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An algebraic interpretation of the one-variable affine q -Krawtchouk polynomials is provided in the framework of the Schwinger realization of $\mathcal{U}_q(sl_2)$ involving two independent q -oscillators. The polynomials are shown to arise as matrix elements of unitary “ q -rotation” operators expressed as q -exponentials in the $\mathcal{U}_q(sl_2)$ generators. The properties of the polynomials (orthogonality relation, generating function, recurrence relation, difference equation, raising/lowering relations) are derived by exploiting the algebraic setting. The results are extended to another family of polynomials, the quantum q -Krawtchouk polynomials, through a duality relation. (Received August 05, 2014)