Pattern of Hypertension in Fayoum Governorate

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Authors' contributions

This work was done in collaboration among all the authors. Author EME designed the study, wrote the first draft of the manuscript. Authors MAA and EME supervised the study and managed the analyses of the data. Author AAE performed the statistical analysis. Author EME managed the literature search writing of the final manuscript. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: Hypertension is a preventable cause of premature death worldwide. Data from the Egyptian National Hypertension Project (NHP) revealed that hypertension is a significant problem among Egyptians. We studied the prevalence of hypertension, related risk factors and its complications in Fayoum governorate.

Patients and Methods: This study included 2800 Egyptian participants aged 18 to 60 years old from Fayoum governorate selected randomly from different places in Fayoum governorate. Blood pressure was measured for them. Re-measurement for those with BP measurements ≥ 140/90 was done with a further assessment. Known hypertensive patients were thoroughly evaluated by clinical examination and laboratory investigations.

Results: Our survey revealed that the prevalence rate of hypertension in Fayoum governorate was 28.4% (19.3% were aware and 9.1% were first diagnosed and unaware of their hypertension), 11% of the study population were pre-hypertensives. Poorly controlled hypertensive patients were 59.9%. Of all hypertensive patients, 63.4% of them were females, 87.9% of them were overweight and obese, while 26.3% of them had diabetes mellitus. Also, 41% of known hypertensive patients had complications.

Conclusion and Recommendations: There is a high prevalence rate of hypertension in Fayoum governorate. More knowledge is required to reveal the reasons behind this high prevalence in addition to the low levels of control and awareness of hypertension, to put the appropriate strategy to improve the rate of control, awareness, and quality of life of hypertensive patients in Egypt.

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1. INTRODUCTION

Cardiovascular diseases along with malignancy, chronic pulmonary diseases, and diabetes mellitus are noncommunicable diseases (NCD) which contribute to 71% of the global deaths annually in the World Health Organization (WHO) 2016 reports [1]. Hypertension prevalence is a growing problem worldwide representing an important and common modifiable risk factor for cardiovascular diseases [2]. Previous epidemiological studies reported a non-causal correlation between the incidence of coronary heart disease and stroke with the degree of rise in blood pressure especially with increasing age [3], besides, a marked relative risk reduction in the incidence of heart failure, stroke and myocardial infarction was noticed with the use of antihypertensive medications in hypertensive patients [4]. Hypertension was documented in about 80 to 85 percent of patients with CKD [5]. WHO in 2018, estimated that 84% of all deaths in Egypt were attributable to NCD [1]. National reports in 2015, estimated the prevalence of hypertension in Egypt to be 17%, with 73% and 47% of males and females respectively were not aware of their high blood pressure [6]. Other cardiovascular risk factors such as smoking, dyslipidemia and/or diabetes mellitus are complicating about 60% of Egyptian hypertensive patients [7]. More knowledge is required about hypertension status in Egypt, so, we aimed at this work to study the prevalence of hypertension, related risk factors and its complications in Fayoum governorate.

2. PATIENTS AND METHODS

This cross-sectional study included 2800 Egyptian participants from Fayoum governorate selected randomly by screening from all the 6 districts in Fayoum governorate. These districts are: Fayoum, Ibshway, Etsa, Tamiyya, Senoris and Yousifelsedik. We randomly selected three villages from each one. The allocated samples were proportional to the population size of each district (1398, 499, 280, 215, 212 and 196 participants respectively). The screening was done from January 2016 to January 2018 after approval of the local ethical committee and informed written consent was obtained from all participants. Eligible participants were males and females, ages 18 to 60 years old, living in Fayoum governorate. All participants were subjected to full history taking including a history of hypertension and its etiology (if present), associated risk factors or complications, history of diabetes mellitus, any received medications, smoking status and family history of these diseases. A thorough clinical examination was done for all participants comprising measurement of waist circumference (WC) in centimeters, height and weight with the calculation of body mass index was done by the formula (BMI)= body weight without shoes in kilograms divided by height2 (kg/m2). Blood pressure (BP) measurement was done for all participants in a standardized fashion using properly validated, well maintained and recently calibrated mercury sphygmomanometer with appropriate cuff sizes while they were seated and relaxed for 3-5 minutes before measurement. An initial estimation of the systolic pressure by palpation was done followed by the auscultatory method. Repeated measurements were done for those with BP measurements ≥ 140/90 for at least two BP measurements in the same setting and two measurements in subsequent settings and we considered the average of the two readings. The diagnostic threshold for hypertension in this survey was according to 2013 ESC/ESH Guidelines [8] for the definition of hypertension as office-based systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg or participants were currently receiving antihypertensive medications. For those known or diagnosed to be hypertensive: fasting blood glucose (FBG), 2 hours postprandial blood glucose (2hs PPBG), glycated hemoglobin (HbA1c), renal and hepatic function tests, urine analysis for proteinuria, total cholesterol, triglycerides (TG), low-density lipoprotein (LDL) cholesterol, electrocardiogram (ECG) and fundoscopic examination were done. FBG, 2hs PPBG and glycated hemoglobin (HbA1c) were asked for diabetic patients and those with hyperglycemia (RBG ≥ 200 mg/dl).

