate analysis model in our study. Analysis shows that after adjusting for the effects of other variables in the model, elevated blood pressure group were more likely than normal blood pressure group to BMI ≥ 25 kg/m² [OR 1.6, 95% CI (1.2,2.3)]. It was noted that the family history of hypertension in first degree relatives have significant association with elevated blood pressure group when adjusted for other variables in the model [1 .5(1 .12.1].

Additive interaction between age and sex was noted during analysis. While taking the reference category of females less than or equals 40 years of age, the adjusted odds of being male and less than or equals 40 years among elevated BP group was 1.7 times as compared to normal BP group [1.7 (1 .12.7]. The adjusted odds of being female and greater than 40 years of age among elevated BP group was 6.8 times as compared to the same odds in normal BP group having the reference category of being female and less than or equals 40 years [6.8(4.3,10.7, the adjusted odds of being male and greater than 40 years among elevated BP group was 8.1 times as compared to odds of being male and age greater than 40 years in normal BP group [8.1(5.0,13.2)].

DISCUSSION

It's a matter of fact that in developing countries there is lack of data for elevated blood pressure, which can be used to guide effective public health control measures. This requires special consideration in view of the rapid development of a second wave of cardiovascular diseases.[18] The aim of our study was to look for the prevalence of Hypertension in the FATA of Pakistan, which was found to be 49.1% among the study population of age 15 and above.

Our study findings are significantly different from the rest of Pakistan as reported in National Health Survey of Pakistan (NHSP) 1990-4 following the same protocol and criteria for

TABLE IV: FACTORS ASSOCIATED WITH ELEVATED BLOOD PRESSURE BASED ON MULTIVARIATE ANALYSIS

Factors		Adjusted odds ratio (AOR)	95 % CI For AOR
Body Mass Index (kg/m^2)	< 25	1	
	≥ 25	1.6	1.2 -2.3
Family history of hypertension	No	1	
	Yes	1.5	1.1 - 2.1
Gender and Age	Female ≤ 40 years	1	
	Male ≤ 40 years	1.7	1.1- 2.7
	Female > 40 years	6.8	4.3 – 10.7
	Male > 40 years	8.1	5.0 -13.2

assessment of elevated blood pressure status. However, in order to compare the different blood pressure status, we considered the biophysical profile of the study participants in both samples.

In the FATA elevated blood pressure study, all (100%) participants were rural dwellers while the NHS was conducted on both rural and urban populations of Pakistan.[16] It seems logical that we should compare our results with the rural sub-sample as compared to whole of the National Health Survey results. In the FATA elevated blood pressure study the male-female ratio was 1:1.2, while in NHS rural sample, the ratio was 1:1.16, reason may be marked differences in different age distribution between the two samples on the basis of collected data. According to National Health Survey sample there were 29.6 % individuals in the same age group and the difference is highly significant (p value<0.05). In the rest of age categories, the proportions of study-samples are significantly more in FATA sample except for the age group 65 and above where distribution is not statistically significant (p value 0.40). In order to overcome such differentials in the age distribution and to make results more comparable, standardized age adjusted rates for elevated blood pressure along with obesity and serum cholesterol level were calculated among males and females of both study sample.

In African Americans the prevalence has been reported up to 45% in urban setting.[18] The study was conducted on a population of 18 years and above and the mean age of the sample was 47 years. Despite the lower socioeconomic status of the sample, the majority of the individuals had contact with the well functional and utilized health care system. Most of the population of FATA belongs to the lower socioeconomic status and lack basic amenities of civilized living such as proper roads, electricity and water supply. The difficult mountainous terrain of the FATA further aggravates their hardships. Such stressful condition of the study sample was obvious when we assessed the anxiety and depression status of the study sample. About 50.3% of the study population were screened positive for anxiety and depression while on the other hand 54.2% of the study subjects having elevated blood pressure were screened positive. Similarly, high prevalence of elevated blood pressure was estimated for an ethnic community of Karachi with 47% prevalence of elevated blood pressure among age 25 and above was reported among Ismaili Muslims of the Karachi city. Although both communities belong to same country and have high prevalence of body mass index greater and equals 25 kg/m^2 but are statistically different from the rest of the country (p value 0.05). The high prevalence of BMI in these communities could be correlated to the high prevalence of elevated blood pressure in these communities, as compared to the rest of the country.

Although the difference of factors between urban and rural setting needed to be explored which usually create differential in elevated blood pressure status, however this study makes us cautious to give a generic statement that rural population has always a lower prevalence of elevated blood pressure than urban population.

It has been described earlier that the sampling frame of the National Health Survey did not include FATA, so it would not be appropriate to generalize the findings of one region to another without finding common grounds.[17] The higher prevalence level in FATA region draws one`s attention to the factors relating to elevated blood pressure so that key factors should be explored to suggest intervention programs based for effective control. Our data have shown similar findings that the overall proportion of overweight (BMI ≥ 25 kg/m²) in present study is 47.7%, and among them about 54.5% were females. Similarly, high proportion of overweight (BMI ≥ 25 kg/m²) of 33.2% was reported in a study conducted on house wives in Karachi.[19]

The association of positive family history of hypertension with elevated blood pressure level came out to be significant in our study sample. Our study findings are in accordance with different regional data of epidemiological studies[19,20] showing association of family history of first degree relatives with the association between positive family history and elevated blood pressure. As most of the families in Pakistan are extended families and they share the common environmental factors and aggregation of elevated blood pressure in the families could be due to their similar diet patterns[20] and sedentary life styles.[21]

CONCLUSION

In population from FATA there was high prevalence of elevated blood pressure as compared to local data. The most important factors associated with elevated blood pressure were gender, age, BMI and family history of hypertension in first degree relatives.

LIMITATIONS OF THE STUDY

Females were in number in the present study this may results in gender bias

results for hypertension. As this is rural area data, very scanty data in Pakistan is available with less number of patients. This was study was a cross-sectional methodology done in rural area so results could not be drawn regarding the hypertension for associated factors. Longitudinal studies are needed to establish this issue. More surveys are needed about hypertension and risk factors in rural area of Pakistan.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

MUH: Conception & study design, analysis and interpretation of data, drafting the manuscript, approval of the final version to be published

CH: Acquisition of data, critical review, approval of the final version to be published

SS: Acquisition of data, drafting the manuscript, approval of the final version to be published

MAR & HRA: Acquisition, analysis and interpretation of data, drafting the manuscript, critical review, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

DATA SHARING STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request

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