

# ***Dietary supplements consumption among Polish female students – the preliminary results of the cross-sectional study “DiSCO” (Dietary Supplements Consumption of Undergraduate Students)***

**Agata Kawalec<sup>1</sup>, Anna Kawalec<sup>2</sup>**

<sup>1</sup> Instytut Nauk Medycznych, Uniwersytet Opolski

<sup>2</sup> Katedra i Klinika Nefrologii Pediatricznej; Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu

## **Abstract**

**Introduction.** The use of products that are consumed in addition to the regular diet, so-called dietary supplements, is considered one of the forms of food behavior. **Aim.** This study aimed to characterize the consumption of dietary supplements among Polish female students. **Materials and methods.** The cross-sectional study “DiSCO” (Dietary Supplements Consumption of Undergraduate Students) was realized in co-operation with the Italian Universities. The anonymous online survey was realized among 188 Polish female students from 01.02.2022 to 31.01.2023. **Results.** 45 (23.9%) students did not use any dietary supplements during the last six months. Vitamin D was the most commonly used supplement. The analysis of the purposes for which the students decided to start supplementation showed that the students used dietary supplements to improve their health (11.52%), due to the deficiency of a given nutrient (4.96%), due to the taste (1.55%), to improve concentration (1.32%), to recover from injury or illness (1.13%), to improve physical appearance (1.11%), and to improve physical performance (1.02%). Most often, students used dietary supplements because of physicians’ or nutritionists’ prescriptions (30.85%), relatives, friends, or teammates’ suggestions (24.47%), and own knowledge (22.87%). Most of the students declared that they bought dietary supplements at the pharmacy (67.02%), in the supermarket (7.45%), or specialized shop (3.72%). The adverse effects were observed by 12 students (6.3%). The most often reported adverse effects were gastrointestinal symptoms. **Conclusions.** Dietary supplements are commonly used by Polish female students. Education about the rational use of dietary supplements and their possible adverse effects is essential. (*Farm Współ* 2023; 16: 82-90) doi: 10.53139/FW.20231608

*Keywords: dietary supplements, women, students*

## **Introduction**

The use of products that are consumed in addition to the regular diet, so-called dietary supplements, is considered one of the forms of food behavior [1,2]. The regulations for dietary supplements are not the same in different countries [3]. In the European Union, dietary supplements are defined as “foodstuffs intended to supplement the regular diet and present concentrated sources of nutrients or substances with physiological effects, which are marketed in dosage forms” [4,5]. The products labeled as dietary supplements can contain dietary ingredients such as vitamins, minerals, amino-

acids, herbs, and botanicals [1]. They can have a form of a pill, capsule, tablet, or liquid [2,5].

Because of the COVID-19 pandemic, dietary supplement use has become more prevalent in all age groups [3]. However, there is limited evidence for the health benefits of the dietary supplements used by well-nourished, healthy people with a balanced diet [2,4]. Young adults, and particularly students, are the group that consumes dietary supplements, for example, to improve concentration and health status and increase their energy level [6,7].

### The aim

This study aimed to characterize the consumption of dietary supplements among Polish female students.

### Materials and Methods

The presented results are the preliminary results of the part of the cross-sectional study “DiSCO” (Dietary Supplements Consumption of Undergraduate Students) realized among Polish female students in co-operation with Italian Universities. The anonymous online survey was created using a Google module and realized at the University of Wrocław, Wrocław Medical University, Wrocław University of Environmental and Life Sciences, University of Opole, and State University of Applied Sciences. From 01.02.2022 to 31.01.2023, 188 female students (mean age 21.59; median 21; SD 2.44) from different Polish Universities: University (80), Medical University (89), University of Environmental and Life Sciences (17), State University of Applied Sciences (2 students) participated in the study. The students studied medicine (92), psychology (60), food technology and human nutrition (10), human biology (9), quality management and food analysis (6), pharmacology (4), medical analytics (3), dentistry (2), nursing (1), and biotechnology (1).

The results were analyzed with the use of Excel. The study obtained the positive opinion of the Bioethics Committee of Wrocław Medical University, Number KB 240/2022.

