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WHAT IS THE PRO-INFLAMMATORY DIETARY MODEL ASSOCIATED WITH?

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Abstract

Introduction. Cellular potential disruption leads to several polyplatoligias due to increased systemic inflammation, as a consequence of the visualized multivariate appearance. Objective. To highlight the relevance of the pathomechanism of oxidative stress and oxidative potential about changes in metabolic mechanisms at the cellular level, predisposing to polypatoligia and the development of destructive transformations visualized in outward appearance targeted by a pro-inflammatory nutritional model. Material and methods. A sample of 226 subjects was selected by random selection of respondents. The author's questionnaire concerned metric data, level of physical exercise, diagnosed disease entity, inflammatory changes within the body dermis, and level of frequency of consumption of selected food groups. The obtained results were verified by statistical analysis with a significance level of $\alpha < 0.05$. Results. The subject was characterized by a diagnosed multimorbidity at the level of (approximately 20%) about the individual clinical course of the respondent. The anthropometric parameter BMI without sex division (due to predominance of female subjects) among 55% of the whole group was within the normal range, constituting 24.4 kg/m2, showed a significant correlation directed at the pathomechanism of multimorbidity at the level of 78% in physical appearance. Conclusions.

The pathomechanism of developing polyposis is significantly associated with the appearance of changes within the tissues translated into the shell system and anthropometric measurements related to the value of body mass index. Multivariable within the common coat is significantly dependent on the implemented phytotherapeutics - bioactive components derived from oregano, to obtain high antioxidant potential.

Keywords: oxidative stress, free radicals, antioxidant capacity, multivariability, polypatoligies

BACKGROUND

Processes disrupting the intracellular balance under the influence of pro-inflammatory factors, among others endocrine disruptors, leading to hyperreactivity of the potential of chemical processes in individual cells. This mechanism triggers a disturbance on the peroxidation-antioxidation line termed oxidative stress. Subsequently, the spectrum of action of pathomechanisms directed at the adaptation of the organism about the diversity of potentials within the cell membrane introduces a state of allostasis. The oxidative concept focuses on the transport of molecules such as electrons, hydrogen atoms, oxygen atoms, cations, anions through uptake and translocation in the metabolic pathway defining the process of composition of various reactive oxygen species [2-4]. The immoderate amount of free radicals produced combines with such chemical molecules as nucleic acid, protein, carbohydrates, lipids (e.g., cholesterol fraction), unsaturated fatty acids. Consequently, it exhibits a potentially toxic effect on the intrinsic environment as multi-molecular chemical compounds with high reactivity potential are formed. The metabolic reaction pathway is mediated by enzymatic (catalase -CAT, superoxide dismutases -DOX, peroxidases-POX) and non-enzymatic compounds (glutathione -GSH, cysteine, α-tocopherol -vitamin E, ascorbic acid -vitamin C, flavonoids, carotenoids, mannitol) activating antioxidant effects through the antioxidant defense system (ADS) pathway [2,3,5]. The key element of the concept of antioxidant pathomechanism at the DNA level of the cell-mediated by antioxidant enzymatically active molecules is illustrated in Figure 1 [2].

