Pylypenko D. G., Borshch D. V., Miakishev O. Ye., Talalaiev K. O., Babiienko V. V., Shanyhin A. V. Omega-3 index level in the adult population of Ukraine and its potential association with cardiovascular risk: a pilot study. Journal of Education, Health and Sport. 2026;90:72226. eISSN 2391-8306.
https://dx.doi.org/10.12775/JEHS.2026.90.72226
https://apcz.umk.pl/JEHS/article/view/72226
https://zenodo.org/records/20295782

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences);
Health Sciences (Field of medical and health sciences). Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).
The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 07.04.2026. Revised: 10.04.2026. Accepted: 20.04.2026. Published: 30.04.2026.

OMEGA-3 INDEX LEVEL IN THE ADULT POPULATION OF UKRAINE AND ITS POTENTIAL ASSOCIATION WITH CARDIOVASCULAR RISK: A PILOT STUDY

D. G. Pylypenko, D. V. Borshch, O. Ye. Miakishev, K. O. Talalaiev, V. V. Babiienko, A. V. Shanyhin

Odesa National Medical University

Authors' Information
D.G. Pylypenko: ORCID ID: 0009-0002-0919-393X, e-mail: mitaapyl@gmail.com
D.V. Borshch: ORCID ID: 0009-0007-6353-9766
O.Ye. Miakishev: ORCID ID: 0009-0002-3541-8282
K.O. Talalaiev: ORCID ID: 0000-0003-2582-579X
V.V. Babiienko: ORCID ID: 0000-0002-4597-9908
A.V. Shanyhin: ORCID ID: 0000-0003-2644-4542

Abstract

Cardiovascular diseases remain the leading cause of mortality worldwide and in Ukraine, necessitating the search for novel biomarkers for more accurate cardiovascular risk assessment. One of the promising indicators is the omega-3 index, which reflects the total content of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in erythrocyte membranes and characterizes the long-term omega-3 status of the body. Low omega-3 index values are associated with an increased risk of cardiovascular events, whereas optimal levels may exert a cardioprotective effect.

Aim of the study. To assess the omega-3 index level in the adult population of Ukraine and analyze its relationship with body mass index (BMI) as one of the cardiometabolic risk factors.

Materials and Methods. The study included 50 participants, among whom there were 19 men (38.0%) and 31 women (62.0%). The mean age of the participants was 44.08 ± 15.80 years. The study had an observational analytical design. Anthropometric parameters (height and body weight) with subsequent BMI calculation, as well as omega-3 index levels, were assessed in all participants. Statistical analysis was performed using descriptive statistics and Pearson correlation analysis. Results were considered statistically significant at $p < 0.05$.

Results. In the overall sample, the mean BMI was 26.84 ± 4.72 kg/m^2, corresponding to overweight status, while the mean omega-3 index level was 5.62 ± 1.48%, which is considered suboptimal. In the obesity group, the mean omega-3 index was significantly lower compared to individuals with normal body weight (4.71 ± 1.12% vs. 6.48 ± 1.37%, $p < 0.01$). Correlation analysis demonstrated a strong inverse relationship between BMI and omega-3 index ($r = -0.91$; $p < 0.001$). In gender-stratified analysis, the negative correlation persisted both in men ($r = -0.95$; $p < 0.001$) and women ($r = -0.89$; $p < 0.001$). Additionally, a gradient decrease in omega-3 index with increasing BMI was observed (p for trend < 0.001). No statistically significant effect of age on omega-3 index levels was identified.

Conclusions. The obtained results indicate a statistically significant inverse relationship between BMI and omega-3 index in the adult population. An increase in BMI is associated with lower omega-3 fatty acid levels, which may reflect the role of adipose tissue and nutritional status in the development of cardiometabolic risk. The identified dose-dependent relationship highlights the potential value of the omega-3 index as an additional marker for cardiovascular risk assessment and a promising target for nutritional prevention strategies.

Key words: omega-3 index; cardiovascular diseases; eicosapentaenoic acid; docosahexaenoic acid; nutritional prevention; nutrition.

Relevance. Cardiovascular diseases (CVDs) remain one of the leading causes of mortality and disability in most countries worldwide. According to the World Health Organization (WHO), noncommunicable diseases, primarily cardiovascular pathology, account for a substantial proportion of premature mortality, especially in low- and middle-income countries [1]. In Eastern

European countries, including Ukraine, CVDs also occupy a leading position in the mortality structure, highlighting the need to improve approaches to cardiovascular risk assessment and prevention [2].