### Results

The results indicate that 45 (23.9%) students did not use any dietary supplements during the last six months. Vitamin D was the supplement most often used by female students. Only 46 students never used Vitamin D (24.5% of female participants in the study). The smallest number of students declared never to supplement vitamin C (78 students; 41.5%), magnesium (91 students; 48.4%), and caffeinated energy supplements (95; 50.5%), which means that these dietary supplements are popularly used among students. One hundred twelve students have never used probiotics (59.6%). The least popular dietary supplements were glucosamine and chondroitin – 185 students have never used them (98.4%). Many students declared never to use chromium (184 students; 97.9%), fluorine (182 students; 96.8%), coenzyme Q10 (182 students; 96.8%), and phosphorus (181 students; 96.3%). Folic acid was never used by 86.17% of students (162). The frequency of use of particular dietary supplements by Polish female students is presented in Table I.

Table I. The frequency of use of dietary supplements by Polish female students and reasons for the use of dietary supplement

Dietary supplement		The declared frequency of use by female students during last six months					
		Never	Once a month	Once a week	Few times a week	Everyday	Few times a day
Multivitamin and multimineral products	N	120	21	7	24	14	2
	%	63.83	11.17	3.72	12.77	7.45	1.06
Vitamin A	N	157	9	5	6	11	0
	%	83.51	4.79	2.66	3.19	5.85	0.00
Vitamin B	N	109	14	10	21	34	0
	%	57.98	7.45	5.32	11.17	18.09	0.00
Vitamin C	N	78	36	17	29	27	1
	%	41.49	19.15	9.04	15.43	14.36	0.53
Vitamin D	N	46	13	17	31	80	1
	%	24.47	6.91	9.04	16.49	42.55	0.53
Vitamin E	N	161	8	4	8	7	0
	%	85.64	4.26	2.13	4.26	3.72	0.00
Vitamin K	N	159	8	2	10	8	1
	%	84.57	4.26	1.06	5.32	4.26	0.53
Coenzyme Q10	N	182	1	2	2	1	0
	%	96.81	0.53	1.06	1.06	0.53	0.00

Dietary supplement		The declared frequency of use by female students during last six months					
		Never	Once a month	Once a week	Few times a week	Everyday	Few times a day
Iron	N	149	6	12	12	8	1
	%	79.26	3.19	6.38	6.38	4.26	0.53
Magnesium	N	91	20	20	24	27	6
	%	48.40	10.64	10.64	12.77	14.36	3.19
Calcium	N	147	19	9	7	5	1
	%	78.19	10.11	4.79	3.72	2.66	0.53
Zinc	N	151	10	6	10	10	1
	%	80.32	5.32	3.19	5.32	5.32	0.53
Folic acid	N	162	6	6	5	9	0
	%	86.17	3.19	3.19	2.66	4.79	0.00
Selenium	N	172	4	4	5	3	0
	%	91.49	2.13	2.13	2.66	1.60	0.00
Potassium	N	170	7	3	3	3	2
	%	90.43	3.72	1.60	1.60	1.60	1.06
Phosphorus	N	181	3	2	1	1	0
	%	96.28	1.60	1.06	0.53	0.53	0.00
Iodine	N	179	5	3	0	1	0
	%	95.21	2.66	1.60	0.00	0.53	0.00
Fluorine	N	182	3	2	0	1	0
	%	96.81	1.60	1.06	0.00	0.53	0.00
Chromium	N	184	3	0	0	1	0
	%	97.87	1.60	0.00	0.00	0.53	0.00
Probiotics	N	112	21	17	20	17	1
	%	59.57	11.17	9.04	10.64	9.04	0.53
Prebiotics	N	162	9	6	8	2	1
	%	86.17	4.79	3.19	4.26	1.06	0.53
Dietary supplements with fiber	N	164	13	4	7	0	0
	%	87.23	6.91	2.13	3.72	0.00	0.00
Non-caffeinated energy supplements	N	178	6	1	2	1	0
	%	94.68	3.19	0.53	1.06	0.53	0.00
Caffeinated energy supplements	N	95	16	22	29	20	6
	%	50.53	8.51	11.70	15.43	10.64	3.19
Isotonic drinks with minerals	N	143	18	12	15	0	0
	%	76.06	9.57	6.38	7.98	0.00	0.00
Herbal products	N	114	17	23	18	10	6
	%	60.64	9.04	12.23	9.57	5.32	3.19
Cannabis sativa products	N	178	7	2	0	1	0
	%	94.68	3.72	1.06	0.00	0.53	0.00
Protein supplements	N	140	13	16	10	8	1
	%	74.47	6.91	8.51	5.32	4.26	0.53
Amino acids	N	175	6	5	2	0	0
	%	93.09	3.19	2.66	1.06	0.00	0.00
Linseed	N	123	26	26	8	5	0
	%	65.43	13.83	13.83	4.26	2.66	0.00
Fish oil	N	131	15	9	10	22	1
	%	69.68	7.98	4.79	5.32	11.70	0.53

