



## Assessment of medical and non-medical university students' knowledge about vitamin D

### Ocena wiedzy studentów uczelni medycznej i niemedycznej na temat witaminy D

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#### ABSTRACT

**INTRODUCTION:** Vitamin D is very important for our body. This is confirmed by the World Health Organization (WHO), the Polish Society for Obesity Research (Polskie Towarzystwo Badań nad Otyłością – PTBO) and the Polish Diabetic Society (Polskie Towarzystwo Diabetologiczne – PTD). Nowadays, due to spending most of our time indoors and using sunscreen, we commonly experience deficiencies of this vitamin. In order to assess the knowledge of students from the Medical University of Silesia and the University of Economics in Katowice regarding vitamin D, a survey was conducted based on a proprietary questionnaire available in electronic form.

**MATERIAL AND METHODS:** The study was conducted with the help of the author's questionnaire containing 18 substantive questions. The study involved 272 students.

**RESULTS:** Students of the Medical University of Silesia have a greater knowledge of vitamin D compared to students of the University of Economics in Katowice. A significant number of respondents (49.8%) have an adequate understanding of supplementation, though some are unaware of the recommended standards (34.7%) or the effects of deficiencies (43.6%).

**CONCLUSIONS:** Students of the Medical University of Silesia in the vast majority have adequate knowledge related to vitamin D, while the knowledge of students of the non-medical university, namely the University of Economics in Katowice, is lower.

#### KEYWORDS

vitamin D, dietetics, supplementation, deficiency, knowledge, synthesis, standards, comparison

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## STRESZCZENIE

**WPROWADZENIE:** Witamina D jest bardzo ważna dla naszego organizmu. Potwierdza to Światowa Organizacja Zdrowia (World Health Organization – WHO), Polskie Towarzystwo Badań nad Otyłością (PTBO) i Polskie Towarzystwo Diabetologiczne (PTD). Współcześnie, w wyniku spędzania czasu głównie w zamkniętych pomieszczeniach oraz stosowania kremów z filtrem, mamy do czynienia z powszechnymi niedoborami tej witaminy. W celu oceny stanu wiedzy na temat witaminy D wśród studentów Śląskiego Uniwersytetu Medycznego oraz Uniwersytetu Ekonomicznego w Katowicach przeprowadzono badanie ankietowe z użyciem autorskiego kwestionariusza dostępnego w formie online.

**MATERIAŁ I METODY:** Badanie przeprowadzono z użyciem autorskiego kwestionariusza, zawierającego 18 pytań merytorycznych. W badaniu wzięło udział 272 studentów.

**WYNIKI:** Wiedzę na temat witaminy D w większym stopniu posiadają studenci Śląskiego Uniwersytetu Medycznego niż studenci Uniwersytetu Ekonomicznego w Katowicach. Znaczna liczba ankietowanych (49,8%) ma wystarczający poziom wiedzy na temat suplementacji, jednak część badanych nie zna norm (34,7%) ani skutków niedoborów (43,6%).

**WNIOSKI:** Studenci Śląskiego Uniwersytetu Medycznego w zdecydowanej większości posiadają wystarczającą wiedzę na temat witaminy D, natomiast wiedza studentów uczelni niemedycznej, tj. Uniwersytetu Ekonomicznego w Katowicach, jest niższa.

## SŁOWA KLUCZOWE

witamina D, dietetyka, suplementacja, niedobór, wiedza, synteza, normy, porównanie

## INTRODUCTION

Vitamins are involved in almost all metabolic processes occurring in the body as coenzymes or biological active substances, acting already in small amounts; they are not a source of energy, although they are necessary for its production in the body, and have little importance as a building material. Vitamins are characterized by low durability, resulting in little resistance to high temperatures, storage, as well as culinary processing, i.e. light, oxygen, alkaline reaction of the environment, which can lead to a significant reduction in the nutritional value of prepared food. Most vitamins must also be supplied to the body from outside due to the fact that they cannot be synthesized by our body as only some of them, such as vitamin D<sub>3</sub>, are partially synthesized in the body under the influence of UV radiation, produced by bacteria in the intestines of humans and animals, an example of which is vitamin K<sub>2</sub>, or can be formed from other compounds (such as niacin from tryptophan) [1].

