

# Summary of professional accomplishment

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## 1 Personal data

Name and surname: **Anna Harton**

Place of work: Chair of Dietetics, Department of Dietetics  
Faculty of Human Nutrition and Consumer Sciences  
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## 2 Education and scientific degree

- Year 2001 **Master of Science**, degree in agricultural sciences, specialization: food technology and human nutrition, field: human nutrition and dietetics, Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences, WULS-SGGW (diploma number: Ż.Cz.1712 / 2001).  
The title of the dissertation: "*Analysis of the causes of overweight and simple obesity in adolescents at the age of 13-15 - the nutritional and psychological aspect*".  
Promoter: Sa'eed Bawa, Ph.D. (WULS-SGGW).  
Assistant promoter: Halina Weker, associate prof. (dr hab.) (The Institute of Mother and Child in Warsaw, Poland).
- Year 2005 **Post-graduate studies** in the field of Pedagogical Improvement Faculty of Economics and Agriculture, Warsaw University of Life Sciences, WULS-SGGW (certificate no: SDP-538/2005).
- Year 2006 **Doctor of Philosophy**, degree in agricultural sciences, discipline: food and nutrition technology, Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences, WULS-SGGW (no: 03029/2006).  
The title of the dissertation: "Evaluation of the way men are fed before and after diagnosing ischemic heart disease".  
Promoter: Lucyna Narojek, associate prof. (dr hab.) (WULS-SGGW).  
Reviewers: Grażyna Broda, Ph.D., assistant professor (dr hab.) (Institute of Cardiology in Warsaw, Poland); prof. Wojciech Roszkowski (WULS-SGGW).

## 3 Information on previous employment in scientific units

- 2002 – 2006 **Doctoral studies** in the field of food and nutrition technology, Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW, Poland
- 2006 – 2008 **Assistant**, Chair of Dietetics, Department of Dietetics, Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW, Poland.
- 2008 – currently **Assistant Professor (adjunct)**, Chair of Dietetics, Department of Dietetics, Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW, Poland.

## 4 Achievement that forms the basis of habilitation proceedings

The scientific achievement constituting the basis of habitation proceedings, in accordance with Article 16, Paragraph 2 of the Act of 14 March 2003 on academic degrees and academic title and on degrees and title in the field of art (consolidated text: Journal of Laws of 2014, item 1852 and 2015, items 249 and 1767) is the monograph published in its entirety.

### 4.1 Title of scientific achievement

**The level of nutritional knowledge of teachers and parents of children aged 3-6 as a basis or developing a nutritional education model.**

### 4.2 Publication as a scientific achievement (author / reviewers)

Harton A. The level of nutritional knowledge of teachers and parents of children aged 3-6 as a basis or developing a nutritional education model. Publishing SGGW-WULS, Warsaw 2019, s. 1-142.

Reviewers : prof. Anna Gronowska-Senger, Warsaw University of Life Sciences, WULS-SGGW, Poland.

Katarzyna Przybyłowicz, associate prof. (dr hab.), University of Warmia and Mazury in Olsztyn, Poland.

### 4.3 Discussion of the scientific objective and results achieved

Proper nutrition for pre-school children determines the optimal growth and development of the body and is an important element in the prevention of many diet-related diseases. Pre-school age is not only a period of intensive growth and development for the child, but also the time to acquire new skills and experiences in the area of food and nutrition, including the intensive development of nutritional behaviors [1, 2, 3, 4, 5]. In childhood, certain attitudes and views in the field of nutrition are formed, which are not always health-promoting, and once incorrect habits are difficult to change [6], it may have consequences not only in childhood, but also in adulthood [7].

Proper nutrition of a small child is the role of parents and caregivers, and in the case of children attending kindergartens, teachers from these institutions also have an important role to play. If the child spends many hours in the kindergarten, 70-75% of the energy and nutrient needs are expected to be delivered within the framework of the offered nutrition. To properly plan and organize child nutrition, you need to know about dietary norms and recommendations for this age group [8], and literature data confirm the occurrence of some

mistakes in nutrition in pre-school age [9, 10, 11]. These irregularities concern not only home nutrition, but also planning of menus in day care centers (DCCs) [10, 12, 13, 14, 15, 16]. Home-based nutrition of children should complement the food ration carried out in kindergarten. Studies prove the frequent fact of duplicating meals - double breakfasts, dinners or afternoon teas are recorded [17, 18]. This state of affairs may result from the lack of parents' interest in feeding children in institutions, and thus their ignorance of the subject. This, however, is not in line with the parents' declarations, which usually indicate the interest of the pre-school menu. In practice, it often turns out that parents do not have sufficient theoretical as well as practical knowledge about the general principles of child nutrition or, if they have such knowledge, they do not use it in many cases [17]. Duplication of meals may result with over-energy absorption in children's diet, as well as excessive supply of some nutrients and deficiency of the others [17]. In pre-school children feeding, the lack of first breakfasts is also frequently noted [19]. Other, irregularities in the nutritional guidelines [20] recorded in pre-school diets are an incorrect assortment of snacks [21], a large amount of sweets, a significant share of high-energy foods [18, 22, 23, 24] as well as too many sweetened beverages [25]. On the other hand, in the nutrition of children there is too small a share of milk and its products, cereal products (especially whole meal bread), vegetables and fruits, as well as fish [10]. The same observations also apply to planned meals in kindergartens [25].

An additional difficulty in the implementation of optimal nutrition for young children is the fact that pre-school age is a period when children eagerly manifest their food preferences (preference for sweet and salty taste) and express reluctance to consume little-known products [26]. In this case, an important role is attributed to the pre-school environment, in which the child, spending a lot of time, learns a lot of new things, also in the field of nutrition. Education about learning new flavors and their preferences can improve the child's eating behavior, however, this cannot be transferred only to the institution. The constant and consistent cooperation with the home and the parents or caregivers of the child is strongly recommended here. After all, the home and family environment are the optimal environment for a small child. The role of parents and the family environment in nutritional education of a child is raised in many studies [27, 28, 29, 30]. A child, being a member of the family, identifies with her, co-creates with its family traditions, customs and patterns, but also takes on her attitudes, views and nutritional behaviors [31, 32, 33]. The parent is a role model for the child and is its teacher in the area of food and nutrition. A special role in the first years is attributed to the mother, who usually spends more time with it than the father. However,

her possibilities are limited by professional activity and dependent on knowledge or culinary skills [34, 35]. In the literature there is a family similarity in the structure of food consumption [32, 33, 36, 37], which is also favored by family meals [38], during which the child observes parents and imitates them in terms of consumed products and beverages. Family meal intake is also correlated with a better structure of the child's diet [39]. Cultivating the tradition of family meals also favors learning food culture and is an opportunity to provide knowledge about nutrition. However, parents' knowledge is not always in line with the norms and recommendations for this age group [40, 41]. Parents planning and implementing a child's diet are often guided by this knowledge as well as varied experience [42]. Nutritional knowledge of parents depends on many factors, education and socio-economic status are of great importance here [28, 43]. The impact of parents on the child's nutritional behavior is not only through the transfer of knowledge, but also the views and preferences of parents [32].

By acquiring nutritional knowledge, a child becomes a more conscious consumer on the food market. However, in early childhood, the child does not decide what he or she gets for eating. The division of roles is strictly defined here - the parent / caregivers decides what, when and how to give the child to eat, and the child will eat it and how much [44]. The situation is already changing somewhat in pre-school age. In the kindergarten the direct educator is a teacher. who not only gives knowledge but is also an authority for the child. If the knowledge is about nutrition, the teacher becomes an educator of nutrition and a role model in this area. Research shows that teachers for nutritional knowledge do not always refer to professional literature [45] and their knowledge is not always satisfactory and complete [45, 46, 47, 48, 49]. Many authors emphasize the need for constant education of kindergarten employees in the aspect of nutrition [45, 46]. What's more, providing the child with divergent information about nutrition at home and in kindergarten can be the cause of an internal conflict that arises in the child. According to Koziół-Kozakowska et al. [34], the formal combination of kindergarten and home eliminates such a conflict, and the child who receives convergent messages does not reject such knowledge gained.

The mistakes made in nutrition in pre-school age can therefore be related to the lack of knowledge of their caregivers, including both parents and pre-school teachers. In order to make such a thesis, however, research is needed on this subject, in which knowledge is combined with the evaluation and its use in practice, i.e. the implementation of nutrition in kindergarten. Research on nutritional knowledge of parents [27, 41, 50] and pre-school teachers [45, 46, 47, 48, 49] implemented so far in our country was relatively small. In

addition, the available publications allow only for limited inference, due to the small sample size and the local range of research [27, 41, 45, 46, 47, 48, 49, 50, 51].

Another problem is the fact that in the research, the authors refer primarily to the level of nutritional knowledge without thorough analysis of the lack of knowledge or incorrect knowledge. In available publications, the authors often also do not identify areas of ignorance and separate it from areas of lack of knowledge. Nutritional ignorance treated as incorrect knowledge may have greater consequences, also in terms of health, than awareness of lack of knowledge. People with incorrect knowledge are often not aware of mistakes they make, which does not encourage them to acquire the correct knowledge. A completely different situation occurs in the absence of knowledge. Those who are aware of the lack of knowledge can express their willingness and feel the need to search for it. Dissemination of incorrect knowledge in society creates some disproportions between correct knowledge and false knowledge, which results in general disinformation.

Another aspect is the planning and implementation of educational programs addressed to various groups of society. Educational programs addressed to pre-school institutions, children and their parents are usually not preceded by research on nutritional knowledge or to recognize existing nutritional problems as well as to identify the needs and expectations of recipients of such activities. Activities implemented without taking into account these aspects are often not as effective as those targeted. Another very important issue is the limited range of such activities as well as the short duration of programs. In addition, the lack of participation of specialists (in this case dieticians / educators) is often noticed, as well as the lack of feedback to the institutions where the programs are implemented as well as the lack of evaluation of the entire actions taken.

Due to the presented facts, there was a real need to plan, execute and summarize research on the knowledge of teachers and parents and their needs and expectations related to the planned nutritional education program. These data served to develop a model of comprehensive nutritional education addressed to day care centers. Subsequently, this model, after adapting to the needs of the program, was used and its effectiveness assessed. Evaluation took place during and after the completion of a comprehensive program addressed to day care centers throughout Poland.

### 4.3.1 Objective, research hypotheses

**The aim of the study** was to assess the level of nutritional knowledge of teachers and parents of children aged 3-6 as a basis for developing a model of comprehensive nutrition education addressed to day care centers, parents and their children.

**The aim of the application** was to develop a model of nutritional education and to evaluate its effectiveness.

#### Research hypotheses

In the context of the goals presented, the following thesis was formulated: unsatisfactory level of nutritional knowledge of pre-school and pre-school children's parents requires comprehensive, consistent and complementary educational activities tailored in their content and methods to identified areas of lack of knowledge and incorrect knowledge, thus creating a chance to reduce the scale of the effects of errors in feeding the youngest and dissemination of a healthy lifestyle.

The main hypothesis assumes that the level of nutritional knowledge of parents of pre-school children and their teachers shows many irregularities depending on endogenous (sociodemographic) and exogenous variables (e.g. economic conditions of the region where the day care centers and the teacher employed in it are located), which result in many irregularities in the nutrition of the youngest, and consequently increase the probability of diet-related diseases.

#### Detailed hypotheses:

- nutritional knowledge of teachers from day care centers and parents of pre-school children is unsatisfactory,
- incorrect nutritional knowledge is greater than its lack in both groups,
- the level of nutritional knowledge of kindergarten teachers is higher than the level of nutritional knowledge of parents of children attending these institutions,
- expectations and needs of teachers and parents, regarding educational programs, show many differences, which may be the result of, among others, different characteristics of feeding children at home and in kindergarten,
- taking into account the results of research on nutritional knowledge, expectations and needs related to educational activities in the field of nutrition will allow to develop a model of nutritional education addressed to day care centers, which will improve the organization and planning of child nutrition in these facilities.



**The scope of work included:**

- assessment of nutritional knowledge of teachers from kindergartens,
- assessment of nutritional knowledge of parents of pre-school children,
- preparation of the data obtained and identification of the main areas of incorrect nutritional knowledge and lack of knowledge (defined as "nutritional ignorance"), both in the group of teachers and in the group of parents,
- gathering information on expectations related to educational activities and interests know about nutrition from both groups participating in the study,
- developing an optimal model of nutritional education addressed to day care centers, parents and their children aged 3-6,
- evaluation of the effectiveness of the nutritional education model.

**General information about the study****Pilot study**

The proper study was preceded by a pilot survey (electronic questionnaire) addressed to teachers from kindergartens and parents of children aged 3-6. It was part of the "Pyramid of Nutrition of Preschooler" program implemented since 2010 in Poland, which was directed to day care centers. The study was carried out in two stages: the first stage - before education and the second stage - after education. Education was carried out indirectly by sending to institutions of specially prepared educational materials addressed to teachers, children and their parents (materials were part of the program). The pilot study was used to validate the applied tool and its improvement before the actual research planned in the next stage.

**Proper study**

The relevant study was of national nature, it was planned at the turn of 2013-2014 and implemented from September 2014 to November 2014. The survey covered a group of teachers and parents of children aged 3 - 6, who attended public kindergartens throughout Poland. The results described in the research work were an inspiration to develop a model of comprehensive nutritional education addressed to day care centers, which then in a modified form (adapted after the needs) was used in the national program "*Eating healthy, growing healthy*" (EHGH) to evaluate its effectiveness. The research scheme is presented in Figure 1.