Dietary supplement		The declared frequency of use by female students during last six months					
		Never	Once a month	Once a week	Few times a week	Everyday	Few times a day
Glucosamine or chondroitin	N	185	2	0	1	0	0
	%	98.40	1.06	0.00	0.53	0.00	0.00
Melatonin	N	169	9	5	5	0	0
	%	89.89	4.79	2.66	2.66	0.00	0.00

The analysis of the aims of why the students decided to use the particular dietary supplements (8 possible answers; 6204 reports) revealed that the students used dietary supplements to improve their health (715; 11.52%), to deal with a specific nutrient deficiency

(308; 4.96%), because of taste appreciation (96; 1.55%), to improve concentration (82; 1.32%), to recover after an injury or a disease (70; 1.13%), to improve physical appearance (69; 1.11%), and to improve physical performance (63; 1.02%) (Table II).

Table II. The aim of dietary supplement use by female students

Dietary supplement		The aim of dietary supplement use by female students							
		I didn't use	Nutrient deficiency	Improvement of health	Improvement of appearance	Due to injury/illness	Improvement of physical performance and sports performance	Improvement of concentration	Because of the taste
Multivitamin and multimineral products	N	120	9	48	2	1	2	1	5
	%	63.83	4.79	25.53	1.06	0.53	1.06	0.53	2.66
Vitamin A	N	153	6	21	7	1	0	0	0
	%	81.38	3.19	11.17	3.72	0.53	0.00	0.00	0.00
Vitamin B	N	109	30	41	4	2	0	2	0
	%	57.98	15.96	21.81	2.13	1.06	0.00	1.06	0.00
Vitamin C	N	80	8	79	3	15	1	0	2
	%	42.55	4.26	42.02	1.60	7.98	0.53	0.00	1.06
Vitamin D	N	47	58	72	4	6	0	1	0
	%	25.00	30.85	38.30	2.13	3.19	0.00	0.53	0.00
Vitamin E	N	158	5	18	6	1	0	0	0
	%	84.04	2.66	9.57	3.19	0.53	0.00	0.00	0.00
Vitamin K	N	156	6	21	2	2	0	1	0
	%	82.98	3.19	11.17	1.06	1.06	0.00	0.53	0.00
Coenzyme Q10	N	175	4	7	1	0	0	1	0
	%	93.09	2.13	3.72	0.53	0.00	0.00	0.53	0.00
Iron	N	144	26	17	0	1	0	0	0
	%	76.60	13.83	9.04	0.00	0.53	0.00	0.00	0.00
Magnesium	N	89	29	46	2	6	3	13	0
	%	47.34	15.43	24.47	1.06	3.19	1.60	6.91	0.00
Calcium	N	148	6	31	0	3	0	0	0
	%	78.72	3.19	16.49	0.00	1.60	0.00	0.00	0.00
Zinc	N	149	6	24	8	0	0	1	0
	%	79.26	3.19	12.77	4.26	0.00	0.00	0.53	0.00
Folic acid	N	159	8	19	0	2	0	0	0
	%	84.57	4.26	10.11	0.00	1.06	0.00	0.00	0.00