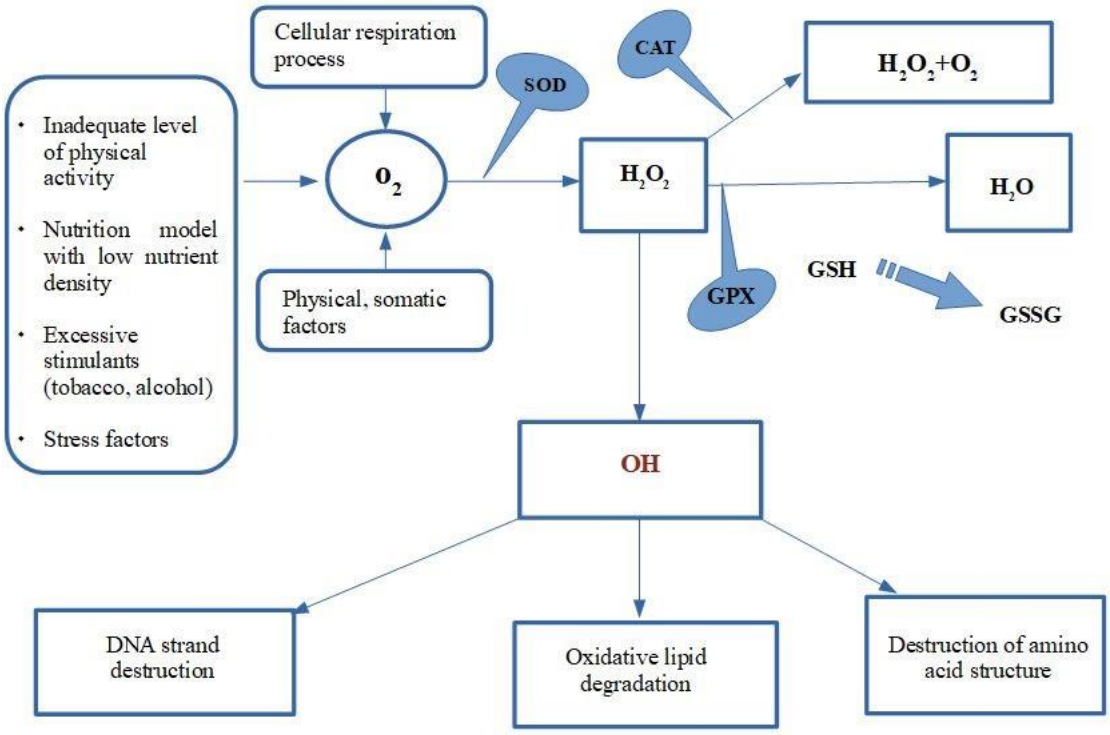

Figure 1. Pathomechanism of oxidative stress induction.

The bromatological analysis allows quantitative and qualitative evaluation of food composition taking into account the presence of specific antioxidants and their degree of antioxidant capacity through free radical deactivation processes. Among the products analyzed using chemical methods, e.g. fluorescence, as well as in vivo studies made it possible to visualize in the form of a scale the assessment of the potential of antioxidant properties. In addition, it is possible to determine. In addition, it is possible to determine in a laboratory analytical way the level of antioxidant potential using TAC (Total Antioxidant Capability) and ORAC (Oxygen Radical Absorbance Capacity) parameters. The antioxidant potential is evaluated using the oxygen radical absorbance capacity, thus defined as the ORAC index. By analyzing the composition of the bioactive compound, it is possible to determine the level of presence of stronger antioxidant properties in the antioxidant under investigation. Then, classifying it to the appropriate range of the numerical value of the coefficient expressed in the ORAC unit against the growth of the antioxidant (Trolox - a derivative of vitamin E). The determination of the TAC parameter, on the other hand, allows us to refer to the antioxidant effect on the oxidoreductive line, but about the whole product of a particular food group [6,7]. According to current scientific reports, the gradually implemented, the protective total antioxidant dose is is in the range of 3300 - 3500 ORAC units. Based on the ORAC scale developed, the highest value of this parameter is distinguished in food of plant origin, successively in fruits, e.g. dried plums, raisins, blueberries, blackberries, and vegetables such as kale, spinach, brussels sprouts, alfalfa sprouts. In the dietary model, the implementation of low-processed plant-based products shows an intense role in removing excess free radicals. consequently neutralizing oxidative stress [6].

In the course of biochemical pathways (synthesis of hydrogen peroxide, lipid peroxides) during allostasis, changes are formed, which can be seen in the form of determination of values of relevant parameters by laboratory analytical methods in the patient's blood serum. At the cellular level, the spectrophotometric exponent showing the process of lipid peroxidation is malondialdehyde (MDA) - a parameter of tissue destruction by free radicals. Further diagnostic indicators are advanced oxidation protein products (AOPPs), C-reactive protein (CRP), advanced glycation end products (AGEs), cytokeratin (pathologies within hepatocytes), isoprostanes (IsoPs) in the urine matrix and the cerebrospinal fluid, and allantoin determined in the urine sample [8-10].

In the light of current scientific reports, the above-mentioned diagnostic (bio-indicators) and prognostic factors represent the future in the field of immunoenzymatic analysis in terms of in vivo diagnosis of the etiopathogenesis of diseases of inflammatory, autoimmune, neurodevelopmental basis, as well as pathologies in the pathomechanism of the developing fetus, thus conditions at the genome level. In addition, it seems important to emphasize the diagnosis of disease entities with a metabolic basis, involving the brain-hepatic-gut axis correlation, thus dependent on diet. Consequently, the parameters of the diagnosed clinical picture are reflected in the selection of a personalized nutritional model with the supplementation of diet therapy with a health-promoting dose of nutraceuticals in the form of antioxidants [9,10]. The body responds in physiological terms contributes to the synthesis of pro-inflammatory cytokines (IL-6, IL-1, TGF-β), PAI-1 (plasminogen activator inhibitor), MCP-1 (monocyte chemotactic protein-1) adipocytokine, haptoglobin, accumulation of pro-inflammatory proteins in the cerebellar structure (significant remission of oxidative stress after lipoic acid administration), destabilization of nitric oxide synthase, preventing contractile function within the blood vessel wall. Indicators of developing inflammation predispose to chronobiological dysfunction associated with inactivation of melatonin synthesis (potent antioxidant potential) by pinealocytes [11-13].

Another important aspect confirmed in scientific research, which is underpinned by inflammation - directed at the induction of oxidative stress are neurohormone-mediated

polyplatoligias associated with endocrine, nervous, and autoimmune dysfunction [Table I] [14-20].

Table I. Own elaboration based on the literature - Pathomechanism of oxidative stress in neurohormonal and autoimmune polyposis.