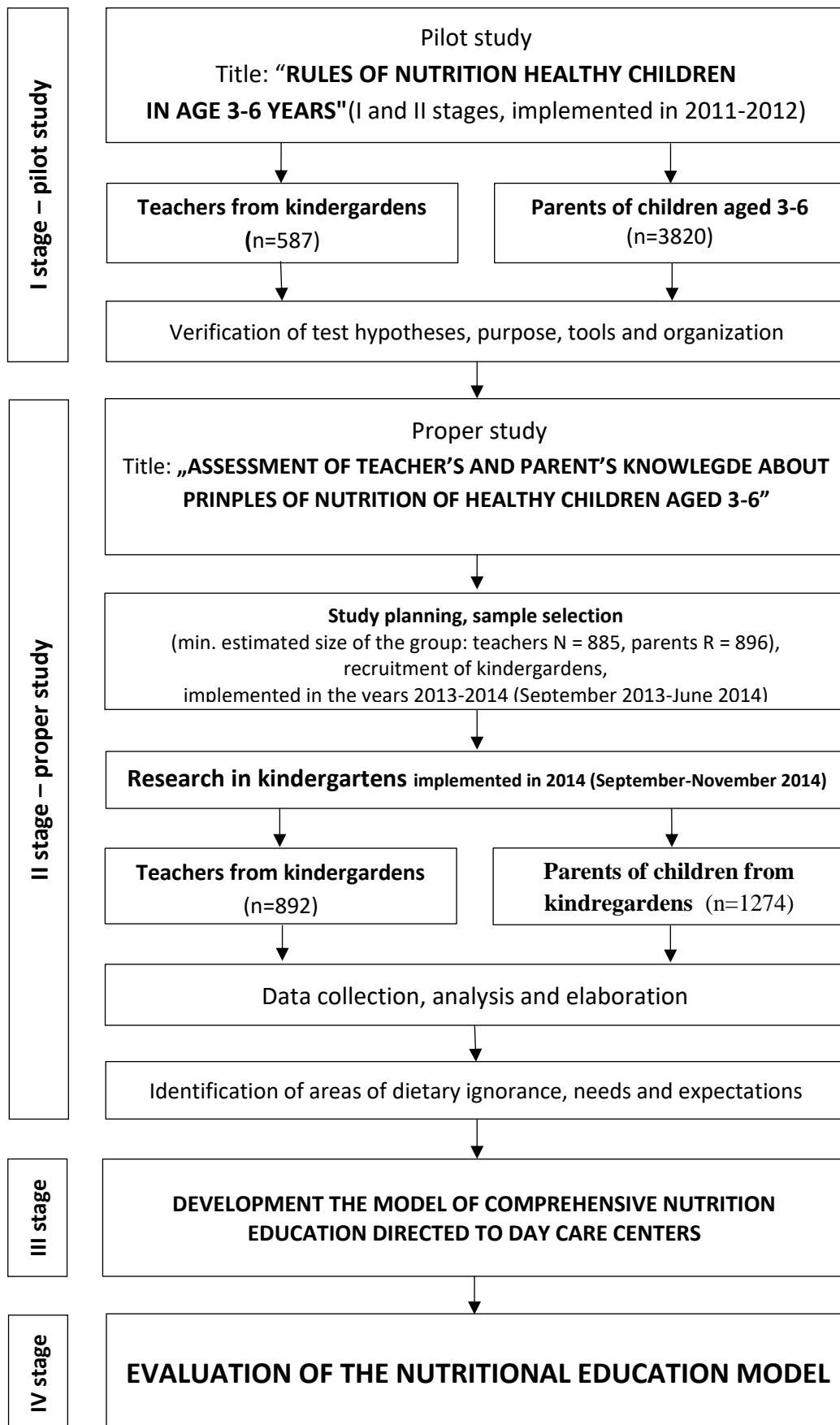


Figure 1. Scheme of the study

### 4.3.2 Materials and methods

The study group consisted of teachers of public kindergartens ( $n = 892$ ) and parents ( $n = 1274$ ) children aged 3-6.

The selection of the sample size for the test was made on the basis of The Central Statistical Office (CSO) data [52]. The total number of teachers employed in Poland in kindergartens in the 2013/2014 school year (68,406 people) and their structure in 16 voivodships in Poland (full employment and part-time employment) was the starting point for estimating the minimum sample size ( $N = 885$ ) and its percentage distribution in all voivodships. To estimate the minimum sample size for a group of parents, reference is made to the number of children covered by pre-school education in the school year 2013/2014 according to the CSO data [52]. It was 1 297.2 thousand. children, in the age group 3-6 years, 75.3% of children were subjected to pre-school education. The study assumes that one child has min. one parent / guardian. Estimated min. the number of parents was  $N = 896$ . In the estimation of the sample size for both groups (teachers and parents), the assumption of repeatability of the tested feature was assumed, it means the fraction size at the level of 0.7; maximum error of 3% and confidence level of 95%. The sample (teachers / parents) obtained in the study was slightly higher (the error rate for both completed trials was 3%).

The selection of the sample took place on the basis of **multiple random sampling** (multi-stage layered selection was used). First, voivodships were drawn, followed by towns and then kindergartens, in which the examined teacher was selected. The draw included a published, nationwide base of kindergartens. The research in institutions was preceded by obtaining the relevant consents. The study did not draw parents, they were initially informed about the study by a kindergarten that has already been recruited for examination; in the end, the institution brokered the parents' examination. It was assumed that in each randomly selected institution, which agreed, it will be tested by min. one teacher, and maximally number of teachers was same as number of age groups of children.

**Criteria for including** teachers in the survey: employment (full time /part time) in a public kindergarten, having the role of the educator of a given age group in the facility, oral consent to participate in the study and cooperation with the interviewer, answering all closed questions included in the composition of the interview. Teachers' interviews rejected due to failure to meet inclusion criteria - 2.3%.

**Criteria for including parents** in the examination: having a healthy child aged 2,5-6,5 who attends a public kindergarten, agreeing to participate in the study and correct completion of the on-line survey, answering all closed questions included in the questionnaire. Parent surveys rejected due to failure to meet inclusion criteria - 5.3%.

### **Assessment of nutritional knowledge**

Assessment of nutritional knowledge of teachers and parents was made using original interview questionnaires or surveys (the formulas of all tools are provided in the monograph). The tools included a certificate (in this part you asked about gender, age, code of your place of residence and the level of education). In the case of parents, the children's age was also asked, in the case of teachers, by the age group of the children whose teacher was an educator. The knowledge assessment was based on the questions contained in the second and third part of the questionnaire (the second part, compulsory to be filled in included 14 closed questions, one-time selection, the third part constituted 2 open questions, they were not obligatory). In the knowledge assessments, the answers to individual questions regarding this issue were analyzed. Subsequent analyzes concerned responses grouped into three types: "correct" answers, "incorrect" answers, and the "do not know" indication described in the study as "lack of knowledge". The analyzes separately used the number (sum) of individual categories of answers. Responses within each group were treated as equal. In the study, in the description of the results, the terminology "nutritional ignorance" was used. In this case the combined invalid responses and indications "I do not know" were treated.

The knowledge assessments also used the level of knowledge (total sum of correct and incorrect answers and indications of "lack of knowledge"). The questions included in the questionnaire were treated equally, but in this case they were assigned other ranks. The correct answer was scored as "1", incorrect answer as "-1" and lack of knowledge as "0" points. The number of closed questions was 14, so you could get a sum of points ranging from -14 to +14 points. Based on the distribution of points obtained and cut-off values Q1 and Q3 (respectively "0" and "4") in the group of teachers and parents in general, the following categories were applied and appropriate levels of knowledge assigned to them:

- lower  $\leq 0$  points, average 1-3 points, higher  $\geq 4$  points.

**Organization of the study**

Assessment of teacher's nutritional knowledge was made using CATI (Computer Assisted Telephone Interview) method. The research in institutions was preceded by sending an invitation by e-mail with information about planning the research, topic, purpose and scope. After the initial consent of the director of the facility, the teacher was appointed to the examination, from whom oral agreement was also collected. Subsequently, the test was carried out in accordance with the test protocol. The interviewer first informed the respondent about the topic, purpose and scope of the survey, and then assured about the anonymity and confidentiality of the collected data. Respondent also received complete information on how to use the collected data, its processing and storage time. After obtaining an oral consent from the respondent, the interviewer proceeded to the study, each time preceded by appropriate instruction. At each stage of the study, the respondent had the right to resign from participation in the study.

The assessment of the nutritional knowledge of parents took place through the kindergarten, which has already been recruited for examination and expressed the consent. The facility instructed parents on how to take part in the study. The parents' examination was voluntary. It was made using the CAWI method (Computer Assisted Web Interview), using a questionnaire carried out on-line. At the beginning of the study, the respondent received complete information on the topic, purpose and scope of the study and the method of using the collected data, processing and the time of their storage. The questionnaire contained instructions on how to respond. At each stage of the study, the respondent had the right to resign from participation in the study.

During the entire teacher survey, no data was collected on the staff, facilities and children attending it, no data of parents and their children were collected during the entire examination of the parents. Due to the above, at the time of planning and implementation of the study, the consent of the bioethical commission was not required.

**Statistical analysis of results**

The data was subjected to statistical analysis using the Statistica package in version 13.1. The quantitative data did not have normal distributions (verification by the Shapiro-Wilk test), therefore only non-parametric tests were used in the analyzes. For comparisons in groups, for the quantitative data, the Mann-Whitney U test and the Kruskal-Wallis test were used. Qualitative data were analyzed using the Chi-square Pearson test, for small groups of people ( $n < 20$ ) the results of the Chi-square NW test were recorded. Data cut points were used

for data categorization - quartiles Q1 and Q3. In the analysis of the level of knowledge, multidimensional correspondence analysis (Multiple Correspondence Analysis, MCA) was used. The analysis assumes a significance level of 0.05.

For the purpose of qualitative analyzes, the examined groups of teachers and parents were additionally grouped with regard to sociodemographic features: education, age, place of residence (all voivodships were included in accordance with the adopted administrative division). In the group of teachers, the age values for Q1 and Q3, respectively 30 and 46, were assumed as cut-off points; the following age groups were distinguished:  $\leq 30$  years, 31-45 years,  $\geq 46$  years. In the case of children whose teacher was a tutor, the following subcategories of age groups were distinguished: children aged 3, 4, 5 and 6 years. In the parents' group, the age values for Q1 and Q3 respectively 30 and 36 years were used as the cut-off points; the following age groups were distinguished:  $\leq 30$  years, 31-35 years,  $\geq 36$  years. In the case of children, the following subcategories of age groups were distinguished: children aged 3 (2.5 - 3.5 years), children aged 4 (> 3.5-4.5), children aged 5 (> 4.5-5.5 years) and children aged 6 (> 5.5 years-6.5 years).

### 4.3.3 Selected results and their discussion

#### CHARACTERISTICS OF THE EXAMINED GROUP IN GENERAL

The teachers participating in the survey are middle-aged people aged 38, the highest percentage of women, respondents with higher education. This characteristic is in line with the figure of the Polish teacher, whose average age is slightly higher [53]. Differences arise from the fact that in these statistics, the authors [53] have captured all teachers, and the surveyed group are only teachers from kindergartens who are habitually characterized by a younger age.

A comparison of teachers in kindergartens and parents of children aged 3-6 has shown a significant difference in their age, gender, education and place of residence. Teachers, compared to the parents, were characterized by an older age (38 years vs. 33), a higher percentage of women (98% vs. 91%) and people with higher education (93% vs. 69%). The silhouette of the examined parent, especially in terms of sex, remained consistent with other Polish nutritional studies, in which women, in comparison to men, habitually more often participate in this type of research.

**ASSESSMENT OF THE NURTIONAL KNOWLEDGE**

Based on the analysis of individual questions regarding nutritional knowledge, it was found that the highest percentage of teachers indicated that in the child's diet should be 4-5 meals. Teachers who pointed to a smaller amount may, next to ignorance, be guided by the fact related to the time of the child's stay in the institution, which is usually 5-10 hours [52], and at that time the child should receive min. 3 meals. In the question about salt sources, it was noted that almost 70% of teachers indicated that only salt and processed food were the source. Referring to protein sources, half of the teachers surveyed knew that meat and milk provide wholesome protein. Certainly, the sources of protein in a child's diet cannot be missing, which is why this knowledge has a purely practical dimension. In many studies, especially for young children, however, its excessive supply is noted [54]. Covering the demand for calcium by a glass of milk was a difficult issue for teachers. A good percentage of them had no knowledge, and less than every 5 people knew the correct answer. Appropriate participation of milk and its products in children's diets is extremely important [20, 55], however, as other studies indicate, the knowledge of the staff in this area is low [46]. Referring to the sources of vitamin C, more than half of the teachers surveyed knew that vegetables and fruits in any form are a valuable source of vitamin C. However, it is worth noting that a large percentage of the surveyed teachers considered only fresh vegetables and fruits as the correct answer. The next questions concerned the type of fat recommended in children's nutrition. On the first of them, a high percentage of people answered correctly that butter is recommended for spreading bread [55], but every tenth teacher indicated a mix of butter with margarine or margarine. Another question about the type of fat to prepare hot dishes was not so obvious, only half of the teachers knew the correct answer. Knowing how to choose the type of fat for the food you prepare is crucial in planning healthy meals for children [56]. Definitely better knowledge, than in the case of fat to dishes, teachers presented in relation to the drink to quench thirst. Only a small percentage of the teachers surveyed indicated juice instead of water. There is still a belief in the high nutritional value of juices in our society, which results in their frequent planning in menus for different age groups as well as over consumption or introducing them too early in feeding the youngest children [54]. Teachers showed relatively large, incorrect knowledge when asked about the source of sugar. Every third teacher pointed out that the source of sugar is sugar and sweets. Knowledge about the sources of sugar is very important especially when emphasizing its significant contribution to increasing the risk of many diet-related diseases. A large percentage of the surveyed teachers

did not know the pyramid of nutrition for children and could not correctly indicate what group of products should be consumed by the child in every meal. As emphasized by the authors of the Pyramid of Healthy Nutrition and Lifestyle for Children and Adolescents [20] it is a simple and general presentation of a comprehensive idea of nutrition, the implementation of which gives an opportunity for intellectual, physical and health performance in adult life, therefore it is a basic knowledge that should be shared by all those involved directly or indirectly in feeding children. The placement of vegetables and fruits on the food pyramid [20] as well as the knowledge that they should be in every meal of the child is also elementary knowledge [55, 56]. Balancing meals and choices about healthy snacks or products not recommended in the child's menu were not always correct in the group of teachers. As a balanced breakfast, 2/3 of the surveyed teachers chose a meal without vegetables / fruit. In this case also ignorance was noted of teachers about the fact that breakfast is the basic, main meal, and its planning should include such important products as vegetables, and / or fruits preferably in the fresh form [55, 56]. A healthy snack in the form of juice and cookies was indicated by almost every fifth teacher, and nuts / seeds and kefir / buttermilk as products not recommended for children until every tenth respondent. In many studies, the authors emphasize that the assortment of snacks served to children is not correct so knowledge of this topic would be very useful in order to eliminate these potential errors in feeding children.

To sum up the parents' knowledge it can be concluded that it was incomplete and, as in the case of teachers, the most incorrect answers were noted for sources of salt, sugar and coverage of the child's recommendation for calcium by a glass of milk. Parents also showed incorrect knowledge about the pyramid of nutrition for children, including its individual levels, which proves the need for education of this group in the general recommendations of children's nutrition. Knowledge of the basic recommendations of children's nutrition by those involved in their care, including parents and teachers, enables not only the use of this knowledge when preparing meals, but is crucial for people who spend several hours a day with their child. Teachers and parents are a role model for children, in this also have an important part in the dissemination of knowledge about nutrition and a healthy lifestyle.



## **RELATIONSHIP BETWEEN THE SOCIO-DEMOGRAPHIC FEATURES AND NUTRITIONAL KNOWLEDGE OF TEACHERS AND PARENTS OF CHILDREN IN THE PRE-SCHOOL AGE**

The analysis of the distribution of correct answers in the group of teachers showed that the highest percentage of them (22%) correctly answered 9 out of 14 questions diagnosed status of the nutritional knowledge. None of the respondents showed complete knowledge. The average score of correct answers for the group of teachers totaled 8. The analysis of correct answers in the group of teachers in general showed significant relationships with features such as education and place of residence. The highest average number of correct answers was given by teachers with higher education and respondents living in the kujawsko-pomorskie and dolnośląskie voivodeships as well as łódzkie and małopolskie voivodeships. The least correct answers were given by the inhabitants of the following voivodeships: opolskie, podlaskie and świętokrzyskie.

