DIET, NUTRITIONAL STATUS AND LIFESTYLE OF MEN IN RELATION TO THE BIOLOGICAL QUALITY OF SEMEN

Infertility was recognised by the World Health Organization as a significant epidemiological problem. In 20-70% cases, it is caused by a male factor. The etiology of reduced semen quality remains unexplained in approximately 30% of cases of male infertility. Studies showed that certain lifestyle factors could affect sperm quality. The association between individual lifestyle components, such as diet and physical activity and sperm quality, has been extensively described in research, but the synergistic effect of their interaction has not been considered.

Undertakenstudy aimed to (1) assess the association between a posteriori dietary patterns and semen quality in men, and (2) evaluate the link between a priori dietary pattern, physical activity and their combination and semen quality.

A cross-sectional study was conducted in 2014-2018 among 207 men aged 20-55. Food intake was assessed using the food frequency questionnaire (FFQ), and the International Physical Activity Questionnaire (IPAQ) was used to assess physical activity. The semen quality parameters (ejaculate volume, total sperm count and concentration, total and progressive sperm motility and their morphology) were assessed in accordance to the World Health Organization (WHO) standards using a computer-aided sperm analysis system (CASA). Dietary patterns (DPs) were determined on the basis of hypotheses (*a priori*), as well as own data set (*a posteriori*). The *a priori* DP was determined according to the criteria of the DASH diet index (Dietary Approaches to Stop Hypertension) developed by Günther et al. The a posteriori approach used data from FFQ, which was reduced to 23 food groups. Using the principal component analysis (PCA), two DP were derived. The 'Pro-healthy' DP was described by higher intake consumption of fruit, vegetables, legumes, soups, mixed dishes, whole grains, juices and nuts. The 'Western' nutrition pattern was described by relatively higher intake of sweets and snacks, processed meat, animal fat, refined cereal products, red meat, potatoes and dairy products. Risk of abnormal sperm parameters in accordance with *a posteriori* DPs was assessed by logistic regression analysis by calculating the odds ratio (OR) and 95% confidence interval (95% CI). The relationship between the DASH diet, physical activity, their combination and semen parameters were assessed using a generalized linear model, and the results of semen quality parameters were presented as back-transformed least square means and their corresponding standard errors. The change in the size of the semen quality parameters was expressed as the cross-tertiles difference (Δ_{T3-T1}) of the analysed research systems.

There was no association between 'Pro-healthy' DP and the risk of abnormal sperm parameters. The risk of abnormal progressive motility of spermatozoa was significantly higher in the middle (OR: 2.89; 95% CI: 1.03-8.09) and upper tertile (OR: 7.78; 95% CI: 1.52-15.06) of the 'Western' DP. In the 'Western' DP, a positive trend of the risk was found for abnormal total sperm count, progressive motility, and sperm morphology (p_{trend} <0.05). Stronger adherence to the DASH diet was associated with a higher total sperm count (Δ_{T3-T1}= 82.1 million / ej) and concentration (Δ_{T3-T1}= 24.6 million / ml). Higher physical activity was associated with higher total sperm count (Δ_{T3-T1}= 69.4 million / ej), total (Δ_{T3-T1}= 11.9%) and progressive motility (Δ_{T3-T1}= 8.5%) and sperm morphology (Δ_{T3-T1}= 2.8%). The combination of the DASH diet and physical activity was positively associated with the total sperm count (Δ_{T3-T1}= 98.1 million / e), sperm concentration (Δ_{T3-T1}= 17.5 million / ml), total (Δ_{T3-T1}= 11.8%) and progressive motility (Δ_{T3-T1}= 10.0%) and sperm morphology (Δ_{T3-T1}= 3.3%).

The combination of a high index of the DASH diet and high physical activity was favourably associated with the largest number of sperm quality parameters analysed. Greater adherence to the DASH diet was associated with a higher total sperm count and concentration. A positive relationship was observed between higher physical activity and total and progressive motility and morphology of semen. The study showed no link between the 'Pro-healthy' DP and the risk of abnormal semen quality parameters in men. The 'Western' DP was related to a higher risk of the abnormal total count, progressive motility, and morphology of sperm.

The conducted research indicates that while adherence to the healthy eating principles does not affect the change of sperm parameters, an unhealthy Western-style diet can deteriorate its quality. Simultaneous change in many lifestyle components to eliminate incorrect eating behaviours can be a better indicator of semen parameters improvement in the context of men's reproductive health control. However, to clarify obtained findings and validate the observed relations, further prospective observational and interventional studies are needed, especially well-designed randomized controlled trials. Evaluation of the interactions described in the study can be of great importance and might contribute to the development of more effective prevention and intervention programs tailored to nutritional and health problems in paternity planning.

Olsztyn, 9.04.2020 r.