Neurohormonal pathology	Pathomechanism
Endometriosis	Destruction of proteins, inactivation of superoxide dismutase potential and concentration, stimulation of transcription factor NF-κB, disturbance of biochemical metabolism of iron, damage to mesothelium causing the development of adhesions
Infertility	Oocyte mitochondrial disorders
Alzheimer's disease	Cytochrome oxidase inactivation, hydroxyl radical accumulation, oxygen species attack leading to microglia activation, and oxidative stress
Parkinson's disease	Activation of microglia synthesis, cytokines, consequently TNF receptors at the neuronal level, activation of apoptotic pathway mediated by caspase activation, successively excess iron and dopamine in the black matter of neurons is a predictor for multiple RFT stimulation
Body aging	Increased aging of body cells, increased biological and metabolic age
Psoriasis, skin allergies	Epidermal cell proliferation, induction of α-2-macroglobulin and α-1-antitrypsin protease inhibitors, and significant levels of thiobarbituric acid-TBARS in erythrocytes and blood plasma. Immune system dysfunction due to inflammatory progression
Dysbiosis of the microbiome	The dominance of pathological strains e.g. Staphylococcus aureus. The mechanism of PPR receptor interaction contributes to the identification of Pathogen-Associated Molecular Patterns (PAMPs)

The process of the research work was directed to the research hypothesis, which is to highlight the relevance of the pathomechanism of oxidative stress and oxidative potential about changes in metabolic mechanisms at the cellular level, predisposing to polyplasia and the development of destructive transformations visualized in physical appearance.

MATERIAL AND METHODS

Population characteristics

The study group consisted of 226 subjects of both female and male sexes, the predominance of female subjects was 85%. The sample selection was done by random selection of the respondents. Among the respondents, the predominant age range was 19-30 years, followed by an average body mass index (BMI) of 24.4 kg/m2 - representing a range of 13.7 to 45.7. The degree of education with a significant predominance was declared as the higher level

and the respondents mainly reside in a city of more than 100 thousand inhabitants. The analysis of the collected data is summarized in Table II in the results section.

Research tool

The research tool was in the form of a self-administered questionnaire that was made available through mass media - Internet among the members of the social networking groups. The questionnaire contained questions about metric data, level of physical exercise, diagnosed disease entity, inflammatory, destructive changes within the body dermis i.e. face, upper limbs, lower limbs, abdomen, head, nails and mucous membranes, frequency of taking pharmaceuticals, type of dietary supplements, as well as eating habits including a table of food groups with the level of frequency of their consumption.

Statistical elaboration

The obtained results were verified by statistical analysis taking into account the significance level $\alpha < 0.05$ using the $\chi 2$ NW test and correlation coefficients V Cramer, Tau-Kendall.

RESULTS

Physical activity realized by the study sample was a low level in the form of walking 1h/week, professional work realized in a sitting and standing mode, daily household chores, mode of transportation by car. The clinical picture of the respondents was presented based on the diagnosed disease entity, which in the majority did not occur, however, taking into account in the next place the course of multi-disease (n=35; 16%) including predominant polyplasia associated with disorders of the endocrine system - hypothyroidism (n=14; 6%), diseases of the cardiovascular system - hypertension (n=8; 4%) insulin resistance (n=7; 3%), diabetes mellitus type I/II (n=6; 3%). The study subjects were characterized by significant body multivariability, which mainly included dry, gray, and rough skin, clots, inflammation arising on the lips, wrinkles, brittle, fragile nails, stretch marks on the skin, skin lesions in the form of acne, hair loss, and prominent bends on the scalp with a predominance of changes in physical appearance in the age group 19-30 years. Pharmacological treatment was not an advantage as a higher percentage of subjects reported not taking pharmaceuticals and sequentially implementing pharmacological therapy in chronic form (n=70; 31%). Supporting the nutritional model with dietary supplements represented a low level, as a greater proportion of respondents do not take supplements (n=93; 41%), while successively respondents declared at a lower level of supplementation considering with predominance supplements in the form of vitamins and minerals (n=55; 24%) and supplements in the form of vitamins and minerals along with essential fatty acids (n=9; 4%) [Table II].

Table II. Characteristics of the study group.