There was a statistically significant relationship between the teacher's incorrect knowledge and their education. The highest number of incorrect answers was given by teachers with the lowest education, and in turn the lack of knowledge concerned more often people with higher education. The place of residence of teachers was also significant. It was noted that more incorrect answers, as compared to the correct ones, were provided by teachers from the opolskie, podlaskie and świętokrzyskie voivodeships. In turn, the least incorrect answers were given by teachers from the kujawsko-pomorskie voivodeship. Considering the lack of knowledge, this type of cases was the most frequent among teachers in the łódzkie and podkarpackie voivodeships.

Summarizing all types of answers in the surveyed group of teachers, it was found that they were dependent on education and place of residence. Referring to the areas of nutritional knowledge - the most correct answers were noted in the case of the question about the best drink to quench the thirst for the child and incorrect answers in relation to dietary sugar sources as well as lack of knowledge in the case of questions about covering the child's calcium recommendation through a glass of milk.

The analysis of the distribution of correct answers in the group of parents showed that more than half of the respondents answered correctly for min. 8 out of 14 questions test knowledge about children's nutrition. The analysis of correct answers in the group of parents in general showed significant relationships with factors such as sex, age of the parent and age of child as well as education. The highest number of correct answers was given by parents aged over 31 years and people with children from the oldest age group (aged 6). Referring to

the remaining analyzed features, a larger number of correct answers was characteristic of women, in comparison to men and people with higher education, in comparison to other respondents. On average, the most correct answers were indicated by the inhabitants of the following provinces: małopolskie, warmińsko-mazurskie, mazowieckie, świętokrzyskie and podkarpackie, and the least lubuskie and podlasie.

The analysis of incorrect responses in the group of parents surveyed showed a significant relationship with factors such as the age of the child, the sex of the parent and his / her education. A higher number of incorrect answers was given by parents of young children, men and respondents with the lowest education. There were no significant differences regarding the place of residence.

Analysis of the lack of knowledge (indications "I do not know") in the group of parents in general showed significant correlations with their age and education. A greater lack of knowledge was characteristic of the youngest parents ( $\leq 30$  years old) as well as people with the lowest education (vocational / basic). Parents from the podlaskie voivodeship, followed by the Pomeranian and West Pomeranian voivodeships, were characterized by the greatest lack of knowledge.

Summing up the various types of responses in the examined group of parents, it was noted that they significantly depended on different, analyzed sociodemographic factors, in which the least dependence was demonstrated with a lack of knowledge. Referring to the areas of knowledge and nutritional ignorance - most parents knew that water is the best drink to quench thirst, while in turn did not know to what extent a glass of milk covers the child's need for calcium. The most incorrect answers were recorded in relation to the sources of salt in the child's diet.

#### **ASSESSMENT OF THE LEVEL OF NUTRITIONAL KNOWLEDGE TEACHERS AND PARENTS - MULTI-DIMENSIONAL ANALYSIS**

In addition, in the assessment of nutritional knowledge, the level of knowledge was used, which subsequently (in multidimensional analyzes), was analyzed taking into account previously identified significant sociodemographic features. Summing up the results of the multivariate analysis, it was noted that the higher and medium level of nutrition knowledge of teachers corresponded with different sociodemographic factors than in the case of a lower level of knowledge in this field. The higher and average level of teachers' knowledge was mostly connected with higher education and the female gender. In turn, the lower level of nutritional knowledge of teachers with at most secondary education occurred.

Summing up the analysis on the mutual dependence of teacher nutrition knowledge with areas of this knowledge, it can be noticed that the provision of incorrect answers concerned similar issues. Incorrect answers corresponded to the low level of nutritional knowledge of the study group. On the other hand, teachers who were assigned a higher level of nutritional knowledge were characterized by the highest number of correct answers. In turn, teachers with an average level of nutritional knowledge more often than others, indicated lack of knowledge. At the same time, it could be noticed that knowledge and ignorance (incorrect answers and lack of knowledge) were grouped into certain thematic areas. There was a grouping of issues on food sources of ingredients, selection of fat for bread and preparing hot dishes or quality recommendations (balancing meals, products indicated / not recommended, recommendations according to the pyramid of nutrition).

Summing up the multidimensional analyzes carried out in the group of parents, it was noted that with the highest nutritional knowledge the most correct answers corresponded. In this case, the smallest correlation was found with the lack of knowledge or incorrect answers. Similarly to the group of teachers, around the levels of nutritional knowledge of parents, the answers from similar thematic areas were grouped, including, for example, issues concerning fat in the child's diet or food sources of selected ingredients.

Summing up the whole of the above-quoted results, it can be concluded that teachers compared to parents were characterized by a higher level of nutritional knowledge. However in the assessment of nutrition knowledge, teachers less often, compared to parents, indicated their lack of knowledge.

### **EXPECTATIONS IN THE EDUCATION OF NUTRITION AND THE INTEREST OF TEACHERS AND PARENTS KNOWLEDGE OF NUTRITION**

The differences in the nutritional knowledge of parents and teachers found in the earlier parts of the work allowed us to suppose that they would represent different expectations and needs in the exploration of the secrets of this knowledge.

Based on the analysis of teachers and parents answers to open questions regarding expectations in this area, quite different results were obtained. Every fifth parent participating in the study did not declare any expectations in the field of education, and in the case of teachers, this percentage was much lower. In the same group, broadening their general knowledge was the most common, declared expectation of the planned education program. In addition, a large percentage of teachers answers concerned the improvement of knowledge and awareness not of themselves and of parents. Teachers also pointed to the need to make

parents aware of the essence of cooperation with the institution in a comprehensive program of nutrition education as well as the need to involve them and activate at every stage of such a process. Teachers also answered that as part of the nutrition education program, they expect to obtain teaching materials to work with children in kindergarten and to acquire knowledge that they can pass on to parents in oral form or, for example, in the form of folders or leaflets.

In turn, parents in the highest percentage indicated the acquisition of general knowledge and the opportunity to learn new tastes by children during such education. As part of the education program, parents also saw the opportunity to gain more knowledge about the nutrition of their children in the institution itself. Among the expectations they also indicated the need to acquire practical knowledge, such as how to prepare a healthy meal for a child and how to feed a child in a disease that requires a change in diet. However, deepening their theoretical knowledge or updating it was not the most important for parents.

Questions about the teachers and parents interest in nutritional knowledge were also open, and just as in the case of expectations, there were some discrepancies in both groups. This time, however, the lack of needs was indicated by a relatively small percentage of teachers and parents, although the group of parents showed a lack of interest in the subject, which concerned 6% of the respondents.

Teachers, as compared to parents, expressed the greatest interest in acquiring knowledge about composing healthy meals and menus as well as about products recommended and not recommended in children's nutrition. Teachers also pointed to practical knowledge, but not the one that relates to the nutrition of sick children.

In the group of parents, the highest percentage declared interest in general knowledge about child nutrition. However, every tenth parent indicated comprehensive knowledge, followed by knowledge useful for self-composing the child's menu or preparing meals at home. Parents were also interested in obtaining ready recipes for interesting and tasty dishes for children. To the least degree, they were interested in knowledge about the pyramid of nutrition, nutritional value or sources of nutrients.

In conclusion, it can be noticed that the general expectations regarding nutritional education and interests regarding the nutritional knowledge of teachers and parents were quite different. Teachers more often indicated the need for comprehensive activities, including the role of parents and children throughout the education process. In turn, the parents, to the greatest extent, declared the need to acquire general knowledge about proper

nutrition of children, although there were also people who were not interested in the subject of nutrition.

### **DEVELOPMENT OF THE NUTRITIONAL EDUCATION MODEL DIRECTED TO DAY CARE CENTERS**

The paper describes the nutritional education model with assumptions, the main goal and intermediate goals and individual stages. In the model, a public and non-public institution dealing with pre-school children was accepted as a day care centers. The model is addressed to kindergartens, kindergarten units and other forms of pre-school education that take care of children aged 3-6. It assumes a permanent and comprehensive cooperation of a day care centers with a children's home and a dietician.

The main goal of education is to provide children's nutrition in the facility and at home in accordance with current nutritional knowledge, including recommendations / standards for a given age group of children. Indirect goals related to the staff, the child and its parent / caregivers have been developed and described separately based on the knowledge obtained from the literature review and additional analysis of the empirical material collected during the study of nutritional knowledge of teachers from kindergartens and parents of children aged 3-6 (described in detail in monograph).

The scheme of nutritional education model (Figure 2) addressed to day care centers assumes four activities: enrollment, implementation, evaluation and outcome - obtaining results, which is important in the development of practical recommendations for feeding children sent to institutions. The work describes each of these elements in detail. The following is some of the content related to the education itself planned in the developed model and its evaluation. In the model, nutritional education is carried out by a trained dietitian, who after completing training courses aimed at acquiring theoretically practical knowledge and updating the knowledge already possessed becomes an educator and then educator is directed to the kindergarten in order to directly educate the staff, children and their parents. Education of teachers and other staff of the facilities includes a series of thematic trainings, consultations and lectures related to issues in the area of child nutrition, their health condition as well as eating behavior and organization of meals. The issues planned in the program result from the identified areas of nutritional ignorance and take into account certain expectations and needs declared by teachers from kindergartens in the completed study. Particular emphasis is placed on transferring practical knowledge, useful in composing menus in kindergarten. Nutritional education of parents includes, for the most part, the same issues, which results from the identification of similar areas of nutritional ignorance, both

among teachers and parents of children. The remaining part of the planned themes implemented in education training refers to the selected, most common expectations of parents declared in the answers in the previously discussed questions open from the study of the nutritional knowledge of parents. Particular emphasis is placed on providing parents with practical and useful knowledge for self-use at home when preparing meals for children. Parents' education will take place in kindergarten. It can be implemented as a separate training or together with the education of staff as well as together with children, e.g. in the form of thematic workshops. The topics covered in the education of children are, however, subject to certain modifications consisting mainly in adjusting the content to the age as well as the form and method / method of communication to the possibilities and perception of the group of recipients. The activities for children prepared as part of the model will be preceded by a consultation with the methodologist and / or other specialists dealing with work with children to whom it will be directed. Activities for children will be implemented mainly in the form of nutrition workshops with the use of various activating methods, competitions and techniques of art and methods for preserving desirable behaviors and health habits. Children's education should take into account the curriculum basic of pre-school education (issues related to health and care about it) provided in the school year in which the implementation of nutritional education is planned.

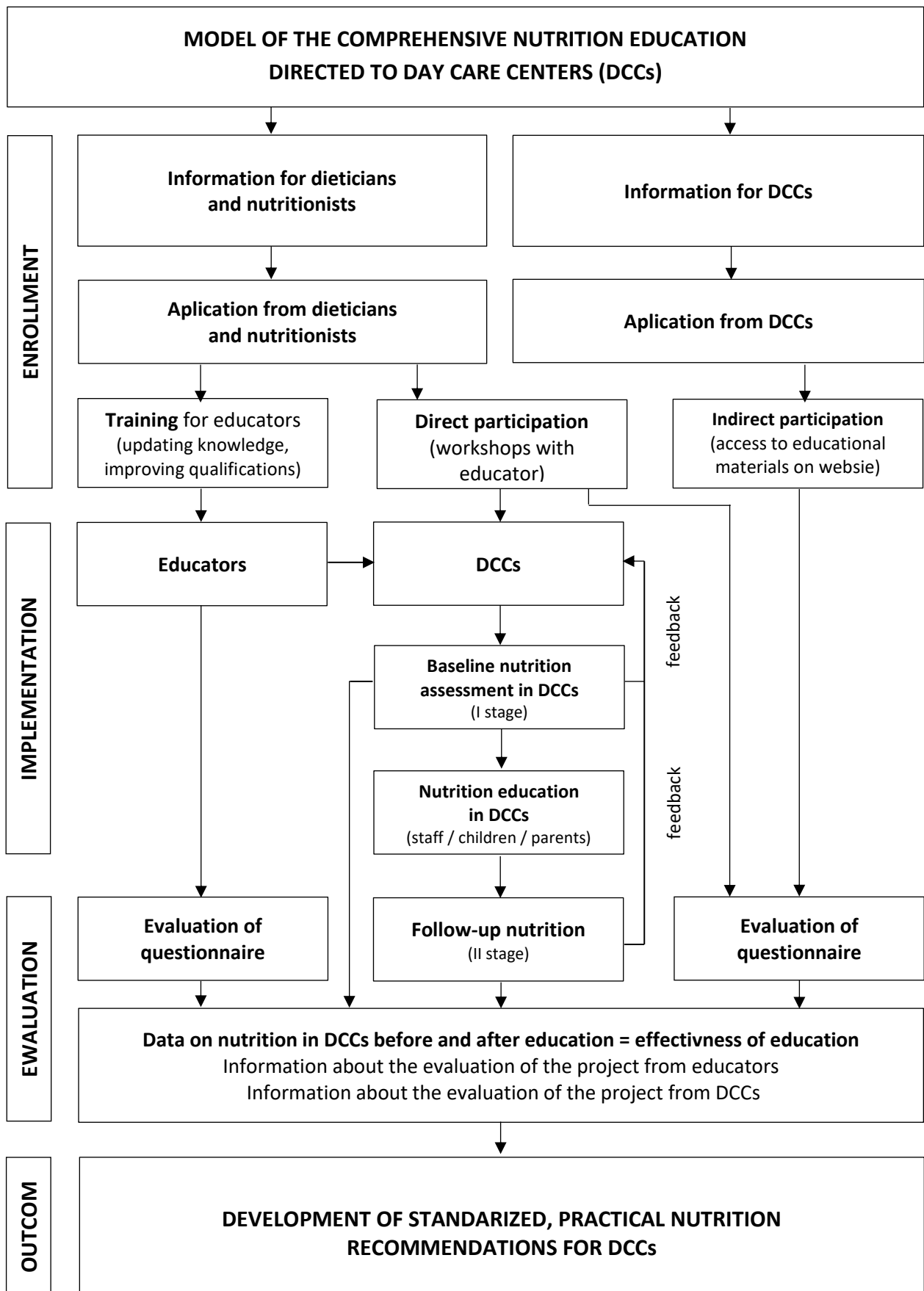
To sum up nutrition education, it is worth emphasizing that the planned scope should be modified depending on the emergence of new nutritional recommendations, updating knowledge in this area as well as the diagnosed state of nutritional knowledge among recipients of educational activities. In the education of the staff of the institutions, at the stage of preparing substantive content, education, place of residence will be taken into account, and in the education of parents, there will also be other sociodemographic features if it is justified. After completing comprehensive education in accordance with the presented model, it will be possible to implement additional activities, including, for example, training for staff or workshops for parents and children as well as individual dietary consultations (depending on the needs / expectations of recipients).