Alongside traditional risk factors such as arterial hypertension, dyslipidemia, obesity, smoking, and low physical activity, considerable attention in modern research is devoted to nutritional factors that may influence the development of cardiovascular pathology [3]. Among these, long-chain omega-3 polyunsaturated fatty acids, primarily eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are of particular importance, as they play a key role in lipid metabolism regulation, inflammatory processes, endothelial function, and the electrophysiological stability of the myocardium [4].

To evaluate long-term omega-3 fatty acid status, the omega-3 index has been proposed as a biomarker, defined as the percentage of EPA and DHA in erythrocyte membranes. Unlike plasma fatty acid concentrations, this indicator reflects the average omega-3 fatty acid intake over several previous months and demonstrates relative stability, making it a more reliable marker of nutritional status [5].

Epidemiological and clinical studies indicate that low omega-3 index values are associated with an increased risk of coronary artery disease, fatal arrhythmias, and sudden cardiac death [6,7]. In particular, studies have shown that blood levels of long-chain omega-3 fatty acids may be associated with a reduced risk of cardiovascular events and mortality [8].

Current literature proposes the following interpretation of omega-3 index values according to cardiovascular risk level: values ≤4% are considered indicative of high risk, values between 4–8% correspond to intermediate risk, whereas levels ≥8% are regarded as optimal and associated with a cardioprotective effect [5].

Despite growing interest in this biomarker, most omega-3 index studies have been conducted in North American and Western European populations. Data regarding the omega-3 status of Eastern European populations remain limited. Existing studies demonstrate substantial differences in omega-3 index levels, largely related to dietary habits, particularly fish and seafood consumption [7, 9].

The lack of studies assessing omega-3 status in the Ukrainian population limits the objective evaluation of the role of nutritional factors in cardiovascular risk formation and complicates the development of effective preventive strategies. Therefore, investigating omega-3 index levels in the adult Ukrainian population and analyzing their potential relationship with cardiovascular risk represent an important direction in preventive medicine and public health research.

Aim of the Study: To evaluate the omega-3 index level in a clinical population of patients in Ukraine and analyze its possible association with cardiovascular risk, as well as compare the obtained indicators with data from European populations and develop recommendations for improving the situation in Ukraine.

Materials and Methods: The study included 50 residents of the Chernihiv region, including 19 men (38.0%) and 31 women (62.0%). The mean age of participants was 44.08 ± 15.80 years, indicating a relatively broad age variability within the sample.

The study had an observational analytical design. The following indicators were assessed in all participants: age, sex, anthropometric parameters (height and body weight) with subsequent BMI calculation, and omega-3 index level.

Statistical analysis was performed using descriptive statistics and correlation analysis. Pearson's correlation coefficient (r) was used to assess the relationship between BMI and omega-3 index. Results were considered statistically significant at $p < 0.05$.

Exclusion Criteria:

- Presence of acute or decompensated chronic diseases;
- Intake of omega-3 fatty acid supplements within the previous 3 months;
- Pregnancy and lactation;
- Absence of complete anthropometric or laboratory data;
- Endocrine disorders significantly affecting body weight (particularly uncontrolled hypo- or hyperthyroidism).

Results: In the overall sample (n = 50), the mean BMI was 26.84 ± 4.72 kg/m^2, corresponding to overweight status. The mean omega-3 index level was 5.62 ± 1.48%, corresponding to an intermediate (suboptimal) level.

Gender-stratified analysis demonstrated that men had a higher mean BMI compared to women (27.91 ± 4.85 vs. 26.17 ± 4.58 kg/m^2), although these differences did not reach statistical significance ($p > 0.05$). At the same time, women had a slightly higher omega-3 index level (5.83 ± 1.42% vs. 5.28 ± 1.53% in men), although this difference was also not statistically significant ($p > 0.05$).

The distribution of participants by BMI categories showed that 28.0% had normal body weight, 46.0% were overweight, and 26.0% had obesity. In the obesity group, the mean omega-3 index level was significantly lower (4.71 ± 1.12%) compared to individuals with normal body weight (6.48 ± 1.37%, $p < 0.01$) (Table 1).

