

## NON-TRADITIONAL RISK FACTORS FOR HYPERTENSION

# Analysis of Hypertension as a Risk Factor for Osteoarthritis Knee

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## ABSTRACT

The basic objective of the recent analysis was to study hypertension as a risk factor for osteoarthritis (OA) knee. In this study, totally 155 patients of OA knee, of age more than 40 years, were enrolled for the study. The study was carried out in the Department of Orthopedic Surgery, King George's Medical University (KGMU), Lucknow, Uttar Pradesh, India. According to the diagnostic criteria of the American College of Rheumatology, the cases were taken into consideration. A brief history about the disease was taken, and complete examinations were done. For the clinical severity, visual analog scale (VAS) and Lequesne index were done and for radiological severity assessment, Kellgren–Lawrence (KL) grading and X-ray bilateral knee were done to observe the radiological changes. Moreover, the blood pressure was measured consecutively in both arms for three times via auscultatory method following the American Heart Association guidelines, and the average was calculated and recorded. If the recorded average is greater than 140/90 mm Hg, then the subject is labeled as “hypertensive.” In this study, we found a significant association between the severity of the OA knee and hypertension. The study is not only for our knowledge enrichment about the association of OA and hypertension, but also to fill the gaps with related information; it will reshape our knowledge toward the management of heart disease, hypertension, and OA. Also, we can determine the new possible risk factors for these diseases.

**Keywords:** Hypertension, Metabolic syndrome, Obesity, Osteoarthritis, Osteoarthritis knee.

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## INTRODUCTION

Osteoarthritis is a very common cause of disability among the elderly. This includes the loss of articular cartilage in the joints. High blood pressure and hyperten-

sion are now thought to cause an adverse effect on the joints. Findlay<sup>1</sup> in a study explained various reasons for this association: first is that the blood vessels gradually become narrowed with time, second is the restriction of blood flow to the bone that lies beneath the joint cartilage via narrowed blood vessels, third is insufficient supply of nutrients to cartilage and circulation of blood, and fourth is the deterioration of cartilage. One of the most important risk factors for OA is obesity.<sup>2-7</sup> The basic objective of this study was to investigate the correlation of hypertension with OA knee and its association with the clinicoradiological profile of OA knee.

## MATERIALS AND METHODS

Totally, 155 cases of OA knee patients of both sexes (male and female) and of age >40 years were registered. However, secondary OA knee patients, those on immuno suppressants and drugs like anticancer agents, ATT etc., with articular malalignment, neuromuscular involvement, uncontrolled diabetes, thyroid disorder, autoimmune diseases, and nonwilling patients were excluded from our study. In the Department of Orthopedic Surgery, KGMU, Lucknow, Uttar Pradesh, India, the whole of the study was carried out. The cases were taken into consideration as per the American College of Rheumatology guidelines. A complete examination along with brief history was done. For clinical severity, VAS and Lequesne and for radiological severity assessment, K L grading and X-ray bilateral knee were done, to observe the radiological changes. Blood pressure was measured consecutively in both arms three times via auscultatory method following the American Heart Association guidelines and the average was calculated and recorded.<sup>8</sup> Mercury manometer was used for measuring blood pressure and an average of greater than 140/90 mmHg in any side was labeled as “hypertensive.”

## Statistical Analysis

Statistical analysis was performed using Statistical Package for the Social Sciences software for Windows program (15.0 version). The continuous variables were evaluated with a mean ( $\pm$ standard deviation) or range value when required. For comparison of the means

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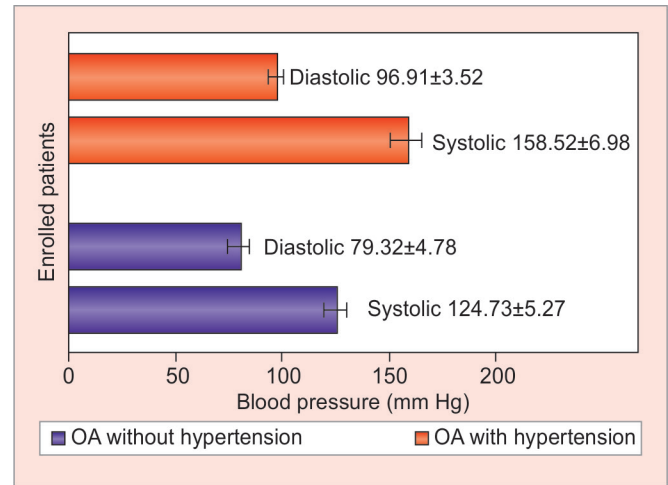
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**Table 1:** Baseline parameters

Parameters	n = 155
Sex	Male = 65 (41.9) Female = 90 (58.0)
Hypertension	Y = 97 (62.6) N = 58 (37.41)
Age (years)	55.48 ± 4.92
Knee involved	B/L = 68 (43.0) U/L = 87 (56.1) R = 53 (34.19) L = 34 (21.93)
Body mass index	Mean = 28.49 kg/m <sup>2</sup> (18–33.5)
Family history of OA	Y = 53 (34.19) N = 102 (65.8)