In the summary, it is worth referring to the evaluation, which is an important element of the nutritional education model, in the model is planned on the basis of data on nutrition carried out in the facility before and after nutritional education of staff, children and their parents (first and second stage of nutrition assessment). After each stage of such assessment, the institution is to receive feedback from the educator - a complete report summarizing the

collected material, including a quantitative and qualitative assessment of the nutrition organization in the facility and the planned menu. After the first stage, this information will be used by the institution to verify the implemented nutrition and make a possible correction under the influence of the implemented educational activities. After the second stage, the verification is repeated and the report submitted to the institution. In addition, information should be collected from the educators themselves and from the facility, which will also be used to evaluate the model. The evaluation is also to concern institutions that participate indirectly in education (without an educator). The entire data is to be reported using specially prepared, uniform evaluation questionnaires.

The final result of the project is the development of standardized, uniform and practical recommendations for children's nutrition in day care centers that could form the basis for planning nutrition in such facilities in the country.

Summarizing the whole model of nutritional education, it is worth emphasizing that it can be modified depending on the needs of educational programs, under which it will be used, including those adapted to other age groups of children than the group of pre-school children assumed in the model.



**Figura 2. Diagram of the nutritional education model**

Source: own description: Harton A., Myszkowska-Rygiak J.



**The model of nutritional education and its use in practice**

Designed model of nutritional education, after its modification was used in the national program "Eating healthy, growing healthy" (EHGH) implemented in the country in 2014-2017.

The originator of the program: NUTRICIA Foundation, financing: Danone Ecosystem Fund. The substantive partners of the program: Faculty of Human Nutrition and Consumer Sciences, SGGW-WULS in Warsaw, The Institute of Mother and Child, The Comenius Foundation for Child Development, The Academic Business Incubators.

The modification of the nutritional education model consisted: extending the scope of activities to institutions taking care about small child (up to 3 years old) - nurseries (originally the model assumed education addressed to kindergartens), focusing mainly on conducting direct education for the personnel of day care centers, and indirectly for parents and children, to refine the scope and subject matter of training for personnel of day care centers depending on the type of facility (nurseries / kindergartens), to specify the scope and subject of training for nutrition educators, including the specificity of child nutrition organization in the facilities where the program was implemented (nurseries / kindergartens).

**The usefulness and effectiveness of the developed model of nutritional education**

The nutrition education model used by the EHGH staff of the day care centers contributed to the improvement of the organization and quality of children's nutrition in these facilities. Favorable changes have already been shown in nurseries and kindergartens in many cities in Poland, including separately in Warsaw and Poznań [57, 58, 59, 60, 61].

Referring to the nutritional education of staff in the nurseries in Poznań [58], significant growth trends were observed in the amount of milk, fermented milk drinks and vegetables planned in the menus. Along with diets, a greater supply of calcium and iron was noted. Favorable changes in the supply of selected product groups, in particular the increase in the supply of vegetables and dairy beverages fermented under the influence of nutrition education were also demonstrated in other studies carried out in nurseries from Warsaw and other Polish cities [59]. Many Polish and foreign studies prove insufficient supply of vegetables and milk and dairy products in the toddlers diets [9, 10, 17, 30, 62, 63, 64, 65, 66] as well as calcium and other important diet components [13, 54, 67]. This situation confirms the legitimacy of undertaking education in this area, which may improve the quality of nutrition for small children [68, 69, 70, 71, 72, 73].

Other own studies also prove the beneficial effect of nutritional education of the personnel of day care centers in the field of supply and implementation of standards for

sodium, potassium, calcium, iron and iodine [60]. In this case, it is worth mentioning that the overall quality of nutrition in Warsaw nurseries, compared to the outlets from other cities, is better, which may be related to the fact that nutrition in the Nurseries Group of Warsaw is regulated by internal regulations [74], and remains under constant care of dietician, who supervises all included facilities. That is way demonstrating beneficial changes under the influence of education in nurseries from Warsaw is more difficult than in other facilities, where nutrition usually falls out worse [59].

Considering the nutritional education of personnel implemented in kindergartens in Poland, also in this case, beneficial changes were noted in our research [57,61]. The planned menus from kindergarten under the influence of staff education have seen a significant increase in the supply of cereal products and vegetables and fermented milk beverages, while reducing the amount of meat and meats product as well as sugar and sweets [57]. Also other own research carried out in nearly 500 kindergartens from all over Poland proved beneficial changes in the organization and quality of child nutrition under the influence of the education of the staff of these facilities [61]. Another measurable effect of the conducted educational activities was a significant impact on the range of beverages served to children for meals and during meals [61]. Under the influence of staff education, there has been a reduction in the supply of sweet drinks and an increase in the share of water in children's nutrition in kindergartens. This change is in line with the latest nutritional recommendations for children and adolescents referring to beverages and the share of sugar in the diet [75] as well as being in compliance with the current law on collective nutrition, including supply of drinks in educational institutions [68].

So far, only results from education in facilities with direct nutrition educator participation have been collected and developed. Actually, conclusions cannot be drawn about the effectiveness of the presented model of nutritional education in institutions in which the educator did not conduct any activities. Formulating final results in this area requires further analysis of the data.

Declarations of institutions regarding interest in the subject of the workshops were connected with declarations of changes that these institutions introduced [76, 77, 78]. Sugar and salt topics were the most popular, which was reflected in the daily practice declared by these institutions (reduction of sugar / salt supply in the planning of children's nutrition). Favorable changes were also declared in other areas of nutrition. Declarations concerning the translation of the acquired knowledge into practice underwent some changes, similarly as

interest in the subject and education itself during the course of the project [78], in 2015-2017 (education was implemented from 2015).

Throughout the education program, variable involvement of parents was noted [76, 77, 78], which, however, was not always satisfactory. These results were consistent with the results of the research presented in this study, in which there was a significant percentage of parents who were not completely interested in or declared no expectations related to the educational program. Such results often prove the observed passive attitude of parents. Even parents who are aware of mistakes, often do not take action on their own initiative, and the responsibility for improper feeding of children and shaping abnormal habits in them is a day care centers. In the evaluation of the ZJZR project, it was shown that the institutions assessed educational activities very well, as did the work of the educators themselves. In addition, they also declared a great interest in the future in similar educational programs, stressing, however, that they should be free of charge for them [76]. The fee for classes is crucial because the institutions often do not have a separate budget for additional educational activities.

The significant impact of the education of the staff of day care centers, as compared to the previous knowledge about the nutrition of their pupils, confirms its validity. In order to increase the effectiveness of such activities, they should be carried out comprehensively and regularly, including the update of knowledge and access to the latest recommendations, which will allow for constant updating of knowledge of those involved and responsible for feeding children in facilities.

#### **4.3.4 Final statements and conclusions**

- Nutritional knowledge of teachers and parents was incomplete, they answered correctly to more than half of the test questions, but also made a lot of mistakes.
- Nutritional knowledge of teachers was mainly related to their education and province of residence, and parents' knowledge in addition to their age and the age of the settled child. In the analyses of the level of knowledge, for both groups examined, there was also a certain dependence on the sex of the respondents. However, these results may be subject to a certain error due to the lack of preserved gender parities in the surveyed groups.
- The least ignorance of nutrition (at the same time incorrect knowledge and lack of knowledge) were characterized by the least educated teachers and parents. In the case of parents, they were more often younger and having a small child.

- In both groups, nutritional ignorance, including the number of incorrect answers, was greater than the lack of knowledge. Such a state of affairs in practice may mean that there is no need to acquire correct knowledge, or even unconscious dissemination of incorrect content. Incorrect knowledge of teachers and parents can be used in the following in the child's nutrition, including its quality and be passed on to the pupils and shape their eating habits and behaviors.
- The thematic areas of nutritional ignorance of teachers and parents were similar, related to each other and to the level of nutritional knowledge.
- Teachers, compared to their parents, were characterized by a higher level of nutritional knowledge, but less frequently than parents indicated lack of knowledge. Aware lack of knowledge may result in the desire and the need to search for it, although this was not confirmed by the frequency of declared expectations and needs of the respondents.
- Expectations of teachers and parents regarding nutritional education and their interest in dietary knowledge were different. Teachers more often indicated the need to deepen and update their knowledge, and parents to acquire general knowledge. Teachers more often indicated that acquiring knowledge in the rational balancing of the children's menu, which may have utility value in improving the quality of their nutrition. Parents often had no expectations regarding the education program and were not interested in acquiring knowledge.
- In the planning of future comprehensive nutrition education in day care centers, the declaration of teachers and parents about the general expectations and needs of gaining nutritional knowledge were very useful. Acquiring such knowledge has an extremely valuable added value, including an important practical dimension. The mere assessment of knowledge, especially made with a tool with closed-ended questions may not be sufficient in this regard to plan comprehensive educational activities.
- Used in the educational program "Eating healthy, growing healthy", the nutritional education model of staff from day care centers was effective in improving the organization and quality of planned child nutrition in those facilities where the program was implemented by a nutrition educator. Documented, beneficial changes have already been demonstrated in many institutions throughout Poland.
- Declarations of institutions regarding interest in the subject of the workshops were convergent with declarations of changes introduced by them in the children nutrition.

However, these changes were subject to certain modifications throughout the entire program. The outlets rated the entire educational program "Eating healthy, growing healthy", but the parents' commitment was not satisfactory.

### Results:

- The unsatisfactory level of nutritional knowledge of teachers from kindergartens and parents of children aged 3-6, indicated in the study, requires comprehensive, consistent and complementary educational activities. This education should be adapted in its content and methods to the identified areas of lack of knowledge and incorrect knowledge. Such planned educational activities create the possibility of limiting mistakes in feeding the youngest and its adaptation to current nutritional recommendations.
- In the planning of nutritional education addressed to day care centers, sociodemographic variables should be taken into account, in particular education and residence of recipients of educational activities (staff of institutions / parents). These factors determine the level of nutritional knowledge, which should be the starting point in the consideration of comprehensive nutritional education addressed to daily care centers.

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## 5 Discussion of other scientific and research achievements

The Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences, WULS-SGGW, Poland is a place with which I have been associated since 1997, when from the second year I started a uniform master's program. Previously I was associated with the Faculty of Chemistry of the University of Warsaw, Poland which, however, turned out not to be my life vocation and passion. I graduated in The Faculty of Human Nutrition and Consumer Sciences in 2002 with a very good result, which was made up of my high average of the entire study, a very well-graded master's thesis and a very good result of the diploma exam. Obtaining the title of master's degree was preceded by several months of professional practice (2000-2001) at Nutrition Department of The Institute of Mother and Child (IMiD) in Warsaw, Poland which was related to the implementation of my master's thesis. After a vigilant eye, Professor Halina Weker gained invaluable professional practice, knowledge and experience in working with children and adolescents with obesity and their parents. This practice resulted in writing a master's thesis entitled: "Analysis of the causes of overweight and simple obesity in adolescents aged 13-15 - nutritional and psychological aspects". From the psychological side, my master's thesis was taken care of by Mrs. Marta Barańska, MSc. from the Department of Early Psychological Intervention of the Institute of Mother and Child in Warsaw, Poland, and the supervisor from the WULS-SGGW was Sa'eed Bawa, Ph.D. The professional practice at the Nutrition Department of IMiD resulted in not only writing a thesis, but also my further interests in the area related to broadly understood prevention as well as dietary therapy of children and adolescents with simple obesity. The interest in the topic of obesity also prompted me in 2002 to become a member of the Polish Scientific Society for Obesity and Metabolism [Appendix no 3; point III.H], directed at this time by Professor Barbara Zahorska-Markiewicz, and this resulted in active participation in numerous thematic scientific conferences [Appendix no 3; point III.B]. Gaining a lot of practical experience contributed to the work at the Dietary Counseling of the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW, where from 2002 I am working with dietary treatment of children and adolescents with obesity. In the area of obesity, I also conduct training [Appendix no 3; point III.I.2] and lectures at scientific conferences [Appendix no 3; points: II.K.9, II.K.10, II.K.14]. I also deal with obesity as part of didactic work at the home Faculty, where I conduct lecture and exercise in prevention and diet therapy of obesity; in this area of nutrition I also conduct classes as part of post-graduate studies [Appendix no 3; point III.I.1.1].

In 2002, I took up doctoral studies at the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW, which I graduated in 2006. During these studies I did teaching classes with students at the same time improving my teaching skills at Postgraduate Studies in Pedagogical Excellence at the Faculty of Economics and Agriculture, WULS-SGGW, which I graduated in 2005 [Appendix no 3; point III.B.97]. During my doctoral studies, in the years 2002 - 2005, I had the great pleasure to work with outpatients in the Cardiology Outpatient of the Institute of Cardiology in Warsaw. Here, under direct care Mrs. doctor Alicji Solik-Tomassi, Ph.D. - internist and cardiologist and in cooperation with other doctors from this clinic, I carried out research for my doctoral thesis. This long-term cooperation allowed me to gain experience in dietary counseling of people with cardiovascular disease, including hypertension as well as obesity, type 2 diabetes and endocrine disorders, but most of all contributed to the writing of the doctoral dissertation titled: "Evaluation of the diet of men before and after diagnosing ischemic heart disease ". While writing a thesis, I drew experience from the knowledge of Professor Lucyna Narojek (WULS-SGGW), which was my promoter. The work was very well evaluated, including by reviewers (Assistant professor Grażyna Broda, Ph.D.; Institute of Cardiology in Warsaw, Professor Wojciech Roszkowski, WULS-SGGW), and public defense honored with a diploma for distinguishes her course [Appendix no 3; point. III.D.1]. The interest in the subject of cardiovascular disease has contributed to many trainings and active participation in conferences organized by the Polish Cardiac Society . In addition, knowledge in this area as well as knowledge about the prevention of other diet-related diseases acquired while working with cardiac patients resulted in establishing cooperation with the American publisher Nova Science Publishers and writing in 2008, in co-authorship, several chapters to the monograph "Research Trends in Nutrition for the Middle Aged and Elderly "[Appendix no 3; points: II.D.48, II.D.49, II.D.50].

My scientific interests from the perspective of years of work at the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW can be grouped into the following thematic groups (numbering of publications and conferences according to Appendix no 3, points.: II.A, II.D, III.B; other points: II.K, II.I, III.I, III.Q).

**5.1.1 Prevalence of overweight and obesity in adolescents as well as dietary counselling and its effectiveness in the treatment of simple obesity** (Appendix no 3, publications point: II.D.33, II.D.44, II.D.45, II.D.46, II.D.47; conferences point: III.B.5, III.B.7, III.B.8, III.B.82, III.B.93, III.B.94, III.B.95, III.B.96, other points: II.I.1, II.K.10, II.K.14, III.I.1, III.I.2, III.I.3.2, III.Q).

**5.1.2 Nutrition as an important element of secondary prevention of cardiovascular disease** (Appendix no 3, publications point: II.A.7, II.D.24, II.D.27, II.D.30, II.D.32, II.D.36, II.D.39, II.D.40, II.D.41, II.D.42, II.D.43, II.D.48, II.D.49, II.D.50, II.D.54, II.D.55, II.D.64; conferences point: III.B.14, III.B.16, III.B.23, III.B.24, III.B.28, III.B.29, III.B.30, III.B.42, III.B.49, III.B.54, III.B.56, III.B.57, III.B.58, III.B.59, III.B.71, III.B.77, III.B.80, III.B.85, III.B.87, III.B.89, III.B.90, III.B.91, III.B.92; other: II.K.3].

