

# Older adults with elevated BMI are at greater risk of accelerated knee osteoarthritis: Data from the Osteoarthritis Initiative



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## Background

- Osteoarthritis (OA), characterized by degeneration of the joint, is an important public health issue. It affects 10% of the U.S. adult population and is the most significant cause of disability.<sup>1</sup>
- Knee osteoarthritis (KOA), one of the most debilitating forms, accounts for a third of all OA cases.<sup>2</sup> KOA progression is typically a slow process. However, some individuals experience accelerated knee osteoarthritis (AKOA), a rapid disease progression from normal knee structure to end-stage disease within 48 months.<sup>3</sup>

## Aim

- To assess whether individuals who develop AKOA differ from those with common KOA and no KOA in terms of demographics (age, ethnicity, gender, income, education), BMI, and physical performance and pain measures (see Methods).
- To determine if baseline characteristics and measures can be used to predict an individual's KOA status (common KOA or AKOA) at 48 months.

## Methods

- The Osteoarthritis Initiative (OAI) is a multicenter prospective cohort study of older adults who have KOA or are at risk of KOA (n = 4,796).
- Radiographic assessment of knee degeneration was evaluated using Kellgren-Lawrence (KL) score (grade 1-4) at baseline through 48-month follow-up. Data from individuals (n = 1,561) free of radiographic KOA (KL <2) at baseline was analyzed.
- Participants were categorized into three groups based on KL score at 48-month follow-up:
  - No KOA: no change in KL score in either knee
  - Common KOA: KL score increase in at least one knee
  - AKOA: at least one knee progressed to end-stage KOA (KL grade 3 or 4)
- Physical performance and pain measures:
  - Physical Activity Scale for the Elderly (PASE, score 0-361; higher score indicates more physical activity)
  - 400m walk (total time in seconds to walk 400m)
  - Repeated chair stand (CS; pace, total number of stands/second)
  - Western Ontario and McMaster University OA index for pain (WOMAC, score 0-20; higher score indicates more pain)
- Baseline differences between groups (no KOA, Common KOA, AKOA) were tested using Analysis of Variance (ANOVA), Welch F test, and Kruskal-Wallis for continuous variables, and chi-square test for categorical variables.
- Multinomial logistic regression was used to determine the magnitude of association between baseline risk factors and 48-month KOA status (AKOA and common KOA, compared to no KOA).

## Results

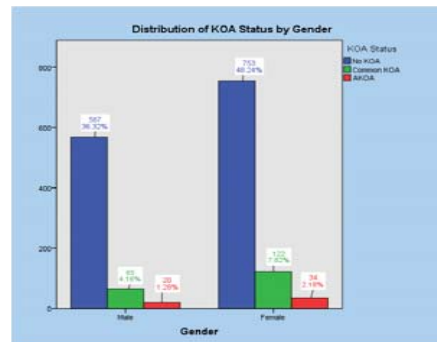
- Baseline characteristics by KOA status at 48-months show significant group differences in mean age (p=0.032), BMI (p<0.001), and WOMAC pain score (p=0.034) (see Table 1).

