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Original Research

Comparison of dietary behaviour of a selected student population as regards their influence on fertility

M. Mizgier[1], G. Jarząbek-Bielecka[2], K. Mruczyk[1], W. Kędzia[2]

[1]Department of Morphological and Health Sciences, Dietetic Division, Faculty of Physical Culture in Gorzów Wlkp., Poznań University of Physical Education, Poznań

[2]Division of Gynecology, Department of Perinatology and Gynecology, Poznań University of Medical Sciences, Poznań (Poland)

Summary

Purpose of investigation: According to the research, there is a link between lifestyle, the use of stimulants, eating disorders (ED), and the incidence of ovulatory infertility. The aim of this study was to assess the differences between the quality of diets, the use of stimulants, nutritional status, the level of physical activity (PAL), and ED among male and female university students. *Materials and Methods:* The study included 112 female and 42 male students. Food frequency questionnaire (FFQ) was utilized to assess dietary pattern and nutrient intake. Fertility dietary scores were evaluated based on frequency of food consumption using Index of Fertility Diet (IFD) and Index of Infertility Diet (IID). *Results:* Female students were more likely to consume food items associated with better reproductive health, while men preferred products that adversely affect fertility. Irregular physical activity has been observed among female as well as male students. In addition, 30% of the population smoked, and almost 90% of the women and 98% of the men drank alcohol. Scores indicative of ED were present in 10.7% of female and 4.8% of male students. *Conclusions:* The students, in particular men, demonstrated deficiencies in terms of their health education. Studies have shown that in order to prevent infertility, young people need education and early diagnosis, as well as prevention of EDs.

Key words: Dietary patterns; Male students; Female students; University students; Fertility disorders; Eating disorders.

Introduction

Infertility is a global public health issue, affecting 15% of all couples of reproductive age. The clinical definition of infertility used by the World Health Organization (WHO) is "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse" [1].

According to the data provided by four Polish infertility centres, the main reasons affecting the female reproductive potential in Poland were anovulatory cycles and endometriosis. The male factor accounted for 55.73% of cases. The average 18.9% of couples exhibited mixed causes of infertility, while an idiopathic factor (of unknown cause) was assigned to 15.99% of cases. Researchers have observed the increase in frequency of this factor [2].

Environmental factors have been known to be part of infertility etiopathogenesis. However, despite the advances of recent years, the types of these factors and their mechanisms have not been explained sufficiently.

According to the Nurses' Health Study II (NHS II), there is a relation between the diet of healthy women and ovulatory infertility. The NHS was carried out over an eight-year period and involved 17,544 healthy (not treated for infertility) women aged 25 to 42. The results of both the NHS II and of animal tests have demonstrated that factors that reduce the risk of infertility include the presence of sufficient amounts of monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) in the diet and reduced intake of isomers of trans fatty acids (TFA) and saturated fatty acids (SFA). Replacing animal proteins with plant proteins was also advantageous. Other important factors are low glycaemic diet, high intake of fat-rich dairy products, and provision of the right amount of vitamins and non-haem iron in the form of plants and dietary supplements [3-5].

Multiple studies have demonstrated that improper nutritional status, including weight deficiency or excessive weight may have an adverse effects on female fertility [6-8]. Hassan *et al.* have proven that the time that women with BMI below 19 kg/m^2 need to conceive is four times longer than that of women with the correct BMI (29 *vs*. 6.8 months) [9]. In view of the far-reaching consequences of improper BMI, every woman should take care to attain the correct body weight before attempting to conceive [6, 7].

Reproductive system dysfunctions in obese men are caused by disorders related to the influence of adipose tissue on the endocrine system and metabolism [10]. Another important issue related to infertility in obese men is the influence of temperature on spermatogenesis, the process of sperm maturing, and their quantity and quality. Elevated

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testicular temperature is related to the excessive build-up of adipose tissue and scrotal adiposity. Studies conducted to date have demonstrated a negative correlation between BMI and sperm concentration and motility. Moreover, overweight and obese male participants had a higher DNA Fragmentation Index (DFI) value compared to men with the correct body weight. A high DFI indicates increased fragmentation of the genetic material in spermatozoons [11].