**Graph 1:** Mean blood pressure of hypertensive and nonhypertensive OA patients

**Table 2:** Association of clinical rigorousness of OA knee and hypertension

VAS/BP	Normotensive n = 57	Hypertensive n = 98	p-value
<4	26 (45.61%)	8 (8.16%)	<0.0001
4–7	24 (42.10%)	41 (41.83%)	
8–10	6 (10.52%)	49 (50.00%)	
Lequesne index/BP	Normotensive, n = 46	Hypertensive n = 109	
Mild (1–4)	11 (23.91%)	8 (10.09%)	<0.0001
Moderate (5–7)	14 (30.43%)	17 (12.84%)	
Severe (8–10)	12 (26.08%)	19 (17.43%)	
Very severe (11–13)	7 (15.21%)	23 (21.1%)	
Extremely severe (≥14)	2 (4.34%)	42 (38.53%)	

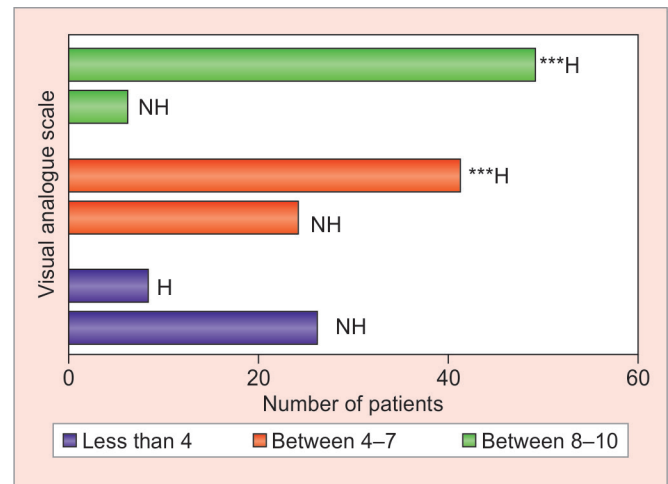
between patient groups, Pearson likelihood ratio, chi-square, linear-by-linear association at 95% confidence interval were used. The p-values smaller than 0.05 or 0.001 and were regarded as significant.

**RESULTS**

Totally, 155 patients (M/F = 1/1.38) were observed with the mean age of 55.48 ± 4.92 years and with a family having negative history of OA in 71.67% patients. Of the 155 OA knee patients, totally 68 patients were recorded with bilateral knee involvement, while 53 patients were recorded with right knee involvement and 34 patients were recorded with left knee involvement (R/L = 1.6). The mean body mass index (BMI) was 28.49 kg/m<sup>2</sup> (Table 1).

Among the 155 OA knee patients, totally 97 (63%) patients were hypertensive and the rest were 58 (37%) normotensive patients with mean blood pressure of 156.4 ± 5.27 mm Hg (systolic blood pressure) and 96.7 ± 2.91 mm Hg (diastolic blood pressure) and 122.4 ± 4.36 mm Hg (systolic blood pressure) and 77.3 ± 3.65 mm Hg (diastolic blood pressure) correspondingly (Graph 1).

We associated hypertension with the medical severity (VAS and Lequesne index) and radiological severity (KL grading) of OA knee; we found a significant correlation between hypertension along with rigorousness of OA knee.



**Graph 2:** Association of clinical rigorousness (VAS) of OA knee and hypertension; NH: Nonhypertensive; H: Hypertensive; \*\*\*Significant (<0.0001)

The mean VAS scores of normotensives and hypertensives were recorded as 8.4 ± 1.02 and 5.8 ± 1.27, respectively (Table 2 and Graph 2). There was a highly important association among hypertensive OA knee patients and VAS scale (p < 0.0001).

In the Lequesne index, 44 patients were in the category of extremely severe, (≥14) out of which 42 patients were hypertensive, the mean score in normotensive patients