**5.1.3 Assessment of organization, quality of child nutrition and compliance with nutritional norms in day care centers** (Appendix no 3, publications point: II.A.1, II.A.2, II.A.3, II.A.4, II.A.5, II.D.2, II.D.3, II.D.6, II.D.7, II.D.8, II.D.10, II.D.11, II.D.52, II.D.53, conferences points III.B.1, III.B.2, III.B.3, III.B.4, III.B.12, III.B.34, III.B.35, III.B.36, III.B.39, III.B.40; other points: II.K, III.I.1, III.I.2).

**5.1.4 Evaluation of the diet of children and adolescents in the aspect of prevention of selected diet-related diseases** (Appendix no 3, publications point: II.D.4, II.D.5, II.D.9, II.D.14, II.D.16, II.D.21, II.D.25, II.D.28, II.D.57, II.D.58, II.D.60, II.D.63; conferences point.: III.B.8, III.B.9, III.B.10, III.B.11, III.B.15, B.18, III.B.19, III.B.20, III.B.61, III.B.66, III.B.70, III.B.76, III.B.79; other points: II.I.2, III.B.97, III.I.1.1, III.I.3.1, III.I.3.2, III.I.3.3, III.Q).

**5.1.5 Nutritional knowledge, diet and nutritional status of women as an important element conditioning their health** (Appendix no 3, publications point: II.A.6, II.D.1, II.D.12, II.D.13, II.D.15, II.D.17, II.D.18, II.D.19, II.D.20, II.D.22, II.D.23, II.D.26, II.D.29, II.D.31, II.D.34, II.D.35, II.D.37, II.D.38, II.D.51, II.D.56, II.D.59, II.D.61, II.D.62; conferences point: III.B.15, III.B.27, III.B.41, III.B.46, III.B.48, III.B.51, III.B.55, III.B.62, III.B.63, III.B.64, III.B.65, III.B.67, III.B.68, III.B.72, III.B.73, III.B.74, III.B.78, III.B.83, III.B.86, III.B.88].

## 5.1 Discussing work in thematic groups

### 5.1.1 Prevalence of overweight and obesity in adolescents and dietary counselling and its effectiveness in the treatment of simple obesity

Obesity in children and adolescents has been the subject of my interests since the beginning of my studies, and I have been deeply interested in my professional work. This disease is an important public health problem that has been observed in many countries of the world for many latest years [1]. Over the last decade, the prevalence of obesity has been increasing, which is particularly evident in the countries of Eastern Europe, where it was relatively low at the beginning of this century, while in other countries there is a relative stabilization or a small downward trend [2]. Children's obesity determines many different sociological, physical and psychological problems that have a significant impact on the quality of life of the child, his family and the environment in which he / she lives [1, 3]. The psychological aspect was examined and interpreted by me (in close cooperation with a psychologist) in my master's thesis. I proved then that adolescents with overweight or obesity, in their peer groups felt quite well and were liked, but every 10th girl was unnoticed and / or rejected by the environment. In addition, I noted that there was a correlation between the actual body mass index (BMI) of adolescents aged 13-15 and their perception. In the same study, I also showed that overweight interfered young people in their daily lives, and the lack of satisfaction with their own appearance (perceived negative self-image) motivated them to change towards excessive body weight.

The psychological aspect taken in working with patients with obesity was one of the elements of my initial interests in this subject. The main stream, however, concerned nutrition, including nutritional behaviors and the effectiveness of diet therapy suitable for the treatment of obesity in adolescent children. Inappropriate lifestyle, including inadequate nutrition alongside low physical activity or lack of physical activity may be an important risk factor for simple obesity in children and adolescents [4]. Based on this knowledge, I undertook research related to the identification of nutritional risk factors for obesity in adolescents [II.D.47, III.B.96]. My research carried out in the group of adolescents with obesity confirmed the fact that the problem of excess body weight diagnosed in them was mainly caused by their poor nutritional behavior. More than half of the surveyed girls and every second boy consumed only three meals a day, and the physical activity declared by them in most cases was only a walk and had a seasonal character. Young people when asked, in this study, for describing a free time, often indicated spending it in front of the TV and listening to the music.

Passive forms of spending free time by young people are also indicated by other Polish and foreign studies carried out as part of the Health Behavior in School-Aged Children (HBSC) Study [2, 3]. Passive forms of spending free time by adolescents with excess body weight were also demonstrated in the next study [II.D.46]. Selected aspects of the lifestyle, including the results of physical activity of obese teenagers aged 13-19, I also analyzed in a large, nationwide study (total number of respondents  $n = 14,044$ , including those with overweight or obesity  $n = 930$ ) [Appendix no 3, point II.I.2]. The results of this study were presented at a press conference summarizing the entire project [Appendix no 3, point II.I.2] and at an international conference [III.B.8]. In my research, it has been shown that overweight or obese children spend 3 hours a day watching TV, while young people with normal body mass spend less time during the day.

Another aspect of my research was the assessment of the energy and nutritional value of the diet of adolescents with overweight and obesity and the structure of their products they consume [II.D.45, III.B.31, III.B.32, III.B.60, III.B.94]. I proved that adolescents consumed higher than recommended amounts of total fat (35% of diet energy), which is an important nutrient risk factor for overweight or obesity. Regarding the structure of consumption, I noticed that overweight or obese youth consumed too little milk and dairy products, vegetables and fruits that are a source of vitamin C, rich in carotene and other products from these groups as well as whole grain breads. Such a structure of the diet resulted, among others, insufficient supply of fiber, calcium, potassium and antioxidative vitamins A and C [II.D.44, III.B.95].

In the case of children with obesity, the composition of the body and its change under the influence of diet therapy were interesting. In studies carried out in the group of overweight or obese children [II.D.46, III.B.93], the aim of which was to assess the body composition made by the bioelectrical impedance analysis (BIA) method [5], using the Bodygram software, I proved that recommended individual dietary treatment lasting min. 6 weeks did not contribute to a significant decrease in body mass index, but BMI caused significant changes in body composition. These changes were characterized by changes in the proportions of individual body components, including a reduction in fat tissue (FM, fat mass) with simultaneous increase in muscle mass (MM, muscle mass) and a negligible increase in the body's water content. These changes were greater in the group of boys than girls. The assessment of body composition and its monitoring in the course of dietary treatment are important from the point of view of assessing the effectiveness of the treatment of obesity treatment. Scheduled diet therapy must be adapted to the child's age and it must not interfere

with its growth and development. The supply of all nutrients, except for total fat and carbohydrates, especially simple sugars and sucrose, should be consistent with the child's needs according to dietary standards, and adjusted to his state of health and physical activity, as well as the energy value of the diet. To correctly estimate the energy value of the diet, and then adjust the caloric deficit to the degree of overweight, in the first place you need to estimate the basic energy needs of the patient. Precise determination of energy demand is not simple, however, because it is determined by many factors, including energy expenditure, which in turn depends on from genetic factors or body weight, including muscle mass and adipose tissue. Therefore, in dietetic practice, it is important not only to assess the composition of the body, but also the energy expenditure. The basic or resting energy expenditure can be assessed on the basis of a mathematical formula, which, however, may be burdened with a certain error (underestimation / overestimation) or measure it. In my scientific work I also dealt with the use of more objective measurement methods for estimating the basic metabolic rate (BMR) as well as resting metabolic rate (RMR) for better, more precise matching of energy needs to the actual needs of patients, including children and adolescents with simple obesity [II.D.46, III.B.93]. In this study, RMR was measured using indirect calorimetry (IC) [6], which is a non-invasive, simple and fast measurement method, which, however, requires specialized equipment. Based on the conducted study, it was found that boys were characterized by a higher RMR value, compared to girls, similarly to older adolescents (13-15 years), compared to a slightly younger one (12 years). During the dietary treatment of this group of adolescents, after 6 weeks, an increase in RMR was observed in the group of younger girls with a simultaneous decrease in RMR in both age groups of boys (12 and 13-15 years). These declines may have resulted from the decrease in energy consumption in accordance with the recommended diet therapy or the adaptation of the body to a reduced calorie diet. The RMR value is related to the amount of food consumed, but also the composition of the body, including the share of lean body mass (LBM). The fall recorded in the study should be considered as incorrect, and these results should be treated only as a pilot due to the small group. This professional experience was for me a valuable, practical experience in working with obese children and adolescents with excess body weight, as well as subsequent experiences that I gained during the course of diet therapy in this age group [II.D.45, III.B.94]. My research proved that the dietary treatment with a low-energy diet (1200-1400 kcal) according to the recommendations of the Institute of Mother and Child [7] was already effective in the treatment of obesity in adolescents within 6 weeks. In the study group,



I recorded a decrease in body weight, BMI body mass index values and arm circumferences, and these values were more significant in the boys group, compared to girls. Changes in body weight resulted from the introduction of beneficial changes in nutrition, including a significant reduction in diet calorie (on average by 380 kcal), total fat (on average by 20 g) and carbohydrates (on average by 48 g) and no changes in protein intake. Favorable changes in the way of nutrition and nutritional status under the influence of the applied dietetic therapy have also been demonstrated in another study in which children with simple obesity participated [III.B.26, III.B.81].

In my professional work, I spent a lot of time researching the assessment of nutritional status, including the incidence of overweight or obesity among teenagers from our country. These studies, organized by the Polish Society of Dietetics, were carried out in 2013-2014, in 207 middle and upper secondary schools (they constituted 10% of all such schools existing in Poland in the years of the study). Schools for study were randomly stratified, they represented 2058 schools that volunteered to participate in the scientific and educational program "Wise nutrition, healthy generation", which I was a coordinator from the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW. In total, 14,044 students aged 13-19 were included in the study. Before starting this study, his methodology was developed, in which I took an active part [II.I.2] and trained dietitians (in which I also took part [II.I.2]), who in turn followed the anthropometric measurements in accordance with the test protocol. Body mass and height measurements were made according to the recommendations of the National Health and Nutrition Examination Survey (NHANES) [8], then the BMI values were estimated and the results were referred to the relevant standards [9, 10] and centile charts [11] and then interpreted. Based on the research, it was found that overweight occurred in 11.6% and obesity in 6.6% of students of Polish schools that participated in the study. The problem of obesity to the greatest extent concerned boys from the youngest, from the examined age groups (boys aged 13 vs. the other). These results have not been published yet and are currently being prepared for publication. Until now, they were presented at a press conference summarizing the project [II.I.2], have been developed in the form of a report [II.E], and were presented at an international conference [III.B.5] and national [III.B.17, III.B.33]. The prevalence of overweight or obesity in teenagers diagnosed in my study in Poland is in line with the results of other studies of this age group [12]. The result of the program, including the assessment of the occurrence of overweight or obesity in the adolescent group studied was the organization of dietary counselling for them, implemented according to the standards

in which I took an active part [II.I.2]. This counseling was organized in schools from which students from the program and proceedings came, and implemented by dieters participating in the whole program, who were additionally trained for this purpose [III.I.2]. The students participated in the counseling voluntarily, minors with their parents / guardians or in the company of the teacher, their participation was free. Organization of dietary counseling implemented as part of the "Wise nutrition, healthy generation" program was presented at an international conference [III.B.7]. These data are currently being prepared for publication.

In the aspect of obesity, I also conducted studies referring to the use of functional foods by patients in order to reduce body weight [III.B.21] and evaluation of economic aspects of selected weight loss diets [III.B.25, III.B.69, III.B. 82]. In my scientific work I also dealt with the subject of sweeteners used in the prevention and treatment of obesity [III.D.33]. The results of the above tests may also be used in dietary management in obesity in children and adolescents, as in this age group selected functional food is used, is looking for sugar substitutes and also the cost of diet is estimated. The scientific experience and knowledge gained in the aspect of dietary treatment of overweight and obesity in children and adolescents allows me to practically practice professional practice at the Dietetics Counselling at the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW [III.Q] as well as lead thematic didactics [III.I.1] and disseminate knowledge in this area in the society [II.I.1, II.K.10, II.K, 14, III.I.2, III,I.3.2].

To sum up this area of my research, I consider it particularly important to participate in studies on the prevalence of overweight and obesity among adolescents in Poland (n = 14,044). The study was carried out using the measurement method, which allowed us to obtain data of high reliability and reliability, these results are unique in the scale of our country because the majority of research conducted in this age group in Poland is conducted only through an interview or self-reporting. Another fact worth emphasizing in this area of my work was the continuation of the activities undertaken, i.e. organization of dietary counseling for adolescents diagnosed with overweight or obesity during the study. My other research carried out in this area is a valuable experience for me, which makes a significant contribution to my work in diet counseling with children and adolescents with obesity.

### **5.1.2 Nutrition as an important element of secondary prevention of cardiovascular disease**

In my professional work, patients with cardiovascular diseases took an important place. The importance of nutrition, including individual nutrients as well as product groups, is well

described in the literature [13, 14, 15]. Nutritional recommendations for people with lipid disorders and cardiovascular diseases, including hypertension refer to the calorie diet and precisely define the participation in the diet of saturated fatty acids (NKT), trans fatty acids (KT trans), as well as the supply of polyunsaturated fatty acids (PUFAs) n-3 and n-6, dietary fiber, minerals such as sodium and potassium and selected B vitamins. In the group of essential products, the role of vegetables and fruits, fish, nuts and alcohol is increased, and in recent years, also on the legitimacy of limiting the share of non-alcoholic beverages with the addition of sugar [13, 14].

In my research, I evaluated the diet of patients with cardiovascular diseases and hypertension [II.D.24, II.D.27, II.D.30, II.D.32, II.D.36, II.D. 39, II.D.40, II.D.41, II.D.42, II.D.43, II.D.54, II.D.55, II.D.64]. Based on the nutritional quality of men (n = 210) from Warsaw and the surrounding area [II.D.39], with the use of the Diet Quality Index (DQI) [16], I found, that menus were more than half of them too large, compared to the recommendations, the amount of total fat, NKT and dietary cholesterol. According to nutritional recommendations, the total fat should not exceed 30% of the energy of the diet, which is, to a large extent, dependent on body weight, and NKT 7% of the energy of the diet [14]. In the majority of men included in this study, I also showed high sodium intake (> 3400 mg / d), in 2/3 of them too low calcium in everyday menus. Only every 8th person consumed 5 or more portions of vegetables and / or fruits daily, and every 7th patient consumed, min. 6 portions of cereal products. Vegetables, fruits and cereal products are a dietary source of fiber, which supply in the amount of 30-45 g / day is recommended in the prevention of heart disease [14]. Fiber affects the peristalsis of the entire gastrointestinal tract, and its soluble fraction is additionally beneficial also to the lipid profile and carbohydrate metabolism, which is important especially in patients with heart disease. Nutritional recommendations related to fiber supply, however, are different and dependent on the disease. Therefore, it is reasonable to analyze the diet of patients in terms of fiber content, which was raised in my other work also presented at the conference [II.A.7, III.B.14].