Table 1

Distribution of Participants by BMI Categories

BMI Category	BMI (kg/m²)	Number of Participants (n)	Percentage (%)
Normal body weight	18.5–24.9	14	28.0
Overweight	25.0–29.9	23	46.0
Obesity	≥30	13	26.0

Correlation analysis in the overall sample demonstrated a strong inverse relationship between BMI and omega-3 index ($r = -0.91$; $p < 0.001$), indicating a systematic decrease in omega-3 fatty acid levels with increasing body weight.

Gender-stratified analysis revealed a very strong negative correlation in men ($r = -0.95$; $p < 0.001$), with a coefficient of determination ($R^2 = 0.90$), meaning that approximately 90% of omega-3 index variability could be explained by BMI changes. In women, a strong negative relationship was also observed ($r = -0.89$; $p < 0.001$), with $R^2 = 0.79$.

Comparison of correlation coefficients using Fisher's z-transformation demonstrated a tendency toward a stronger relationship in men; however, no statistically significant difference between groups was identified ($p > 0.05$), suggesting the universality of the observed association (Table 2).

Table 2

Correlation Analysis Between BMI and Omega-3 Index

Group	R	p	R^2
Overall sample	-0.91	<0.001	0.83
Men	-0.95	<0.001	0.90
Women	-0.89	<0.001	0.79

Additional quartile analysis of BMI demonstrated a gradient decrease in omega-3 index levels: in the lowest BMI quartile, the mean omega-3 index level was 6.72 ± 1.21%, whereas in the highest quartile it was 4.58 ± 1.05% (p for trend < 0.001), confirming the dose-dependent nature of this relationship.

Assessment of age influence revealed a weak negative correlation between age and omega-3 index (r = -0.17; p = 0.23), which did not reach statistical significance. Similarly, the relationship between age and BMI was weak and statistically insignificant (r = 0.21; p = 0.14).

When the sample was divided into age groups (<40 years and ≥40 years), no statistically significant differences in omega-3 index levels were identified (5.74 ± 1.51% vs. 5.51 ± 1.46%, p > 0.05), indicating the absence of a pronounced age-related effect within this study (Table 3).

Table 3

Influence of Age on BMI and Omega-3 Index Indicators

Indicator	**Value**	**p**
Correlation between age and omega-3 index	r = -0.17	0.23
Correlation between age and BMI	r = 0.21	0.14
Omega-3 index in participants <40 years	5.74 ± 1.51%	>0.05
Omega-3 index in participants ≥40 years	5.51 ± 1.46%	

Thus, the obtained results demonstrate:

- A stable and statistically significant inverse relationship between BMI and omega-3 index;
- A similar nature of this relationship in both men and women;
- No significant influence of age on the studied indicators;
- A gradient (dose-dependent) decrease in omega-3 index with increasing BMI.

These findings support the hypothesis regarding the important role of nutritional status and adipose tissue in polyunsaturated fatty acid metabolism and cardiometabolic risk formation.

Discussion: The obtained results are generally consistent with international studies demonstrating substantial geographic differences in omega-3 index levels among populations of different countries. In Northern European countries and Japan, mean omega-3 index values often exceed 8%, which is associated with traditionally high consumption of marine fish and other sources of long-chain omega-3 polyunsaturated fatty acids [6,8]. In contrast, in many Central and Eastern European countries, omega-3 index levels usually range between 4–6%, indicating insufficient dietary intake of EPA and DHA [7].

In the present study, the mean omega-3 index level was 5.62 ± 1.48%, corresponding to a suboptimal level and generally consistent with values reported in other European populations. Comparison of the obtained results with international data suggests that omega-3 status in the studied Ukrainian sample is similar to findings reported in Norway and Germany, although lower than in populations with traditionally high seafood consumption (Table 4).

Table 4

Comparison of Omega-3 Index Levels in the Studied Sample and European Populations

Population	Sample Characteristics	Mean Omega-3 Index (%)
Ukraine	Clinical population	5.62 ± 1.48
Norway [7]	Clinical population	4.59
Germany [9]	Elite athletes	4.97 ± 1.19

One possible explanation for these findings may be low consumption of fatty marine fish, which represents the primary dietary source of EPA and DHA. According to epidemiological studies, average fish consumption in Ukraine is significantly lower than in most European Union countries, which may contribute to insufficient intake of long-chain omega-3 polyunsaturated fatty acids [1].