Alcohol consumption and tobacco smoking are among the causes of sexual dysfunctions in men. At the same consumption level, the risk of alcohol-related conditions is higher in women than in men. A single intake of 80 ml of alcohol contributes to menstrual cycle disturbance and menstruation problems in about 10–12% of women. Reproductive health disorders may also occur in women who partake of small amounts of alcohol only on an occasional basis. Alcohol affects the pituitary and ovaries, and also causes hormonal balance disorders such as reduced estrogen and FSH concentration, which in turn causes pubertal disorders in young people [12].

Numerous studies have found that tobacco smoking contributes to reduced fertility and increased risk of infertility as well. It has been demonstrated that nicotine plays a role in disturbing the menstrual cycle by increasing the FSH concentration. Polycyclic aromatic hydrocarbons hinder oocytes and the development of the corpus luteum. Moreover, studies show that elements of tobacco smoke disrupt embryo implantation and contribute to DNA damage [12, 13].

Physical activity is an important factor influencing female reproductive functions. In conjunction with the appropriate diet, exercise reduces abdominal obesity and improves insulin sensitivity, thus directly decreasing the risk of infertility. An analysis of data from NHS II shows that it is primarily the increase in high-intensity physical activity, not moderate activity that is related to a smaller risk of ovulatory infertility and that every hour of intensive exercises a week reduces the risk of infertility by 7% [14]. On the other hand, very intensive physical activity may be detrimental to reproductive functions in young women who exercise often. It may lead to disturbed menstruation or even amenorrhea and secondary amenorrhea, and may also reduce the duration of the luteal phase and anovulatory cycles [15-16].

Eating disorders are defined as disorders of nutritional habits or behaviour related to body weight control. They are manifested displayed as eating restrictions, disinhibited eating, compensation for excess food intake by vomiting, use of cathartics, or excessive physical activity. The most common eating disorders are anorexia nervosa (AN) and bulimia nervosa (BN) [17].

It has been found that ED may be related to fertility disorders, but patients with eating disorders may have children, provided that their correct body weight and ovulatory cycles are restored [17-20].

The primary goal of this paper was to compare groups of university students of both sexes and to determine the degree to which their diet may be considered beneficial or detrimental to fertility. To this end, two indices were defined: Index of Fertility Diet and Index of Infertility Diet. Next information on the diets of the participants was collected with a particular focus on fertility-related products. The students were compared in terms of nutritional status, the intensity of physical activity, use of stimulants (tobacco, alcohol), and occurrence of disrupted dietary attitudes.

Material and Methods

The study was conducted in 2015–2017 at the Institute of Dietetics in the Department of Human Nutrition Hygiene at Poznań University of Life Sciences, Poznań University, of Medical Sciences, Poznań University of Economics, Adam Mickiewicz University in Poznań, Poznań University of Technology, Poznań University of Physical Education, and the University Security College in Poznań.

The study involved 154 persons: 112 female students and 42 male students. The study inclusion criterion was being a student at a university located in Poznań, while the exclusion criterion was age below 18 or above 35 years. The following information was collected from the students: age, body weight, diet, physical activity, and dietary attitude.

The study used the KomPan questionnaire of eating beliefs and habits for the 16–65 age group, ver. 1.1 administered by an interviewer-researcher. In order to assess whether the participants exhibited any pathological attitudes towards nutrition, the EAT-26 questionnaire (Eating Attitude Test) was used.

The aforementioned studies commenced with an assessment of nutritional status using the BMI. BMI was calculated using basic anthropometric parameters such as body weight and height. Body weight was measured (down to 100 grams) with an electronic medical scale. Body height was measured (down to 1 cm) with a stadiometer connected to the aforementioned scale. Measurements were performed without the outer layer of clothing and shoes. The measurements were carried out in line with the principles of anthropometric tests (World Health Organisation, 1987). Based on the height and body weight measurements, the body mass index was calculated with the following formula: BMI = (body weight [kg]) / (height [m])^2

The nutritional status was interpreted based on the current WHO standards (World Health Organization WHO, 2000). Diet assessment was based on the Food Frequency Questionnaire (FFQ) included in the KomPan questionnaire.