In the next assessment of nutrition of patients with coronary disease [II.D.30], in which I compared their diets with food rations with controlled content of fatty acids [17], I proved that over half of the subjects consumed too small amounts of milk and cheese and vegetable oils, and too much meat products and sugar. The implementation of the ration significantly differentiated the age of the respondents, including younger people (under 60),

consumed more meats, meat products and fish, and older people (over 60 years) had more milk. Consumption of selected products such as, for example, fish may depend on the socio-economic status (SES), and others associated with certain traditions and habits (for example, milk in the older age group). The relationship between SES and the structure of consumption of products, especially those with a beneficial impact on health, is indicated by other studies [18]. Fish, especially sea and fatty in accordance with the recommendations for nutrition for people with heart disease should be in the diet in an amount of at least 1-2 portions per week. Too low fish consumption is a big mistake, but in Poland quite commonly reported, as already demonstrated in older study [19].

The subject of compliance with dietary recommendations by elderly people with heart disease continued in my next article. Meeting the recommendations is not easy, especially for the elderly, who have many of their habits also in the area of food and nutrition. In a study, in a group of 132 men with ischemic heart disease (IHS), over 60 years of age [II.D.43], I proved that these people did not follow the recommendations for supply with the NKT diet, the amount of which should be below 7% of energy diets, their diets were also characterized by a higher than recommended (below 300mg / d) content of dietary cholesterol. A greater share of NKT in the diets of older men, compared to younger ones, was also demonstrated in the results of another work [III.B.80]. In this case, it was found that older men, more often than younger, consumed animal products with higher fat content. Such tastes may pose great difficulties in changing eating habits, and thus impair their compliance with nutrition recommendations in the disease.

In subsequent analyzes of the diets of patients with cardiovascular disease, the influence of education was revealed [II.D.43]. However, it did not concern the supply of individual components of the diet, and the structure of the diet. It was noted that people with higher education, compared to the others with secondary or vocational / basic education consumed less sources of saturated fat and animal fat in total, and more vegetable fat oils, fish and fruit. Higher education may be associated with greater nutritional knowledge, understanding of recommendations and higher nutritional awareness, which may significantly translate into better adherence to nutrition recommendations. The influence of education in compliance with recommendations is also indicated by my other research on people with heart disease [III.B.29], in which the issue of body mass is also raised. Nutrition recommendations for people with cardiovascular disease pay attention to their body weight. Obesity is an important risk factor for cardiovascular disease, it may increase the risk of lipid

disorders, disturbances in carbohydrate metabolism in these patients as well as worsen the prognosis in the disease itself [14].

In nutrition of people with cardiovascular disease, especially with obesity and a history of cardiac incidence, special attention should be paid to the calorie content of the diet as well as the proportion and quality of fat. My research was also carried out in this area [III.B.80]. 140 men with ischemic heart disease, myocardial infarction and excessive body weight were involved in the assessment of diet. The subjects were divided into two age groups: below and over 60 years (respectively:  $n = 55$ ,  $BMI = 28.7\text{kg} / \text{m}^2$  and  $n = 85$ ,  $BMI = 27.3\text{kg} / \text{m}^2$ ). The usual frequency of consumption of fat source products in the diet was determined on the basis of the Food Frequency Questionnaire (FFQ), 5 stages of frequency were used (from "I do not eat" to "5 times a week"). It was noted that the diets of the studied people were characterized by a high share of vegetable fats, which are a valuable source of fatty acids, which have cardioprotective effects.

In the aspect of cardiovascular diseases, the B group vitamins, including vitamin B6, B12 and folic acid are important [14, 15], because they takes part in the metabolism of homocysteine. I took up this topic in one of my plenary lectures [II.K.3]. The purpose of the menu analyzes of people with heart disease, which I presented at the cardiological conference [III.B.85] was to estimate the dietary intake of selected B vitamins (B1, B2, B6, B12, folic acid), which was made on the basis of 3 days menus ( $n = 630$ ). In the study, I showed higher, compared to the recommendations, dietary intake of vitamins such as B1, B2, B6 and PP, and close to the recommendations of vitamin B12, and lower folic acid.

In other publications concerning this group of patients, I undertook the subject of adherence dietary recommendations and the seasons [II.D.40]. The significant impact of the season on the nutrition of men with IHD was revealed while taking into account the age of the respondents. In the nutrition of younger people, compared to older people, there was a higher share of favorable menus in the autumn and winter season.

Compliance with dietary recommendations by patients with heart disease may be determined not only by their age, education or past cardiac incident, but also by the duration of the disease, place of residence or their personality. This issue along with other factors I refer to in the publication in which I refer to non-nutritional factors [II.D.32]. In the literature on the topic, for many years, the issue of personality and its relation to heart diseases has been raised [20, 21, 22]. The influence of personality on nutritional behavior cannot be overlooked. For this reason, my interest also concerned this issue. In cooperation with a

psychologist, in the group of 210 people from IHD research was conducted using the NEO-FFI Personality Inventory by Costa and McRae [23], which defines the main personality dimensions such as: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. Based on the results [II.D.36], I found that the nutritional behaviors related to the frequency, portion size and regularity of meals and body mass of the men participating in the study, to a different extent, were related to personality traits such as neuroticism, extraversion, agreeableness and conscientiousness. Patients with a high level of agreeableness and conscientiousness compared to the other men were characterized by better compliance with the diet. This dependence was also confirmed in another Polish study of people with lipid disorders [24]. In my next study [II.D.64] I found that the quality of nutrition of people with IHD may be affected by personality traits such as openness to experience and neuroticism, related to the level of education. In the group of younger people (<65 years), compared to older people (≥65 years), I noted a higher percentage of people characterized by high levels of extraversion and agreeableness, which may affect better diet compliance. In addition, among men with the lowest level of education, compared to the others, there was a lower percentage of people with low neuroticism and high openness to experience, which may in turn affect the diet's worse compliance.

In my other publications, I was involved in the implementation of dietary recommendations before and after diagnosing coronary heart disease (CHD) [II.D.41], the results I received were subjected to many statistical analyzes also using the confidence areas for probabilities of polynomial distribution [II.D.42].

I devoted separate publications to patients with arterial hypertension [II.D.24, II.D.27, II.D.54], in which I assessed the knowledge and adherence to recommendations [II.D.24], I analyzed the impact of diet [II.D.27] [II.D.27] [II.D.27]. Due to the fact that cardiovascular diseases are associated with comorbidities such as obesity and diabetes, I also undertook these issues in my monograph publications [II.D.48, II.D.49, II.D.50].

In my research I also pointed out non-pharmacological methods of treatment of cardiovascular diseases, including used phytotherapy [II.D.55]. Phytotherapy is part of alternative medicine, and its use in the prevention of cardiovascular disease has been confirmed in research [25, 26]. However, it should not be used by patients alone, without consultation with a doctor, because ignorance in this respect, also in relation to the possible interaction of herbs with medicines can result in serious health consequences. In a group of 74 women and men with cardiovascular disease over the age of 40, I have proved the use of

herbs practically by half of the subjects, but only every third of them consulted a doctor before taking a phytotherapy. This proves the fact that patients independently reach for herbal preparations. In my study, patients were knowledgeable about herbs mainly from the experiences of other members of their family and from friends. Such a practice is definitely not recommended in the case of people who are ill, especially because they use phytotherapy to improve their health.

The results of my research on the assessment of the diet of people with heart disease, including myocardial infarction and the influence of non-nutritional factors on their compliance in the disease were presented at numerous national conferences [III.B.16, III.B.23, III.B.24, III.B.28, III.B.29, III.B.30, III.B.42, III.B.49, III.B.54, III.B.56, III.B.57, III.B.58, III.B.59, III.B.71, III.B.77, III.B.87, III.B.89, III.B.90, III.B.91, III.B.92].

To summarize this area of my research, it is worth emphasizing their multifaceted nature. Patients with cardiovascular disease were examined not only in terms of diet. In the studies, I also took into account the personality of patients, which may significantly determine the effectiveness of dietary counseling. In addition, I undertook the subject of non-pharmacological methods of treatment, education and its impact on the implementation of dietary recommendations as well as considered the occurrence of associated diseases. This comprehensive approach allows better planning of dietary counseling for patients with cardiovascular disease, where nutrition is an important element of therapy.

### **5.1.3 Evaluation of the organization, quality of child nutrition and compliance with nutritional norms in day care centers**

In the case of the youngest children who attend day care centers and spend an average of 5-10 hours a day there, home nutrition is a part of the total nutrition for this age group during the day. Indeed, it is parents who are most responsible for feeding young children, but in this situation the institution is also very responsible, and the teacher's knowledge can play a significant role, which was the subject of my analysis, I presented at the 7th DIETS conference organized by The European Federation of the Associations of Dietitians in 2013 in Italy [III.B.12]. According to the Act on the care of a young child [27], the nursery should follow the nutrition standards [28], and the kindergarten is additionally obliged to comply with the provisions of the Regulation of the Minister of Health of 26 July 2016. [29]. When implemented by day care centers, min. 3-4 meals are expected to have min. 70-75% of the demand for energy and nutrients. Due to this fact, my interest also included organization and

nutrition carried out in day care centers. As part of the nationwide project "Eating healthy, growing healthy" [II.I.3], in which I was the deputy project manager on behalf of the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW, as well as one of the main contractors, a study was planned to assess the organization and quality of children's nutrition in nurseries and kindergartens throughout Poland. Prior to this study, I took part in the development of a complete methodology to collect the data [II.I.3]. The methodology and the entire program were presented at an international conference [III.B.3, III.B.4]. I was also a co-author and reviewer of the reports which were sent to the outlets after analyzing the diet, in order to indicate the mistakes made by the institutions in the organization and quality of child nutrition. About 4,000 such reports were created during the whole program as well as about 20 000 1-day menu were analyzed.

As part of the conducted research, in 128 public and non-public crèches, which covered the care of 8182 children [II.D.2], I proved that half of the examined institutions planned in their menus the share of whole grains, almost all gave fresh vegetables and fruits to children, including every third in every meal. Most often, compote was served during meals. Access to the water between meals offered children the majority of examined places. The quality of the diet varied due to the type of institution (public, non-public). Depending on its type, the diversity in the range of salting and sweetening dishes were noted. In this study, I also analyzed the dependence of nutrition on the feeding rate (the amount of money allocated per day to feed a child in a DCC), which often significantly determines its quality. In my research, I showed that public institutions had a much lower rate of non-public nutrition, most of them ran their own kitchen and did not have a dietitian. Despite the higher rate of nutrition in public nurseries, I have observed some mistakes in the planning of child nutrition, which in practice means that nutrition is not determined solely by the nutritional rate.

The importance of the nutritional rate, in addition to the presence of a dietitian and the type of cuisine, was also demonstrated in another nationwide study referring to the organization and quality of children's nutrition from 211 crèches (they constituted 10.8% of all existing facilities in Poland in 2015) [II.A.1]. In this study, however, the subject of my analyzes was mainly the type of milk given to children. Milk is a very important product, especially in the nutrition of infants and young children, and its range should be matched to the child's age. In my study, I took into account two age groups - infants and young children (children aged 1-3). I proved that cow's milk was given in Polish nurseries already to infants, which was more common practice in non-public establishments compared to public ones.



However, giving cow's milk to infants does not comply with the recommendations for this age group [30]. On the other hand, maternal milk was more often given to children in non-public settings. However, its use in outlets is subject to many legal requirements related to, e.g. with safety [31, 32]. This situation may discourage the practice of using mother's milk by day care centers.

Another aspect of the quality of child nutrition in the day care centers that I researched was the range of children's drinks served to meals as well as between them. This issue is of particular importance in the context of the growing number of overweight and obese children in our country in recent years. The problem of excess body mass is particularly present in the group of younger children [33], and completely does not bypass the youngest [34]. In my study on nurseries, the results of which were presented at an international conference [III.B.2], I showed that the most often served in these establishments was a compote, followed by tea, and then water. In my other study on this time, kindergartens [II.A.5], I showed a similar structure of drinks served to children - in this case also the compote was given to children most often.

Another area of my research related to the organization and quality of children's nutrition in Polish day care centers as well as their compliance with standards [28] and nutritional recommendations for those age groups over whom care institutions were looked after. I carried out my research both in nurseries and in kindergartens. Preliminary results of the research have already been presented at several scientific conferences [III.B.34, III.B.35, III.B.36]. In this context, in my research [II.A.2, II.D.3, II.D.7, II.D.11, II.D.52, II.D.53] concerning nurseries [II.D. 3, II.D.11, II.D.52] and separate kindergartens [II.A.2, II.D.7, II.D.53] showed that the facilities did not always follow the recommendations. The most important observations and conclusions regarding nurseries can include a small supply in planned menus of milk and dairy products, especially dairy fermented beverages and fish, and too much meat, bread and fat content [II.D.3]. Such a structure of the diet resulted, among others, too low calcium content in the planned diets, as well as vitamin D, the deficiency of which is also noted in other Polish studies of young children [34]. In the analysis of pre-school menus, I showed similar irregularities, in this particular attention was paid to the fact that the amount of milk and dairy products was too small and additionally a small amount of vegetables, which in this case also resulted in insufficient calcium and vitamin D content in the planned menus and additionally inappropriate to the recommendations of the supply of vitamin C [II.D.7]. These facts were confirmed in my other studies carried out in 35 nurseries from various Polish cities

[II.D.11]. The food ration used by these establishments was characterized by a particularly low supply of milk and dairy products. The calcium content below the recommended level for children, like potassium, iron and iodine, was noted in the next study of crèches [II.D.52]. Many irregularities in the implementation of standards, including a small share of calcium, iron, vitamin C and D in planned menus also showed for kindergartens from Krakow [II.D.52] as well as in a study of 270 kindergartens from all over Poland [II.A.2]. The latter research evaluated 270 decade menus and 2,700 daily inventory reports. The results obtained regarding the energy and nutritional value of the menus evaluated proved too high supply of calories, total fat and saturated fatty acids, while low content of iodine, iron, vitamin D, menus from 99% of kindergartens did not meet standards for calcium. These observations clearly indicate the need for nutritional education of the personnel of day care centers, especially those who are directly responsible for feeding children in these facilities, because irregularities recorded in children's nutrition may have their consequences not only in childhood, but also in subsequent years. Particularly dangerous are calcium deficiencies in the diet, which may result in osteomalacia in children, less bone mass, higher risk of bone fractures as well as osteoporosis in subsequent years, especially in women after menopause [35]. Education effectively improves some irregularities in planned menus for children in nurseries and kindergartens, which I also showed in my research [II.A.3, II.A.4, II.D.3, II.D.8, II.D.10, II.D.11, D.52], and the results of these studies have been presented at several conferences [III.B.1, III.B.2, III.B.39, III.B.40].

