Identification of Risk Factors in Early Osteoarthritis of the Knee Joint

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Abstract: Osteoarthritis of the knee joint is a common age-related disorder that plagues a vast majority of the elder aged group[1] population of our country. It is a mechanobiological derangement of the joint[2]. At present, most patients are diagnosed at a late stage when not much can be done to halt the progression or reverse the disease. With the advent of newer radiological and non-radiological imaging and evaluation techniques, it is possible to diagnose these patients at an earlier stage. However, what needs to be refined is the ability to pick up such candidates for further evaluation. This study aims to study, compare and correlate the risk factors that are associated with early Osteoarthritis of the knee, so as to screen these patients more effectively and give timely intervention.

I. Introduction

Osteoarthritis (OA) of knee commonly presents with pain, disability and deformity of the knee joint[2]. It is a dynamic mechanobiological derangement of articular cartilage of knee.It is characterized by loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis and range of biochemical and morphological alterations of the synovial membrane and joint capsuleand is caused due to chronic degeneration of the articulating surfaces of the joint[3].Late stage changes of OA include softening, ulceration of the articular cartilage, synovial inflammation also may occur.Patients usually present with symptoms of pain, particularly after prolonged activity and weight bearing; whereas stiffness is experienced after inactivity[4]. Most patient with Osteoarthritis have no known cause. This is known as Primary osteoarthritis. Primary osteoarthritis is mostly related to aging. It can be localized, generalized or as erosive osteoarthritis. Secondary osteoarthritis is caused by another disease or condition.

OA Knee has multiple Risk factors [5], which include age (>50 in Males and >45 in females), sex (Female > Male), BMI (>25%), History of joint injury, frequent stair climbing (15 or more flights per day), frequent lifting of heavy weights (10 kg or more), occupations involving kneeling or squatting for more than 2 hour per day, occupations with climbing for more than 1 hour per day, continuous standing for more than 2 hours per day or walking more than 3 hours per day.

OA Knee usually presents in patient in the 61-70 age group, more commonly in females than in males in any Orthopedic Out patient department. Most of these patients present with advanced level disease, with complains of pain over a chronic period of time, with some patient presenting with visible deformities in the joint.

II. Material and Methods

The present study was a longitudinal study conducted in Sassoon General Hospital, Pune, Maharashtra. All patients attending orthopedic outpatient department with complains of knee pain forms the study population.

Study Design: Prospective open label observational study
Study Location: This was a tertiary care teaching hospital-based study done in Department of Orthopedics, at Sassoon General Hospital, Pune.
Sampling Method: Convenient Sampling
Study Duration: January 2018 to June 2018.
Sample size: 70 patients.

Inclusion Criteria
1. Early OA knee – Kellgren and Lawrence (K and L) Grade 0 and 1.
2. Qualitative C- reactive Protein – Negative.
3. Erythrocyte Sedimentation Rate- <20 mm/1 hr.
4. Serum Uric Acid level < 6 mg/dl
5. Total Leucocyte count < 10000/ Cu.mm.

3.4 Exclusion Criteria –
1. Advanced OA knee with Kellgren And Lawrence (K and L)> Grade 2
2. Joints pain due to Rheumatological or Systemic diseases
3. Malalignment of Weight Bearing Axis
4. Internal Knee derangement causing knee pain

Procedure methodology
Informed written consent in language understood by the patient was taken.Personal data, clinical findings, radiological findings, biochemical reports and related medical records of all patients were obtained. A pre-tested semi structured questionnaire was administered to all patients. Questionnaire was divided broadly in to two parts. The first part included socio-demographic details.

The second part consisted of the possible risk factors for developing OA of the knee such as age, gender, occupation, family history of OA, physical activity, history of injury to the knee etc. X-ray, weight and height measurement along with all necessary investigations according to standard protocol were done. On basic evaluation, patients having symptoms suggestive of OA Knee were sent for X rays. On X ray, Grade 2 patients were excluded from the study and Grade 0 and Grade 1 patients were taken in the study. Baseline biochemical parameters of these patients was recorded, and patients were followed up after 3 and 6 months. Simultaneously, patients were started on medication and physiotherapy

Statistical analysis
Statistical analysis was conducted by using Medcalc software. An unpaired t test was used to test the null hypothesis. The procedure calculates the difference between the observed means in two independent samples. A significance value (P-value) and 95% Confidence Interval (CI) of the difference is reported. The P-value is the probability of obtaining the observed difference between the samples if the null hypothesis were true. The null hypothesis is the hypothesis that the difference is 0. P value less than 0.05 is considered significant.