Gender	**Female -♀ (n=192; 85%) Male - ♂ (n=34; 15%)**
Age	19-30 years old (n=149; 66%) 41-50 years old (n=30; 13%) 31-40 years old (n=22; 10%) 51-60 years old (n=17; 7%) 61-70 years (n=6; 3%) 71-80 years (n=2; 1%)
Body mass index (BMI)	Mean ($\bar{x}$) −24,4kg/m^2 – **normal weight** ± 5,2 – standard deviation (SD) BMI range (Min-max): **13,72 – 45,73** kg/m^2 **(emaciation - obesity of III degree)**
Educational level	**Higher (n=118; 52%)** Secondary (n=96; 43%) Professional (n=7; 3%) Lower Secondary School (n=4; 2%) Basic (n=1; 0.4%)
Type of residence	**City with more than 100 thousand inhabitants (n=109; 48%)** City below 100,000 inhabitants (n=67; 30%) Rural areas (n=50 ;22%)
Physical activity level	**Low activity (n=116; 51%)** Moderate (n=96; 43%) High (n=14; 6%)
Diagnosed disease entity	**No diagnosis (n=128; 56.6%)** Multi-morbidity (n=35; 15.5%) Single disorder: - Endocrine system - hypothyroidism (n=14; 6.2%) - Cardiovascular - hypertension (n=10; 4.4%) - Endocrine System - Insulin Resistance (n=8; 3.5%) - Endocrine System - Type I/II Diabetes (n=7; 3.1%) - Endocrine System-Hypothyroidism/Immune System-Allergy (n=6; 1.3%) - Respiratory - bronchial asthma/cancer/nervous system - anxiety and neurosis/vascular system - iron deficiency anaemia (n=2; 0.9%) - Neuromuscular system-myotonia/visceral system (cataract)/ cardiovascular system-hypercholesterolemia/ischemic heart disease/coronary artery disease/nervous system-depression/ digestive system-reflux/ musculoskeletal system-drug-resistant epilepsy/ nervous system-epilepsy/ digestive system-stomach inflammation/ dermatosis-acne (n=1; 0.4%)
Changes in external appearance	**Multi changes (n=117; 78.3%)** One change (n=39; 17.3%) No changes (n=10; 4.4%)
Drug therapy with medication	**No type of pharmacotherapy used (n=119; 52.7%)** Long-term pharmacotherapy (n=70; 31%) Short-term pharmacotherapy (n=37; 16.4%)

Supplementation	**Not taking supplements (n=93; 41.2%)** Taking supplements one specified most commonly for the immune system (n=69; 30.5%) Multiple types of supplements (n=64; 28.3%)
Type of supplements taken	**-Supplements containing minerals and vitamins (n=55; 24.3%)** -Supplements containing minerals and vitamins, supplements containing essential fatty acids (n=9; 4%) -Supplements that support the immune system (n=6; 2.7%) -Supplements containing minerals and vitamins, supplements that support the immune system (n=5; 2.2%) - Supplements containing minerals and vitamins, digestive support supplements (n=4; 1.8%) -Other supplements representing individually each of n=54 approximately 0.4 -1%)

Between the category of body mass index and diagnosed polyplasia (multimorbidity) statistical relationship was found (p=0.00001), while the strength of the compiled statistical characteristics determining BMI and multimorbidity is medium (V- Cramer=0.4). Body mass index and the number of changes in physical appearance occurring in their relationship are not statistically significant (p=0.8), while the strength of the association is determined as weak (tau-kendall=0.002). The type of diagnosed single disease entity along with the body changes in the shell system did not show statistical significance (p=0.63) and the strength of the correlated features proved to be medium (V - Cramer = 0.4), while the pathomechanism of multimorbidity and the number of changes in physical appearance showed a significant relationship (p=0.01) along with the strength of the relationship of weak degree (V - Cramer = 0.2). Multivariability likely suggests multi-morbidity, or in the example of the author's study, a lack of diagnosis in the clinical picture, thus a lack of adequate prevention targeting diagnostic testing. Furthermore, the number of lesions present lesions in comparison with stimulants did not show significance i.e. alcohol (p=0.07) and tobacco (p=0.09). As the level of physical activity increased, the number of changes decreased, but there was no statistical significance between the variables (p=0.5). Response to stressors in the form of snacking increased the amount of multivariability compared to starvation as a result of the interacting stress, however, no significant relationship was established between these characteristics (p=0.4). The diet of the study group is presented in the table [Table IIIa and IIIb] with the most frequently declared answers.

Table IIIa. Diet of the respondents - most frequent consumption

Milk and dairy products	**Milk** - several times a week (n=50; 22%) **Kefir** - not at all (n=115; 51%) **Natural yoghurt** - several times a month (n=65; 29%) **Plain yogurt (home-made)** - not at all (n=145; 64%) **Ready-made sweetened dairy products** - not at all (n=115; 51%) **Skimmed or semi-skimmed cottage cheese** - a few times a month (n=64; 28%) **Yellow cheese, processed** - several times a month (n=57; 25%)
Meat, fish, cold cuts and offal	**Poultry meat e.g. chicken, turkey** - several times a week (n=103; 46%) **Pork** - several times a month (n=56; 25%) **Fatty fish and lean fish** - once a month (n=59; 26%), **Offal** - not at all (n=152; 67%), **Smoked, baked, and cooked sausages** - several times a month (n=52; 23%)
Legume seeds	**Peas, beans, soybeans, lentils, broad beans** - several times a month (n=75; 33%)
Spices with a high ORAC value	**Oregano** - several times a week (n=76; 34%) **Turmeric** - several times a month (n=56; 25%), **Marjoram**- several times a month (n=61; 27%) **Nigella**- not at all (n=117; 52%)