In order to identify specific nutritional habits and perform a comprehensive assessment of students' diets with regards to their influence on fertility, two indices for food consumption were proposed. One of them was related to food with a potential beneficial impact on fertility (IFD), and the other included food detrimental to fertility (IID).

Nine groups of products were included in the IFD-9: wholemeal baked products, wholegrain products (coarsely ground grits, oatmeal, wholegrain pasta), milk, fermented milk products (yoghurt, kefir), quark, fish, legumes (beans, peas, soya beans, lentils), fruit, and vegetables

Fifteen groups of products were included in the IID-15: white baked goods (including wheat, rye, wheat and rye, toast, rolls, croissants), refined grain products (white rice, regular pasta,

semolina, couscous), fast food (such as French fries, hamburgers, pizza, hot dogs, grilled cheese baguettes), fried dishes, butter (with baked goods or dishes, for frying or roasting), lard (with baked goods or dishes, for frying or roasting), high-fat cheese (such as hard cheese, blue cheese, cheese spread), processed meat products (cold meats, sausage, hot dogs), red meat (such as pork, beef, veal, mutton, lamb, venison), poultry (chicken, turkey), sweets and confectionery products (such as candies, pastries, pies, bars, other confectionery products), tinned meat, sweetened fizzy or still drinks (such as Cola, Pepsi, Sprite, Fanta, orangeade, lemonade), energy drinks (such as 2KC, Black Horse, Red Bull, Burn, Shot or other), and alcoholic drinks.

The procedure for calculating the aforementioned indices was the following: each response was assigned a weight ([consumption events per day] in accordance with the KomPan questionnaire) – Table 1. Weights in fertility product groups and infertility product groups were totalled for each participant to obtain IFD-9 and IID-15. In order to harmonise the range of both indices and facilitate their interpretation, the total frequency of consumption (consumption events per day) was expressed as a 1–100 score.

Index of Fertility Diet IFD score: IFD [score] = (100 x IFD-9) / 18

Index of Infertility Diet IID score: IID [score] = (100 x IID-15) / 30

Determination of IFD-9 and IID-15 revealed which products in the groups were preferred by the participants. The results are presented in the Tables and Figures. In order to visualise the results better, the IFD-9 was marked with a plus sign and the IID-15 with a minus sign.

In order to determine whether the diet was predominantly beneficial or detrimental to fertility, a Modified Diet Index (MDI) was proposed. The MDI was the difference between the IFD expressed as a score (IFD [score]) and the IID expressed as a score (IID [score]).

MDI[score] = IFD[score] – IID[score]

where:

MDI[score] – Modified Diet Index

IFD [score] – IFD expressed as a score:

IID [score] – IID expressed as a score

The KomPan questionnaire was used to collect information on physical activity (at school, work, during free time), smoking (at present and in the past), alcohol consumption, and other elements of lifestyle, including time spent watching TV or at a computer. Additionally, the health status of the participants as compared to their peers and also their nutritional knowledge were assessed.

Dietary attitudes were assessed with a standard Eating Attitude Test (EAT-26). The questionnaire consists of 26 questions related to attitudes and beliefs, behaviour related to eating, the perception of appearance, and body weight. The questions were grouped into three sub-scales that facilitate determination of disrupted dietary attitudes. The first scale, slimming, dominated by bulimic behaviour assesses dissatisfaction with the shape and appearance of the body. The second scale, labelled 'bulimia and eating control' contains features of bulimic behaviour and behaviour related to compulsive eating and increased body weight. The third scale called 'oral control' identified behaviour and beliefs related to eating and stemming from forced control and restrictions. This scale assesses anorexia and reduced body weight. The participant replies to a question by selecting one response: always, usually, often, sometimes, rarely, never. In the first 25 questions, the answer 'always' is worth 3 points, 'usually', 2 points, and 'often', 1 point. In question 26, the answer 'never' is worth 3 points, 'rarely', 2 points, and 'sometimes', 1 point. A score of 20 or more points indicates a disturbed dietary attitude. The authors included five questions related to inducing vomiting, the use of cathartics, feeling of having no control over food intake, excessive physical activity, and significant weight loss over a short period. In order to determine whether a participant is susceptible to EDs, it sufficed that they selected an answer in the EAT-26 questionnaire related to such a pathological behaviour regardless of the frequency [21].