III. Result

After analyzing a total of 70 patients in the study, it was observed that there was almost and equal prevalence of males and females in the study (M=34, F=36). Majority of the patients were below the age of 60 years (55.72%). Most of the patients included in the study were found to be in the middle and lower classes (50%).

Age Group	Number	%
≤40	8	11.43
41-45	6	8.57
46-50	9	12.86
51-55	7	10.00
56-60	9	12.86
61-65	12	17.14
66-70	8	11.43
71-75	9	12.86
76-80	2	2.86

AGEWISE DISTRIBUTION OF STUDY POPULATION
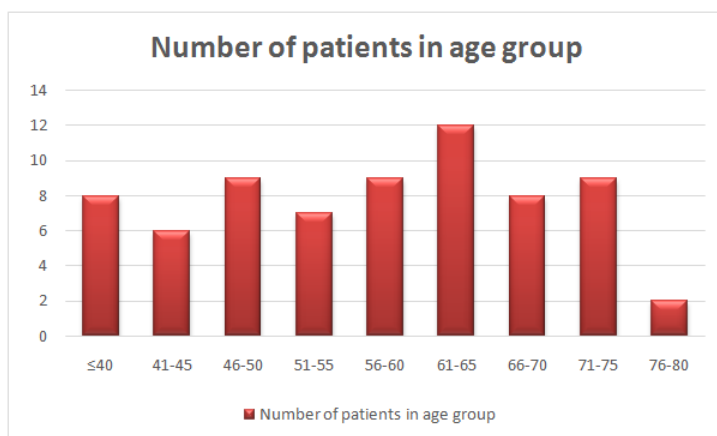
| Gender		
Males	34	48.57
Females	36	51.43
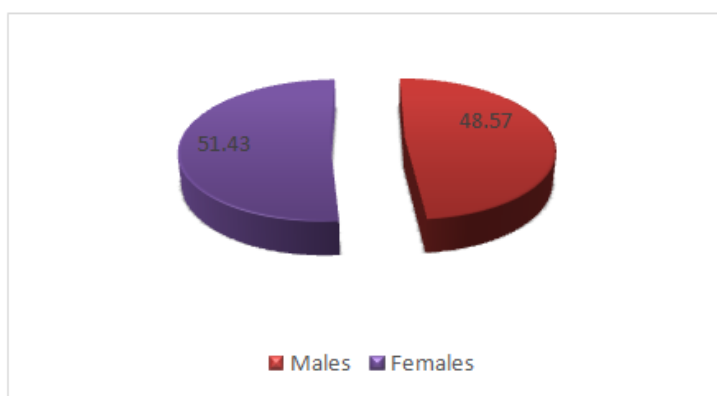
Socioeconomic Status

Lower Class	35	50.00
Middle Class	33	47.14
Upper Class	2	2.86
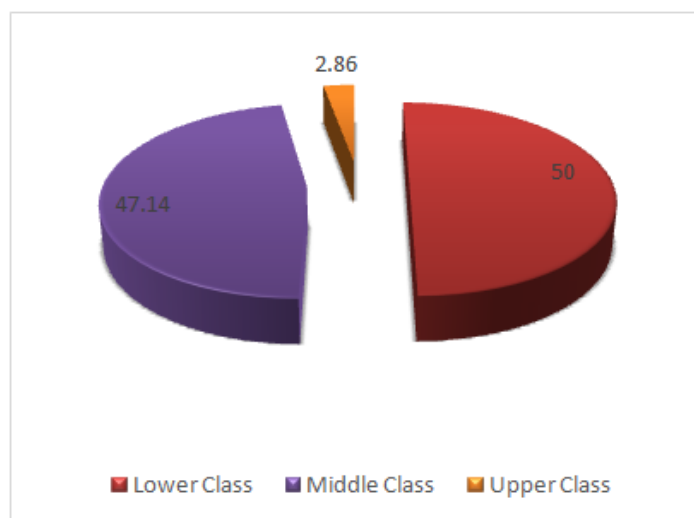
On evaluation of BMI of the individual patients, it was noticed that majority (58.5%) of the patients belonged to either Overweight or Obese classes. An overwhelmingly low proportion of patients (2.8%) were found to be underweight.