Table IIIb. Diet of the subjects

Predisposition to excessive body weight	**Inadequate diet** (n=163; 72.1%) Genetic conditions (n=63; 27.9%)
Regularity of meals	**4-5 hours between meals** (n=113; 50%) 2-3 hours between meals (n=82; 36.3%) More than 5 hours between meals (n=31; 13.7%)
Number of meals per day	**3-4 meals (n=153; 67.7%)** 5-6 meals (n=40; 17.7%) 1-2 meals (n=31; 13.7%) More than 6 meals (n=0.9%)
Snacking	**Yes** (n=127; 56.2%) No (n=99; 43.8%)
Drinking levels	**1.5-2 liters** (n=112; 49.6%) 0.5-1 liter (n=66; 29.2%) More than 2 liters (n=39; 17.3%) Don't know (n=9; 4%)
Type of liquids	**Still, mineral, spring water** (n=106; 47%) Black, white, red, green, fruit, herbal tea (n=56; 24.8%) Sparkling, highly mineralized water (n=29; 12.8%) Instant/boiled coffee (n=16; 7.1%) Sweetened, carbonated drinks or fruit juices and nectars (n=9; 4%) Fruit and vegetable juices (n=1; 0.4%)

The category of mass index versus snacking between meals and regularity of meals consumed showed no statistically significant relationship. Among the study group, snacking predisposed to an increase in multivariability, but without significance between traits.

Vegetable consumption did not affect the amount of change in physical appearance. The implementation of vegetables mostly in the cooked form represented a level of frequency several times a week in the subjects' eating plan [Figure 2].

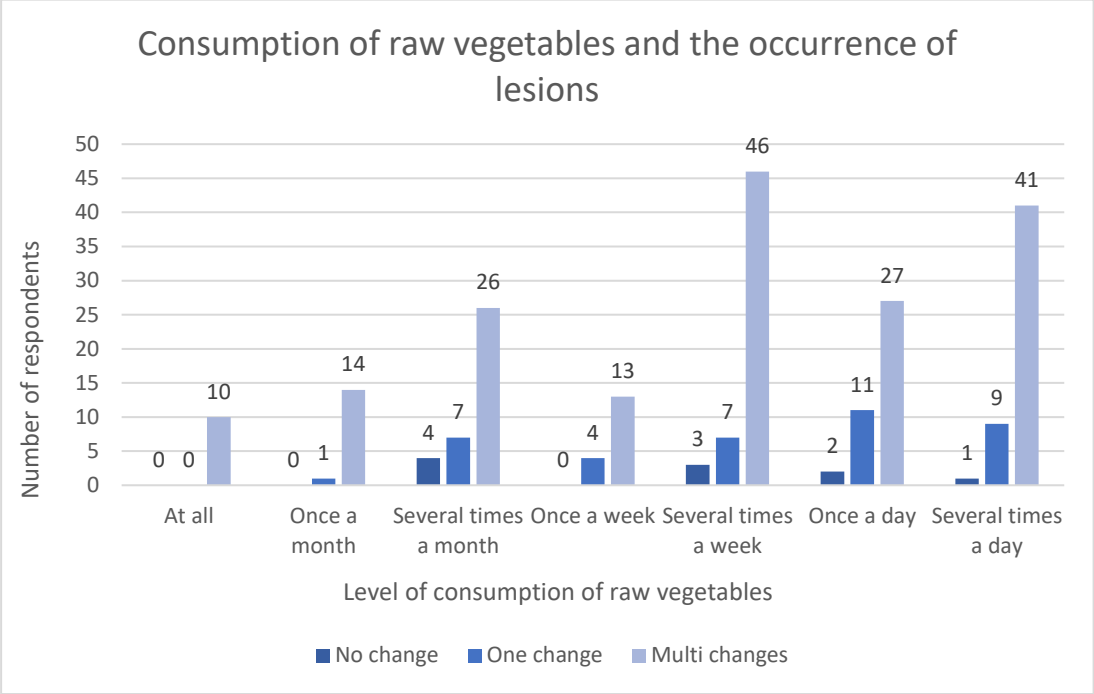

Figure 2. Frequency of consumption of raw vegetables vs. occurrence of changes in physical appearance.

Raw fruit consumption was an indicator of frequency several times a week with multivariate occurrence among the study sample. Two summary characteristics did not show significant significance (Figure 3).