Table 1. — *Indices for food consumption.*

Consumption frequency categories	Daily frequency [consumptions per day]
Never	0
1–3 times per month	0.06
Once per week	0.14
Several times per week	0.5
Once per day	1
Several timer per day	2

The statistical analysis was carried out with the Statistica suite. First, a general profile of the participants was created (mean, standard deviation, minimum and maximum, median), after which, selected features were analysed with respect to the study objectives.

The analysis adhered to the following principles: if the analysed features were distributed normally, parametric tests were applied (evaluation of significance of differences with Student's *t*-test, Pearson's correlation); if the values of the features were not distributed normally, non-parametric tests were used to process the results (significance of differences with the Mann-Whitney and chi-square test, Spearman's correlation). The statistically significant confidence interval for the analyses was set at $p < 0.05$.

Results

The study involved 154 students, including 112 women and 42 men. The mean age of the women was 23.2 ± 2.5 years, and of the men, 23.8 ± 2.4 years. The difference was not statistically significant (Table 2). There were, however, statistically significant differences as regards body weight, body height, and the BMI ($p = 0.0001$). The mean BMI value was within the normal range for the women (21.5 ± 2.9), while for the men it slightly exceeded the upper limit of the norm and amounted to 25.3 ± 3.6.

Dietary attitude disorders were found in 10.7% of the female students and 4.76% of the male students. There were no significant relations in this regard (Table 3). The mean EAT-26 score was 9.6 ± 6.8 for the women, and 8.4 ± 5.9 for the men (Table 2). An analysis of the EAT-26 results demonstrated that at least one type of pathological behaviour indicating susceptibility to ED was found in 38.4% of the females and 45.2% of the males (Table 3).

Figure 1 shows preferences within the groups of different sexes as regards the frequency of consumption of foods listed in IFD-9 and IID-15.

The determination of the aforementioned indices demonstrated that the female students consumed fertility improving products (vegetables, fruit, milk and fermented milk products, quark, wholegrain products, and legumes) more often while male students tended to choose products detrimental to fertility (refined flour bakery products and other foods, various types of meat and processed meat products,

Table 2. — *Anthropometric profile of the participants categorised into two groups, including EAT-26 results.*

	Women (n=112)				Men (n=42)				
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	*p**
Age (years)	23.2	2.5	18	35	23.8	2.4	20	29	0.0880
Body weight (kg)	60.6	9.9	43	102	81.8	11.8	47	100	0.0001
Body height (m)	1.7	0.07	1.5	1.6	1.8	0.07	1.6	1.9	0.0001
BMI (kg/m^2)	21.5	2.9	16.38	35.3	25.3	3.6	17.8	35.1	0.0001
EAT-26 (score)	9.6	6.8	2	42	8.4	5.9	3	34	0.3319

*SD – standard deviation * Mann-Whitney test*

Table 3. — *Occurrence of EDs and ED susceptibility in both sexes*

	Women n (%)	Men n (%)	*p**
Eating disorders	12 (10.71%)	2 (4.76%)	0.1179
ED susceptibility	43 (38.4%)	19 (45.2%)	0.3151

** Pearson's chi-square test*

including tinned meat, fast food, fried meals, lard, high-fat cheese, fizzy and still sweetened drinks, energy drinks, and alcohol). The only product in the IFD-9 group consumed by the men was fish. Moreover, men more often than women ate products detrimental to fertility: sweets, confectionery, and butter with large amounts of saturated acids (Figure 1).

The application of the MDI that represents the difference between the IFD expressed as a score (IFD-9 [score]) and the IID expressed as a score (IID-15 [score]) helped assess whether the diet of the participants is dominated by products that are potentially beneficial or harmful to fertility.