BMI		
Underweight (BMI< 18.5Kg/M2)	2	2.86
Normal weight (BMI< 18.5-24.9	27	38.57
Overweight (BMI 25-30)	34	48.57
Obese (BMI> 30)	7	10.00
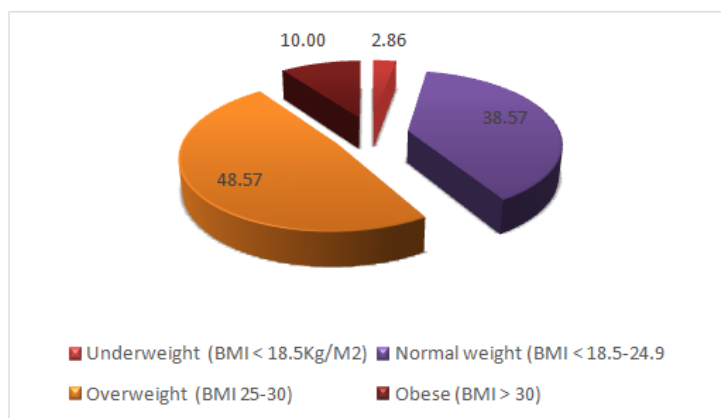
On evaluating relation of Posture and habits with Osteoarthritis of the knee, it was seen that a large number of patients (58.57%) had daily activities which included frequent stair climbing. Other activities found frequently associated with the disease were Occupational Hazards (44.29%), Habitual Squatting (47.14%) and frequent weight lifting (44.29%).

**RELATION OF POSTURE AND HABITS WITH OSTEOARTHRITIS**

Particulars	Number	%
Occupational hazards	31	44.29
Stair Climbing	41	58.57
Habitual squatting	33	47.14
Frequent Weight Lifting	31	44.29
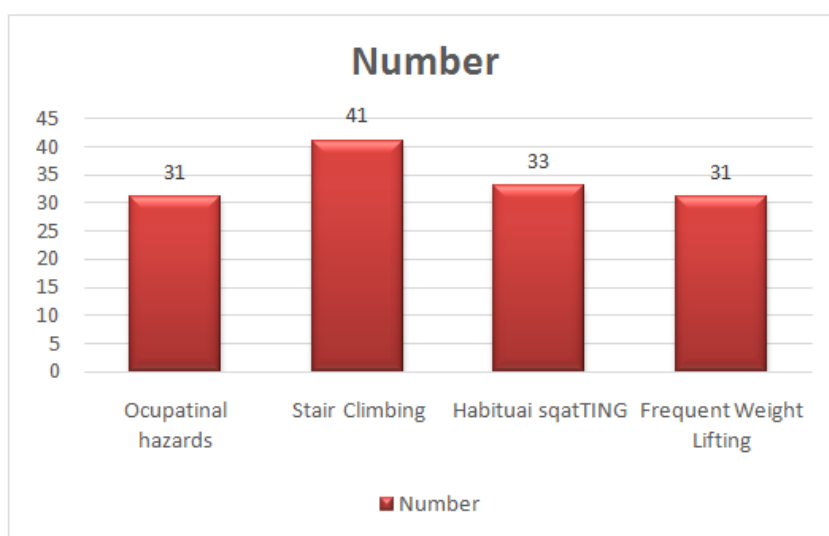
Diabetes Mellitus (17.14%) and Hypertension (7.14%) were the co morbidities which were found to be commonly associated with the disease. On comparing the presence of family history of Osteoathriitis, it was found that 22.86%) had a positive correlation with the same.

RISK FACTORS ASSOCIATED WITH OSTEOARTHRITIS

Particulars	Number	%
Diabetes Mellitus	12	17.14
Hypertension	5	7.14
Previously operated	3	4.29
History of injury to knee	6	8.57
Family History of Osteoarthritis	16	22.86
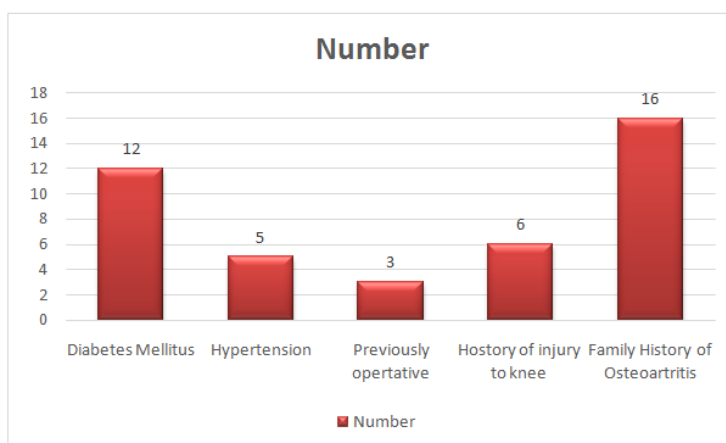
ACR Score [6], LEFS score [7], VAS score [8] and K and L score [9] was utilized to quantify the disability in each patient at the initiation of the trial, and at the end of 6 months, during which period patient was routinely followed up in OPD and was treated in the form of analgesics and regular physiotherapy. The data obtained was used to analyze if there was any difference in the improvement characteristics in different demographics within the same population, such as Obese and Non Obese patients, Menstruating and Post Menopausal women, Patients with positive risk factors and those without, and in patients with and without positive family history. The following data was conjured.

