ORIGINAL RESEARCH

Evaluation of pattern of chest X-ray findings among adult hypertensive patients

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Received: 23 March, 2013 Accepted: 25 April, 2013 Published: 07 May, 2013

Abstract
Background: Hypertension is a systemic disorder with profound effects on the cardiovascular system, often remaining "invisible" to radiologists due to its lack of localized physical manifestations. Hence; the present study was conducted for assessing pattern of chest X-ray findings among adult hypertensive patients
Materials & methods: A comprehensive evaluation was conducted involving 100 hypertensive patients. Standard radiographic procedures and appropriate exposure factors were employed to obtain chest radiographs, while patient records served as a source for the necessary data. Information was gathered from request, query, or referral documents within the x-ray unit, including the corresponding reports. The radiographic imaging data was extracted from the patients' x-ray results.
Results: A total of 100 patients were evaluated. Mean age of the patients was 49.2 years. 61 percent of the patients were males. 58 percent of the patients were of urban residence. Abnormal X-ray findings were seen in 41 percent of the patients. Aortic unfolding, Cardiomegaly, Heart failure, Left ventricular preponderance, Atheromatous plaque in aortic knuckle and Calcification of the arch was seen in 17 percent, 5 percent, 16 percent, 8 percent, 2 percent, and 3 percent of the patients respectively. Non-significant results were obtained while comparing X-ray findings with age and gender.
Conclusion: While plain x-ray is not an ideal tool for diagnosing hypertension due to its limited sensitivity and specificity, it can still reveal abnormal findings that provide valuable insights into the prevalence and characteristics of the condition. Notably, plain chest radiographs can help establish relationships between hypertension and factors like sex and age range. In resource-limited settings where more advanced imaging modalities like echocardiogram, CT, and MRI are unavailable or unaffordable, plain x-ray can serve as a useful alternative for identifying signs of hypertension.
Key words: Chest X-ray, Hypertension

Introduction

Hypertension is a systemic disorder with profound effects on the cardiovascular system, often remaining "invisible" to radiologists due to its lack of localized physical manifestations. Despite this, it plays a significant role in cardiovascular disease, which is the leading cause of mortality in Western countries. Approximately 40-50% of cardiovascular disease-related deaths have underlying hypertension, resulting in an estimated 5 million premature deaths worldwide annually. The causes of death include coronary heart disease, hypertensive heart failure, stroke, and renal failure. While primary (essential) hypertension accounts for most cases, secondary hypertension is attributed to various underlying disorders, albeit in a minority of patients.[1- 3]

Essential hypertension, accounting for approximately 90% of cases, is a multifactorial disease influenced by genetic, environmental, and behavioral factors. The exact cause of essential hypertension remains unknown, but it is understood to result from an imbalance between factors that increase blood pressure and those that try to normalize it. When compensatory mechanisms fail to counteract perturbations, hypertension develops. This complex interplay highlights the challenges in understanding and managing essential hypertension.[4- 6]Hypertension is an important risk factor for cardiovascular disease. In 2009–2010, nearly 82% of adults with hypertension were aware of their status, and nearly 76% were taking medication. Despite considerable improvement in increasing the awareness, treatment, and control of hypertension, undiagnosed and uncontrolled hypertension among minority groups remains a challenge.[7]Hence; the present study was conducted for assessing pattern of chest X-ray findings among adult hypertensive patients.

Materials & methods

This research is a retrospective study of the pattern of chest x-ray findings among adult hypertensive patients. This study was on adult patients whose request, query or referral documents were designatedhypertension, congestive cardiac failure or heart failure. A comprehensive evaluation was conducted involving 100 hypertensive patients. Standard radiographic procedures and appropriate exposure factors were employed to obtain chest radiographs, while patient records served as a source for the necessary data. Information was gathered from request, query, or referral documents within the x-ray unit, including the corresponding reports. The radiographic imaging data was extracted from the patients' x-ray results.All the results were subjected to statistical analysis using SPSS software. Chi-square test was used along with ANOVA test for evaluation of level of significance.

Results

A total of 100 patients were evaluated. Mean age of the patients was 49.2 years. 61 percent of the patients were males. 58 percent of the patients were of urban residence. Abnormal X-ray findings were seen in 41 percent of the patients. Aortic unfolding, Cardiomegaly, Heart failure, Left ventricular preponderance, Atheromatous plaque in aortic knuckle and Calcification of the arch was seen in 17 percent, 5 percent, 16 percent, 8 percent, 2 percent, and 3 percent of the patients respectively. Non-significant results were obtained while comparing X-ray findings with age and gender.

