Undiagnosed Isolated Systolic Hypertension in Adult; Profile and Associated Factors

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ABSTRACT:

BACKGROUND:

Isolated systolic hypertension is defined as Systolic blood pressure ≥140 and a Diastolic blood pressure <90mm Hg. The rate of isolated systolic hypertension increased with increasing age in both sexes, isolated systolic hypertension, more than any other hypertension subtype, increases the risk for stroke and coronary heart diseases and is associated with many complications.

OBJECTIVE:

To assess the prevalence of isolated systolic hypertension among the adult population in Baghdad.

METHODS:

A cross-sectional study using a convenient sample from the outpatient clinic in Baghdad aged (18-60) year. Data was collected using a questionnaire as a direct interview, with measurements of weight, height and blood pressure.

RESULTS:

A total of 800 adults, were included in the final analysis. Males constituted about 52.1% of the study population. The prevalence of undiagnosed isolated systolic hypertension was 11.4%. Four factors were found to be significant independent risk factors. Age (increasing one year will increase the risk of isolated systolic hypertension by (OR=1.03), illiteracy (OR=1.4), BMI (OR=1.08), and male gender (OR=1.77).

CONCLUSION:

Undiagnosed Isolated systolic hypertension is common and increased with age in both men and women. And more common among males with association with low education and BMI.

KEYWORD: isolated systolic, undiagnosed, adults.

INTRODUCTION:

Hypertension is one of the important reasons to visit physicians in both developed and developing countries [1]. Hypertension is considered the sixth leading cause of death in Iraq with a prevalence that ranges from 35.6% to 40% in 2015. This prevalence may exceed 60% in diabetic participants [2].

Isolated systolic hypertension (ISH) is defined as systolic blood pressure (SBP) ≥140 and a Diastolic blood pressure (DBP) of <90mm Hg. The rate of isolated systolic hypertension (ISH) increased with increasing age in both sexes[3]; The 2013 European Society of Cardiology/European Society of Hypertension guidelines for management of arterial hypertension further categorize isolated systolic hypertension into grades according to systolic BP values:

Grade 1:SBP140-159mmHg, DBP<90mmHg
Grade 2:SBP160-179mmHg ,DBP<90mmHg
Grade 3:SBP>180mmHg ,DBP<90mmHg [4]

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It is the most common type of hypertension in the elderly, and it is the most prevalent type of untreated hypertension among older people over 60 years of age [5]. According to the cumulative 24-year data from the Framingham Study, the incidence of ISH is high both in women and in men over the age of 65 years. Subjects with (Grade-1) ISH were found to be at increased risk of progression to definite (Grade 2) hypertension and the development of cardiovascular disease [6].

It was found that systolic blood pressure was a stronger predictor of outcome than diastolic blood pressure, and an excess risk of cardiovascular diseases exists in subjects with stage I ISH [6,7].

The modifying effect of Body Mass Index (BMI) and cigarette smoking is particularly interesting in light of the National Health and Nutrition Examination Survey (1999–2004) observations, where obesity, male sex, low level of education, and current smoking status were all independently associated with higher odds of having ISH, Higher BMI was also associated with ISH [8].

Findings were largely similar in the National Health and Nutrition Examination Survey (1999–2001), but the proportion of ISH was greater in non-Hispanic whites and those with high educational attainment [9].

Other clinical characteristics of ISH in young and middle-aged adults include greater height, more activity in sports, and higher resting heart rate compared with normotensive individuals [10].

OBJECTIVE:

To assess the prevalence of isolated systolic hypertension (ISH) among adults attending outpatient clinics in Baghdad and to study the associated factors.

METHODS:

A Cross-sectional study conducted in Baghdad, A convenient sample of adults aged (18-60) years as relative or as patients for other reasons rather than hypertension, who attending t outpatient clinic.

Exclusion criteria:

Known Hypertensive respondents on medications.

Peopuseing antihypertensive drugs for medical conditions other than hypertension.

Pregnancy.

Known cases within-stage chronic kidney diseases (dialysis stage).

