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Screening for hypertension among adults: community outreach in Cairo, Egypt

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ABSTRACT

Background Studies have shown alarming levels of hypertension among adults in the Middle East. The aim of our study is to measure the prevalence rate of hypertension among adults in Cairo (Egypt), identify possible risk factors for the development of hypertension and assess the rates of undiagnosed and uncontrolled hypertension.

Methods Cluster sampling was utilized and the fieldwork was conducted by 12 teams; each team consisted of a house officer, community worker and senior epidemiologist. A formulated questionnaire that addresses risk factors for hypertension was filled by all participants. Also, weight and height measurements were done to calculate the body mass index. Blood pressure measurement was done by calibrated sphygmomanometers. Blood pressure measurement was done twice, and a mean recording was calculated. A case which recorded both systolic blood pressure of $\geq$140 and diastolic blood pressure of $\geq$90 was considered hypertensive.

Results The study included 774 adult residents of Al-Waily District (Western Zone of Cairo) in late 2011 and early 2012. The mean age of the study participants was 46.5 (SD 17.9) years. Female subjects constituted 67.1% of the studied sample. The prevalence rate of hypertension in our study was 16.5% (95% confidence interval (CI): 13.9–19.3). The rate of hypertension was higher among females and three times higher among obese compared with normal or overweight adults. The prevalence of undiagnosed hypertension was 11% (95% CI: 8.4–13.9), and uncontrolled hypertension was 30% (95% CI: 24.2–37).

Conclusions Community outreach campaigns should be conducted regularly in the future for early detection of hypertension cases and proper health education about hypertension and its dangerous consequences.

Keywords BMI, Cairo, hypertension, prevalence, risk factors, smoking

Introduction

Hypertension poses a great danger on the development of many chronic diseases especially cardiovascular and neurological complications.[1] Recent studies have shown alarming levels of hypertension among adults in the Middle East.[2] This could be attributed to the higher prevalence of risk factors of hypertension. Lack of physical exercise has reached almost 50% among females in the Middle East.[3]

Recent study in Upper Egypt, principally a rural area, showed that 66% of cases with stroke had hypertension.[1] Other study in Egypt confirmed that risk factors of hypertension are more prevalent in urban population.[2]

Cardiovascular disease is a rapidly increasing cause of mortality and morbidity in both industrialized nations and economically developing countries, like Egypt.[4] Hypertension is one of the major contributing factors for the development of ischemic heart disease (IHD) and had a score of ten in an additive risk scoring for factors associated with coronary heart disease in Egypt.[5] Globally, ~51% of stroke and 45% of IHD deaths are attributable to high systolic blood pressure.[6]

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Although hypertension is common in developing countries particularly in urban areas yet the rate of awareness, treatment and control is very low.[7] It is evident that hypertension is a common problem in developing countries like Egypt, and unfortunately, it is not fully addressed in terms of undiagnosed and uncontrolled cases.

The aims of our study were: (i) to identify the prevalence rate of hypertension among adult inhabitants of Al-Waily District in Cairo, (ii) to identity the possible risk factors associated with the development of hypertension and (iii) to assess the rates of uncontrolled and undiagnosed hypertension among the study population.

Subjects and methods

This research was done as a part of the Community Outreach activities of the Faculty of the Medicine of Ain Shams University (Cairo, Egypt) to screen the neighboring society for non-communicable diseases. Al-Waily District is located in the Western Zone of Cairo with almost 196 000 inhabitants.

Sample size calculation

Based on the total population of 196 000, estimated percentage of hypertension in the desired population of 20% with 5% CI, 95% confidence coefficient, around 40 clusters to be studied, percentage of response 60% and on average 2 eligible adults in each household, the calculated sample size is 480 subjects. Open Epi Program version 4.06.08 was used for sample size calculation.

Questionnaire

A questionnaire was formulated to inquire about personal history, detailed history of smoking or exposure to passive smoking, history of previous medical or surgical problems and treatment of chronic diseases with special emphasis on the history of hypertension and its treatment. The risk factors of hypertension included in the questionnaire were smoking history, history of regular physical exercise (30 min for more than three times per week) and history of hypercholesterolemia.