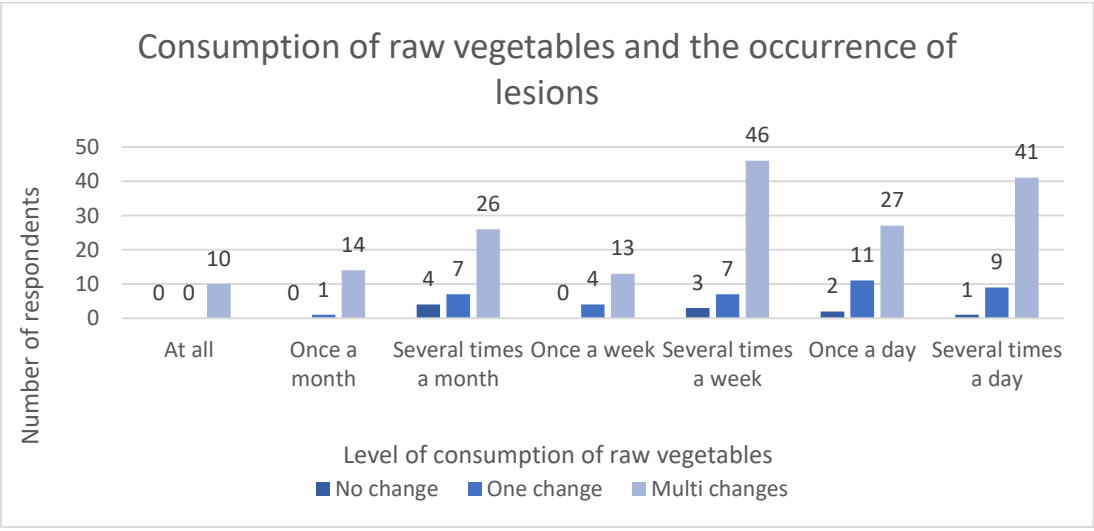

Figure 3. Frequency of consumption of raw fruits vs. occurrence of changes in physical appearance.

The introduction of polyunsaturated fatty acids into the dietary model represented a level of frequency several times per week with the pathomechanism of multivariability without significance between variables (Figure 4).

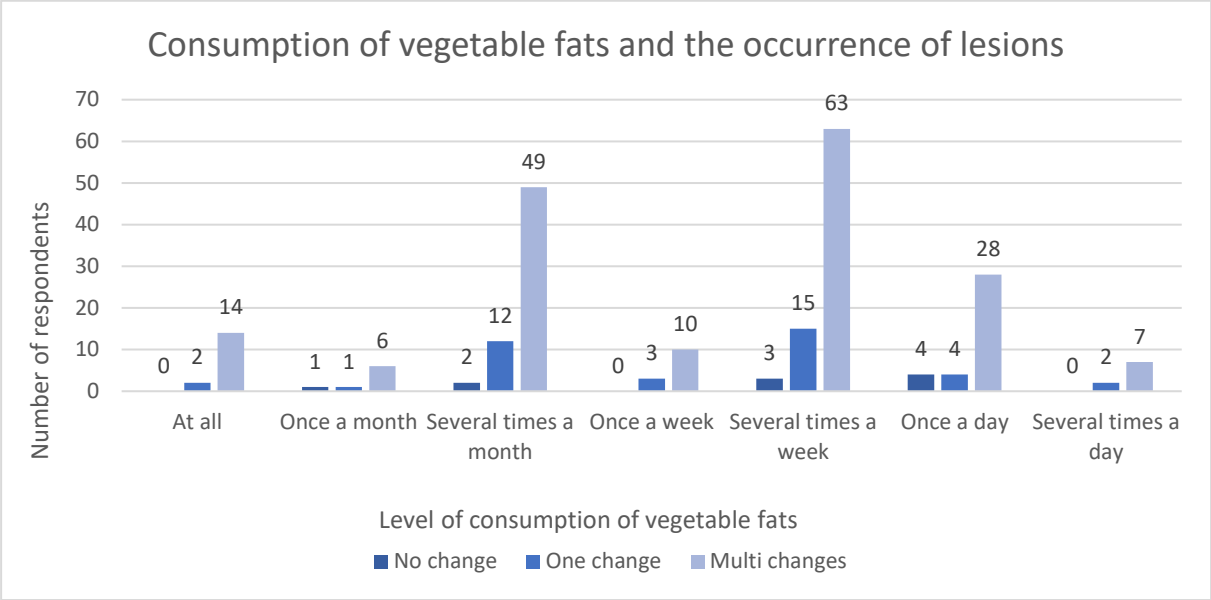

Figure 4. Frequency of consumption of vegetable fats vs. occurrence of changes in physical appearance.

The frequency of consumption at the level of several times a week of cereal products in the form of coarse groats did not account for statistical significance between changes in the subjects' physical appearance. but was predictive of an increase in multivariability (p=0.056) – (Figure 4).

