In this paper, we introduce a new type of convergence for a sequence of function, namely, $\delta$-statistically convergent sequences of functions in random 2-normed space, which is a natural generalization of convergence in random 2-normed space. In particular, following the line of recent work of Karakaya et al. [12], we introduce the concepts of uniform $\delta$-statistical convergence and pointwise $\delta$-statistical convergence in the topology induced by random 2-normed spaces. We define the $\delta$-statistical analog of the Cauchy convergence criterion for pointwise and uniform $\delta$-statistical convergence in a random 2-normed space and give some basic properties of these concepts. In addition, the preservation of continuity by pointwise and uniform $\delta$-statistical convergence is proven.