Comparison of Clinical Improvements from baseline to 6 months' Follow up in Overweight versus normal weight patients.

	Non Obese N=29		Obese N=41		
Scale	MEAN Difference	SD	MEAN Difference	SD	P value
ACR	0.8620	0.9035	0.8536	0.9522	0.9648
LEFS	-15.3448	14.5437	-15	8.1598	0.9011
K and L	0.9310	0.7384	0.7804	0.7280	0.4027
VAS	1.9310	0.7827	1.8048	0.7207	0.4747

Comparison of Clinical Improvements from baseline to 6 months' Follow up in Menstruating versus Post-menopausal females

	Menstruating Females N=16		Post-menopausal Females N=20		
Scale	MEAN Difference	SD	MEAN Difference	SD	P value
ACR	1	0.9138	0.0861	0.9445	0.1572
LEFS	-14.37	18.2671	-32.6371	11.4707	0.7579
K and L	0.74	0.5672	0.1727	0.5501	0.9579
VAS	1.93	0.7439	1.1860	0.8645	0.3945

Comparison of Clinical Improvements from baseline to 6 months' Follow up in Patients with and without risk factors(DM,HTN,Trauma)

	With Risk Factors n=24		Without Risk Factors n=46		
Scale	MEAN Difference	SD	MEAN Difference	SD	P value
ACR	0.79	0.95	0.89	0.95	0.68
LEFS	-15	8.24	-15.43	8.23	0.84
K and L	0.75	0.73	0.91	0.74	0.39
VAS	1.75	0.73	1.93	0.72	0.33

Comparison of Clinical Improvements from baseline to 6 months' Follow up in Patients with positive family history and without it.

	With Positive Family History n=16		Without Family History n=54		
Scale	MEAN Difference	SD	MEAN Difference	SD	P value
ACR	1.25	0.72	0.74	0.95	0.051
LEFS	-17.81	7.80	-14.54	8.16	0.16
K and L	1.00	0.64	0.81	0.73	0.35
VAS	1.94	0.68	1.85	0.72	0.66

IV. Discussion

To assess whether we can pick up early knee osteoarthritis by identifying risk factors, we interviewed 70 patients who came to Ortho OPD with symptoms suggestive of OA Knee. These patients were made to fill up a basic questionnaire and were followed up for treatment in the form of analgesics and physiotherapy.

On analyzing the data, it was seen that an almost equal proportion of elderly (above the age of 60) and non-elderly (below 60) were part of the study. Hence it could be conjured that early changes of OA knee may not necessarily be age dependent. An almost equal proportion of Males and Females was seen, which suggests that early OA changes need not be gender specific either, as supposed to the late changes, which are predominantly seen in females.[4,5,11,12,13,14]

Socio economic factor seems to play a key role, as 97.14% of the study population belonged to the lower or middle classes. This should be ought to the possibility that most population belonging to this demographic usually engage in occupations that require more physical activity. This leads to more biomechanical stress to the knee joint, and hence possibly a higher prevalence. Another contributing factor might be the lifestyle habits of people in this population, such as use of Indian toilet, walking as a mode of transport due to lack of vehicles etc.

The fact that approximately 58% of the population had a BMI belonging to the overweight or obese category further cements the fact that BMI is a strong contributing risk factor to OA Knee[16]. Higher BMI implies, more biochemical strain on the knee joint vis a vis leading to more wear and tear. Hence, the importance of weight loss and constant physiotherapy cannot be stressed enough in the management of OA knee.

In this study, we also aimed to investigate whether risk factors can alter the degree of improvement in patients that present with early changes of OA knee. Hence, ACR, LEFS K and L and VAS scoring of patients were compared in different groups at the beginning and end of the study. These were compared for menstruating and post-menopausal women, obese and non-obese patients, patients with daily activities considered as risk factors and those without, and patients with and without family history.

On comparing the scores for these groups before and after the study, it was unanimously seen that the p value was insignificant. Implying that irrespective of presence or absence of risk factors, if diagnosed at an early stage, OA knee will exhibit similar improvement with physiotherapy through all demographics. This further cements the reasoning behind diagnosing OA knee at an earlier stage, as the presence or absence of risk factors at this stage does not significantly alter the overall outcome of therapy[19,20,21,22].

V. Conclusion

Recognizing the risk factors for development of Osteoarthritis of the knee joint in a patient, helps in predicting the development of the disease at an early stage, and hence can help with initiation of therapy at an earlier stage. Early diagnosis and treatment can cause significant improvement in the progression of the disease universally, irrespective of presence or absence of co morbidities, family history and multiplicity of risk factors.

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