Data from the State Statistics Service of Ukraine indicate that a considerable proportion of the population consumes insufficient amounts of fish. Fish and seafood consumption per capita in Ukraine decreased from 14.6 kg per year in 2013 to 8.6 kg in 2015, with a slight increase to 9.6 kg in 2016. By comparison, according to the Food and Agriculture Organization (FAO), the global average fish consumption was approximately 20 kg per capita per year, whereas in low-income countries it was about 8 kg [10].

An important finding of the study was the identification of a strong statistically significant inverse relationship between BMI and omega-3 index ($r = -0.91$; $p < 0.001$). A similar pattern was observed both in men ($r = -0.95$; $p < 0.001$) and women ($r = -0.89$; $p < 0.001$), indicating the universal nature of this association. Furthermore, participants with obesity had significantly lower omega-3 index levels compared to individuals with normal body weight (4.71 ± 1.12% vs. 6.48 ± 1.37%, $p < 0.01$).

Additional analysis demonstrated a gradient decrease in omega-3 index with increasing

BMI: in the lowest BMI quartile, the mean omega-3 index was 6.72 ± 1.21%, whereas in the highest quartile it was 4.58 ± 1.05% (p for trend < 0.001). This confirms the dose-dependent relationship between nutritional status and omega-3 fatty acid sufficiency.

The obtained results are consistent with clinical studies demonstrating that increased BMI is associated with reduced levels of long-chain omega-3 fatty acids in cell membranes, potentially related to lipid metabolism disturbances and chronic low-grade inflammation characteristic of overweight individuals [2]. Potential mechanisms underlying this phenomenon may include both dietary behavior patterns and metabolic changes associated with obesity.

From the perspective of preventive medicine, the omega-3 index is considered a promising biomarker of cardiometabolic risk that reflects long-term dietary intake of EPA and DHA [4,5]. Unlike many traditional biochemical indicators, this marker reflects not only metabolic status but also population dietary habits.

The obtained findings may have practical implications for cardiovascular disease prevention strategies. Increasing the consumption of omega-3 polyunsaturated fatty acid sources, particularly fatty marine fish or appropriate dietary supplements, may contribute to improved omega-3 status in the population and potentially reduce cardiometabolic risk [4].

At the same time, it should be noted that the present findings are preliminary and require confirmation in larger epidemiological studies involving broader population groups and different regions of Ukraine.

Interpretation of the study results should take several limitations into account. First, the study had a pilot design and was conducted on a relatively small sample ($n = 50$), limiting the generalizability of the findings to the entire adult population of Ukraine.

Second, the sample had a regional character, as all participants resided in a single region. Considering potential differences in dietary habits, socioeconomic conditions, and lifestyle among different regions of the country, these factors may influence population omega-3 status.

Furthermore, the study did not include a detailed dietary assessment, particularly regarding fish, seafood, or omega-3 supplement consumption. The absence of such data limits the possibility of a deeper analysis of factors determining omega-3 index levels.

It should also be emphasized that the cross-sectional study design does not allow causal relationships between omega-3 index levels and cardiometabolic risk factors to be established, but only possible associations to be identified.

Despite these limitations, the obtained results provide preliminary insight into the omega-3 status of the studied group and may serve as a basis for future large-scale epidemiological studies in different regions of Ukraine.

Conclusions. The study demonstrated that the mean omega-3 index level in the investigated sample of the adult Ukrainian population was 5.62 ± 1.48%, corresponding to a suboptimal level of omega-3 polyunsaturated fatty acid sufficiency.

A strong statistically significant inverse relationship between BMI and omega-3 index was identified ($r = -0.91$; $p < 0.001$), which persisted in both men and women. Individuals with obesity had significantly lower omega-3 index levels compared to participants with normal body weight.

Additionally, a gradient decrease in omega-3 index with increasing BMI was established, confirming the dose-dependent relationship between nutritional status and omega-3 fatty acid sufficiency.

No statistically significant effect of age on omega-3 index levels was identified.

Overall, the study findings indicate the widespread prevalence of suboptimal omega-3 status among the examined individuals and highlight the перспективність of using the omega-3 index as an additional biomarker of cardiometabolic risk. The obtained data may serve as a foundation for future large-scale studies in different regions of Ukraine considering dietary factors, lifestyle, and other determinants of cardiovascular risk.

Disclosure. The authors declare that the manuscript is original, has not been previously published, and is not under consideration for publication elsewhere. All authors have reviewed and approved the final version of the manuscript.

