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Low-Se status may be associated with a higher risk of notably advanced prostate cancer. In a Danish population with a relatively low Se intake, we investigated the association between pre-diagnostic Se status and (1) the risk of total, advanced and high-grade prostate cancer and (2) all-cause and prostate cancer-specific mortality among men with prostate cancer. Within the Danish ‘Diet, Cancer and Health’ cohort, including 27 179 men, we identified 784 cases with incident prostate cancer through 2007. Each case was risk set-matched to one control. Two-thirds (n 525) of the cases had advanced disease at the time of diagnosis, and among these 170 had high-grade disease; 305 cases died (n 212 from prostate cancer) during follow-up through 2012. Plasma Se was not associated with total or advanced prostate cancer risk, but higher Se levels were associated with a lower risk of high-grade disease (HR 0·77; 95 % CI 0·64, 0·94; P=0·009). In survival analyses, a higher level of plasma Se was associated with a lower risk of all-cause (HR 0·92; 95 % CI 0·85, 1·00; P=0·04), but not prostate cancer-specific mortality. Higher levels of selenoprotein P were associated with a lower risk of high-grade disease (HR 0·85; 95 % CI 0·74, 0·97; P=0·01), but not with the risk of or mortality from advanced prostate cancer. In conclusion, levels of plasma Se and selenoprotein P were not associated with the risk of total and advanced prostate cancer, but higher levels of these two biomarkers were associated with a lower risk of high-grade disease.