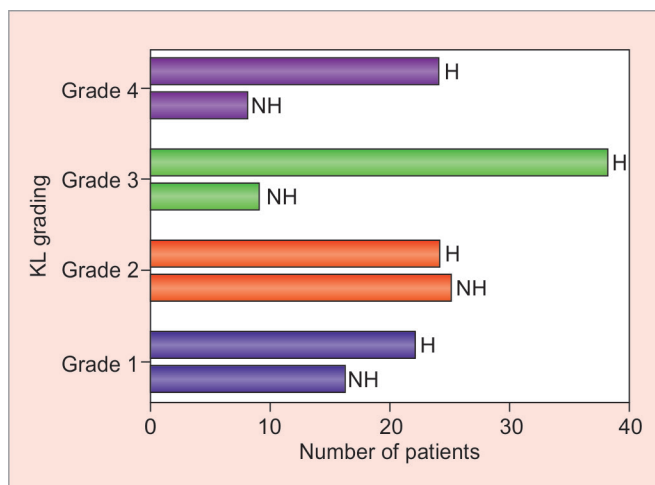
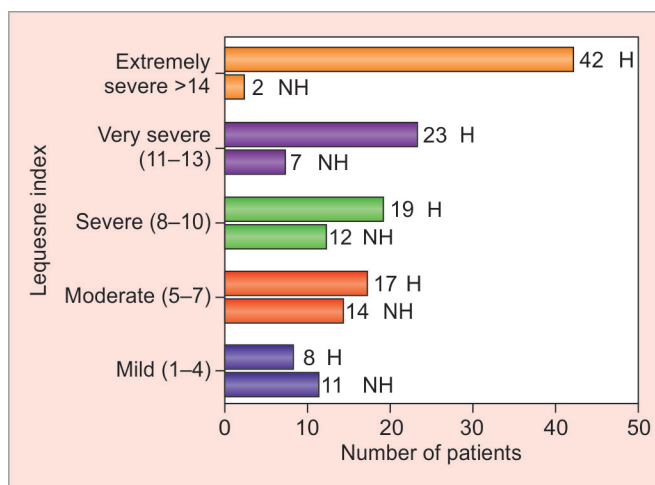
**Table 3:** Association of radiological rigorouslyness of OA knee with hypertension

KL grading/BP	Normotensive, n = 57	Hypertensive, n = 98	p-value
Grade I	16 (28.07%)	22 (22.44%)	<0.0001
Grade II	25 (43.85%)	24 (24.48%)	
Grade III	9 (15.78%)	38 (38.77%)	
Grade IV	8 (14.03%)	24 (28.48%)	

BP: Blood pressure

and hypertensive being  $16.2 \pm 2.63$  and  $09.8 \pm 2.09$  respectively (Table 3 and Graph 3). There was a highly important relation among hypertensive OA knee patients and the Lequesne Index ( $p < 0.0001$ ).

According to the radiological rigorouslyness in the KL grading scale, 47 patients were recorded with grade III, out of which 38 patients had hypertension (Table 3 and Graph 4). There was a highly significant association among hypertensive OA knee patients and KL grading scale ( $p < 0.0001$ ).

**Graph 3:** Association of radiological severity of OA knee with hypertension; NH: Nonhypertensive; H: Hypertensive; \*\*\*Significant ( $< 0.0001$ )**Graph 4:** Association of clinical severity (Lequesne index) of OA knee and hypertension; NH: Nonhypertensive; H: Hypertensive; \*\*\*Significant ( $< 0.0001$ )

## DISCUSSION

The OA causes pain and loss of functional ability frequently.<sup>9</sup> Hypertension and high blood pressure lead to adverse effects of OA because, in these cases, the blood vessels become narrowed and result in restricted blood flow to the site. Hence, blood and nutritional supply to the cartilage get deprived that further leads to the beginning of cartilage destruction. If the problems are left unattended long enough, it may lead to OA.<sup>10-14</sup> In the present study, we aimed to study the correlation of hypertension as a risk factor for OA knee and its association with the clinicoradiological profile.

According to Lohmander et al,<sup>11</sup> the increasing population and obesity were directly proportional to incidences of OA, which will consistently rise over the coming decades. People with obesity, accidents, and physically challenged profile have the risk of OA, especially at the level of hand, knee, and hip. In another study, Dahaghin et al<sup>12</sup> found that in 3,585 patients with OA of hand, overweight patients with OA of hand was commonest OA and when compared with relative patients of younger age it was found true. As per Singh et al,<sup>15</sup> the OA commonly coexists with hypertension in the same patient. In the NHANES III (3rd National Health and Nutrition Examination Survey), statistics demonstrated that OA is diagnosed in around 21% of the 115.9 million US adults when they were aged 35 years and with OA.<sup>15</sup> In fact, NHANES III expected that a diagnosis of hypertension is present in 40% of these treated subjects.<sup>13-15</sup> A study by Kozochina and Bagirova<sup>16</sup> in 1,350 patients with OA found that 82% patients had metabolic syndrome. They concluded that an important correlation exists between OA and metabolic syndrome.

We also found a significant relationship between hypertension and severity of OA knee like in previous similar studies.<sup>10,12,15,16</sup> This means that paying attention to weight, blood pressure, and blood glucose is important to prevent the development and persistence of OA. Single center study with a small sample size was the limitation of the present study.

## CONCLUSION AND FUTURE IMPLICATIONS

The study is not only for our knowledge enrichment about the association of hypertension and OA, but also to fill the gaps with related information; it will reshape our knowledge toward the management of heart disease, hypertension, and OA. We can also determine the new possible risk factors for these diseases.

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