Fat-soluble vitamins, which include vitamins A, D, E and K, are stored in the body mainly in adipose tissue and the liver, which can result in their over-accumulation – hypervitaminosis, above the tolerable upper intake level (UL) for a given age group. Fish liver oil tablets containing 400 IU of vitamin D are commonly used, and the most commonly recommended daily dose is 400 to 1,000 IU [2].

Vitamin D<sub>3</sub> is one of the few vitamins that the body can produce endogenously, hence it does not meet the definition of a vitamin. Vitamin D<sub>2</sub> and D<sub>3</sub> do not raise blood levels of vitamin D in the same way. Vitamin D<sub>3</sub> is much better at raising calcifediol levels and maintaining normal blood calcium levels. Of importance is the fact that although the metabolic effects of vitamin D<sub>2</sub> and vitamin D<sub>3</sub> are similar, these compounds bind to different types of plasma proteins.

As a result, vitamin D<sub>3</sub> lasts longer and is 2–10 times more effective than vitamin D<sub>2</sub> [3].

Symptoms of vitamin D poisoning in adults can be induced by excessive doses exceeding 20,000 IU, while in children it is a daily dose of more than 1,800 IU. Vitamin D poisoning is a very rare complication of supplementation or treatment with pharmaceutical preparations of cholecalciferol, and it actually only affects people with a genetic hypersensitivity to vitamin D [4].

The aim of this study is to draw attention to the important but overlooked vitamin D and to analyze the knowledge possessed by medical students, using the example of the Medical University of Silesia (Śląski Uniwersytet Medyczny w Katowicach – ŚUM) and students of a non-medical university – the University of Economics in Katowice (UE).

## MATERIAL AND METHODS

A survey was conducted using a proprietary questionnaire containing 18 questions including 4 demographic questions and 14 factual questions. It was divided into students of the medical university (ŚUM) and students of the non-medical university (UE). The survey was conducted online by means of Google Forms between 11–25/09/2023. Respondents from both the universities were solicited utilizing the snowball method; in addition, a link requesting completion was also posted on social media, i.e. Messenger and Instagram. Additionally, via Facebook, a link to the survey questionnaire was posted on “Spotted” of every major city in the Silesian province (including Piekary Śląskie, Myszków, Tychy, Jaworzno, Mikołów, Rybnik) since most of the students come from neighboring cities.

The survey included one open-ended question regarding age, while the remaining questions were



closed-ended with single-choice answers. The majority of the respondents (40 people) from the non-medical university declared to be 21 years old (31%), similarly, among the students from the medical university, the majority (30 people) were also 21 years old (21%). The substantive questions concerned vitamin D – its sources, standards, absorption, impact on the human body, and supplementation.

The inclusion criteria were to study at the ŚUM or the UE. A total of 143 (52.6%) students from the ŚUM and 129 (47.4%) students from the UE participated in the study. The total number of people taking part in the survey was 272. The number of people taking part in the survey was estimated using a sampling calculator (Figure 1). The size of the population is the number of students from both universities according to the information provided by each university.



Fig. 1. Sampling calculator (author's own work).

Ryc. 1. Kalkulator doboru próby (opracowanie własne).

## RESULTS

The conducted studies confirm the existence of a relationship between the individual data obtained from the responses and the students' knowledge, which is necessary to live with full awareness, about the role and importance of this important vitamin for our body. They allowed the author to verify the stock of knowledge declared by the respondents participating in the study on the standards, effects, absorption and supplementation of vitamin D. From the results obtained in the study, it can be seen that the level of knowledge about vitamin D in the medical community is higher compared to a comparable one in students from non-medical universities.

One of the questions asked about products rich in the vitamin in question. The correct answer (fish), was given by 37.8% of the medical college students and 27.1% of the non-medical college students (Figure 2). Regarding the effect of vitamin D on the functioning of the human body, more than  $\frac{3}{4}$  of the students associated with medical faculties gave the correct answer; in the case of the non-medical college students, 29.5% of the respondents marked the correct answer (Figure 3).