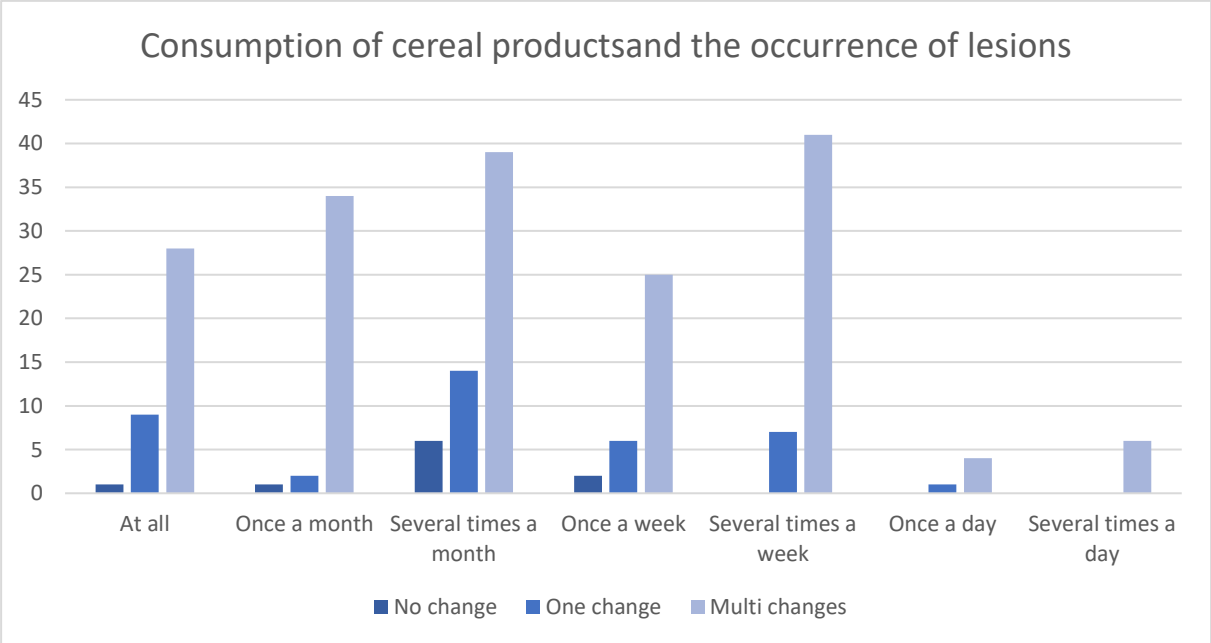

Figure 5. Frequency of consumption of cereal products and vs. occurrence of changes in physical appearance.

The implementation of selected phytotherapeutics (oregano, turmeric, marjoram, nigella) into the dietary model with an increased ORAC in the case of oregano spice with a frequency of several times a week represented statistical significance (p=0.003) - (Figure 6).

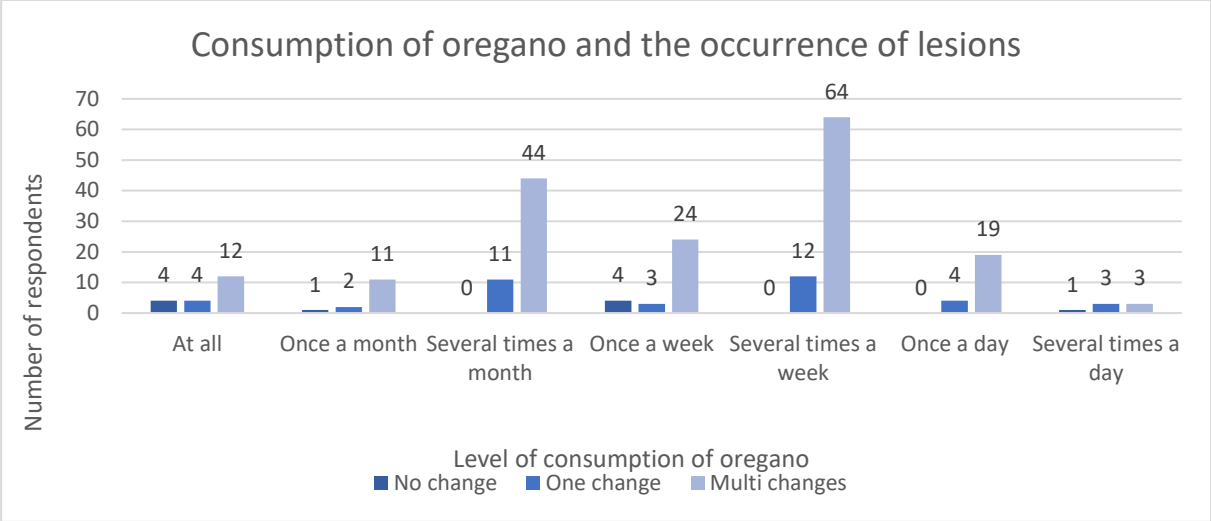

Figure 6. Frequency of consumption of oregano vs. occurrence of changes in physical appearance.

DISCUSSION

Pathophysiologic processes, and more specifically metabolic reactions occurring at the cellular level, are directed in their mechanism at achieving intracellular homeostasis. Disturbances of chemical processes, in consequence, lead to the formation of an excess of free hyper-reactive oxygen species, so-called RFT - (Reactive Oxygen Species) interfering with the oxidative potential of cells and tissues of specific organs and consequently the whole organism. The state caused by this dysfunction is called oxidative stress. According to the definition of oxidative stress, there is an impaired or complete imbalance between antioxidant capacity and free radical production. The cellular potential as a result of the disruption leads to a series of poly-pathologies due to increased systemic inflammation. A key element is a rational yet balanced nutrition at the cellular level [1].

