Background: In this study, we aimed to investigate the association of dietary phytochemical index (DPI) with serum insulin, homeostasis model assessment of insulin resistance (HOMA-IR), β-cell function (HOMA-B), and insulin sensitivity (HOMA-S). Methods: This longitudinal study was conducted on 1141 participants of the Tehran Lipid and Glucose Study. Dietary data were collected using a validated semi-quantitative FFQ with 168 food items at baseline and DPI was calculated based on method developed by McCarty as follows [PI = (daily energy derived from phytochemical-rich foods kcal/ total daily energy intake kcal) × 100]; phytochemical rich foods were considered as fruits and vegetables, legumes, whole grains, nuts, soy products, olives and olive oil. Fasting serum insulin and glucose were measured at baseline and again after a 3-year of follow-up; hyperinsulinemia, insulin resistance, β-cell dysfunction and insulin insensitivity were defined. Results: Mean age of participants was 35.6±12.0 years. Participants in the highest compared to the lowest DPI quartile had lower fasting glucose and insulin at baseline. After 3-years of follow-up, the risk of hyperinsulinemia significantly decreased by 65 (OR=0.35, 95% CI=0.21-0.60) and 86% (OR=0.14, 0.07-0.29), in the third and fourth quartile categories of DPI (P for trend=0.001), respectively. The occurrence of insulin resistance and insulin insensitivity in participants with higher calorie intakes of phytochemical-rich foods was significantly lower than the others (OR=0.48, 95% CI=0.25-0.93 and OR=0.11, 95% CI=0.05-0.24, respectively). There was no significant between DPI and risk of β-cell dysfunction. Conclusion: Higher consumption of phytochemical-rich foods may have protective effects against development of insulin resistance.