**Table 1. Baseline Characteristics by 48-Month KOA Status**

Variable: mean ± SD or n (%)	No KOA (n = 1320)	Common KOA (n = 187)	AKOA (n = 54)	p-value
Age	59.24 ± 9.15	58.13 ± 8.38	61.81 ± 8.59	0.032 <sup>a3</sup>
Female, n (%)	753 (57.0)	122 (65.2)	34 (63.0)	0.081 <sup>b</sup>
<b>Race</b>				
White	1139 (86.5)	156 (83.4)	46 (85.2)	0.518 <sup>b</sup>
All Others	178 (13.5)	31 (16.6)	8 (14.8)	
Edu >HS grad	1167 (88.7)	162 (87.6)	44 (84.6)	0.622 <sup>b</sup>
Income >\$50K	877 (68.6)	130 (72.6)	29 (56.9)	0.100 <sup>b</sup>
BMI	27.04 ± 4.42	27.92 ± 4.39	28.89 ± 4.67	0.001 <sup>a1</sup>
PASE	168.71 ± 82.14	178.47 ± 82.47	182.04 ± 91.03	0.182 <sup>a1</sup>
CS pace (stands/sec)	0.54 ± 0.15	0.54 ± 0.16	0.50 ± 0.12	0.265 <sup>a1</sup>
400m (secs)	296.55 ± 49.77	293.19 ± 40.79	296.74 ± 37.20	0.610 <sup>a2</sup>
WOMAC pain	1.50 ± 2.08	1.74 ± 2.19	2.08 ± 2.30	0.034 <sup>a3</sup>

Note: a<sup>1,2,3</sup>, p-value from ANOVA F test (a1), Welch F test (a2), Kruskal-Wallis (a3); b, p-value from chi-square test

- Compared to males, females had 61% greater risk of common KOA and 52% higher risk AKOA (see Figure 1).



**Figure 1.** Distribution of KOA status by gender.

- Age was significantly associated with KOA status (p=0.049) based on the adjusted multinomial logistic regression results (see Table 2).

**Table 2. Predicting KOA Status (Relative Risk Ratios [RRR] for Common KOA and AKOA Compared to No KOA, Adjusted)**

Parameter	KOA Status			p-value <sup>b</sup>
	No KOA (reference) n = 1236 RRR	Common KOA: n = 174 RRR (95% CI) p-value <sup>a</sup>	AKOA: n = 52 RRR (95% CI) p-value <sup>a</sup>	
Age	1.00	0.99 (0.97, 1.01) 0.481	1.04 (1.00, 1.07) 0.021	0.049
BMI	1.00	1.07 (1.03, 1.11) <0.001	1.12 (1.05, 1.19) 0.001	<0.001
Male vs Female	1.00	0.63 (0.45, 0.98) 0.009	0.70 (0.39, 1.27) 0.239	0.018
400m Time	1.00	0.99 (0.99, 1.00) 0.074	0.99 (0.99, 1.00) 0.167	0.081

Note: a, p-value for parameter estimate by group; b, p-value for final model

## Results (cont'd)

- Table 2 also shows older age was associated with greater risk of AKOA only. Baseline BMI was significantly associated with 48-month KOA status (p<0.001). Higher BMI was associated with greater risk of common KOA and AKOA compared to no KOA. Also, a significant association between gender and KOA status was observed (p=0.018). Being male was protective against common KOA when compared to no KOA, but not against AKOA.

## Discussion and Conclusion

- Descriptive analysis from this study suggest that there are significant mean differences in age, BMI, and pain among individuals with different KOA status (No KOA, Common KOA, AKOA). This finding is consistent with the literature; it was found that individuals with AKOA were older and more likely to report higher levels of pain than those with common KOA and no KOA.<sup>3</sup> Furthermore, it was found that obesity is a significant risk factor for developing KOA.<sup>1</sup>
- Results from the multinomial logistic regression suggest that individuals with higher BMI are at a greater risk of developing common KOA and AKOA compared to no KOA. In individuals with higher BMIs, an increasing trend of severity of KOA (AKOA) was observed.
- Results also suggests that older age is associated with AKOA. These findings are similar to those reported in the literature. Older individuals with higher BMIs were at high risk of AKOA.<sup>3</sup>
- Our results suggest that gender is associated with KOA status. We found that being male was protective against common KOA when compared to no KOA. KOA is more common among women compared to men and women are more severely impacted by KOA.<sup>4</sup>

## Conclusion:

- Older individuals with elevated BMIs may be at greater risk of rapid progression to end-stage KOA (AKOA).
- We recommend that individuals with or at risk of KOA seek to maintain a normal BMI in order to mitigate their risk of AKOA, and preserve a higher quality of life.

## References

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