The used questionnaire consisted of 38 questions divided in 4 sections. The first section was personal history, second section history of smoking and exposure to passive smoking. The third section was history of previous medical or surgical problems, history and treatment of chronic diseases and special emphasis on the history of hypertension and its treatment. The fourth section was for risk factors of hypertension. The risk factors of hypertension were smoking history, history of regular physical exercise (30 min for more than three times per week) and history of hypercholesterolemia. Weight and height were measured to estimate the body mass index (BMI) of each participant.

After designing of the questionnaire, a pilot study was done to test the understanding, clarity and logical order of questions as perceived by inhabitants of Al-Waily district. Testing the questionnaire in this primary stage was done on 20 subjects. Then, the ambiguous questions were modified and a final version of the questionnaire was obtained. Face validity was done by asking five specialists in the field of cardiology about the content of the questionnaire. Evaluation of the internal consistency of the sections of the questionnaire was carried out by calculating the Cronbach Alpha coefficient.

Ethical consideration

This study had the ethical approval of the Ethical Committee of the Faculty of Medicine, Ain Shams University. A written consent was signed by every participant after explaining the study objectives and methodology.

Fieldwork

A meeting with the local health authorities and local administrative authorities of Al-Waily District was made before the start of the outreach activities with the aim of facilitation of fieldwork. Those two authorities notified the residents of Al-Waily District of the community outreach activity by the Faculty of Medicine through banners, flyers and brochures. The fieldwork was facilitated by the presence of representatives of the local health authorities and local administrative authorities. The participants of the study were collected by cluster random technique. About 40 clusters of inhabitants of Al-Waily District were reached. The participants of the study were examined inside their habitats.

Data collection was done by 12 teams; each team consisted of a house officer, community worker and senior epidemiologist staff from the Department of Community Medicine of Ain Shams University (Cairo, Egypt). The questionnaire was filled by the house officer for all adult subjects inside the house. Also, weight and height measurement were done to calculate the BMI. Blood pressure measurement was done by calibrated mercury sphygmomanometers. Blood pressure measurement was done at room temperature; the subject was seated comfortably with the back and arm supported. The subjects were instructed to relax as much as possible and not to talk during measurement. Two readings were recorded 5 min apart, and a mean recording was calculated. A subject with recorded both systolic blood pressure of $\geq$140 and diastolic blood pressure of $\geq$90 was considered hypertensive. The fieldwork started in November 2011 and lasted till February 2012.

Statistical analysis

First, the following descriptive analysis was done: frequency, percent, mean and standard deviation. Thereafter, comparisons were done using the student's *t*-test for continuous variables and Pearson's Chi-square test for categorical variables. Level of significance was set at $P < 0.05$. The adjusted risk factors for hypertension were obtained using the logistic regression analysis. The dependent variable was the presence and absence of hypertension in all participants. All variables described previously were considered as possible candidates for the final model. The initial multivariable model construction consisted in the preliminary selection of variables using a manual purposeful selection method and a relatively large significance level (alpha approximately 0.25). Subsequently, the resulting model was reduced using a likelihood ratio test with a significance level of 0.05. Before accepting a final model, the interactions as well as confounding were evaluated. The calibration of the final model was assessed using the Hosmer and Lemeshow goodness-of-fit test, and its discrimination was assessed by the area under the receiver operator characteristic curve. Data entry screen was done on Microsoft excel 2007. Statistical analysis was performed using the Statistical Package for Social Science (SPSS) version 15.0 (SPSS, Inc., Chicago, IL, USA).

Results

Description of the study population

Our study included 774 adult residents of Al-Waily District in Western Zone of Cairo. The mean age of the study participants was 46.5 ± 17.9 years. Most of the participants (48.1%) were ≥50 years, whereas those of <30 years constituted 23.8% of the studied sample.

Female subjects constituted about two-third (67.1%) of the study participants. Thirty-six percent of the subjects were illiterate and 40.8% of the subjects had primary to secondary education whereas 16% were highly educated. Married subjects constituted 59.4% of the sample, 17.5% of the subjects were single and 19% of the subjects were widowed whereas 4% of the subjects were divorced.

The overall prevalence of smoking among studied subjects was 22.9%, and the prevalence of smoking was very high among males (63%) compared with females (2.9%), with statistical significant difference.

