The Standard Model in particle physics has successfully explained almost all experimental results in the microscopic scale with high accuracy. However, the nature of dark matter and the Higgs mass hierarchy problem are still unanswered questions. Supersymmetry (SUSY), which proposes a new symmetry between fermions and bosons, is one of the most promising theories beyond the Standard Model for potentially answering these questions. In recent searches for supersymmetric particles that are involved in strong interaction, their masses were found to be above 1 TeV. This might suggest that the pair production of electroweak gauginos is a dominant SUSY production process at the Large Hadron Collider (LHC). Also, the recent upgrade in the increased center-of-mass energy of the proton-proton collisions to 13 TeV has opened a new phase of exploration for SUSY.

In this thesis, a search is presented for the electroweak pair production of a chargino and a neutralino (), where the chargino decays to the lightest neutralino and a W boson (), and the second lightest neutralino decays to the lightest neutralino and a Standard-Model-like Higgs boson with mass 125 GeV (). The final state with two same-sign leptons, jets and missing transverse momentum are considered in this search. The two leptons come from the leptonic decay of the W boson and the Higgs boson, with the decay modes of , or . This analysis is based on the proton-proton collision data delivered by the LHC at = 13 TeV with the ATLAS (A Toroidal LHC ApparatuS) particle detector. The integrated luminosity of data is 36.1 fb-1.

The exclusion limits for the masses of and are extended up to 245 GeV, while the exclusion limits for the mass of are extended up to 40 GeV, with 95% confidence level, in the context of a simplified supersymmetric model.