Dietary supplement	The aim of dietary supplement use by female students								
	I didn't use	Nu- trient deficiency	Improve- ment of health	Improve- ment of appearance	Due to injury/ illness	Improve- ment of physical performance and sports performance	Improve- ment of concentration	Becau- se of the taste	
Selenium	N	167	6	11	4	0	0	0	0
	%	88.83	3.19	5.85	2.13	0.00	0.00	0.00	0.00
Potassium	N	166	6	14	0	0	0	2	0
	%	88.30	3.19	7.45	0.00	0.00	0.00	1.06	0.00
Phosphorus	N	177	3	8	0	0	0	0	0
	%	94.15	1.60	4.26	0.00	0.00	0.00	0.00	0.00
Iodine	N	174	4	10	0	0	0	0	0
	%	92.55	2.13	5.32	0.00	0.00	0.00	0.00	0.00
Fluorine	N	178	3	7	0	0	0	0	0
	%	94.68	1.60	3.72	0.00	0.00	0.00	0.00	0.00
Chromium	N	177	3	7	1	0	0	0	0
	%	94.15	1.60	3.72	0.53	0.00	0.00	0.00	0.00
Probiotics	N	114	7	44	1	9	0	0	13
	%	60.64	3.72	23.40	0.53	4.79	0.00	0.00	6.91
Prebiotics	N	161	4	17	1	3	0	1	1
	%	85.64	2.13	9.04	0.53	1.60	0.00	0.53	0.53
Dietary supplements with fiber	N	167	3	14	0	1	1	1	1
	%	88.83	1.60	7.45	0.00	0.53	0.53	0.53	0.53
Non-caffeinated energy supplements	N	169	3	3	0	0	5	6	2
	%	89.89	1.60	1.60	0.00	0.00	2.66	3.19	1.06
Caffeinated energy supplements	N	102	1	5	0	2	13	36	29
	%	54.26	0.53	2.66	0.00	1.06	6.91	19.15	15.43
Isotonic drinks with minerals	N	147	8	7	0	2	13	4	7
	%	78.19	4.26	3.72	0.00	1.06	6.91	2.13	3.72
Herbal products	N	117	8	29	2	5	2	7	18
	%	62.23	4.26	15.43	1.06	2.66	1.06	3.72	9.57
Cannabis sativa products	N	173	5	6	0	0	0	4	0
	%	92.02	2.66	3.19	0.00	0.00	0.00	2.13	0.00
Protein supplements	N	140	6	8	7	2	16	0	9
	%	74.47	3.19	4.26	3.72	1.06	8.51	0.00	4.79
Amino acids	N	174	3	6	1	0	4	0	0
	%	92.55	1.60	3.19	0.53	0.00	2.13	0.00	0.00
Linseed	N	128	12	31	5	3	2	0	7
	%	68.09	6.38	16.49	2.66	1.60	1.06	0.00	3.72
Fish oil	N	130	14	34	5	1	1	1	2
	%	69.15	7.45	18.09	2.66	0.53	0.53	0.53	1.06
Glucosamine or chondroitin	N	182	3	2	0	1	0	0	0
	%	96.81	1.60	1.06	0.00	0.53	0.00	0.00	0.00
Melatonin	N	171	5	8	3	1	0	0	0
	%	90.96	2.66	4.26	1.60	0.53	0.00	0.00	0.00

Most often, students used dietary supplements because of physicians' or nutritionists' prescriptions (30.85%), relatives, friends, or teammates' suggestions

(24.47%), and own knowledge (22.87%). Only 1.6% of students used dietary supplements due to the pharmacists' suggestions. The reasons for using dietary

supplements are presented in Figure 1.

When asked about the purchasing channel, most of the students declared that they bought dietary supplements at the pharmacy (67.02%), in the supermarket (7.45%), specialized shop (3.72%) (Figure 2).

The adverse effects were observed by 12 students (it was a multiple-choice question). The most often reported adverse effects were gastrointestinal

symptoms (12 students), muscle tremors (4 students), agitation (3 students), excessive sleepiness (3 students), insomnia (3 students), and heart palpitations (3 students). The students also reported concentration difficulties (2 students), anxiety (2 students), irritability (1 student), vertigo (1 student), and skin changes (1 student).