Vitamin D is synthesized with the help of the sun's rays; however, it is dependent on the environmental conditions prevailing at any given time. The correct answer to the presented question was given by 90.2% of the ŚUM students and 76.7% of the UE students (Figure 4).

In the following question, the correct answers were absorption through the skin and the oral route – this was the answer given by the majority of students from the two universities, 76.9% and 40.3%, respectively (Figure 5).

The majority of the ŚUM respondents, 67.1%, believe they know the health consequences of a deficiency of this vitamin. The remainder do not know the consequences of insufficient concentrations of this vitamin. Nonetheless, among the UE respondents, 32.6% gave the correct answer (Figure 6).

A large discrepancy in the results was observed in the question about supplementation. 65.7% of the ŚUM respondents know when to supplement this vitamin, while 34.3% do not have adequate knowledge on the subject. In contrast, the opposite is true for the UE students, where the results are as follows: 27.9% have knowledge of when to supplement vitamin D, and 72.1% have no such knowledge (Figure 7)



Which foods are rich in vitamin D?

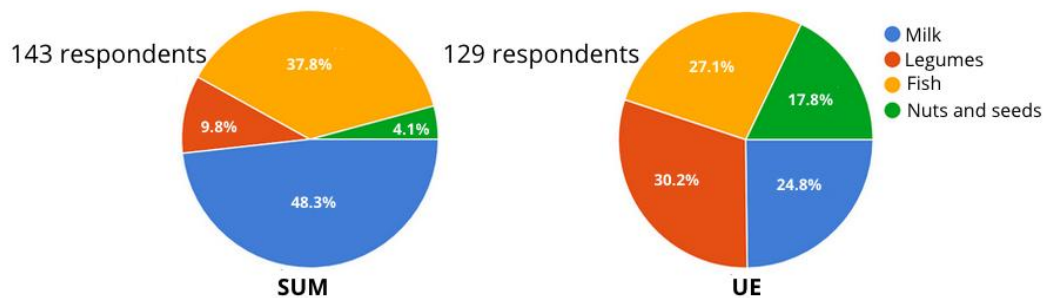


Fig. 2. Food sources of vitamin D.  
Ryc. 2. Źródła witaminy D w pożywieniu.

What does vitamin D do?

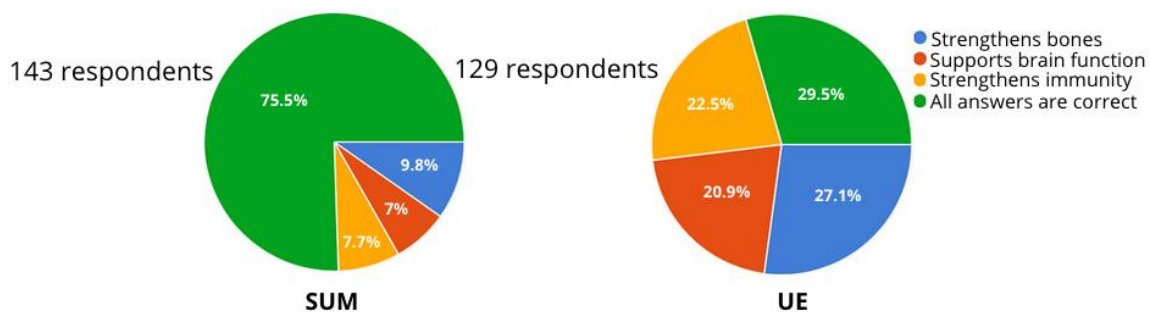


Fig. 3. Positive effects of vitamin D on the body.  
Ryc. 3. Pozytywny wpływ witaminy D na organizm.

Vitamin D synthesis is the same regardless of the season, day and weather.