Only 31% of participants reported history of realizing regular exercise, and a very low percentage (4%) reported having hypercholesterolemia.

The mean BMI of the subjects was 30.6 ± 8.3. Participants with normal BMI constituted only 20.8% of the total sample. Participants with overweight were 24.1%, and participants with obesity grade I were 37.0%, whereas participants with grade II obesity were 11.6%. A higher percentage of obesity with BMI of ≥30 was observed among females (62.5%) compared with males (20.7%), with statistical significant difference. The highest prevalence of obesity (66.7%) was observed among age group of 40–50 years, whereas the least age group with obesity (21.7%) were those below 30 years, with statistical significant difference.

Prevalence of hypertension in the study population

The total examined cases for blood pressure were 752 subjects, and the prevalence of hypertension was 16.1% (124 subjects) with a 95% CI from 13.9 to 19.3.

Risk factors for hypertension in the study population

Higher prevalence of hypertension was noticed among females (19%) compared with males (11.3%), and the difference is highly significant statistically (Table 1). Our results show that highest prevalence of hypertension was noticed among cases of 40–50 years of age (27.4%) and cases of

Table 1 Comparison between gender and presence of hypertension among studied subjects in Al-Waily District (Cairo, Egypt)

Variables	*Hypertension* N *(%)*	*X2*	P	*OR (95% CI)*
Males (*N* = 247)	28 (11.3)			
Females (*N* = 505)	96 (19.0)	7.0	0.008**	1.8 (1.1–2.9)
Age				
<30 years (*N* = 177)	6 (3.4)			1.0
30 years (*N* = 97)	7 (7.2)	45.7	0.000**	2.2
40 years (*N* = 113)	31 (27.4)			10.7
50> years (*N* = 360)	79 (21.5)			8.0

**$P < 0.01$ highly significant.

Table 2 Multivariate analysis for risk factors of hypertension among adults in Al-Waily District (Cairo, Egypt)

Variables	B	*95% CI*	P
Gender	0.96	0.48–1.9	0.9
Obesity (BMI 30 or more)	3.2	1.9–5.5	0.000**
Age	5.1	2.7–9.7	0.000**
Physical inactivity	1.0	0.6–1.6	0.9
Smoking	0.7	0.3–1.5	0.7

**$P < 0.01$ highly significant.

≥50 years of age (21.5%) compared with younger age groups and the difference is highly significant statistically (Table 1).

Odds ratio for having hypertension was 4.4 (95% CI: 2.7–7.3) for obese persons compared with normal or overweight persons. Meanwhile, odds ratio for having hypertension among physically inactive persons was 1.6 (95% CI: 1.1–2.7). The prevalence of hypertension among smoker subjects was 11 compared with 16% among nonsmokers, with no statistical significant difference.

The multivariate logistic regression model has identified age and obesity (BMI > 30) as the only independent risk factors for hypertension (Table 2).

Rates of uncontrolled and undiagnosed hypertension in the study population

The rate of undiagnosed hypertension was 11% (95% CI: 8.4–13.9) among those who did not give history of hypertension, whereas the rate of uncontrolled hypertension was 30% (95% CI: 24.2–37).

The rate of uncontrolled hypertension was higher among obese subjects (39%) compared with normal or overweight subjects (13.6%), and the difference is highly significant statistically.

Discussion

Main finding of this study

The main objective of our study was to identify the prevalence rate of hypertension among adult inhabitants in Cairo. The prevalence of hypertension among participants from Al-Waily District was 16.5%, which is slightly lower than the prevalence rate (21.7%) published in a systemic review of the prevalence of cardiovascular risk factors in the Middle East.[8] The prevalence rate of hypertension in our study is similar to that reported by the Demographic and Health Survey, which showed overall prevalence of 17.6% among adults between 25 and 59 years of age. This previous study reported that the prevalence rate in inhabitants of Cairo is ∼31%.[9] Of note, the prevalence rate of hypertension in the USA in adult cases of >20 years of age is also around 31%.[10] In contrary, the rate of hypertension in STEPWISE surveillance (2012) showed that 41% of adults had hypertension, more than two times rate of our study.[11]

The second objective of our survey was to identity the possible risk factors associated with the development of hypertension among Egyptian adults living in Cairo. Before reaching conclusions based on the present results, it is necessary to consider a number of potential objections to the methodology. Our study did not estimate cholesterol and blood lipid levels among the study subjects; known risk factors for hypertension. We only relied on asking participants about past history of hypercholesterolemia. Only 4% reported having hypercholesterolemia, which reflects clear under-diagnosis of hypercholesterolemia among participants.