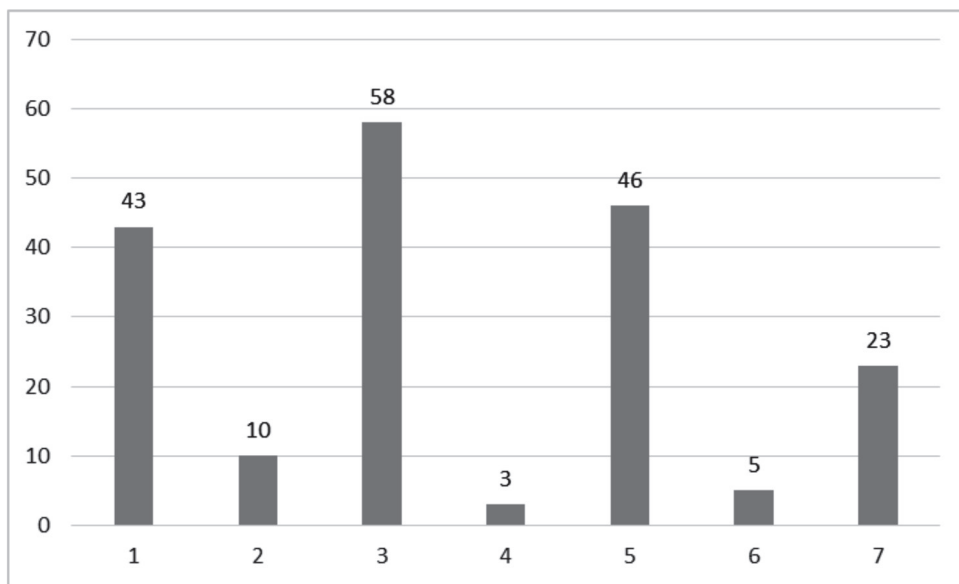


Figure 1. Reasons why students used dietary supplements.

Respondents answered a single-choice question: If you have been consuming dietary supplements in the last six months, what prompted you to do so? If you consume more than one dietary supplement, include the one you consume in the largest amount.

X – reason

1 – my knowledge;

2 – advertising

3 – physician's or nutritionist's prescription

4 – pharmacist's suggestion

5 – relative's, friend's, or teammate's suggestion

6 – trainer's suggestion

7 – I didn't use dietary supplements

Y – number of students

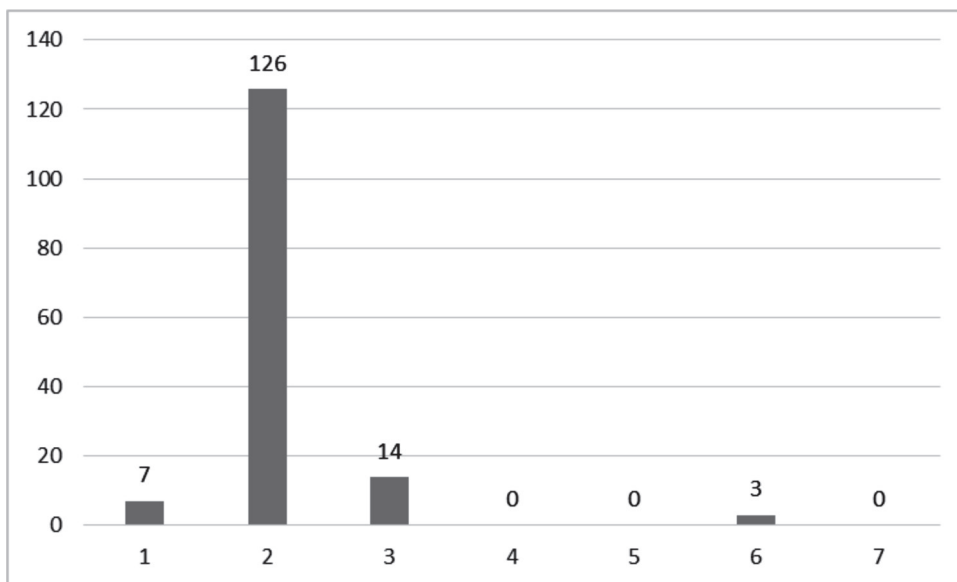


Figure 2. Purchasing channel

Respondents answered a single-choice question: If you have consumed dietary supplements in the last six months, where did you buy them? If you consume more than one preparation, include the one you consumed in the largest amount.