Table 4 shows anthropometric data for female students classified into two sub-groups. The first sub-group included students with a positive MDI, and the second those with a negative MDI value. A similar comparison was made in sub-groups of male students built with the same criteria (Table 4). According to the data in Table 4, the 'healthier' diet as regards fertility (positive MDI) was found in significantly older (23.5 *vs*. 22.3) and shorter (1.66 *vs*. 1.71 m) female students. No differences within the two sub-groups were found among the men.

No statistically significant differences between the women and the men were found with regards the level of physical activity, although the proportion of women who exercised moderately was greater than that of men who exercised moderately during their free time, at school and at work (Table 5). A larger proportion of men than women preferred intensive (large) activity during their free time. At the same time, a larger number of men declared poor physical activity as compared to the other study group.

As was the case with physical activity, no significant differences were found between the groups with regards to the amount of sleep during the week and on days off or the time spent in front of the TV or computer. Despite the fact that the assessment of health status and diet was not significantly different between the two groups, there was a significant difference in the self-assessment of dietary

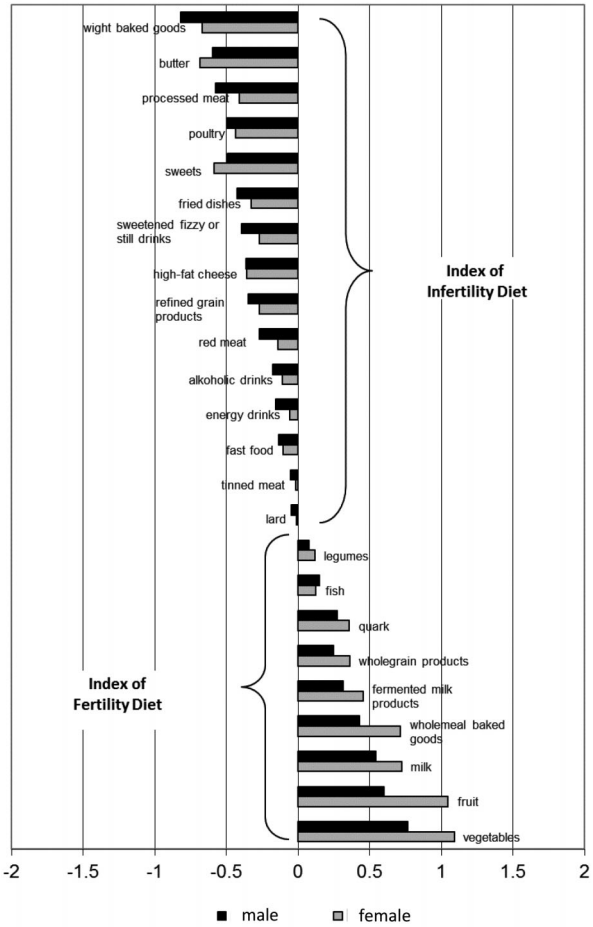

Figure 1. — Proportion of selected foods in the diet (depending on the frequency of consumption) expressed as IFD-9 and IID-15 for individual sex groups.

knowledge. Twice as many men assessed their knowledge as insufficient and four times as many female students assessed their knowledge as very good (Table 5).

As expected, statistically significant differences were found between the groups as regards the use of stimulants (tobacco, alcohol). More male students declared greater intake of alcohol in total and consumed high-alcohol beverages and beer more often. Female students preferred wine and alcoholic drinks. Sixteen percent of female and male

Table 4. — *Juxtaposition of anthropometric data in sub-groups of female students based on the MDI values.*

Feature	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	*p**
	Women – positive MDI (n=85)				Women – negative MDI (n=27)				
Age (years)	23.5	2.6	19	35	22.3	1.6	18	25	0.0197
Body weight (kg)	60.3	9.4	43	102	61.4	11.5	47	98	0.8809
Body height (m)	1.66	0.07	1.5	1.9	1.71	0.06	1.6	1.8	0.0036
BMI (kg/m^2)	21.7	2.9	16.4	35.3	20.9	2.9	16.5	30.3	0.0787
	Men – positive MDI (n=17)				Men – negative MDI (n=25)				
Age (years)	24.4	24	20	28	23.4	2.5	20	29	0.1995
Body weight (kg)	80.9	81	61	99	82.4	12.8	47	100	0.5469
Body height (m)	1.8	1.8	1.7	1.9	1.8	0.07	1.6	1.9	0.5987
BMI (kg/m2)	24.7	24.3	20.5	29.2	25.6	4.2	17.8	35.1	0.4574