2.1 Statistical Analysis

Data were collected and coded to facilitate data manipulation and double entered into Microsoft Access and data analysis was performed using SPSS software version 18 in windows 7. A simple descriptive analysis in the form of numbers and percentages for qualitative data, and arithmetic means as central tendency measurement, standard deviations as a measure

of dispersion for quantitative parametric data, and inferential statistic test were done. For quantitative parametric data; In-depended student t-Test was used to compare measures of two independent groups of quantitative data. For qualitative data: Chi-square test to compare two or more than two qualitative groups. The p-value is significant if p <0.05.

3. RESULTS

This survey was conducted on 2800 Egyptian participants from Fayoum governorate their mean age was 44.6 ±12.2 years, 1798(64.2%) of them were females and 1002(35.8%) were males, 409 (14.6%) were smokers. We found that 79.1% of the study population were overweight and obese and 63, 4% with increased waist circumference, 77.9% of them were

females. Characteristics of participants are shown in the Table 1.

Regarding the prevalence of hypertension, we found that prehypertensive patients represented 11% of the study population, patients unaware to be hypertensive were 9.1% while known hypertensive patients were 19.3% of all participants. The results are shown in the Table 2.

Regarding sex distribution among hypertensive patients (aware and unaware) the majority of the hypertensive patients were female 504(63.4%) patients versus only 291(36.6%) patients were males. Comparing different risk factors among the hypertensive patients (aware and unaware) and non-hypertensive participants revealed a statistically significant increase in BMI, waist

**Table 1. Characteristics of all participants**

Variable		N=2800(%)
BMI	Underweight (<18.5 kg/m2)	86(3)
	Normal weight (18.5-24.9 kg/m2)	501(17.9)
	Over weight (25-29.9 kg/m2)	881(31.5)
	Grade I obesity (30-34.9 kg/m2)	763(27.2)
	Grade II obesity (35-39.9 kg/m2)	385(13.8)
	Grade III obesity (40 or more kg/m^2)	184(6.6)
Waist circumference	Normal	1024(36.6)
	Males <102 cm	610(59.6)
	Females <88 cm	414(40.4)
	Increased	1776(63.4)
	Males ≥102 cm	392(22.1)
	Females ≥ 88 cm	1384(77.9)
Systolic blood pressure	<120 mmHg	962(34.4)
	120-129 mmHg	780(27.9)
	130-139 mmHg	480(17)
	140-159 mmHg	355(12.7)
	160-179 mmHg	170(6.1)
	≥180 mmHg	53(1.9)
Diastolic blood pressure	<80 mmHg	1343(48)
	80-84 mmHg	888(31.7)
	85-89 mmHg	52(1.8)
	90-99 mmHg	357(12.8)
	100-109 mmHg	149(5.3)
	≥110 mmHg	11(0.4)

Table 2. Prevalence of hypertension among all participants

Variable	N=2800(%)
Normal blood pressure (<130/85 mmHg)	1696(60.6)
Prehypertensive (130-139/85-89 mmHg)	309(11)
Unaware to be hypertensive (BP ≥140/90 mmHg)	254(9.1)
Known to be hypertensive (aware)	541(19.3)
Hypertensive patient (aware and unaware) associated with DM	209(7.5)

Table 3. Comparison of different risk factors among hypertensive patients (aware and unaware) and non-hypertensive participants

