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**Original Research Article****Correlation of Hypertension with the severity of Osteoarthritis of Knee****Ishaan Vohra<sup>1</sup>, Ajai Singh<sup>2\*</sup>, Sabir Ali<sup>3</sup>, N S Verma<sup>4</sup>, Ashish Kumar<sup>5</sup> and Vatsala Katiyar<sup>6</sup>**<sup>1</sup>MBBS, King George's. Medical University, Lucknow, India<sup>2</sup> Professor, Department of Orthopaedic Surgery, King George's, Medical University, Lucknow, India<sup>3</sup>Ph.D Scholar, Department of Orthopaedic Surgery, King George's, Medical University, Lucknow, India<sup>4</sup>Professor, Department of Physiology, King George's. Medical University, Lucknow, India<sup>5</sup>Professor, Department of Orthopaedic Surgery, King George's, Medical University, Lucknow, India<sup>6</sup>MBBS, King George's. Medical University, Lucknow, India**\*Correspondence Info:**

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E-mail: [as29762@gmail.com](mailto:as29762@gmail.com)**Abstract****Objective:** To analyze the correlation between hypertension with the clinico-radiological profile and severity of OA knee.**Method:** In this cohort study, total 120 cases of osteoarthritis knee patients of either sex or age > 40 years were enrolled. The entire study was conducted in department of Orthopedic Surgery, King George's Medical University. Cases were selected as per the diagnostic criteria of the American College of Rheumatology. A detailed history was taken and thorough examination of the affected joints and related regions was done. For the clinical severity, VAS and Lequesne Index was used. To assess the radiological severity of the disease, K.L grading was used and X-ray bilateral knee was done to see the radiological changes of the disease. Blood pressure was measured in both the arms via auscultatory method following American Heart Association guidelines. The Blood Pressure was measured thrice in both the arms and the average was calculated. If the average was more than 140/90 mm Hg in any side; then the subject was labeled as 'hypertensive'.**Result:** The correlation of hypertension with the clinical and radiological severity of OA knee was found to be statistically significant.**Conclusion:** The significant correlation of hypertension with osteoarthritis will not only bridge the information gap, but will also modify our approach towards the management of hypertension, heart diseases and osteoarthritis. We may be able to find out the new possible risk factors of these diseases hence it should be further investigated.**Keywords:** Osteoarthritis; Osteoarthritis knee; Hypertension**1.Introduction**

Osteoarthritis (OA) is a leading cause of disability among the elderly people. OA is characterized by gradual loss of articular cartilage in the joint. High blood pressure, hypertension, is among the blood vessel disorders that is now thought to adversely affect the joints. In a study[1], several reasons have been described for this association: 1) blood vessels become narrowed over time 2) narrowed vessels causes restricted blood flow to the bone that lies beneath the joint cartilage 3) circulation of blood and nutrients to cartilage suffers, and 4) cartilage begins to deteriorate. Obesity is considered to be one of the most important risk factors of

Osteoarthritis[2]-[7]. WHO initiative on counteracting obesity also accepts OA as a consequence of obesity[8] but the role of hypertension in OA knee still remains a mystery. The aim of this study was to investigate the association of hypertension with osteoarthritis knee and its correlation with the clinico-radiological profile of OA knee.

**2.Material and Method**

In this cohort study, total 120 cases of osteoarthritis knee patients of either sex or age > 40 years were enrolled. The whole of the study was

conducted in department of Orthopedic Surgery, King George's Medical University. All the cases were selected according to Diagnostic criteria of knee osteoarthritis (American College of Rheumatology – ACR):Knee pain with osteophytes on X-ray and any one or more of the following – Crepitus on knee range of motion; Age 50 years or older; Morning stiffness of short duration (<30min).Exclusion Criteria- Patients with secondary osteoarthritis knee, patients on drugs like ATT, anti-cancer, immunosuppressants etc., articular malalignment, neuromuscular involvement, thyroid disorder, autoimmune diseases, uncontrolled diabetes, no consent or non-willing patients were excluded from our study.