The most important identified risk factor was overweight. The prevalence of overweight and obesity in Al-Waily District was very high (72%). This result agrees with national STEPWISE surveillance study done in 10 governorates of Egypt, which shows that the rate of overweight and obesity nationwide is almost 62% and about one-third of Egyptians are obese.[11] Obesity is higher among participant females as 62% of the studied females are obese compared with 20.7% of participant males. This finding agrees with a study done on all Egypt, which showed a higher prevalence of obesity among females (48.1%) compared with males (18.7%).[12] Also our results of overweight and obesity prevalence agree with the results of Demographic and Health Survey (2008), which denoted that the incidence of overweight and obesity for those >25 years of age is 74–86% in females and 69–77% in males.[13]

Odds ratio for obesity and development of hypertension in our study is 4.4, which is much higher than a study done on the national level in Saudi Arabia with odds ratio of 2.2.[14] Our results agree with a study conducted in China, which revealed an odds ratio for obesity and hypertension of 4.2.[15]

Obesity and hypertension in our study was higher among participant females compared with participant males. This agrees with the results of a recent systemic review for all cardiovascular risk factors in the Middle East, which reported a higher prevalence of obesity and hypertension among females.[8] Several studies from the Middle East showed that hypertension is also higher among females compared with males.[16–19]

The prevalence of cigarette smoking is very high among participant males, and this agrees with a previous study that reported a prevalence of cigarette smoking of 48% among men in North Africa and Middle East.[20] The rate of smoking did not differ in cases with and without hypertension. This finding agrees with a study done in Palestine where the

authors reported current smoking status among hypertensive patients of 8.3 compared with 16.7% among controls.[21]

What is already known on this topic

Physical inactivity is well-known modifiable risk factor for hypertension. Lack of physical activity is very high among our study participants. This highly correlates with a study done in Palestine, which reported that 76% of their studied subjects with hypertension did not practice any exercise. Furthermore, in the previous study, the rate of physical inactivity was only 15% in the control group.[21] Other previous study reported that the physical activity is not among the significant risk factors for the development of incident hypertension in rural areas.[22]

What this study adds

Our study revealed that 11% of cases of who gave no history of hypertension were actually suffering of hypertension. This finding is correlated with the high BMI and sedentary lifestyle. The rate of undiagnosed hypertension in our study is lower than that reported by a recent study conducted in rural areas of India where 58% of incident cases of hypertension were unaware of their condition.[22]

The rate of uncontrolled hypertension is 30% among our study participants diagnosed and treated for hypertension. Our finding of controlled hypertension was higher than a study done on Egyptian Demographic and Health Survey, which reported a rate of controlled hypertension in urban areas to be 46%.[9] The total percentage of uncontrolled hypertension in the USA in 2011 was 47%, which is slightly higher compared with our detected rate of uncontrolled hypertension in Al-Waily District.[10] Data from the Egyptian National Hypertension Project, published in 1995, showed that 37.5% of studied subjects were aware of the disease and only 8% had controlled hypertension.[23]

Limitations of this study

Before reaching conclusions based on the present results, it is necessary to consider a number of potential limitations. Although our surveillance methodology can be applied in different districts hospitals, these results pertain solely to Al-Waily District and could not be considered generalizable. Our screening survey was conducted in Al-Waily District in Western Zone of Cairo, with its special demographic and socio-economic characteristics that could be different from other zones in Cairo or Egypt in general. However, our findings were consistent and coherent, strongly indicating the external validity of the study.

In conclusion, community outreach campaigns should be conducted regularly in the future for the residents of Al-Waily District for early detection of hypertension cases and proper health education about hypertension and its dangerous consequences. A special care should be directed to those with undiagnosed hypertension and cases with resistant hypertension. Our study calls for more attention to health education programs with special emphasis on healthy life style like regular physical exercise, weight control and quitting smoking to avoid risk factors for hypertension and better control of the disease among diagnosed and treated patients.

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