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# Factors Influencing The Success Of Hyaluronic Acid Injections In Treating Knee Osteoarthritis

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## Abstract:

This study examines factors behind effective treatment of knee osteoarthritis (OA) using hyaluronic acid (HA) injections. We will look at patient demographics, clinical characteristics, and treatment responses to find out what leads to good results. According to our research, it is essential to consider age, initial severity of OA, and body mass index (BMI) when planning therapy as these are the main predictors of its success.

**Keywords:** Hyaluronic acid injections, knee osteoarthritis, treatment effectiveness, predictors, age, BMI, baseline OA severity, pain reduction, joint function improvement.

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## I. Introduction

Osteoarthritis of the knee stands as one of the most prevalent degenerative joint disorders, presenting patients with debilitating symptoms such as pain, stiffness, and limited range of motion(1). In the pursuit of alleviating these distressing manifestations and enhancing joint functionality, clinicians frequently turn to intra-articular injections of hyaluronic acid (HA) as a therapeutic intervention(4) . Despite the widespread use of HA injections, the variable response observed among patients poses a significant challenge to achieving consistent treatment outcomes(3,5).

In light of this clinical conundrum, the present study endeavors to elucidate the demographic and clinical factors that underpin a favorable response to HA injections in knee osteoarthritis (OA) patients(2).By systematically exploring the intricate interplay between patient characteristics and treatment outcomes, we aim to unravel the determinants that dictate individual responsiveness to this therapeutic modality.

## II. Methods

### Study Design

We conducted a retrospective cohort study of a series of medical records for patients with knee OA who underwent HA injections in a tertiary care centre between March 2023 and March 2024.

### Participants

Inclusion criteria:

- Participants were diagnosed with knee OA based on clinical and radiographic criteria.
- Received at least one course of HA injection.

Exclusion criteria:

- A history of knee surgery in the last year.
- Concurrent inflammatory arthritis.

**Data Collection:** We have collected the data on patient demographics, including age, sex, BMI, baseline OA severity as per the K-L grade, and clinical outcomes assessed at 6 and 12 months post-injection, to assess pain reduction and improvement in mobility

**Statistical Analysis:** Multivariate logistic regression was then used to establish predictors of successful treatment, as defined by at least a 50% reduction in pain and improvement in the function of the joint.

## III. Results

**Patient Characteristics:** We included a total of 150 patients. The mean age was 65 years, ranging from 45 to 80 years. Females made up 60% of the cohort, and the mean BMI was 28 kg/m<sup>2</sup>.

**Treatment Outcomes:**

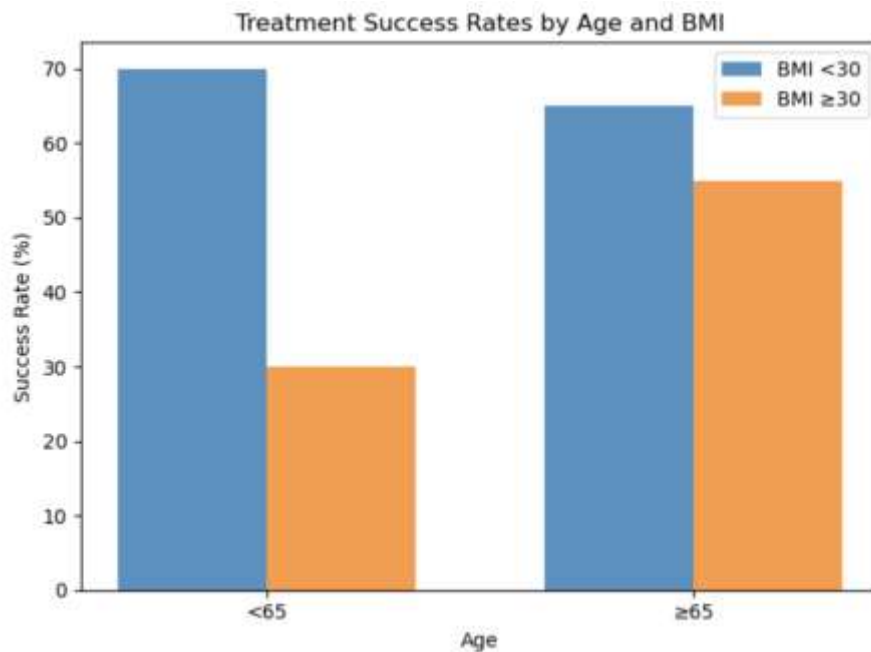
- 60% of patients reported > significant pain reduction at 6 months.
- 50% maintained improvement at 12 months.

**Predictors of Success:**

- Age: The risk of poor outcomes was lower in younger patients below the age of 65 years.
- BMI: Patients with a BMI of <30 had a better response than those with higher BMIs.
- Baseline OA Severity: Lower Kellgren-Lawrence grades (1-2) were associated with improved outcomes.