Table 1: Demographic data

Variable		Number	Percentage
Age group	>40 years	23	23
	<40 years	77	77
	Mean age	49.2	
Gender	Males	61	61
	Females	39	39
Residence	Rural	42	42
	Urban	58	58

Table 2: X-ray findings

X-ray findings	Number	Percentage
Aortic unfolding	17	17
Cardiomegaly	5	5
Heart failure	16	16
Left ventricular preponderance	8	8
Atheromatous plaque in aortic knuckle	2	2
Calcification of the arch	3	3
Normal findings	59	59

Table 3: Correlation of X-ray findings with age and gender

Variable		Normal X-ray findings (n=59)	Abnormal X-ray findings(n=41)	p-value
Age group (years)	<40	10	13	0.112
	>40	49	28	
Gender	Males	40	21	0.288
	Females	21	18	

Discussion

The National Health and Nutrition Examination Survey 2007–2008 data on prevalent hypertension and 2010 population estimates suggest there are roughly 70 million hypertensive patients in the U.S. Although roughly 50% of all hypertensive patients have blood pressure (BP) controlled to <140/<90 mm Hg, approximately 35 million people have uncontrolled hypertension.[6-9]Multiple patient, provider, treatment and system variables impact BP control.3 One key to progress is to identify modifiable variables that impact hypertension control.4 Prospective clinical efficacy studies first showed in 2003 then subsequently confirmed that initial treatment with single-pill combinations achieved more rapid BP control during the first three to six months than initial monotherapy with add-on medications. Second, adherence is better when medications are given as single-pill combinations than free combinations. Third, randomized, clinical studies suggest that hypertensive patients achieving lower blood pressures in the first three to twelve months of treatment experience fewer cardiovascular events during that time period.[10-12]Hence; the present study was conducted for assessing pattern of chest X-ray findings among adult hypertensive patients.

A total of 100 patients were evaluated. Mean age of the patients was 49.2 years. 61 percent of the patients were males. 58 percent of the patients were of urban residence. Abnormal X-ray findings were seen in 41 percent of the patients. Aortic unfolding, Cardiomegaly, Heart failure, Left ventricular preponderance, Atheromatous plaque in aortic knuckle and Calcification of the arch was seen in 17 percent, 5 percent, 16 percent, 8 percent, 2 percent, and 3 percent of the patients respectively. Non-significant results were obtained while comparing X-ray findings with age and gender. Rayner BL et al determined the usefulness of the chest radiograph in the assessment of target organ damage in hypertensive patients.Unselected patients attending an academic hypertension clinic were studied. The cardiothoracic ratio and the aortic knob width were measured and compared to other markers of target organ damage. The aortic width was measured in age- and sex-matched controls.Seventy-two hypertensive and 77 age- and sex-matched normotensives were evaluated. There was a highly significant difference the aortic knob width between the normotensive and hypertensive patients (3.28 cm v 3.69 cm, P <.0001). The aortic knob width was significantly correlated with age in normotensive and hypertensive patients, systolic and diastolic blood pressure (BP), and all markers of target organ damage except the electrocardiogram (ECG) voltage. The cardiothoracic ratio was also significantly correlated with age and other markers of target organ damage, but not clinic BP. Multiple regression analysis revealed that only the cardiothoracic ratio (r = 0.34, P <.02) and the ECG voltage (r = 0.58, P <.00005) were independently correlated with left ventricular mass.The chest radiograph provides important predictive information of associated target organ damage in hypertensive patients.[13]Njeze NR et al analyzed the chest findings in patients clinically diagnosed with hypertension. A retrospective analysis of patients who had plain chest radiographs. Of the 500 patients studied, 60.2% (301/500) were females and 39.8% (199/500) were males. There were 9.8% (49/500) patients with normal chest findings while 90.2% (451/500) had diverse chest findings which included: cardiomegaly 69% (345/500)), aortomegaly 51% (255/500), artheromatous plaque 6.6% (33/500)), upper lobe blood vessel diversion 11% (55/500), and perivascular cuffing 5% (25/500). The remaining 0.8% (4/500) had unrelated chest findings. Simple chest radiograph interpreted by a competent radiologist is a very useful ancillary diagnostic tool in the detection and management of hypertension.[14]

Conclusion

While plain x-ray is not an ideal tool for diagnosing hypertension due to its limited sensitivity and specificity, it can still reveal abnormal findings that provide valuable insights into the prevalence and characteristics of the condition. Notably, plain chest radiographs can help establish relationships between hypertension and factors like sex and age range. In resource-limited settings where more advanced imaging modalities like echocardiogram, CT, and MRI are unavailable or unaffordable, plain x-ray can serve as a useful alternative for identifying signs of hypertension.

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