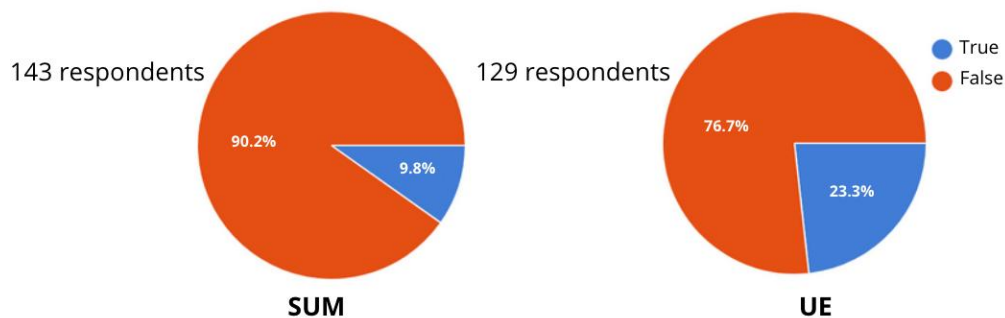


Fig. 4. Efficient dermal synthesis of vitamin D.  
Ryc. 4. Efektywna synteza skórna witaminy D.



What are the routes of absorption of this vitamin?

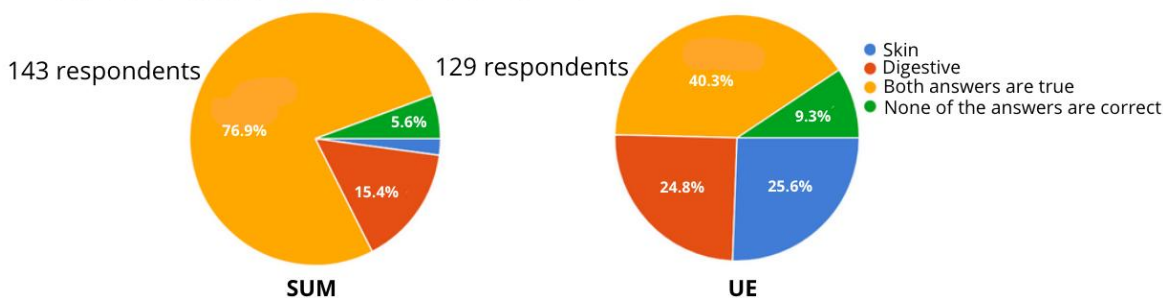


Fig. 5. Routes of vitamin D absorption as perceived by respondents.  
Ryc. 5. Drogi wchłaniania witaminy D w opinii respondentów.

What is the risk of vitamin D deficiency?

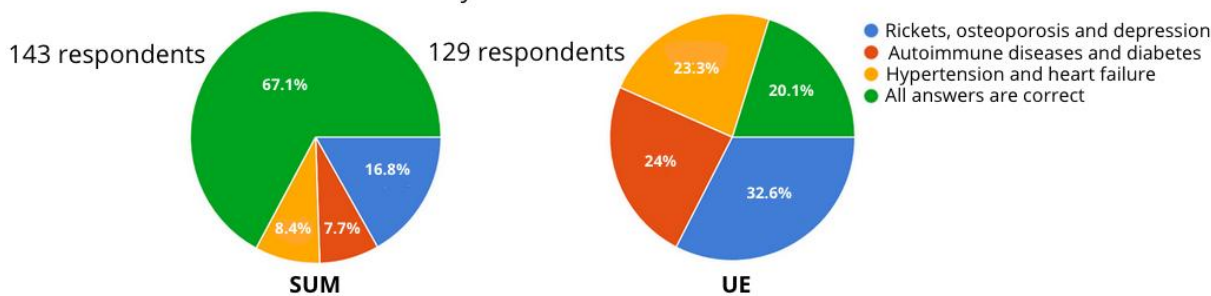


Fig. 6. Negative effects on the body due to vitamin D deficiency.  
Ryc. 6. Negatywne skutki dla organizmu z powodu niedoboru witaminy D.

Do you know when to supplement this vitamin?