Data c ollected through direct interviews with each participant. Using a structured questionnaire which was constructed for the purpose of the study.

Ethical issue:

Verbal consent was taken from each individual after full explanation of aim and methods of the research. Ensure to the participants there is no any physical harm or discomfort, invasion of privacy.

Measurement:

Height in centimeters, it measured by tape measure on a solid surface with the participants in the erect position with heel and back of head against the wall (off shoes) .

Weight measured in kilograms (kg) by MED True brand mechanical scale platform; the scale had a capacity of 110 KG. The study participant was required to remove his or her shoes and weight was recorded to the nearest 0.1kg.Body mass index (BMI)was calculated for each study participant. (BMI) measured by: weight divided by height squared (kg/meter2) [11].

Blood pressure measurement: The participants were seated and restful for 3-5 minutes prior to measurement with taking into consideration the participants had stopped smoking at least half-hour otherwise it will be postponed. The participants were seated in a comfortable chair with their backs supported and arms bared and supported at heart level. Blood pressure was measured in millimeters of mercury (mmHg) by the auscultatory method. It was obtained by mercury sphygmomanometer (speidal and killer). The device is new one and was standardized by a medical technician engineer The measurements were taken by exposure of the upper arm; removing any tight or restrictive clothing from the arm and using the appropriately sized cuff with taking into consideration obese participants to ensure accuracy and subject in sitting position. The cuff is placed at point halfway between the olecranon and the acromion 2.5 cm above the antecubital fossa, with the center of the cuff bladder over the brachial artery. The cuff bladder was covered 80-100% of the circumference of the arm. Blood pressure was measured twice at 10-15-minute intervals Both Right and Left arm BP measured, the arm with the higher BP should be considered for diagnosis of hypertension. The measurement long lasting nearly 5minutes for each person and time for questionnaire lasting 1minutes.

Statistical analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 25. The data were presented as mean, standard deviation and ranges. Categorical data were presented by frequencies and percentages. Chi square test was used to assess the association between prevalence of isolated systolic hypertension and certain information. A level of P – value less than 0.05 is considered significant.

RESULTS:

Table1: Distribution of study participants by sociodemographic characteristics and lifestyle determinants.

Variable	No. (n=800)	Percentage (%)
AGE (years)		
18-30	214	26.8%
30-39	270	33.8%
40-49	167	20.9%
50-60	149	18.7%
Gender		
male	417	52.1%
female	383	47.9%
BMI		
Normal	222	27.8
Overweight	350	43.8
Obese	228	28.5
Educational level		
Illiterate	65	8.1
Primary School	199	24.9
Secondary School	176	22.0
College or higher education	360	45.0
Family history of hypertension		
Yes	415	51.9
No	385	48.1
Marital Status		
Married	621	77.6
Others	179	22.4
Physical Activity		
Light	344	43.0
Moderate	408	51.0
Vigorous	48	6.0

Table 2: Distribution of study participants by past medical and surgical history.

Variable	No. (n=800)	Percentage (%)
Past Surgical history		
Yes	169	21.1
No	631	78.9
Past Medical history		
No	668	83.3
yes	132	16.7
Diabetes Mellitus	51	6.4
Ischemic heart disease	35	4.4
Thyroid Disease	36	4.5
Asthma	28	3.5

Table 3: Distribution of study participants by medication used.

Medication Used	No. (n=800)	Percentage (%)
No medication used	621	77.6
NSAIDS	68	8.5
OHA	36	4.5
Insulin	21	2.6
Steroid	26	3.3
OCP	31	3.9
Thyroxine	23	2.9

Table 4: Association between prevalence of isolated systolic hypertension and sociodemographic characteristics and some variables.