Variable		Hypertensive patients (aware and unaware)		Non-hypertensive participants		P-value	Sig.
		No (795)	%	No(2005)	%		
Sex	Male	291	36.6%	711	35.5%	0.57	NS
	Female	504	63.4%	1294	64.5%		
Family history of HTN		202	25.4%	402	20.1%	0.01	S
Smoking		117	14.7%	292	14.6%	0.92	NS
BMI	Normal	96	12.1%	355	16.7%	0.01	S
	Overweight and obese	699	87.9%	1670	83.3%		
waist circumference	Normal	153	19.2%	871	43.4%	0.01	S
	Increased	642	80.8%	1134	56.6%		
Diabetes Mellitus		209	26.3%	461	23%	0.07	NS
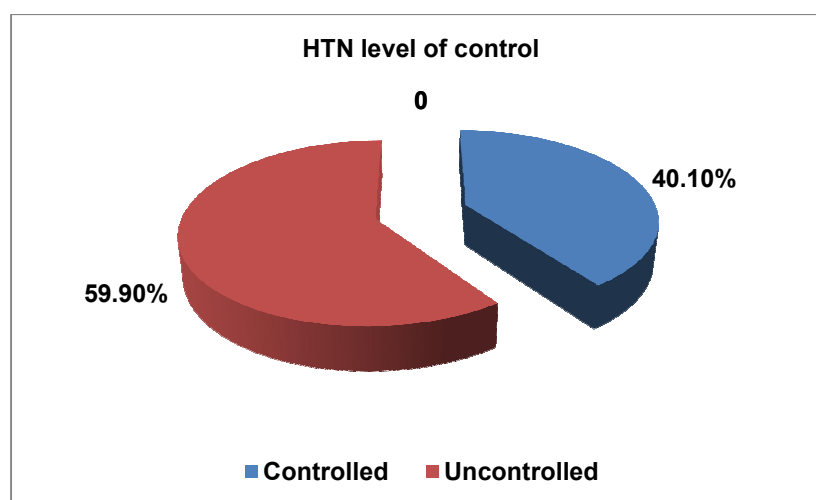
Fig. 1. Level of control of blood pressure among known hypertensive patients

circumference and the presence of a family history of HTN among the hypertensive group, while statistically insignificant differences were present between the two groups regarding sex distribution, smoking or the presence of associated DM. Comparison between the two groups of participants was shown in the Table 3.

Regarding the level of control of blood pressure among known hypertensive patients, we found that 324 (59.9%) of known hyperten sive patients were uncontrolled as shown in Fig. 1.

In this study we found that the prevalence of the hypertension complications among the known hypertensive patients was 40.9%, the most frequent of them was the presence of Ischemic Heart Disease (IHD) followed by hypertensive nephropathy, as shown in Fig. 2.

Comparing between controlled and uncontrolled hypertensive patients regarding different cardiovascular risk factors revealed that there was a statistically significant increase in the number of patients with high LDL cholesterol, serum creatinine levels, presence of proteinuria and ECG findings (LVH, IHD, and MI) among uncontrolled hypertensive patients, whereas statistically insignificant differences were present among both groups regarding BMI, smoking, fundus examination findings, mean FBG, 2hPP BG, HbA1c, total cholesterol and triglycerides levels. Regarding the antihypertensive medication types, 139 patients (64.1%) of the controlled group were on combination therapy followed by ACEI [23 patients (10.6%)] while in the uncontrolled group 148 patients (45.6%) were on combination therapy followed by beta-blockers [78 patients (24.1%)] as shown in Table 4.

Regarding the comparison between the presence of different complications of hypertension and various cardiovascular risk factors, we found statistically insignificant differences regarding sex distribution, duration of hypertension, smoking, BMI, duration of DM or the level of DM control among different hypertension complications, which indicated that no statistically significant effect of these factors on different complication types, as shown in Table 5.

4. DISCUSSION

We tried in this study to perform a more precise estimates for the prevalence of hypertension,

related risk factors and its complications in Fayoum governorate. This survey comprised 2800 participants from18 to 60 years old, from the 6 districts in Fayoum governorate. We estimated hypertension prevalence rate to be 28.4% with a bit equal sex distribution between males (29%) and females (28%), while the prehypertension prevalence rate was 11%.