A detailed history (including drug intake) was taken and thorough examination of the affected joint and related regions was done(VAS and lequesne Index).X-ray bilateral knee – AP (standing), Lateral and skyline view was done to see the radiological changes of the disease to assess the radiological profile of the disease(K.L grading). Blood pressure was measured in both the arms by auscultatory method following American Heart Association guidelines[9]. Mercury manometer was used for measuring Blood pressure. The Blood pressure was measured thrice (as per AHA guidelines) of both the arms and the average was calculated. If the average was more than 140/90 mm Hg in any side; then the subject was labeled as 'hypertensive'.

### 2.1 Statistical analysis

The data were entered in Microsoft Excel and were checked for any inconsistency before analysis. Statistical analysis was performed using SPSS software for Windows program (15.0 version). The continuous variables were evaluated with mean ( $\pm$ SD) or range value when required. For comparison of the means between patient groups,Pearson Chi-Square, Likelihood Ratio, Linear-by-Linear Association at 95% confidence interval was used. A p value less than 0.05 or 0.001 were regarded as significant.

### 3.Results

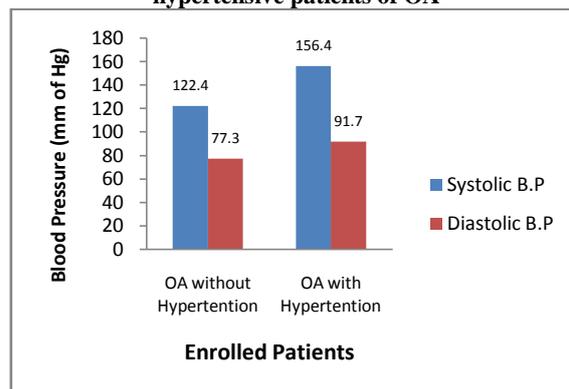
Total 120 patients (M/F = 1/1.4) were studied with the mean age of 55.8yrs with a negative family history of OAin 71.67% patients. Out of 120 patients with OA knee,54 patients had bilateral knee involvement while in 38 patients right knee was involved and 28 patients had left knee involvement (R/L=1. 36). The mean BMI was27.18kg/cm<sup>2</sup> (Table-1).

**Table-1: Baseline Parameters**

| Parameters           | N=120  |
|----------------------|--|
| Sex                  | Male=50 (41.7)<br>Female=70 (58.3)                           |
| Hypertension         | Y=78 (65.0)<br>N=42 (35.0)                                   |
| Age                  | 55.8yrs(45 - 78)   |
| Knee involved        | B/L=54 (45.0)<br>U/L=66 (55.0)<br>R=38 (69.0)<br>L=28 (31.0) |
| BMI                  | Mean=27.18 kg/cm <sup>2</sup><br>(18-33.5)                   |
| Family history of OA | Y=34 (28.3)<br>N=86 (71.7)                                   |

Out of 120 patients with OA knee, n=78 (65%) patients were hypertensive and rest 42 (35%) patients were normotensive with mean blood pressure of 156.4mm of Hg(Systolic blood pressure), 91.7 mm of Hg (Diastolic blood pressure) and 122.4 mm of Hg (Systolic blood pressure) and 77.3 mm of Hg (Diastolic blood pressure) respectively(Figure-1).

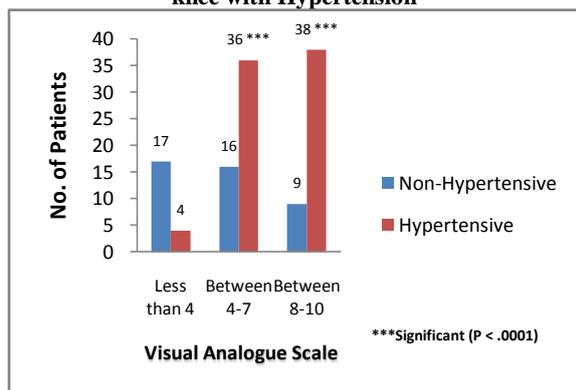
**Figure 1: Mean B.P of hypertensive and non-hypertensive patients of OA**