Sociodemographic characteristics	Isolated Systolic Hypertension		Total (%) n= 800	P – Value
	Yes (%) n= 94	No (%) n= 706		
Age (Years)				
18-30	16 (7.5)	198 (92.5)	214 (26.8)	0.001
30 – 39	22 (8.1)	248 (91.9)	270 (33.7)	
40 – 49	30 (18.0)	137 (82.0)	167 (20.8)	
50 – 59	20 (18.7)	87 (81.3)	107 (13.4)	
60	6 (14.7)	36 (85.3)	42 (5.3)	
Gender				
Male	60 (14.4)	357 (65.7)	417 (52.1)	0.016
Female	34 (8.9)	349 (76.8)	383 (47.9)	
BMI Level				
Normal	19 (8.6)	203 (91.4)	222 (27.8)	0.032
Overweight	38 (10.9)	312 (90.1)	350 (43.8)	
Obese	37 (16.2)	191 (83.8)	228 (28.5)	
Educational level				
Illiterate	14 (21.5)	51 (78.5)	65 (8.1)	0.003
Primary School	26 (13.1)	173 (86.9)	199 (24.9)	
Secondary School	21 (11.9)	155 (88.1)	176 (22.0)	
College or higher education	33 (9.2)	327 (90.8)	360 (45.0)	
Family History				
Yes	55 (13.3)	360 (86.7)	415 (51.9)	0.188
No	39 (10.1)	346 (89.9)	385 (48.1)	
Marital Status				
Married	75 (12.1)	546 (87.9)	621 (77.6)	0.693
Others	19 (10.6)	160 (89.4)	179 (22.4)	
Physical Activity				
Light	109 (19.6)	235 (80.4)	344 (43.0)	0.326
Moderate	109 (19.6)	299 (80.4)	408 (51.0)	
Vigorous	14 (19.6)	34 (80.4)	48 (6.0)	

Table 5: Association between social habits and prevalence of isolated systolic hypertension.

Social Habits	Isolated Systolic Hypertension		Total (%) n= 800	P- Value
	Yes (%) n= 94	No (%) n= 706		
Smoking Status				
Daily Smoker	29 (17.0)	142 (83.0)	171 (21.3)	0.023
Occasional Smoker	8 (11.3)	63 (88.7)	71 (8.9)	
EX-Smoker	7 (20.6)	27 (79.4)	34 (4.3)	
Non-Smoker	50 (9.5)	474 (90.5)	524 (65.5)	
Alcohol				
Drinker	11 (20.8)	42 (79.2)	53 (6.6)	0.002
Non Drinker	82 (11.0)	664 (89.0)	747 (93.4)	

Table 6: Association between prevalence of isolated systolic hypertension and past medical and surgical history and medication used.

Variable	Isolated Systolic Hypertension		Total (%) n= 800	P- Value
	Yes (%) n= 94	No (%) n= 706		
Past Surgical History				
Yes	17 (10.1)	152 (89.9)	169 (21.1)	0.503
No	77 (12.2)	554 (87.8)	631 (78.9)	
Past Medical History				
Yes	24 (18.2)	108 (81.8)	132 (16.5)	0.012
No	70 (10.5)	598 (89.5)	668 (83.5)	
Medication used				
Yes	32 (14.7)	186 (85.3)	218 (27.3)	0.115
No	62 (10.7)	520 (89.3)	582 (72.2)	

Figure 1: Distribution of study participants by alcohol drinking

3.3. Past Medical and Surgical History.

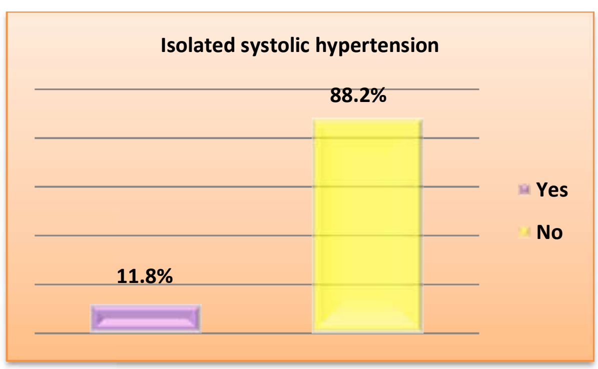

Figure 2: Distribution of study participants by isolated systolic hypertension.

DISCUSSION:

In the current study, the prevalence of ISH was 11.8% among the study participants.