** Mann-Whitney test; SD – standard deviation; MDI – Modified Diet index.*

Table 5. — *Juxtaposition of lifestyle, health status, and diet knowledge of female and male students.*

Feature	Intensity/duration/ quantity	Woman [number]	[%]	Man [number]	[%]	Significance of differences (*p*)
Physical activity on business days	Minor	43	38.39	20	47.62	0.4829**
	Moderate	51	45.54	15	35.71	
	High	18	16.07	7	16.67	
Physical activity in free time	Minor	30	26.79	12	28.57	0.1612*
	Moderate	57	50.89	15	35.71	
	High	25	22.32	15	35.71	
Smoking in the past	No	62	55.36	24	57.14	0.8425*
	Yes	50	44.64	18	42.86	
Smoking currently	No	80	71.43	31	73.81	0.7693*
	Yes	32	28.57	11	26.19	
Type of the most often consumed alcohol	None	12	10.71	1	2.38	0.0001*
	Beer	42	37.50	31	73.81	
	Wine	39	34.82	1	2.38	
	Drinks	15	13.39	4	9.52	
	Strong alcohols	4	3.57	5	11.90	
Drinking	None	12	10.71	1	2.38	0.0098*
	Yes	100	89.29	41	97.62	
Sleep duration on weekdays (hours per day)	< 7	27	24.11	16	38.10	0.1544**
	7–9	80	71.43	25	59.52	
	> 9	5	4.46	1	2.38	
Sleep duration on weekends (hours per day)	< 7	12	10.71	8	19.05	0.2412**
	7–9	68	60.71	25	59.52	
	> 9	32	28.57	9	21.43	
TV, computer (hours per day)	< 2	28	25.00	7	16.67	0.3834**
	2-4	27	24.11	12	28.57	
	4-6	23	20.54	8	19.05	
	6-8	10	8.93	5	11.90	
	8-10	17	15.18	5	11.90	
	> 10	7	6.25	5	11.90	
Health status compared to peers	Better	24	21.43	9	21.43	0.4090**
	Comparable	77	68.75	25	59.52	
	Worse	11	9.82	8	19.05	
Assessment of diet knowledge	Insufficient	8	7.14	6	14.29	0.0454**
	Sufficient	46	41.07	21	50.00	
	Good	46	41.07	14	33.33	
	Very good	12	10.71	1	2.38	
Diet assessment	Very bad	3	2.68	1	2.38	0.1616**
	Bad	27	24.11	16	38.10	
	Good	76	67.86	24	57.14	
	Very good	6	5.36	1	2.38	

** Chi-squared Pearson test; ** Mann-Whitney test.*

students declared that they had given up smoking (Table 5).

Discussion

The most common causes of infertility are disturbed menstrual cycle, fallopian tube and peritoneum conditions, male factor, and pathological changes in the uterus. The causes of about 15-20% of infertility cases remain unidentified [2, 22]. It is also known that both the nutritional state and some elements of lifestyle, such as insufficient or excessive physical activity, a poorly balanced diet high in alcohol, full-fat dairy products, sugar-sweetened beverages, sweets, processed meats, and other products contained saturated fatty acids and trans-fatty acids (TFA) have been detrimentally associated with the quality of semen, fecundability rates and do play a significant role in the etiology of infertility. At the same time, different studies suggest that appropriate physical activity and a diet rich in omega-3 fatty acids, some antioxidants (vitamin E, vitamin C, β-carotene, selenium, zinc, cryptoxanthin, and lycopene), other vitamins (vitamin D and folate) and a diet rich in fish, whole grain cereals, vegetables and fruits, low-fat dairy, and skimmed milk were positively associated with several sperm quality parameters and fertility [5, 8, 12, 23-28].