We correlated hypertension with the clinical severity (VAS and lequesne Index) and radiological severity (K.L grading) of OA knee. We found a significant association of hypertension with the clinical severity (VAS and lequesne Index) and radiological severity (K.L grading) of OA knee. The mean VAS score was 7.32, 52 patients were in the scale of 4-7 out of which 36 were hypertensive while 47 were in the scale of 8-10 out of which 38 were hypertensive, the mean VAS score of hypertensive and normotensive was 9.1 and 5.5 respectively (Table-2 & Figure-2). There was a highly significant correlation between hypertensive OA knee patients with VASbetween 8-10(p<0.0001).

**Table 2: Correlation of Clinical severity of OA knee with Hypertension**

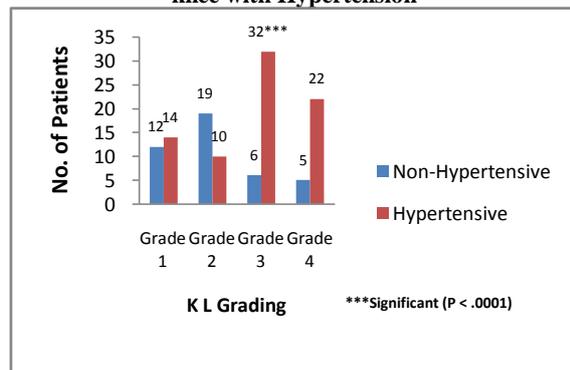
| VAS/B.P                   | Normotensive<br>N=42 | Hypertensive<br>N=78 | P<br>Value |
|---------------------------|----------------------|----------------------|------------|
| Less than 4               | 17(40.45%)           | 4(5.13%)             | <.0001     |
| 4 -7                      | 16(38.09%)           | 36(46.15%)           |            |
| 8-10                      | 9(21.43%)            | 38(48.72%)           |            |
| Lequesne<br>Index/B.P     | Normotensive<br>N=39 | Hypertensive<br>N=81 |            |
| Mild(1-4)                 | 9(23.07%)            | 7(8.64%)             | <.0001     |
| Moderate(5-7)             | 12(30.77%)           | 8(9.88%)             |            |
| Severe(8-10)              | 10(25.64%)           | 13(16.05%)           |            |
| Very Severe(11-13)        | 8(20.51%)            | 15(18.52%)           |            |
| Extremely Severe<br>(≥14) | 3(7.69%)             | 35(43.21%)           |            |

**Figure 2: Correlation of Clinical severity (VAS) of OA knee with Hypertension**

In the lequesne index 38 patients were in the category of extremely severe ( $\geq 14$ ) out of which 35 patients were hypertensive, the mean score in hypertensive and normotensive patients was 15.7 and 10.4 respectively (Table-2 & Figure-3). There was a highly significant correlation between hypertensive OA knee patients with extremely severe ( $\geq 14$ ) grade of the Lequesne Index ( $p < 0.0001$ ).

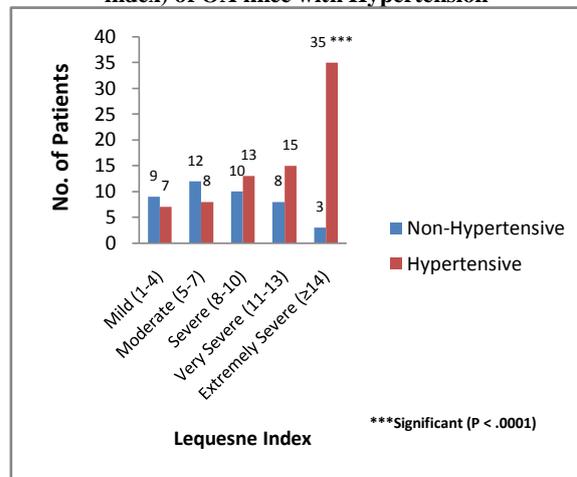
**Table 3: Correlation of radiological severity of OA knee with Hypertension**