X – purchasing channel

1 – specialized shop

2 – pharmacy

3 – w supermarkecie / supermarket

4 – sport facility

5 – specialized website

6 – general trade website

7 – I didn't use dietary supplements

Y – number of students

## Discussion

Polish female students commonly use dietary supplements - 76.1% have used them in the last six months. The high usage (70%) of dietary supplements by students was reported by another Polish study carried out by Merwid-Łąd et al. during the COVID-19 pandemic [8]. Our results indicate that Polish students use dietary supplements more often than Italian students [9]. We can compare our results with those of Gallé et al., who used the same survey on Italian students [9]. In the Gallé et al. study, 71.5% of all students and 73.8% of female students used dietary supplements [9]. The study by Axon et al. revealed that 52% of US pharmacist students (female and male students) had used at least one dietary supplement in their lifetime

[10]. Bojana Vidović et al. investigated the prevalence and patterns of dietary supplement use among Belgrade University undergraduate students (79.1% of students were women) and reported that 55.7% used dietary supplements during the past year [5]. The interesting findings were obtained by Tarı Selçuk et al. [11]. The cross-sectional study of Tarı Selçuk et al. conducted on nursing students (72% of the participants were women) in Turkey revealed that 18.6% of the students used dietary supplements in the last 12 months and the use of dietary supplements was associated with orthorexia nervosa [11]. The diagnostic criteria for orthorexia nervosa remain controversial [11]. However, it is a term used to define a state when the interest in healthy nutrition and diet becomes a pathological condition,

the so-called “obsession with healthy food and proper nutrition” [11].

The most often dietary supplement used by Polish female students was Vitamin D (75.5%), while it was used by 25.2% of Italian female students [9]. This difference can be explained by the different climate and the fact that for the Polish population, it is recommended to supplement vitamin D once a day from October till April because of the limited exposure to sunlight [12-14].

The most popular dietary supplements among Italian students were multivitamins and multiminer- al compounds [9]. Similar results were obtained by Vidović et al. [5]. Belgrade University undergraduate students most commonly used vitamins and minerals, alone or in combination, probiotics, proteins/amino acids, fish oils, and herbal supplements [5]. However, Vitamin C, the B group of vitamins, magnesium, and zinc were the most commonly consumed micronu- trients [5]. In the study of Axon et al., the most popular dietary supplement was fish oil or omega-3 fatty acids because almost half (46%) of the student pharmacists used them [10]. In Turkey, the most commonly used dietary supplements among students were vitamin B12 (7.5%), iron (7.1%), and vitamin C (4.5%) [11].

Most Polish female students used dietary sup- plements because of a physician’s or nutritionist’s prescription. Similar to students in Italy – 55.9% [9]. In the study on students from Serbia, 52% of all dietary supplement use was advised by medical doctors and pharmacists [5]. Most Polish students and students from Serbia and Italy bought dietary supplements at the pharmacy [5,9].

In our study, the main aim of using dietary supplements was to improve students’ health. Also, students in the study of Vidović et al. used supple- ments to maintain health and well-being [5]. As the main reason for taking dietary supplements, Portugal students indicated that they make them feel good in cases of tiredness, fatigue, or stress (20% of students) [15]. In the study of Botelho et al., 19.4% of students used dietary supplements also to prepare for exams [15]. Surprisingly, female students more often than male students took dietary supplements when they “need to prepare for exams” (22.0% vs. 14.2%) and when they “need to concentrate” (18.7% vs. 8.0%) [15]. The

students from the United States reported that they use dietary or herbal supplements to prevent disease (24%), improve physical performance (19%), and improve immune function (16%) [10].

The adverse effects of dietary supplement use were observed by 6.4% of students. The percentage is higher than reported by Italian students (3.1%) [9], and the students from the study of Vidović et al. (4.5%) reported adverse reactions due to dietary supplements usage, including gastrointestinal symptoms, skin flushing, dizziness, and heart palpitation [5]. On the other hand, the nursing students from the study of Tarı Selçuk et al. complained of gaining weight (18.3%), nausea (13.5%), diarrhea (5.8%), constipation (5.8%), and insomnia (5.8%) [11].

## Conclusions

Dietary supplements are commonly used by Polish female students. 76.1% of them used dietary supplements in the last six months, most commonly to improve their health (715; 11.52%). Vitamin D was the most commonly used supplement (75.5%). Most students bought dietary supplements at the pharmacy (67.02%) because of a physician’s or nutritionist’s pre- scription (30.85%). The adverse effects were observed by 6.3% of students (most often gastrointestinal symp- toms; 12 students). Education about the rational use of dietary supplements and their possible adverse effects is essential.

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## Conflict of interest

None

## Correspondence address

✉ Agata Kawalec

Institute of Medical Sciences, University of Opole  
Oleska St. 48, 45-052 Opole

☎ (+48 77) 452 75 54

✉ agata.kawalec@uni.opole.pl



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