



# How age, gender, and body mass index affect the erythrocyte sedimentation rate and the c-reactive protein in early rheumatoid arthritis

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## Background:

The erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are two commonly used measures of inflammation in rheumatoid arthritis (RA). As current RA treatment guidelines strongly emphasize early and aggressive treatment aiming at fast remission, optimal measurement of inflammation becomes increasingly important. Dependencies with age, sex, and body mass index have been shown for both inflammatory markers, yet it remains unclear which inflammatory marker is affected least by these effects in patients with early RA. With this study we aim to provide more insight into this.

## Methods:

### Patients

Baseline data of 589 patients from the DREAM registry.

### Analyses

- First univariate analysis, next multivariate analysis with backward elimination.
- Controlling for the other core components of the 28-joint Disease Activity Score.
- The multivariate analyses were repeated after 1 year.

## Results – at baseline:

- For each decade of aging, ESR and CRP levels became 1.19 and 1.09 times higher, respectively (Table 1).
- Women demonstrated average ESR levels that were 1.22 times higher than that of men, whereas men had 1.20 times higher CRP levels (Table 1).
- Association with BMI disappeared in multivariate analyses.
- Effects were strongest on the ESR (standardized beta's Table 1).

## Results – after 1 year:

- BMI now significantly associated with both inflammatory markers, showing higher levels with increasing weight.
- Age continued to be significantly associated, whereas sex remained only associated with the ESR level.

## Conclusions:

Age and sex are independently associated with the levels of both acute phase reactants in early RA.

This emphasizes the need to take these external factors into account when interpreting disease activity measures.

BMI appears to become more relevant at later stages of the disease.

**Table 1 – Multivariate associations of the inflammatory markers (ESR and CRP) with age and sex at baseline (N=589).**

Variables*	Unstandardized coefficient		Standardized coefficient	p-value
	Beta (95% CI)	Std. error	Beta (95% CI)	
<b>ESR model</b>				
TJC28	-0.012 (-0.028 – 0.003)	0.008	-0.075 (-0.168 – 0.018)	0.115
SJC28	0.044 (0.028 – 0.059)	0.008	0.256 (0.166 – 0.345)	<0.001
General health	0.006 (0.003 – 0.009)	0.001	0.170 (0.089 – 0.250)	<0.001
Female sex	0.198 (0.053 – 0.342)	0.073	0.104 (0.028 – 0.179)	0.007
Age	0.017 (0.012 – 0.022)	0.003	0.262 (0.186 – 0.337)	<0.001
<b>CRP model</b>				
TJC28	-0.001(-0.020 – 0.018)	0.010	-0.006 (-0.100 – 0.089)	0.908
SJC28	0.058 (0.039 – 0.077)	0.010	0.279 (0.188 – 0.370)	<0.001
General health	0.008 (0.004 – 0.011)	0.002	0.180 (0.098 – 0.262)	<0.001
Female sex	-0.182 (-0.362 – -0.001)	0.092	-0.078 (-0.155 – -0.001)	0.048
Age	0.009 (0.002 – 0.015)	0.003	0.108 (0.031 – 0.185)	0.006

\* ESR = erythrocyte sedimentation rate, CRP = C-Reactive Protein, TJC28 = tender joint count in 28-joints, SJC28 = swollen joint count in 28-joints. CI = confidence interval. R<sup>2</sup> ESR-model: 18.7%, R<sup>2</sup> CRP model: 16.2%.