There is a wide range of hypertension prevalence rates worldwide ranging from 4% to78% with the highest estimates present in low and middle-income countries [9]. Our results are in concordance with the previous estimates of 29% reported in the Eastern Mediterranean

Table 4. Comparing different parameters between controlled and uncontrolled hypertensive patients

| Variable		Controlled 217		Non-controlled 324		p-value	Sig.
Smokers (N%)	No	205	94.5%	301	92.9%	0.07	NS
	Yes	12	5.5%	23	7.1%		
BMI (No %)	Normal	23	10.6%	47	14.5%	0.07	NS
	Overweight	48	22.1%	79	24.4%		
	Obese	146	67.3%	198	61.1%		
LDL Cholesterol (N%)	Normal	74	34%	69	21.2%	0.01	S
	High	143	66%	255	78.8%		
FBG (mean, SD)		174.8	92.6	174	71.2	0.9	NS
2hPP BG (mean, SD)		248.1	108.9	269.4	104.3	0.1	NS
HbA1c % (mean, SD)		8.6	2.6	8.6	1.9	0.91	NS
Cholesterol (mean, SD)		201.8	44.9	202.2	59.3	0.9	NS
Triglycerides (mean, SD)		165.7	77.3	169.4	98.2	0.7	NS
LDL cholesterol (mean, SD)		112.6	41.9	130.4	46.7	0.6	NS
Serum Creatinine (No %)	Normal	204	94%	279	86.1%	0.01	S
	High	13	6%	45	13.9 %		
Proteinuria in urine analysis (No %)	Absent	204	94%	275	84.9%	0.01	S
	Present	13	6%	49	15.1%		
ECG findings (No %)	Normal	187	86.2%	225	69.4%	0.01	S
	LVH	8	3.7%	18	5.6%		
	IHD, old MI	22	10.1%	81	25%		
Fundus examination (No %)	Normal	208	95.9%	297	91.7%	0.06	NS
	Retinopathy	9	4.1%	27	8.3%		
Hypertension medications (No %)	Diuretics	9	4.1%	10	3.1%	0.01	S
	ACEi	23	10.6%	44	13.6%		
	ARBs	5	2.3%	2	0.6%		
	CCB	21	9.7%	30	9.3 %		
	BB	20	9.2%	78	24.1 %		
	Single pill combination	119	54.9%	96	29.6%		
	Two and three pills	20	9.2%	52	16%		
	Noncompliant on treatment	0	0%	12	3.7%		
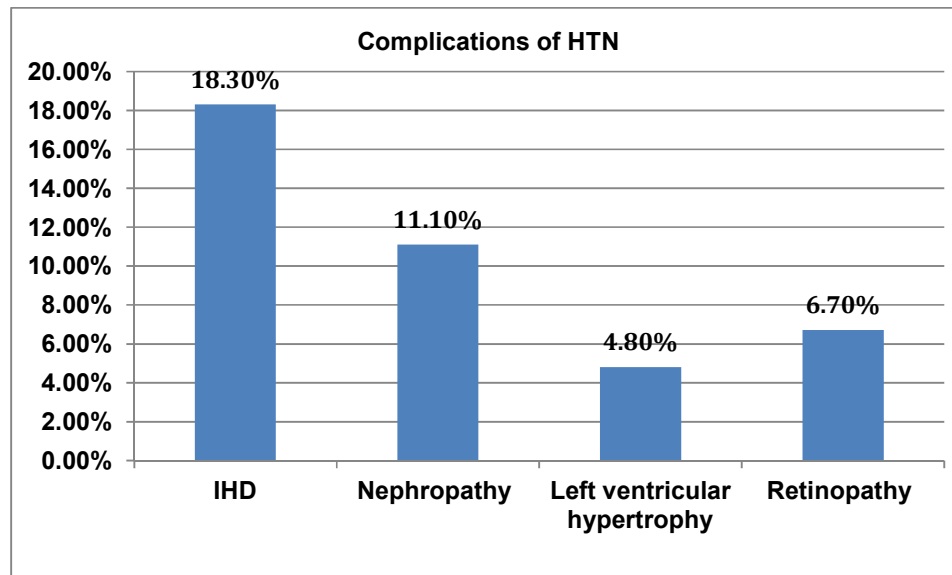
Fig. 2. Frequency of different complications among known hypertensive patients
IHD; Ischemic Heart Diseases

Table 5. Prevalence of different risk factors among different hypertension complications