Chavarro *et al.* demonstrated a positive correlation between the consumption of high glycaemic index (GI) products and ovulatory infertility in the prepregnancy period in nulliparous women (i.e. women who give birth for the first time) and a negative correlation in the case of low-GI products [3]. According to the results of the study, in terms of high-GI products, female students consumed sweets and confectionery more often than male students who ate white flour products and other refined flour products more frequently. Additionally, they drank sweetened energy drinks and fizzy and still drinks with large amounts of simple sugars more often. They also consumed high-fibre food, rich in minerals and vitamins, fruit and vegetables, wholegrain products, and legumes less often than the women.

The type of protein ingested also had a significant impact on the pathogenesis of fertility disorders. It has been demonstrated that replacing 5% of animal protein energy with plant protein energy reduces the risk of ovulatory infertility by half [3, 29]. Sources of plant protein include legumes, which were less often eaten by male students. In the contrast the men ate high animal protein poultry, red meat, and processed meat products significantly more often than the women. It has been demonstrated that the consumption of red and processed meat is positively correlated with the decreased quality and quantity of semen and amount of hormones involved in reproduction [30]. Fertility disorders are also related to the consumption of poultry. Chavarro *et al.* demonstrated that one additional serving of animal proteins a day (in the form of poultry or red meat, including processed meat) significantly reduces ovulatory fertility [29].

Factors that are beneficial to fertility include mono- and polyunsaturated fatty acids, while intake of trans-isomers and saturated fatty acids entails a risk of infertility. Replacing 2% of the daily energy intake (DEI) from monounsaturated fatty acids (MUFA) with isomers of TFA was related to more than doubling the risk of ovulatory infertility [3]. The intake of TFA was also associated with lower total testosterone and calculated free testosterone concentrations. The intake of omega-3 polyunsaturated fatty acids was positively related to testicular volume, while the intake of omega-6 polyunsaturated fatty acids and TFA was inversely related to testicular volume. These data suggest that fat intake, and particularly intake of omega 3, omega 6, and TFA may influence testicular function [31].

Products containing TFA include sweets, ready-made confectionery products, or fast food. SFA are found in fast foods and fatty meat or lard. Moreover, high-fat milk products such as butter and fatty cheese have a high content of SFA. This study demonstrated that it was mainly male students who consumed fast food and meat rich in saturated fats, processed meat such as tinned products, and high-fat cheese and lard more often. Female students, on the other hand, more often declared consumption of sweets and confectionery, which contain trans-fats and butter, which has high SFA content. The results of NHS II demonstrated the reduced risk of ovulatory infertility in women who consumed full-fat milk products, which is probably related to the presence of estrogens synthesised in dairy cows and the trans-palmitoleic acid, which reduces insulin resistance. However, the authors stressed the high content of saturated fatty acids in the products and their adverse influence on fertility [3, 32].

As was mentioned above, consumption of polyunsaturated fatty acids is beneficial to reproductive health. Missmer *et al.* demonstrated that women with a higher intake of polyunsaturated fatty acids from oily sea fish experienced a lower risk of endometriosis as compared to a group that consumed less fish [33]. According to the present study, although fish were consumed by men slightly more often, over 40% of the population consumed fish only 1–3 times a week, and about 10% did not eat fish at all.

An analysis of dietary preferences of the study groups in terms of the frequency of consumption of food affecting fertility, (i.e. IFD-9 or IID-15) demonstrated that the women consumed fertility-improving products (vegetables, fruit, milk and fermented milk products, quark, wholegrain products, and legumes) more often while the men tended to choose products detrimental to fertility (refined flour baked products and other foods, various types of meat and processed meat products, fast food, fried meals, fizzy and still sweetened drinks, energy drinks, and alcohol).

An analysis of the groups with regard to the MDI showed that in the female group, the healthier diet for fertility was found in significantly older (23.5 *vs*. 22.3 years)

and shorter (1.66 *vs*. 1.71 m) female students. No differences within the two sub-groups with positive and negative MDI were found among the men.

It has been demonstrated that both excess weight and weight deficiency are harmful to fertilisation capabilities in women and the reproductive health of both sexes [3, 6, 7]. The assessment of student nutritional status in this study indicated that the mean BMI both in the entire population and in the female group was within the norm, while it was excessive in the male group. It is possible that the excessive BMI may be caused by a high muscle tissue percentage in persons who practise strength sports particularly intensely. Nevertheless, in most cases, elevated BMI is caused by excess adipose tissue. According to the literature data, reproductive system dysfunctions may stem from disorders related to the endocrine system and metabolism being affected by adipokines, inflammatory cytokines secreted by the adipose tissue, and elevated testicular temperature related to scrotal adiposity [10].

