The present study aimed to examine hypoxia-inducible factor (HIF)-1 expression and its association with glucose uptake in invasive breast cancer. In addition, connections between glucose uptake and several other prognostic parameters of breast cancer were studied. Between August 2013 and April 2015, 92 patients with biopsy-diagnosed breast cancer were subjected to 18F-fluorodeoxyglucose positron emission tomography/computed tomography. The primary tumor and nodal maximum standardized uptake values (SUVmax) were recorded, and HIF-1 expression and clinical parameters, including tumor mass, estrogen receptor (ER) and progesterone receptor (PgR) levels, human epidermal growth factor receptor-2 (HER-2), Ki-67 index, grade and histology, were analyzed. SUVmax was compared with clinicopathological parameters and HIF-1 expression. The median SUVmax values of the ER-negative and PgR-negative tumors were significantly increased compared with ER and PgR-positive tumors, respectively (P=0.004 and P=0.008). SUVmax differed significantly between the T2 and T3 tumors and the T1 tumors. The median SUVmax levels were higher in the Ki-67 expression >10% group than the Ki-67 index <10% group (P=0.001). Although the median SUVmax values in HER-2-positive and -negative tumors were similar, triple-negative tumors demonstrated significantly higher values (P=0.04). With regard to tumor grade, the median SUVmax was greater in the high-grade tumors compared with the low-grade tumors. SUVmax did not exhibit a significant correlation with HIF-1 expression; however, HIF-1 expression was associated with tumor size and PgR expression. HIF-1 expression increased with a larger tumor size (r=0.27; P=0.008) and decreased PgR expression (r=-0.26; P=0.0002). The axillary nodal SUVmax of the N1 tumors was significantly lower than the N2 and N3 tumors (P<0.0001). In the multivariate analysis, tumor size, Ki-67 expression and ER Allred score were independent factors that impacted SUVmax. The results of the present study indicated strong associations between tumor size, tumor grade, Ki-67 expression, triple-negativity, downregulated hormone receptor expression and SUVmax values. Conversely, there was no association observed between glucose uptake and levels of HIF-1. Based on these results, it is suggested that the lack of association between hypoxia and glucose uptake indicates phenotypic independence.