In a local study conducted in Iraq in Thi-Qar governorate in 2014 by Al-Ghuzi and colleagues, they noticed that prevalence of ISH pressure among the study population was 6.8% [12]. Another Iraqi study in 2011 in University of Basra, done by Ghadhban and colleagues found lower results, as prevalence of ISH was 1.8% [13].Different results observed in Neighboring Arab countries, in KSA conducted study by Al-Hamdan showed the prevalence of ISH was 7.6% [10].

This prevalence was higher than that observed in Tehran by Asgari et al study in 2015, in which ISH was observed in 5.7% of study participants [14]. Another lower prevalence was observed in India in a study conducted by Midha and colleagues in 2010, in which prevalence of ISH was 4.3% (15). In addition, it was lower than that reported among office workers in the north Indian town of Shimla, in a study conducted by Gupta and colleagues in 2006, in which the prevalence of ISH was noticed among 7.8% of study participants (16).

These variations are dependent on the adopted definition by the researchers, and methodology of blood pressure measurement, as well as the difference in the study population, region of sample collection and its age and sex distribution (17).

The prevalence of ISH in the current study was significantly increased with advancing in age, the highest prevalence in participants aged 50 - 59 years and = 60 years (18.7% and 14.7% respectively).

An agreement was observed in Midha et al study in India in 2010, in which they noticed that a significant association of ISH with age. Prevalence was found to be high in ≥60 years' age group (45.8%) and low in 20-29 years age group (1.0%) [26]. This agrees with similar finding as reported by Al-Hamdan in KSA in 2015 significantly increased with advancing age in both genders, prevalence higher in age 50-59 groups (34%) and lower in 20-29 age groups (4%) (10).

Another agreement observed in Asgari et al study in 2015, in which found that ISH was significantly more prevalent in older participants, in comparison to normal (37.45 vs. 55.46 years,) (14). In contrary, Ghadhban et al study in Iraq in 2011 found that no statistically significant difference could be detected among various age groups despite some variations in various levels of ISH across age groups (13)..

The association between ISH and age can be explained by fact that ISH is believed to be a complication of the aging ppraying andis mostly related to structural and functional changes of the vessel walls; an increase in arterial stiffness causes elevated pulse pressure, with increased ISH and decreased diastolic blood pressure (18).

In this study, prevalence of ISH was significantly higher among males (14.4 %,) and significantly higher in obese participants (16.2%).

Differently, Al-Ghuzi et al study in Iraq in 2014 observed that the ISH was significantly more common among females than males (44.9% vs. 24.3) (12)

Inconsistent to an Iranian study conducted by Asgari and colleagues in 2015, in which they found that prevalence of ISH had a significant female prevalence in more than half of participants (51%), while similar in that participants with incident ISH had higher wrist circumference and BMI compared to individuals free of ISH at the end of follow-up (14) .

The differences observed among above studies about gender, might due to sampling size of each study. Concerning male predominance in the current study, because economically productive population, which can adversely affect the prevalence and is a possible source of confounding if the results are, compared with the general population.

Also inconsistent with a study conducted by Xu and colleagues in 2008, in which found that prevalence of ISH was significantly higher in females than males, also compared with the normotensive group, patients with ISH had a significantly higher BMI (23.13 ± 3.35 kg/m2 versus 22.93 ± 2.84 kg/m2) (17).

Concerning educational level in this study, a significant association observed between educational level and ISH, as the prevalence of ISH was significantly higher among illiterate participants (21.5%). These findings go in line with Al-Ghuzi et al study in Iraq (2014), as found a statistically significant association of hypertension with low level of education (12). Similarity was observed in Asgari et al study in Iran at 2016, in which participants with ISH had a lower educational level, as found that participants had < six years' education had represent the highest proportion with significant association between them (14). In contrary, Ahmed et al study in 2019, noticed that the prevalence of ISH increased within older ages, higher education and higher wealth status individuals, with the highest observed in those with higher education (35%) (19).