Another very interesting aspect of my research was the impact of legal regulations on improving the organization and quality of nutrition of children in day care centers [II.D.6]. In Poland in 2015, the Minister of Health introduced the Regulation [36], which quite precisely regulated the quality and type of products and dishes served to children, including how they were prepared. This document was dedicated to kindergartens. In 2016, this Regulation was repealed and new ones were introduced [29], some of which were already less restrictive. Taking into account these facts, it was interesting to what extent the obligatory legal regulations existing in the school years 2015/2016 and 2016/2017 affected the nutrition of children in kindergartens. A total of 706 kindergartens participated in the study, which included nationwide ones, including public DCCs (n = 521) and non-public DCCs (n = 185). The study analyzed selected quality parameters characterizing the menus planned for children. In total, 706 decade menus and 7060 daily inventory reports were assessed, the data was additionally verified during direct interviews with the staff of the DCCs, they were conducted

by pre-school nutrition educators. It has been noted that over 90% of kindergartens have introduced provisions contained in the Regulation of the Minister of Health of 2015 [36] referring to the supply of fresh vegetable menus planned for children. In addition, I noticed that the recommended rapeseed oil was used to fry the dishes, however the frequency of using frying was not so precisely observed (only more than 70% of DCCs) as well as the requirement to give children vegetables and / or fruits in every meal (about 50% of DCCs). There were also some irregularities related to the fact of sweetening and salting the dishes. Every second outlet still used non-recommended traditional salt, and every fourth sugar for the preparation of beverages. In the next school year 2016/2017, when the new, less restrictive Regulation of the Minister of Health [29] was in force, especially in relation to the fact of sweetening and salting, a greater share of children's nutrition was noted. Comparing the data in terms of the type of facility, more irregularities in the use of sugar and salt were found in public kindergartens, compared to non-public ones. The conducted study proved that legal regulations can be an effective tool for making changes in a short time, however, with their validity there should be an appropriate information and education campaign, during which educated in the field of nutrition should be all those involved in the planning and organization of children's nutrition and its implementation. Parents and their children should also be included in this kind of education. Considering this fact, I carried out such lectures and trainings [II.K] as well as informative and educational meetings in educational institutions. As part of the nutritional education of children, in every school year I am the organizer and implement and provide substantive care over the nutritional workshops run by students to children from kindergartens and schools [III.I.1]. From 2018, training for education employees involved directly or indirectly in child nutrition is also carried out as part of the nationwide program "Yellow Plate" [III.I.2]. The training topics concern the general principles of child nutrition in the face of existing legal requirements, including topics related to the same sugar, salt and fat in feeding children in different age groups.

Summing up my research in this area, I think that their national character and obtaining unique data in the whole country are special. In recent years in Poland, no other similar studies have been carried out relating to the organization and quality of nutrition of children in day care centers such as nurseries and / or kindergartens. Acquiring such data, as well as data on the effectiveness of educational activities addressed to staff of day care centers, will allow for the development of standardized, uniform and practical recommendations on nutrition for children in DCCs, which is currently under preparation.

### 5.1.4 Evaluation of the diet of children and adolescents in the aspect of prevention of selected diet-related diseases

In the field of my scientific interests, for many years there are issues related to the way of feeding infants and older children, including adolescents [II.D.63]. The diet of healthy children and adolescents should be adjusted to standards [28] and recommendations for particular age groups [28, 37] because it is an important element of a healthy lifestyle and affects their proper growth and development. It is also an important element in the prevention of various diet-related diseases.

Nutritional behaviors are conditioned by many factors [38], others in each age group of children. In the case of young children, nutrition can be determined by knowledge as well as food preferences of parents. In my research, I undertook these issues with reference to pre-school children [II.D.4, II.D.9]. In the study, which aimed to assess the nutritional knowledge of parents [II.D.4] and its impact on the consumption of milk and dairy products by pre-school children, I proved that the parents' knowledge determined not only the quantitative consumption of milk and dairy products by children, but also influenced also on the selected product range of this group. Taking into account the results, it is justified to conduct nutritional education of parents of children in pre-school age. Better knowledge and nutritional awareness of parents can improve children nutrition regard to the quantity and quality of milk and milk products consumed, especially that liquid milk is currently not preferred by children, and its consumption, despite many educational campaigns [39] in recent years in Poland declining [40]. In another study, I analyzed the mother's taste preferences for dairy products and assessed their impact on the consumption of this product group by children [II.D.9]. I found that mothers showed preference for natural dairy products, compared to dairy milk products. Differing results were observed in the case of children who, as more often liked from natural ones, indicated dairy flavors. The preferences of mothers significantly influenced their children's tastes with respect to yoghurts with fruit mousse and chocolate addition, as well as plain homogenized cheese. In conclusion, it can be stated that these preferences were only visible in the case of selected products.

Pre-school age is a time of intensive development, therefore in children's diets definitely should not lack such important sources of calcium as milk and dairy products, however, their quality is essential because in addition to calcium, they can also provide large amounts of fat and sugar, which is not desirable. In the case of insufficient supply of calcium

in children's diets due to the lack or insufficient consumption of milk, it is worth considering introducing to the child's diet other substitutes that are a similar source of this ingredient. In the case of small healthy children, the substitute for cow's milk may be modified milk, however, the cost of feeding the child using such products, compared to its natural counterparts is definitely higher, as demonstrated by the example of the infant's diet [II.D.5]. Higher diet costs also apply to the use of other specialist products, which I also analyzed, this time in the case of a gluten-free diet [II.D.14, III.B.76]. However, the use of such products is justified for children and adults on elimination diets, which should be preceded by an appropriate diagnosis.

Another problem in feeding children is inadequate supply of vegetables and fruits. In my research on pre-school children, I also undertook this subject [II.D.16]. In this case, the study covered 85 randomly selected parents of children aged 3-6, who attended public kindergartens in Plock. Vegetable and fruit intake was estimated by a Semi-Quantitative Food Frequency Questionnaire (SFFQ). I noticed that children consumed almost twice as much fruit as vegetables, and their consumption decreased with age. Nearly 9 in 10 children did not eat enough vegetables a day, and every third child did not eat enough fruit. The consumption of vegetables and fruits was determined by the consumption of these products by parents. In addition, in the same study, the body mass was also evaluated and correlated with intake. The body weight of children was significantly related to the consumption of vegetables, and only every second child tested had normal body mass, in the group of parents overweight or obese had every 3rd person. Dietary habits conducive to obesity of pre-school children were also the purpose of another study [II.D.57], in which I also analyzed the share of vegetables in children's diets. The subject of vegetables and fruits was a key issue in the HabEat project, the results of which I presented in my publication [II.D.21]. In the article I referred to factors determining eating behavior, which affect the acceptance and preferences of vegetables and fruits by children, and this is directly reflected in the participation of these products in the diet. Breastfeeding and its length as well as complementary nutrition of infants are of great importance here. In this work, I also described ways to increase the acceptance and preferences of new products, including vegetables in infants and toddlers, because at this time children are additionally exhibiting nutritional neophobia, which significantly reduces the chance for optimal nutrition and the appropriate share of vegetables in the diet. At the end of this article [II.D.21] I refer to the role of education and parental nutrition practices, as well as to materials for parents and health professionals prepared as part of the HabEat project. As

part of this project, an international conference was organized in France, in which I took an active part and presented my research [III.B.9, III.B.19]. The theme of my poster was education in kindergarten on the subject of vegetable and fruit intake among this age group. In 2013, as part of the HabEat project, a "3rd Stakeholder Workshop" conference was organized jointly with the SGGW-WULS, which took place at the Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences in Warsaw and I took part in it [III.B].

Another important issue in the nutrition of children is the consumption of beverages, including their range. I researched the subject in relation to the preferences of mothers and their small children up to 3 years of age, which was the subject of a conference speech [III.B.18, III.B.61]. This issue, however, is particularly important in the context of the supply of sugar with a diet that comes in large quantities from sweet drinks. In my scientific work, in this area, I assessed the consumption of water and other drinks in nutrition of preschoolers [II.D.60, III.B.66]. In the diets of the examined children, I found sufficient amount of water, as well as milk and milk drinks. Consumption of milk and other drinks, including sweet ones, was also analyzed in a nationwide study in a group of healthy teenagers [III.B.8], in which I took part. The daily consumption of milk and dairy products was declared by 60% of adolescents aged 13-19, including a significantly higher proportion of middle school students compared to high school students. A similar percentage declared consumption of sweet drinks several times a week.

Youth is a very specific group whose nutrition is no longer as dependent on parents as in the case of younger children. In my scientific work, I undertook topics related to the assessment and analysis of nutrition in this age group. In the nationwide study quoted above, the results of which were presented at the international conference in Athens in 2014 [III.B.8], I found that out of the total group surveyed (n = 14,044) less than half consumed vegetables, fruits were consumed slightly more often, 60 % of students declared consumption of breakfast before leaving home to school. In another youth study presented this time at a conference in Scotland in 2013 [III.B.10] I showed that young people aged 14-16 consumed breakfast more often, however, at this meal absolutely no vegetables or fruit were recorded, their frequency of consumption during the week it was also low. Compared to previous surveys, these results should be treated as a pilot due to the small size of the surveyed group and the place of residence, in this study only 60 students of Warsaw took part. At the same conference in Scotland, I also presented other studies related to the dietary preferences of children and adolescents [III.B.11]. Noted in the study of adolescents, often irregular dietary habits may

result in insufficient supply of certain nutrients, including selected minerals, which was also the subject of my research [II.D.25, III.B.79].

The specificity of the age group which is young is also due to the perception of their body weight, and this can be closely related to eating behaviors and practices in the field of food and nutrition. The perception of body weight was a separate current of my research [II.D.58]. The aim of these studies was self-assessment of body mass in the context of its regularity by 160 students aged 13-16, and their nutritional knowledge in the field of eating disorders was also assessed. On the basis of this research, I found that teenagers tend to inadequate self-esteem, and their knowledge of eating disorders, especially less typical ones such as, for example, compulsive overeating, is low. The results obtained indicate the need to educate this population group in this area of eating disorders. In subsequent studies in which I participated, the risk of eating disorders was assessed next to the diet [II.D.28]. The study was carried out in a group of 132 girls and boys from the Warsaw high school. It was noted that the percentage of girls indicating a low probability of eating disorders was 57% and boys 76%, while abnormal feeding assessed using the Starzyńska method showed significantly greater irregularities in the girls' diet compared to boys (51% and 35% respectively). Data on knowledge and awareness of high school students on the subject of various eating disorders was also presented at scientific conferences [III.B.15, III.B.20, III.B.70]. The results quoted above confirm that in terms of nourishment teenagers are a specific group, whose nutritional knowledge and behavior and the perception of their body weight are not always correct. In view of the above, it should be recognized that widely understood education of this age group also in the field of rational nutrition, eating disorders as well as methods of objective assessment of own body weight is justified.

The educational activities I have been conducting for many years are addressed to various age groups of children and young people [Appendix no 3, point. I]. As part of these activities in relation to the youngest, including infants and toddlers, in 2011-2018 I was an expert and consultant in the field of nutrition in a popular magazine titled 'Your Child', which is recommended for parents by the Institute of Mother and Child. As part of the education of pre-school children, since 2010 I have been managing and organizing the author's program of nutritional education for children aged 3-6, and these activities are also addressed to school children. Only in the years 2017-2019, 1,200 children from Warsaw and the surrounding area were covered by such activities. In the case of young people, I was the coordinator of the scientific and research program of the "Wise nutrition, healthy generation" program, which

included teaching materials, including demonstration lessons on healthy nutrition addressed to junior and high school students throughout Poland, and educational materials for teachers and parents [II.I.2]. I also carry out the education of children and young people within the framework of my function as a representative of the Dean for Contacts with Schools [III.Q] and as part of numerous educational programs in which I am a manager, contractor or expert as well as in cooperation with foundations, associations and other partners [II.I, III.I.3.2, III.I.3.3].

Summing up this area of my research, I would like to particularly emphasize the importance of the research problems undertaken, because nutrition of children and adolescents determines their current health and has a significant impact on their health in adulthood. Knowledge about the nutritional behavior of particular age groups of children has a significant application value because it allows for better planning of various educational activities addressed to themselves and their parents and caregivers, including teachers.

#### **5.1.5 Nutritional knowledge, diet and nutritional status of women as an important element conditioning their health**

Within my scientific interests, women's health has been found for many years, which was reflected in the published works [II.A.6, II.D.12, II.D.13, II.D.18, II.D.19, II.D.20, II.D.22, II.D.23, II.D.26, II.D.29, II.D.34, II.D.35, II.D.37, II. D 38, II.D.51, II.D.56, II.D.59, II.D.62]. This issue is of fundamental importance because a woman in her life prepares herself for the role of a mother, so her nutritional status, which largely depends on nutrition should be correct. Proper nutrition of woman is a guarantee of maintaining her health, proper body weight, prevention of many diet-related diseases, as well as guaranteeing the health of the future generation.

In my initial studies of women, I dealt with their body weight, composition and energy expenditure [II.D.37, II.D.38]. The aim of these tests [II.D.38] was to determine the body composition by the method of bioelectrical impedance analysis (BIA) and to calculate the amount of adipose tissue based on selected formulas and to determine whether the obtained results differ significantly. The research involved 65 female students from the Warsaw University of Life Sciences (WULS-SGGW) at the age of 22-25. At the beginning, they performed anthropometric measurements (body weight, height) and body composition measurements with the company's camera Akern-RLJ BIA 101/s. In the study group, the content of fat mass (FM), fat-free mass (FFM) and BMI, fat mass index in relation to height (FMI, FM [kg] / height [m<sup>2</sup>] [41] were calculated. The percentage of adipose tissue was



calculated according to the formulas: Deurenberg et al. [42, 43], Gallagher et al. [44] and Jackson-Pollock [45]. Women were divided into 3 groups due to BMI: underweight group (BMI < 20kg / m<sup>2</sup>), normal body weight (BMI = 20 - 25kg / m<sup>2</sup>) and overweight (BMI > 25kg / m<sup>2</sup>) according to the accepted WHO criteria [10]. It was found that the percentage of FM content in the studied group of students estimated on the basis of available mathematical equations did not significantly differ from the values determined by the method of BIA [5]. Moreover, it was shown that the BMI index does not give information about the real FM level in an individual case and should not be used as the only criterion in weight reduction, especially in the case of people with a BMI below 30 kg / m<sup>2</sup>. In working conditions in a diet counseling center, the BIA method can be useful for measuring the body composition.

The purpose of further research [II.D.37] carried out this time in a group of 42 female students aged 22-23 from the same university was determination of resting metabolic rate (RMR) by indirect calorimetry (IC) [6] and comparison of these results with values estimated on the basis of available mathematical formulas. The RMR value was determined using the IC method, based on the respiratory determination of the volume of oxygen consumed and the separated carbon dioxide per unit of time. Energy expenditure was determined on the basis of the formula Weira (1949):  $MR = (3,9 VO_2) + (1,1 VCO_2)$  [46]. The study was carried out in the respiration chamber of the Nutrition Department of the Faculty of Human Nutrition and Consumer Sciences, WULS-SGGW at 22-23°C, fasting or at least 4 hours after a meal, in a sitting position. The duration of the measurement - 60 minutes, air samples were analyzed every 6 minutes on a regular basis. Before each measurement, the analyzers were calibrated using a gas mixture prepared by Linde Gaz. The measured mean RMR values were compared with the average values estimated on the basis of selected mathematical formulas, such as: Harris-Benedict [47], Owen [48], Mifflin-St Jeor [49], WHO [50] as well as Bernstein [51]. Finally, I noticed that the most similar RMR results obtained using the IC method give an estimate of energy expenditure using the Harris-Benedict equation. The obtained results indicate that for young girls this method can be useful as a quick and easy to calculate RMR in working conditions in a diet counseling center. The results obtained in both studies had a useful and practical dimension.