Variable		HTN complications			p-value	Sig.
		IHD, old MI (No.103)	Nephropathy (No.62)	Retinopathy (No.36)		
Sex (No %)	Male	34 (33%)	14 (22.6%)	16 (44.4%)	0.5	NS
	Female	69 (67%)	48 (77.4%)	20 (55.6%)		
Duration of HTN (mean, SD in years)		5.6±4.5	3±2.9	5±3.2	0.4	NS
Smokers (No %)	No	96 (93.2%)	50 (80.6%)	32(88.9%)	0.6	NS
	Yes	7 (6.8%)	12 (19.4%)	4 (11.1%)		
BMI (No %)	Normal	12 (11.7%)	14 (22.6%)	4 (11.1%)	0.25	NS
	Overweight or obese	91 (88.3%)	48 (77.4%)	32 (88.9%)		
Duration of DM (mean, SD in years)		8.1±5.9	8.4±6.7	9.4±6.9	0.7	NS
Diabetes mellitus (No %) (total No209)	Controlled	14 (13.6%)	12 (19.4%)	4 (11.1%)	0.7	NS
	Uncontrolled	22(21.4%)	16 (25.8%)	5 (13.9%)		

IHD; Ischemic Heart Disease   MI; Myocardial infarction

Region [10], and 26.3% in Egypt in a former systematic review but with a prehypertension prevalence rate of 57.2% [11]. However, our estimates are much higher than those of Egypt Health Issues Survey done in 2015 [6] which reported it to be 17% and higher than other studies that stated it to be 16.5% [12] and 12% [13]. This controversy emphasis the discrepancy between different governorates in Egypt regarding disease distribution.

We found that the global prevalence of overweight and obesity were 31.5% and 47.6% respectively, with 53.8% of females and 36.4% of males being obese. These estimates were close to the previously recorded rates in Egypt of 67.5% [6] and 72.7% [14].

In this survey, we documented that about one third (32%) of the hypertensive patients were unaware of having hypertension. This approximates to 35.3% [13] and 38.3% [15] previously documented in Egypt, although, Egypt Health Issues Survey 2015 [6] stated that patients unaware of their hypertension were 58.5%, and in another study, they were 45.8%

[16]. These disagreements could be attributed to the differences in the sample size and the geographic distribution of participants.

Our results revealed that 59.9% of known hypertensive patients were uncontrolled, closer to 53.6% recorded by Egypt Health Issues Survey 2015 [6]. On the contrary, higher rates were stated by Elbaz et al., (2015) (86%) [17] and Ikeda et al., (2013) (62.9%) [13] and the global estimates of 92.3% in middle- and low-income populations by Mills, et al. (2016) [18]. Many factors in Fayoum governorate may affect the rate of control as the cost of medications, the availability of close and affordable medical care which allows follow up and the use of multiple medications versus combined pills which encourage patient's compliance.

In our study, we recorded the complication rates of hypertension in the known hypertensive patients to be 41%; 19% of them had IHD, 11.5% had hypertensive nephropathy, 3.9% had LVH by ECG, while 6.6% had hypertensive retinopathy. In a previous report [7], 16% of patients with high blood pressure (>160/100 mmHg) had IHD, while 20% of them had LVH by ECG. Higher estimates of hypertension complications were noticed in another report with the prevalence of IHD, retinopathy, LVH, and albumin in urine were 39%, 38.8%, 37% and 20% respectively, but most of participants were from urban areas [17]. The occurrence of complications of hypertension is largely affected by the associated metabolic risk factors like obesity, dyslipidemia, and DM [19], besides the adherence to medications [20].

One of the strong points in the current survey is that qualified physicians did all measurements of blood pressures, besides the variability in the socio-economic characteristics of the participants.

The limitations of this survey are that we could not assess the physical activities and the nutritional status of the participants.

5. CONCLUSION AND RECOMMENDA-TIONS

There is a high prevalence rate of hypertension in Fayoum governate. More knowledge is required to reveal the reasons behind this high prevalence in addition to the low levels of control and awareness of hypertension, to put the appropriate strategy to improve the rate of control, awareness, and quality of life of hypertensive patients in Egypt.

CONSENT AND ETHICAL APPROVAL

The screening was done from January 2016 to January 2018 after approval of the local ethical committee and informed written consent was obtained from all participants.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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