Objective
The aim of this research was to explore whether the intake of maternal energy-generating nutrients is reflected in the metabolic profile of 2nd trimester amniotic fluid. A holistic NMR metabolomics approach in conjunction with Chemometrics was implemented.

Methods
Amniotic fluid samples were obtained from 59 women that underwent amniocentesis for prenatal diagnosis, between the 18th and 24th gestational week. Dietary assessment was carried out by registered dietician using a food frequency questionnaire and 24-h recall. Evaluation of energy generating nutrients intake was performed using the USDA National Nutrient Database for Standard Reference. A complementary questionnaire concerning demographic data and maternal history details was also completed. A holistic metabolomics approach was employed by using a 600MHz Varian NMR spectrometer and CPMG pulse sequence to suppress protein signals of the untreated samples. All NMR spectra were phase and baseline corrected, reduced into spectral buckets of 0.0001 ppm and aligned using the MestReNova software. The SIMCA-P 14.0 software was used to implement Principal Component Analysis (PCA) and Orthogonal Partial Least Squares Discriminant Analysis (OPLS-DA).

Results
Interestingly, the implementation of Chemometrics on the CPMG NMR spectral data led to the differentiation of pregnant women according to the intake of protein, lipids, and carbohydrates. The holistic NMR metabolomics approach indicated glucose, lactate, pyruvate and glutamine/glutamate as the most important metabolites that contribute to this classification.

Conclusion
The results of the present study attest to the ability of the NMR-omics approach to successfully examine amniotic fluid metabolic variations with respect to the intake of energy-generating nutrients. Within this frame, metabolomics offer exciting opportunities for elucidating markers of dietary components. This knowledge could contribute towards determining the potential mechanisms which influence the development of pregnancy. This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program “Education and Lifelong Learning” of the National Strategic Reference Framework (NSRF) - Research Funding Program: Thales. Investing in knowledge society through the European Social Fund.