These differences might be due to differences in the sample size of each study, the individuality of the participants concerning education, loss of knowledge of the disease and its associated risks and assessment procedure methodologies.

In the current study, no significant association was observed between family history of hypertension and ISH.

This study in accordance to Iraqi study done by Ghadhban in 2011, in which ISH non significantly related to family history of hypertension and study conducted by Grebla and colleagues in 2010, in which studied the relation between family history and prevalence of ISH, they noticed that percentage of participants without family history had a non-significant higher incidence of ISH than those with family history (48% vs. 52% respectively) (8,13)

In the contrary, Clara et al study in 2007 found that ISH prevalence is higher among participants with a family history of hypertension, with a significant association between family history and ISH (20). Following Iraqi study in 2014, conducted by Al-Ghuzi and colleagues, where the results showed a significant association between ISH and positive family history of hypertension [12].

This study agreed with Discrepancies among the above-mentioned studies, might be attributed to sample size included, differences in genetic predisposition, nutritional status, assessment procedure methodologies and different durations of exposure to ISH risk factors in various populations.

Regarding marital status in the current study, no significant association between marital status and prevalence of ISH. Current result was different to the result obtained by Asgari and colleagues in their study in 2016, in which noticed that incidence of ISH was significantly higher in married participants in comparison to those with normotensive readings (81.5% vs. 88.5%) [14]. In contrary, Al-Ghuzi et al study in 2014, showed a statistically significant association of ISH with being divorced [12].

The effect of marital status of participants on the incidence of ISH, might attributed to changes in a person's lifestyle and their individual and social behavior.

In this study, no significant association between prevalence of ISH and physical activity This finding differed from that noticed in Midha et al study in 2010, in which found that prevalence of ISH increased significantly with decreasing level of physical activity .The lowest prevalence of ISH was found among those with heavy level of physical activity[15].The difference observed between studies can be related to the different sample size.

It is documented that regular physical activity slows the normal loss of elasticity in the cardiovascular system with age, and to that extent exercise, interventions can reverse some age-related decline in arterial stiffness [21].

In current study, a significant association noticed between ISH and social habits, as the highest prevalence of ISH was significantly higher among ex-smokers and alcohol drinkers.

An agreement observed in Midha et al study in 2010, in which noticed that a significant difference in the prevalence of ISH seen between smokers and non-smokers, and between alcoholics and non-alcoholics [15]

Compared with the normotensive group in Xu et al study in 2008, subjects with ISH contained fewer alcohol drinkers (28.2% versus 30.4%) whereas, smoking was the strongest significant modifiable ISH risk factor associated with ISH [17].

The persistent association between smoking and ISH risk supports a growing body of research about the effects of smoking on arterial compliance suggesting that smoking elevates SBP by increasing arterial stiffness, even among younger adults [22]. While regarding alcohol, it may due to an imbalance of the central nervous system, impairment of the baroreceptors, enhanced sympathetic activity, stimulation of the renin-angiotensin-aldosterone system, increased cortisol levels, increased vascular reactivity due to an increase in intracellular calcium levels[23].

Data from the Asia Pacific Cohort Studies Collaboration found that raised SBP is a key risk factor for coronary heart disease (CHD), ischemic and hemorrhagic stroke, ischemic heart disease, and cardiovascular and renal deaths [24].

The total risk of cardiovascular disease was increased 4.5-fold in participants with systolic–diastolic hypertension and 2.7-fold in those with ISH compared with normotensive individuals (25). Moreover, for every additional 10 mm Hg elevation in systolic blood pressure, the risk of CHD increases by 23%, ischemic stroke by 43 % ,and hemorrhagic stroke by 74% [26].

The European Society of Hypertension and the European Society of Cardiology recently developed an evidence-based update of their Guidelines on the Management of Hypertension for health professionals involved in hypertension treatment, control and prevention [12]. Some significant issues such as Blood pressure values at treatment starts and target BP values in elderly participants need future randomized controlled trials to resolve it [27].

CONCLUSION:

The prevalence of isolated systolic hypertension in this stud was y considered high, but is nearly comparable to that among local and neighboring studies.

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