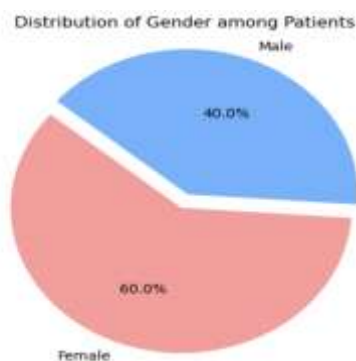
**Table 1: Patient Demographics and Clinical Characteristics**

Variable	Successful Treatment (n=90)	Unsuccessful Treatment (n=60)
Age (mean)	62	68
Female (%)	65	55
BMI (mean)	26	30
KL Grade (1-2)	70	30

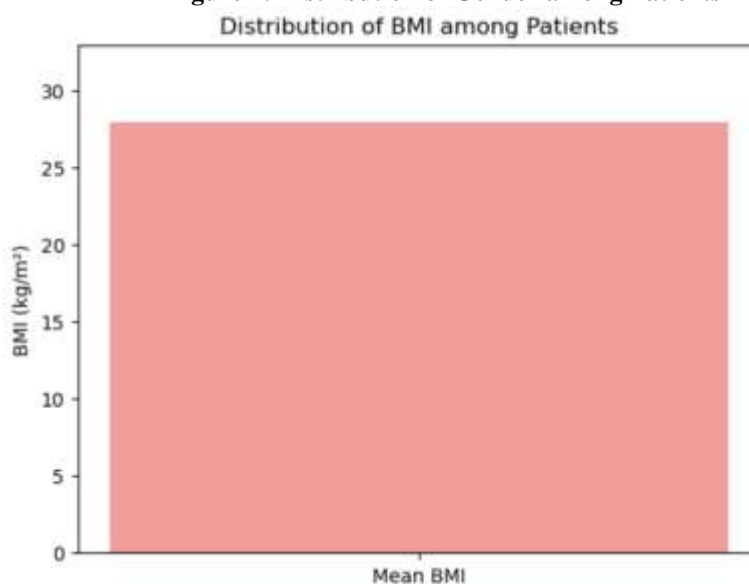


**Figure 1: Treatment Success Rates by Age and BMI**

*Description of Figure 1:* The following graph illustrates the success rates of HA injections in knee OA patients stratified by age and BMI. Higher success rates were noted in younger patients below 65 years of age with a lower BMI below 30.



**Figure 2: Distribution of Gender among Patients**



**Figure 3: Distribution of BMI among Patients**

#### **IV. Discussion**

Our study identifies age, BMI, and baseline OA severity as significant predictors of successful HA injection outcomes in knee OA patients. Younger age, lower BMI, and milder OA were associated with greater improvements in pain and function. Findings emphasize the critical role of patient-specific factors in optimizing treatment outcomes.

First and foremost, age emerges as a critical determinant of treatment efficacy. Our findings indicate that younger patients tend to experience more pronounced improvements in both pain management and functional ability following HA injections. This observation underscores the dynamic nature of OA progression and suggests that age-related differences may impact the body's response to therapeutic interventions.

Additionally, our study sheds light on the role of body mass index (BMI) in shaping treatment outcomes. Notably, individuals with lower BMI levels exhibit a greater likelihood of deriving substantial benefits from HA injections compared to their counterparts with higher BMI values. This association underscores the intricate relationship between body composition and OA pathology, highlighting the potential influence of biomechanical factors on treatment response.

Furthermore, we elucidate the significance of baseline OA severity as a predictor of treatment success. Patients with milder forms of OA at the outset of therapy demonstrate more favorable responses to HA injections, characterized by notable reductions in pain levels and enhancements in overall joint function. This underscores the importance of early intervention in managing OA progression and suggests that timely administration of HA therapy may yield optimal outcomes in select patient cohorts.

#### **V. Conclusion**

Hyaluronic acid injections offer an exciting avenue for the effective management of knee osteoarthritis. To unlock the full potential of this therapy, treatment decisions could be based on individualized treatments

tailored according to age, BMI, and OA severity, leading to optimized outcomes and enhanced patient satisfaction.

Developing an individualized plan of treatment is an important shift in knee OA care. This is similar to the tailoring of a bespoke suit, whereby each element is carefully chosen to fit the unique contours of an individual. Just as a well-fitted suit enhances comfort and style, individualized treatment approaches enhance the quality of care for knee OA patients.

Take, for example, the aspect of age. Younger patients are most likely to respond to treatment more and often show better resilience, just like the vigor and adaptability that come with youth. In that case, knowing it, we could tailor interventions to leverage their inbuilt healing capacities for a more robust and durable outcome.

Similarly, BMI plays a very significant role. Patients with a lower BMI may exert reduced mechanical stress on the knees, hence creating a better environment for treatment efficacy. So, if that's a positive correlation, we could calibrate dosages and treatment protocols to optimize the therapeutic benefits accordingly.

Also, the OA severity at baseline provides important insight into the disease progression and treatment response. Patients with milder forms of OA may represent a window of opportunity for intervention, where timely and appropriate treatments can halt or even reverse the trajectory of the disease. So, intervening early in the process of disease can preserve the function of the joints and better the quality of life.

In other words, individualized treatment strategies, informed by age, BMI, and OA severity, are changing the face of knee OA management. They herald a shift away from a one-size-fits-all approach toward a more individualized and fine-tuned model of care. We raise the bar of care while helping our patients embark on a better journey of health and mobility

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