| K.L<br>grading/B.P | Normotensive<br>N=42 | Hypertensive<br>N=78 |        |
|--------------------|----------------------|----------------------|--------|
| Grade 1            | 12(28.57%)           | 14(17.95%)           | <.0001 |
| Grade 2            | 19(45.34%)           | 10(12.82%)           |        |
| Grade 3            | 6(14.28%)            | 32(41.02%)           |        |
| Grade 4            | 5(11.90%)            | 22(28.20%)           |        |

**Figure 3: Correlation of Radiological severity of OA knee with Hypertension**

As per the radiological severity in the K.L grading scale 38 patients were grade 3 out of which 32 patients were hypertensive (Table-3 & Figure-4).

There was a highly significant correlation between hypertensive OA knee patients and grade 3 K.L grading scale ( $p < 0.0001$ ).

**Figure 4: Correlation of Clinical severity (Lequesne index) of OA knee with Hypertension**

#### 4. Discussion

Osteoarthritis (OA) is the most frequent musculoskeletal disease and the most frequent cause of pain and loss of functional and working ability [10]. High blood pressure, hypertension, is among the blood vessel disorders that is now thought to adversely affect joints. In a study [1], which proposed that blood vessels become narrowed over time causing restricted blood flow to the bone that lies beneath the joint cartilage hence the blood and nutritional supply to the cartilage gets compromised, ultimately leading to deterioration of cartilage. If left long enough, it can lead to osteoarthritis. The phenomenon of coexistence between these two diseases is often seen in the elders, although they belong to the different systems [11]. In behalf of the above background, in the present study we aim to investigate the association of hypertension with osteoarthritis knee and its correlation with the clinico-radiological profile of OA knee.

According to Lohmander *et al* (2007), owing to the progressive aging of the population and the growing burden of obesity, the incidence of OA is expected to consistently rise over the next decades. In addition to age and obesity, trauma and physically challenging occupations are additional determinants of the risk of OA, especially at the level of hand, knee and hip [12]. Dahaghin *et al* (2007), while studying 3,585 patients with osteoarthritis of the hand, found that osteoarthritis of the hand was increasingly common when overweight occurs together with hypertension and diabetes and concluded to be significantly true relationship, when occurred at a relatively younger age [8]. Also the OA not only causes physical disability of the

patient but also imposes a significant financial burden both on patients and healthcare systems twice[13][14]. According to Singh *et al*(2002), the OA and hypertension frequently coexist in the same patients[15]. Also in the Third National Health and Nutrition Examination Survey (NHANES III), statistics showed that OA is diagnosed in approximately 21% of the 115.9 million US adults aged  $\geq 35$  years that have OA[15]. The NHANES III also estimated that a concomitant diagnosis of hypertension is present in 40% of these treated subjects[15].

Study by Kozochina *et al*(2007)[16], in 1,350 patients with osteoarthritis, 82 percent patients had metabolic syndrome. Beside the significant association they also had shown that patients with metabolic syndrome developed their osteoarthritis earlier than those who did not have metabolic syndrome.

Similar to the various studies[8][11][15][16] result, in the present study we also found the significant correlation of hypertension with the clinical and radiological severity of OA knee. This likely means that; paying attention to weight, blood pressure and blood glucose could be important in preventing the development of osteoarthritis (the OA without known primary cause). Single centric study with small sample size was the limitation of the present study.

## 5. Conclusion

This study will not only enrich our knowledge about the possible correlation of hypertension with osteoarthritis but also bridge the information gap; it will modify our approach towards the management of hypertension, heart diseases and osteoarthritis. We may be able to find out the new possible risk factors of these diseases. Further we may be able to find out the new possible risk factors of these diseases hence it should be further investigated.

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