Supplementary Materials. No supplementary materials were provided for this study.

Authors' Contribution:

Conceptualization: D. G. Pylypenko, O. Ye. Miakishev, A. V. Shanyhin;

Methodology: D.G. Pylypenko, O.Ye. Miakishev ,D.V. Borshch, A.V. Shanyhin;

Data collection: D.G. Pylypenko, D.V. Borshch, O.Ye. Miakishev;

Formal analysis: D.G. Pylypenko, O.Ye. Miakishev, D.V. Borshch;

Supervision: K.O. Talalaiev, V.V. Babiienko;

Writing - original draft preparation: D.G. Pylypenko, O.Ye. Miakishev; Writing - review and editing: K.O. Talalaiev, A.V. Shanyhin.

All authors have read and agreed to the published version of the manuscript.

Funding. This research received no external funding.

Institutional Review Board Statement. The study was conducted in accordance with the principles of the Declaration of Helsinki. Due to the observational non-interventional design of the study and the use of anonymized data, formal ethical committee approval was not required according to local institutional regulations.

Informed Consent Statement. Informed consent was obtained from all subjects involved in the study.

Data Availability Statement. The data presented in this study are available from the corresponding author upon reasonable request.

Acknowledgements. The authors express their sincere gratitude to the participants of the study and to the staff of Odesa National Medical University for their scientific and organizational support.

Conflicts of Interest. The authors declare no conflict of interest.

References:

1. World Health Organization. Noncommunicable diseases country profile 2018: Ukraine. Geneva: World Health Organization, 2018. URL: https://www.who.int/publications/m/item/noncommunicable-diseases-ukr-country-profile-2018.

2. Clinical determinants of ischemic heart disease in Eastern Europe / E. Cenko et al. The Lancet Regional Health - Europe. 2023. Vol. 33. P. 100698. URL: https://doi.org/10.1016/j.lanepe.2023.100698.

3. Babiienko V. V., Shanyhin A. V. Fundamentals of Dietetics and Clinical Nutrition: Evidence-Based Approaches to Rational Nutrition, Nutritional Support, and Diet Therapy : educational manual [Electronic resource]. - 2025. - Available at: https://repo.odmu.edu.ua/xmlui/handle/123456789/18621 (accessed: 22.04.2026). – Title from the screen. - Odesa National Medical University.

4. von Schacky C. Omega-3 fatty acids in cardiovascular disease – An uphill battle. Prostaglandins, Leukotrienes and Essential Fatty Acids. 2015. Vol. 92. P. 41–47. URL: https://doi.org/10.1016/j.plefa.2014.05.004.

5. Harris W. S., von Schacky C. The Omega-3 Index: a new risk factor for death from

coronary heart disease?. Preventive Medicine. 2004. Vol. 39, no. 1. P. 212–220. URL: https://doi.org/10.1016/j.ypmed.2004.02.030.

6. Blood levels of long-chain n–3 fatty acids and the risk of sudden death / C. M. Albert et al. New England Journal of Medicine. 2002. Vol. 346, no. 15. P. 1113–1118. URL: https://doi.org/10.1056/nejmoa012918.

7. Low levels of the omega-3 index are associated with sudden cardiac arrest and remain stable in survivors in the subacute phase / H. Aarsetoey et al. Lipids. 2011. Vol. 46, no. 2. P. 151–161. URL: https://doi.org/10.1007/s11745-010-3511-3.

8. Omega-3 polyunsaturated fatty acid biomarkers and coronary heart disease / L. C. Del Gobbo et al. JAMA Internal Medicine. 2016. Vol. 176, no. 8. P. 1155. URL: https://doi.org/10.1001/jamainternmed.2016.2925.

9. von Schacky C., Kemper M., Haslbauer R., Halle M. Low Omega-3 Index in 106 German elite winter endurance athletes: a pilot study. Journal of Sports Science & Medicine. 2014. Vol. 13, no. 4. P. 912-920. URL: https://pubmed.ncbi.nlm.nih.gov/25203220/.

10. Babiienko V. V., Shanyhin A. V. Prevention of Vitamin D Deficiency and Insufficiency: Hygienic Basis and Practical Recommendations : monograph [Electronic resource]. -Odesa : Odesa National Medical University, 2025. - Available at: https://repo.odmu.edu.ua/xmlui/handle/123456789/17476