In the present work, we have studied the spatial evolution of the nickel alloy plasma generated by the fundamental (1064 nm) and second (532 nm) harmonics of a Q-switched Nd: YAG laser by placing the target material in air at atmospheric pressure. The four Ni I lines at 335.10 nm, 394.61 nm, 481.19 nm and 515.57 nm are used for the determination of electron temperature ($T_e$) using Boltzmann plot method. The electron temperature is calculated as a function of distance from the target surface for both modes of Nd: YAG laser (1064 nm as well as for 532 nm). In case of fundamental (1064 nm) mode of laser, the temperature varies from 13700 – 10270 K as the distance is varied from 0 to 2 mm. Whereas, in the case of second (532 nm) mode of laser it varies from 13270 - 9660 K for the same distance variation. The electron temperature has also been determined by varying the energy of the laser from 90 to 116 mJ, for the fundamental (1064 nm) laser and from 58 to 79 mJ for the second harmonic (532 nm). The temperature increases from 14192 to 15765 K in the first case and from 13170 to 14800 K for the second case. We have also studied the spatial behavior of the electron number density in the plume. The electron number density ($N_e$) in the case of fundamental harmonic (1064 nm) of Nd:YAG laser having pulse energy 125 mJ varies from 2.81 x 10^{16} cm^{-3} to 9.81 x 10^{15} cm^{-3} at distances of 0 mm to 2.0 mm, whereas, in the case of second harmonic (532 nm) with pulse energy 75 mJ it varies from 3.67 x10^{16} cm^{-3} to 1.48 x 10^{16} cm^{-3} for the same distance variation by taking Ni I line at 227.20 nm in both the cases.