In our study, the dietary pattern of the sample characterized by multivariate variation in physical appearance differed from the recommended dietary recommendations intended for the population of subjects without disease entities and with diagnosed chronic disease entities with metabolic and hormonal disorders constituting an increased percentage among the respondents. The evaluation of the nutritional plan of the respondents was characterized by a low intake of vegetables in raw form, with an inadequate portion of fruit, whole-grain cereal products viz. The assessment of the nutrition plan of the respondents was characterized by low intake of vegetables in raw form with the inadequate portion of fruits, whole grain cereal products such as bread, pasta, flakes, rice, groats, vegetable fats, and animal fats in the form of fish constituting moderate or inadequate level of nutrition by the standards of nutrition of the adult population, also based on the DASH model together with high ORAC potential at the realized AI (Adequate Intake) level. In relation of the above-mentioned results of the author's study to the current scientific reports also confirming nutritional errors in the compiled nutrition report within the framework of the national project conducted by NIZP PZH-PIB concerning nutritional behavior and frequency of consumption of selected products among about 1800 persons of the Polish population aged 18-64 years. The analysis confirmed low frequency of consumption of the following groups of products: vegetables - several times a week, fruits - several times a week, oily sea fish - several times an in a month, pulses - once or several times a month, whole grain products - once or several times a week, in general, and fermented dairy

products - once or several times a month, while fats of plant origin - several times a week, including an increased supply of butter - daily [21]. According to a review of publications, the consumption of fish as a source of antioxidant peptides containing angiotensin I-converting enzyme inhibitors and polyunsaturated fats is recommended at least once a week as a preventive factor aimed at cardioprotection [22].

The process of diet therapy together with daily supplementation with bioactive components in the form of nutraceuticals predisposes to achieve the increased total antioxidant potential of the diet. Ensuring adequate levels of vitamin C, E, carotenoids, including lycopene, polyphenols, nepitrine, and flavonoid glycosides in the blood predisposes to reduced induction of free radical forms and a reduction in the pathomechanism of oxidative stress, combating systemic inflammation exemplified by a decreasing process of pathological changes in coronary vessels and myocardial tissues [23-25]. According to current scientific reports, the implementation of plant phytotherapeutics in the form of herbs, spices such as oregano, nigella, marjoram, turmeric, thyme, savory show antioxidant, inflammation-reducing, hypoglycemic, hypocholesterolemic effects [26-30]. Referring to the author's analysis, the use of spices did not represent a high frequency among the study sample. The relationship between the set spices and the multivariate was found in the case of phytotherapeutic oregano, while in the case of cumin, as well as marjoram and turmeric, no significant relationship was found, but it should be emphasized that the successive non-use increases the number of changes that occur because our results show at 80% level the occurrence of multivariate in people using cumin successively: once and several times a week, once and several times a month, and not implementing it at all. It seems reasonable to use it regularly in the amount of 5g in a single dose, several times a day, to obtain a protective effect.

The preventive element is consequently reproduced in the clinical picture due to anti-inflammatory pathophysiological changes occurring at the cellular level. The homeostatic state undergoing metabolic disturbances is also directed towards its opposite effect - the state of allostasis. Given the above. Therefore, the processes of aging and inflammation occurring at the base of tissues reflect these disturbances in the form of changes in external appearance - stretch marks, wrinkles, gray epidermis, inflammatory changes in the form of acne, scars, hair loss, and brittle nail structure. Changes in visceral adipose tissue induction are mediators of inflammation predisposing to polyplatoligia with particular metabolic and hormonal factors that are reflected in the form of progressive aging processes and acceleration of biological age. Stress factors also affect the mechanism of hunger and satiety, regulating the relationship with food and consequently influencing body mass index [31, 32, 33]. In our analysis, we found significance between the pathomechanism of many disease entities of the so-called multimorbidity and the increase in BMI and multimorbidity showing accelerated aging processes and inflammation.

In the nutritional intervention model, interdisciplinarity in the form of an appropriate medical and nutritional history, including intervention by a physician with a specialty in metabolic diseases, a clinical dietitian, a psychodietican, and a psychotherapist is important. Extending the self-examination with oxidative stress biomarkers to highlight the individual pathomechanism of the changes and the aspect of dysmorphia and eating disorders in the form of psychodietetic tests performed would be an important as well as effective issue in the analysis of the results since a larger percentage of the study sample showed a body mass index within the normal range with a variety of multivariable. The psychological issue is an important integral element, as diet and perception of external appearance may be disturbed as a result of factors that lower self-esteem, development of psychosomatic symptoms. The above factors predispose to neurohormonal disorders by disrupting the synthesis of neuromediators, ultimately resulting in increased synthesis of free radicals and potentiation of the oxidative stress mechanism the mechanism in cells.

CONCLUSIONS

1. Low physical activity of the subjects predisposes to the pathomechanism of multivariate appearance inducing oxidative stress levels.
2. Bioactive components (vitamin B1, B2, PP, magnesium, selenium, zinc) present in the dietary model on the example of complex carbohydrates in the form of whole-grain cereals, rice, and brown pasta (without statistical significance) together with a phytotherapeutic agent (statistical significance) - oregano with high antioxidant potential, showed an effect on changes in appearance, while it was not reproduced about BMI.
3. The oxidative stress factor influencing the induction of aging processes in the form of changes seen in physical appearance is polypatoligies, while body mass index significantly influences multimorbidity. Moreover, the lack of a diagnosed disease entity did not predispose to the non-appearance of multiple changes in the subjects.
4. Supplementation in the majority of the study sample was not implemented in the daily eating plan, thus did not affect changes in physical appearance.
5. The response to stressors in the form of snacking resulted in an increase in multivariable versus starvation as a result of interacting endogenous stress in somatic terms.

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