The reproductive process may be disturbed by excess adipose tissue and by its insufficient amount [17]. In the present study, the mean BMI was normal for all the groups. Nevertheless, for some participants, the minimum value did not exceed 19 kg/m^2. The lowest BMI values (16.4 kg/m^2) were found among female students.

Physical activity plays a significant role in body weight regulation (including reduction of insulin resistance related to fertility), reduction of the risk of miscarriage, and correct embryo implantation [3, 23]. It is alarming that one-third of the students declared low physical activity (on days off) including almost half of the male group (on weekdays). At the same time, the male students preferred more intensive forms of physical activity (on days off) than female students, who chose moderate activity more often. The literature does not offer cases of a negative impact of intensive physical activity on men's reproductive health. However, in women increased intensive physical activity is related to a reduced risk of ovulatory infertility on the one hand, but very intensive and frequent exertion may be detrimental to reproductive functions on the other [16, 18, 23]. In light of the inconsistent results from studies on the influence of intensive physical activity on reproduction in women, the issue of the relationships between various levels of physical activity and reproductive capabilities of men requires further study.

Stimulants such as alcohol or tobacco are also causes of sexual dysfunctions in men. It is therefore particularly alarming that more male students (89.3 *vs*. 97.6%) partook in alcohol and drank beverages with a significantly higher alcohol content than female students. It should be noted that fewer than 10% of female students abstained from alcohol. This finding is disconcerting in the context of the study because at the same consumption level, the risk of alcohol-related conditions is higher in women than in men [13].

It has been found that tobacco smoking contributes to reduced fertility and an increased risk of infertility. Elements of tobacco smoke disrupt embryo implantation and contribute to DNA damage [13]. In the present study, almost 30% of men and women admitted to smoking. The optimistic outlook is that a significant group of the students gave up smoking. Sixteen percent of female and male participants declared that they had given up smoking.

According to the literature data, current or past eating disorders: AN and BN also influence fertility [34]. Sira and Pawlak states that the average prevalence of ED among college students in Eastern North Carolina is 12.64%. This included 13.04% of females and 10.2% of males [35].

The author's own studies indicated that dietary attitude disorders were found in 10.7% of female students and 4.8% of male students, while ED susceptibility was noted in 38.4% of women and 45.2% of men. These results, as well as Sira and Pawlak's results, suggest that disturbed eating attitudes are not just the domain of females. Young Caucasian adults often appear to be more concerned about their body weight and have more negative body cognitions than any other ethnic group [35].

Conclusions

The study findings support the following conclusions: 1) based on the created indices IFD and IID, it was established that the diet of the students, in particular men, did not benefit fertility to a satisfactory degree, 2) the introduction of the MDI revealed that the diet of significantly older women was dominated by products beneficial to fertility, 3) most of the students declared alcohol consumption. The proportion of men was greater than the proportion of women (additionally, male students drank high-alcohol content beverages four times more often than female students), 4) the number of smokers was high, accounting for almost 30% in both groups, 5) on days off, almost 30% of the students were active physically to a lesser degree, while on weekdays, the percentage reached 50% in the male group, 6) EDs were found in over 10% of the women and almost 5% of men, while ED susceptibility was registered in over 38% of the women and 45% of men, and 7) implementing the principles of correct dietary behaviour should be an important element of fertility disorder prevention in all the students, in particular in men. Environmental factors are modifiable. Therefore, the education should start as early as possible in order to reduce exposure to these factors.

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Corresponding Author:
M. MIZGIER, PhD
Department of Morphological and Health Sciences
Dietetic Division
Faculty of Physical Culture in Gorzów Wlkp.
Poznań University of Physical Education
ul. Estkowskiego 13
66-400 Gorzów Wlkp. (Poland)
e-mail: m.mizgier@awf-gorzow.edu.pl