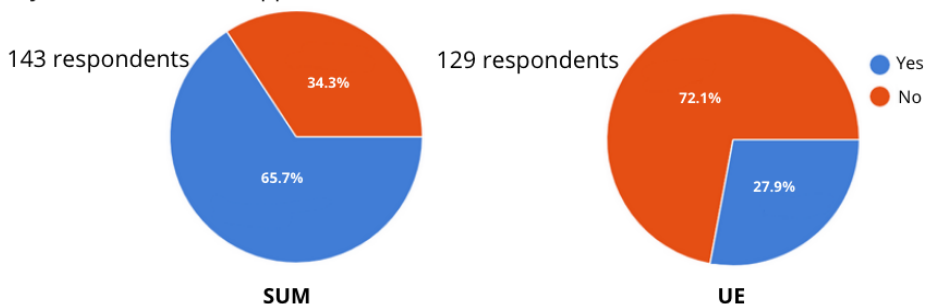


Fig. 7. Respondents' knowledge of need for supplementation.  
Ryc. 7. Wiedza respondentów na temat konieczności suplementacji.

## DISCUSSION

Nearly half of the respondents from the compared universities declared that they often encounter information about vitamin D. Despite this, more than 30% of all the respondents believe that the knowledge they have is insufficient. This means that some students have gaps in their knowledge. It is presumed that some students also spent a great deal of time studying the topic. The most common responses regarding the norms, deficiencies and excesses, were that the students knew the relevant norms, the effects of incorrect values,

and when to supplement the vitamin. More than half of the students believe that inadequate values can pose risks to the body, and the majority (83.45%) are aware that the production of vitamin D is not the same at all times of the year, day and depends on the intensity of sunlight.

Comparing the results presented in the paper with those obtained by female students of the Department of Physical Rehabilitation at the Bronisław Czech University of Physical Education in Krakow [5], many similarities as well as differences were noted. More than half of the respondents (51.9%) declare knowledge of the physiological function of vitamin D<sub>3</sub>, where in



the survey conducted on SUM and UE students, the respondents were found to have adequate knowledge on the subject. Both the study groups were mostly aware of the effects of hypovitaminosis and hypervitaminosis. In the comparative study, 58.3% of the respondents report ignorance about the need for cholecalciferol in different age groups, which is comparable to the results of the SUM students, but 20% lower than that of the UE students. The study also showed negligible knowledge among young adults about the role, sources and specificity of vitamin D<sub>3</sub>.

The knowledge of the elderly population regarding the role of vitamin D for health maintenance and indications for supplementation [6] is not at a good level either. The cited study showed that the vast majority of respondents (73.7%) presented a low level of knowledge on the subject. The younger generation, on the other hand, is familiar with basic information related to this issue. More than half (51.3%) of those taking part in the survey did not use the necessary vitamin D supplementation at all. Similar results were obtained in a study conducted by the SUM [7], where 59% of the people knew about the main source of vitamin D, which is sunlight, and in the author's conducted study, such an answer was given by 76.9% of the SUM students and 40.4% of the UE ones. The main source of vitamin D, which is fish, was known to 58% of the respondents, where 3/4 of the students associated with medical faculties gave the correct answer. The use of vitamin D supplements was declared by 45% of the survey participants – a result of almost half that of the SUM and EU students at 28% and 17.1%, respectively. The recommended daily supplementation dose of vitamin D, according to the Institute of Food and Nutrition (Instytut Żywności i Żywienia – IŻŻ), of 2018 amounting to 800–2000 IU for an adult, was correctly selected by 41% of the respondents – among the medical university students, the answers were at a similar level of 46.9%, while the non-medical university students have less knowledge (22.5%) in terms of the standards from 2020 also published by the IŻŻ [2].

Similar questions were also included in a study conducted by the University of Rzeszow [8], where when asked about the use of dietary supplements or medications containing vitamin D, 47.3% of the respondents answered in the affirmative – answers to this question differ as 28% of the SUM students and 17.1% of the UE students regularly take supplements containing vitamin D. When asked about their knowledge of the effects of vitamin D deficiency, 53.2% answered in the affirmative, which is close to the answers obtained by the SUM respondents (67.1%). Nevertheless, a significant difference can be seen with respect to those studying at the UE. Only 20.2% marked such an answer.