In subsequent studies carried out in a group of women, I undertook an evaluation of their nutritional behaviors [II.D.35]. In the menus of the studied students, which I assessed in 2009, I noted a lot of irregularities, including too low energy supply with diet and insufficient participation in the diet of dietary fiber, as well as potassium, calcium and folic acid. In

addition, I found a relatively high total dietary intake of total protein and a percentage of total fat energy exceeding the recommendation. In the next stage, it was interesting to know whether the behavior of WULS-SGGW students differs from another similar group of young women from another university. Such studies were carried out the following year [II.D.29]. Nutritional behaviors of WULS-SGGW students were compared with the behavior of students from the University of Physical Education. It was found that the diet of University of Physical Education female students was characterized by a greater number of nutritional errors compared to female students of WULS-SGGW, however these differences were not statistically significant. The most common nutritional errors were the irregularity of eating meals, their too small number, the insufficient share of vegetables, fruit, whole meal bread, milk and their products, and too frequent consumption of sweets, carbonated beverages, alcoholic beverages, and instant and fast food products. However, both groups did not differ in terms of BMI. Knowledge about irregularities existing in the nutrition method allows their correction, especially if these errors significantly increase the risk of diet-related diseases.

My further studies of women concerned pregnant women and their nutritional knowledge [II.D.22, II.D.23]. The research [II.D.22] covered a total of 50 women aged 21-36, who were in II trimester of pregnancy (n = 24) and in III trimester of pregnancy (n = 26). The assessment of nutritional knowledge was carried out using a questionnaire and the method of nutrition based on 3-day menus. It was found that despite the high subjective assessment of nutrition reported in the group of over 2/3 women, their knowledge of nutrients, rational nutrition and the impact of nutrition on the course of pregnancy and child's health was fragmentary. These observations prove that knowledge about optimal nutrition should be more widely disseminated in the group of pregnant women and in the women of reproductive age. Especially that the results of other own research carried out in the group of women of childbearing age also confirmed their insufficient knowledge about the nutritional recommendation in this physiological state [II.D.51].

In another study of women in the third trimester of pregnancy [II.D.23], in which the dietary intake of polyunsaturated fatty acids (PUFA) was evaluated, their diets were characterized by too low content of PUFA such as docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA), arachidonic acid (AA) and linoleic acid (LA). Among the many essential nutrients that a pregnant woman should provide to her body, a long-term PUFA from the n-3 and n-6 families play a special role. The most important is docosahexaenoic acid (DHA), whose adequate supply in pregnancy determines the normal development of the brain and

retina of the eye in the fetus [52]. The dietary advice of pregnant women should, therefore, additionally take into account the proper balancing of the diet, in terms of the relevant proportion of PUFA.

Another aspect of pregnancy research was to assess their knowledge of specific eating disorders [II.D.26]. The topic literature nowadays distinguishes itself with an unusual disorder such as pregorexia. Pregorexia is anorexia that develops in pregnant women and immediately after delivery due to the guilt associated with weight gain during this period, which may result in dietary restrictions and / or intense physical exercise. This issue is an important research problem. 62 pregnant women participated in my study, whose knowledge in this area was evaluated using a questionnaire. I noted that 9 out of 10 surveyed women declared knowledge about eating disorders, 18% of them came across the concept of pregorexia. It was also noted that 1/4 of the surveyed women did not accept weight gain during pregnancy, but none of them used a low-calorie diet during this period. Education regarding atypical eating disorders should also be an element of education of pregnant women, in this time it is worth educating them in the field of normal body weight gains.

During their lifetime, women undertake various dietary practices, including those related to weight reduction, for this purpose they reach for fashionable diets or preparations, the importance of which in weight control was the subject of considerations in another publication in which I am a co-author [II.D. 17]. An example of such a fashionable diet can be a volumetric diet. In the next study [II.D.56], in which I took part, I focused on the assessment of the effectiveness of the volumetric diet in weight reduction in the group of 26 women with a mean age of 27 years and an average BMI weight index of 27.8 kg / m<sup>2</sup>. At the beginning as well as after 14 and 28 days of diet use basic anthropometric measurements and BIA body composition. Body composition and RMR measurements were estimated using the Bodygram program. In women using the volumetric diet for a period of 28 days, a significant reduction in body weight, a reduction in the percentage of fat mass, while increasing the percentage of muscle mass and the total amount of water in the body was observed. At the same time, a significant increase in the RMR level was found in the examined group of women. Thus, the effectiveness of this diet in weight reduction was demonstrated in the group of women who used it.

In another study of women [II.D.59], I also evaluated how they perceive the preparations supporting weight reduction, which are usually and not always under the control of specialists, reaching many people with the problem of weight bearing.

In studies carried out in a group of women, I also evaluated their diet in the aspect of prevention of cardiovascular disease [II.D.13], atherogenicity of diets [III.B.62] and knowledge of risk factors for heart disease [II.D.18]. I proved that menus of the studied group of women (n = 204, age 21-24) assessed by DQI were the most satisfying recommendations in the field of heart disease prevention in relation to the supply of cholesterol and sodium, and in the smallest - calcium and complex carbohydrates. Only over half of the examined women consumed an appropriate number portions of fruit and vegetable. Regarding their atherogenicity, only every third woman was characterized by low atherogenicity, which was in correlation with her body mass index. In contrast, the knowledge of women assessed on the risk factors of cardiovascular disease was not significantly different from the knowledge of men in this field [II.D.18]. Having knowledge about risk factors for heart disease is particularly important because of their frequent occurrence in our country as well as the confirmed role of nutrition in primary prevention. A special group in this respect are women in the post-menopausal period, in which the risk of developing heart disease is further increased.

In further studies carried out in groups of women, I have already focused on specific, selected nutrients. In this topic, I analyzed, among others, the participation in flavonoid diets [II.A.6]. For this study, I included 254 young women, based on their 3-day menus on a regular basis, I evaluated the supply of flavonoids in general as well as their five subclasses (flavonols, flavones, flavanones, flavan-3-ols, anthocyanidins), and analyzed their food sources. I proved that the main source of flavonoids was tea, followed by vegetables, fruits and potatoes, and some quantities of cocoa and bitter chocolate and herbs / spices. The average amount of flavonoids delivered with the diet, in the studied group of women is 272 mg (the highest share of flavan-3-ols). My results were similar to those observed in other European studies [53]. In a healthy rational diet certainly cannot be missing flavonoids due to their role in the prevention of cardiovascular disease, cancer, diabetes and other diseases dependent on diet. In an appropriately balanced diet should also be the source of lycopene, while definitely excessive sugar, caffeine and salicylates should be avoided, especially in the case of hypersensitivity to these ingredients. In subsequent studies, women assessed the share of lycopene [II.D.19], mono and disaccharides [II.D.12] and caffeine and theobromine [III.B.63] along with the analysis of their sources in terms of selected diet-related diseases. In studies on salicylates [II.D.20], the analysis of their sources proved that they come mainly from fruits, vegetables and drinks, including alcoholic beverages as well as to a small extent from herbs

and spices. The research confirms the need to assess the salicylate content in food products in Poland and to create a database necessary for planning low-salicylates diets, which can be very useful in dietary counseling implemented for people with hypersensitivity to the ingredients.

In my scientific work I additionally dealt with the analysis and evaluation of the vegan diets used [II.D.15], and also referred to new strategies for the treatment of selected diseases using the FODMAP diet [II.D.61]. The use of the FODMAP diet is justified in the treatment of irritable bowel syndrome (IBS), which is much more common in women than in men [54]. I also undertook research on women in celiac disease [II.D.34], while the prevention and treatment of selected diseases using whey proteins were discussed in another publication in which I participated [II.D.1]. I also evaluated selected aspects of nutrition in groups of patients with chronic kidney disease [II.D.31, III.B.84] as well as women with polycystic ovary syndrome [II.D.62].

The research results described above were presented at numerous national conferences in the form of presentations and / or posters [III.B.15, III.B.27, III.B.41, III.B.46, III. B.48, III.B.51, III.B.55, III.B.62, III.B.64, III.B.65, III.B.67, III.B. 68, III.B.72, III.B.73, III.B.74, III.B.78, III.B.83, III.B.86, III.B.88].

To sum up this area of my scientific work, it is worth paying attention to the multifaceted nature of the research undertaken regarding the health of young women. In my research, I undertake the subject of assessment of nutritional status, nutrition and nutritional knowledge. Valuable application value has also research using objective methods of measuring energy expenditure and women's body composition. The results of the presented research can be used to plan effective dietary counseling for healthy young women, including in the aspect of prevention of diet-related diseases.

## **5.2 Summary of the scientific and research work**

Summing up my scientific and research work, I would like to particularly distinguish participation as a manager, coordinator and main contractor in large nationwide studies "Assessment of nutritional status and nutrition of teenagers aged 13-19" carried out as part of the project "*Wise nutrition, healthy generation*" as well as participation in the "Assessment of the organization and quality of children nutrition in nurseries and kindergartens in Poland" carried out under the project "*Eating healthy, growing healthy*". In both of these studies unique data were collected. These data have application value because they can be used to

develop standardized, uniform and practical recommendations for children's nutrition in day care centers as well as to plan more effective educational activities directed to children, adolescents as well as their parents and caregivers. Other studies I carried out and results may be used to better carry out dietary counseling for healthy people and patients with selected diet-related diseases.

My scientific achievements consists of a total of **148** items, including:

- 71 scientific articles, 60 of them original articles, 7 of them published in magazines indexed in the Web of Science database, 17 items are chapters in monographs (also in English), in 30 of them I am the first author and the correspondence author,
- 16 abstracts published in peer-reviewed conference materials,
- 59 popular science and popular articles,
- 1 documentation of research works as a report,
- 1 monograph that is a scientific achievement.

In addition, I took active part in **7** international conferences and **52** national conferences. During my professional career, I delivered plenary lectures, and the results of my research were presented in the form of **16** oral and poster presentations at international conferences, **28** oral presentations and **36** posters at national conferences.

My summary Impact Factor according to the year of publication is **16.731**, and the five year Impact Factors is **19.483**. The total number of point from all publications and studies in accordance with the year of issue is **612**, and according to the list of the Ministry of Science and Higher Education in 2017 is **712** points.

The number of publications cited according to the Web of Science database is **12**, according to Google Scholar **136**. The Hirsch index according to the Web of Science database is equal to **2**, according to Google Scholar **6**.

A summary of scientific achievements as a the list of published scientific papers with the Impact Factor (IF) and number of points from the list of Ministry of Science and Higher Education (MSaHE) is included in Table 1.

**Table 1. A summary of scientific achievements**

Publication	Number of publications	IF <sup>a</sup>	IF <sup>b</sup>	Points MSaHE <sup>a</sup>	Points MSaHE <sup>c</sup>
PUBLICATIONS PUBLISHED BEFORE THE DOCTOR					
Scientific journals without IF listed in Part B of the Minister's List					
Żywność Człowieka i Metabolizm	3	-	-	6	24

Bromatologia i Chemia Toksykologiczna	1	-	-	2	6
Przegląd Lekarski	1	-	-	5	10
Colloquium Biometryczne	1	-	-	0	8
Chapters in scientific monographs					
In Polish	1	-	-	3	5
<b>Total</b>	<b>7</b>	<b>-</b>	<b>-</b>	<b>16</b>	<b>53</b>
PUBLICATIONS PUBLISHED AFTER THE DOCTOR					
Scientific journals with IF included in the Journal Citation Reports (JCR) listed in Part A of the Minister's List					
Agro FOOD Industry Hi Tech	2	0,499	0,458	30	30
International Journal of Environmental Research and Public Health	2	4,290	5,216	60	60
Nutrients	3	11,942	13,809	105	105
<b>Total</b>	<b>7</b>	<b>16,731</b>	<b>19,483</b>	<b>195</b>	<b>195</b>
Scientific journals without IF listed in Part B of the Minister's List					
Roczniki Państwowego Zakładu Higieny	2	-	-	28	28
Problemy Higieny i Epidemiologii	11	-	-	81	99
Handel Wewnętrzny	2	-	-	24	24
HPC Health Problems of Civilization	1	-	-	9	9
Standardy Medyczne Pediatria	2	-	-	12	16
Bromatologia i Chemia Toksykologiczna	11	-	-	51	66
The Journal of Pre-Clinical & Clinical Research	2	-	-	12	20
Żywnienie Człowieka i Metabolizm	3	-	-	6	24
Medycyna Ogólna i Nauki o Zdrowiu	1	-	-	6	6
Kosmos	1	-	-	6	12
<b>Total</b>	<b>36</b>	<b>-</b>	<b>-</b>	<b>235</b>	<b>304</b>
Chapters in scientific monographs					
In Polish	13	-	-	65	65
In English	3	-	-	21	15
<b>Total</b>	<b>16</b>	<b>-</b>	<b>-</b>	<b>86</b>	<b>80</b>
Papers in peer-reviewed foreign journals outside of the Minister's List					
NutraCos	1	-	-	-	-
Papers in peer-reviewed Polish journals outside of the Minister's List					
Annales Universitatis Mariae Curie-Skłodowska. Sectio D. Medicina	2	-	-	-	-
Journal of Health Inequalities	1	-	-	-	-
Polish Journal of Applied Sciences	1	-	-	-	-
<b>Total</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Abstracts in reviewed conference materials					

In Polish	15	-	-	-	-
In English	1	-	-	-	-
<b>Total</b>	<b>16</b>	-	-	-	-
Popular science and popular publications					
Dietetyka. Oficjalne pismo Polskiego Towarzystwa Dietetyki	2	-	-	-	-
Trendy	1	-	-	-	-
Super Linia	4	-	-	-	-
Shape	2	-	-	-	-
Twoje Dziecko	50	-	-	-	-
<b>Total</b>	<b>59</b>	-	-	-	-
Others					
Monograph that is a scientific achievement <sup>d</sup>	1	-	-	80	80
Documentation of the research works as a report	1	-	-	-	-
<b>Total</b>	<b>2</b>	-	-	<b>80</b>	<b>80</b>
<b>Total (all publicatons)</b>	<b>148</b>	<b>16,731</b>	<b>19,483</b>	<b>612</b>	<b>712</b>

<sup>a</sup> in the year of publication

<sup>b</sup> average five-year IF

<sup>c</sup> according to the currently valid list of Ministry of Sciences and Higher Education on 26/01/2017

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