Other European countries are also conducting studies on vitamin D. An example is the United Kingdom (UK) [9], where only 43.5% of the survey participants said they take vitamin D supplementation. The most commonly reported reason for its use was insufficient sun exposure (57%). This is justified by the typical weather in the UK, health benefits (51%) and insufficient food intake containing adequate doses to meet the standard (46%). Most participants took supplements daily (77%), with the rest declaring a wide range of practices, including weekly (12%), less than weekly (5%), seasonally (1%) and other (5%). Dermal synthesis is dependent on the prevailing environmental conditions at any given time, i.e. season, time of day and weather. This question was answered correctly by 90.2% of the SUM students and 76.7% of the UE students.

Not only European countries, but also countries located in Asia are conducting a number of studies on vitamin D. This type of research is mainly conducted by Saudi Arabia, which has conducted a large number of studies in different age groups related to vitamin D. One of the most important studies was conducted by specialists from the Saudi Arabian Ministry of Health [10], a study in which few respondents were able to give a correct answer about the benefits of adequate vitamin D levels in the human body.

In a survey of Polish students, the majority (75.5%) of medical school students filling out the questionnaire gave the correct answer that the vitamin strengthens bones and the immune system, as well as supports proper brain function. A big difference is evident in the use of supplementation as all the respondents (100%) from Saudi Arabia declared that they did not take vitamin D supplements, which may be related to the country's geographic location, while in Poland 46.2% and 55.8% of medical and non-medical university students, respectively, do not use oral supplementation. In the pre-discussed articles from various scientific centers around the world and in the author's own research, it can be noted that knowledge regarding this vitamin is at an insufficient level in Europe, in contrast to Asian countries, i.e. Saudi Arabia, where the level of declared knowledge is higher. It should be noted, however, that all the studies were conducted on different research and age groups. The large differences in the results between the studies show how much of a lack of interest there is in this vitamin. In particular, the attitude of medical students is extremely important since they are the ones who have the most knowledge to pass on to patients, and the author's research shows that some students do not think they have adequate knowledge related to this vitamin. This indicates that not enough time has been spent on the subject, and therefore the knowledge gaps should be filled. It also seems necessary for state institutions to take measures



to change the eating habits of the population by introducing the subject of nutrition education in schools from an early age.

A proper diet can contribute in the future to reducing morbidity and mortality from many diseases of civilization, categorized as diet-related diseases, while the demonstrated passivity towards the possibility of prevention and treatment of hypovitaminosis among the studied population indicates the need to increase public awareness, with the aim of preventing systemic pathologies.

Studies conducted in Poland in recent years indicate that the level of public knowledge about vitamin D is low. Some people do not know basic information about the functions, sources, risks and supplementation of vitamin D. Few people are aware that vitamin D deficiency can have serious health consequences, i.e. osteoporosis, rickets, heart disease or cancer.

The study shows that there is a serious problem related to the lack of knowledge about hypovitaminosis D. The participants are unaware of the negative consequences of deficiencies in this vitamin, which can result from inadequate dietary habits. In addition, the study participants showed low awareness of the importance of sun exposure and vitamin D supplementation.

## CONCLUSIONS

Based on the analysis of the obtained results and all the relevant aspects of the covered topic, the following conclusions were drawn:

1. Students of the ŚUM mostly have knowledge based on the latest research and scientific reports, compared to students of the UE.
2. The students of ŚUM mostly gave correct answers to questions related to vitamin D biosynthesis, dependent on environmental conditions and the Polish latitude.
3. Research has shown that non-medical university students' knowledge about vitamin D is insufficient. To effectively counteract this issue, various educational activities should be conducted, targeting all age groups, with a particular focus on the elderly.
4. It is necessary to both increase the number of informational campaigns and extend their reach. Education should take place in schools by including the topic of vitamins in the curriculum of primary and secondary schools, as well as in medical facilities such as clinics, hospitals, and pharmacies to ensure that patients have access to information about vitamin D and the possibilities of its testing and supplementation.

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### Authors' contribution

Study design – W. Ficoń, R. Polaniak, B. Całyniuk

Data collection – W. Ficoń

Data interpretation – W. Ficoń

Statistical analysis – W. Ficoń

Manuscript preparation – W. Ficoń, R. Polaniak

Literature research – W. Ficoń

Final approval of the version to be published – W. Ficoń, R. Polaniak, B. Całyniuk

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