

Effects of substances on serum zinc levels in postmenopausal women

Stężenie cynku w surowicy krwi kobiet w wieku postmenopauzalnym

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Abstract

Introduction: Demographic facts and forecasts about lengthening life expectancy motivate to systematize the knowledge of health problems experienced by women at the age of 50 and older. It refers to the whole health policy including health economics. Longer female life spans cause that an increasing number of women suffer from health problems associated with the perimenopausal period, and become health care recipients. Also a shift of retirement age is the reason to take interdisciplinary actions for women's health and quality of life.

This study describes a decline in the levels of many bioelements in hair, urine and blood serum, which progresses with age. It not only correlates with a decrease in the synthesis and secretion of estrogen, but also environmental pollution, unhealthy lifestyle and the use of substances.

Aim of the study: The aim of this study was to determine the correlation between serum zinc levels in postmenopausal women and such variables as the use of substances (cigarettes, alcohol) and menopausal hormone therapy (MHT).

Material and method: The study was conducted among 152 healthy women being 1-16 years after menopause. The women were divided into study group (MHT users) and control group (MHT non-users). A sub-division criterion was the use of substances (cigarettes, alcohol). Serum zinc levels were determined in all women.

Results: The use of substances significantly contributed to the lowering of serum zinc levels in postmenopausal women. MHT users had statistically higher average zinc levels in blood serum, which referred both to smokers and consumers of alcohol and those who did not use these substances.

Conclusions:

1. The use of substances (cigarettes, alcohol) contributes to the lowering of zinc levels in blood serum.
2. MHT positively affects serum zinc levels in postmenopausal women regardless of whether they use substances (cigarettes, alcohol) or not.

Key words: **menopause / zinc / menopausal hormone therapy / substances /**

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Streszczenie

Wstęp: Fakty i prognozy demograficzne dotyczące stałego trendu wydłużania się średniej długości życia, stają się pilnym postulatem do opracowywania oraz usystematyzowania problemów zdrowotnych kobiet w wieku 50+. Dotyczy to całokształtu polityki zdrowotnej, także w aspekcie ekonomiki zdrowia. Wydłużanie czasu życia kobiet sprawia, że coraz liczniejsza ich populacja doświadcza problemów zdrowotnych związanych ze zjawiskami okresu około-menopauzalnego, co odzwierciedla się dynamiką wzrostu korzystania z opieki zdrowotnej. Opisywane przez Autorów procesy obniżania się stężenia wielu biopierwiastków we włosach, moczu i w surowicy krwi postępują wraz z wiekiem. Zmiany te korelują nie tylko z obniżeniem syntezy i sekrecji estrogenów, ale także zatruciem środowiska oraz niewłaściwym stylem życia, w którym pierwszoplanowym problemem jest rozpowszechnienie stosowania używek.

Cel pracy: Określenie zależności pomiędzy stosowaniem używek (papierosy, alkohol) a stężeniem cynku w surowicy krwi u kobiet po menopauzie, oraz wpływu menopauzalnej terapii hormonalnej (MHT) na to stężenie.

Materiał i metoda: Badanie przeprowadzone zostało wśród 152 zdrowych kobiet w wieku od 1 roku do 16 lat po menopauzie. Badane podzielono w zależności od tego czy paliły papierosy lub/i spożywały alkohol. U wszystkich oznaczono stężenie cynku w surowicy krwi. Kryterium podziału stanowiło także stosowanie, bądź nie MHT.

Wyniki: Stosowanie używek wpływało istotnie na obniżenie stężenia cynku w surowicy krwi kobiet po menopauzie. Kobiety stosujące MHT miały statystycznie wyższe średnie stężenie cynku w surowicy krwi, zarówno te, które paliły papierosy i piły alkohol jak i te, które nie stosowały tych używek.

Wnioski:

1. Intensyfikacja edukacji zdrowotnej, mającej na celu zaniechanie stosowania używek może wpłynąć korzystnie na stężenie cynku w surowicy krwi kobiet w wieku postmenopauzalnym, co za tym idzie poprawę ich stanu zdrowia.
2. Upowszechnienie stosowania MHT wpływać może korzystnie na stężenie cynku w surowicy krwi u kobiet po menopauzie zarówno u kobiet stosujących jak i nie stosujących używki (papierosy, alkohol).

Słowa kluczowe: **menopauza / cynk / menopauzalna terapia hormonalna / używki /**

Introduction

In Poland, natural menopause usually occurs between the age of 43 and 55 (50.8 years on average). According to demographic forecasts women aged 50 and older will soon constitute 23% of the population in the developed countries and about 20% in the countries of East and Central Europe [1, 2]. As a result of lengthening average life spans, an increasing number of women face health problems typical of the perimenopausal period. In 1996 in Geneva the World Health Organization published a document 'Research on the menopause in the 1990', which highlights the necessity for environmental, biochemical and physiological research on this group. It also emphasises the usefulness of systematized data concerning the leading health problems of women at this stage of life (for ex. when planning the costs of pharmacotherapy) [3].

Typical manifestation of the perimenopausal period is the occurrence of a whole range of unfavourable symptoms associated with a decline in the estrogen level. Climacteric symptoms, whose range and severity are influenced by many factors, make everyday functioning of women considerably harder and quality of life lower [4, 5]. Aside from vasomotor changes assessed with the Kupperman Index, the symptoms include: insomnia and sleep disorders, night sweats, low mood, irritability, urogenital atrophy resulting in pollakiuria, vaginal dryness and dyspareunia. Other observed changes are: less flexible and thinner skin, poor hair and nails, brown melanoderma or leucoderma, lower activity of sweat and sebaceous glands, and spinal changes such as so called

'dowager's hump'. The clinical picture of this period is related to the lower estrogen production as well as vitamin deficiency and lower levels of bioelements [6, 7, 8].

There are reports on a decrease in the levels of many bioelements (including zinc) in hair and blood serum, which progresses with age. It is worth mentioning that it correlates with the incidence of osteoporosis, hypertension, and diabetes [9,10].

Research on perimenopausal women prove that symptoms of zinc deficiency may manifest as: brittle nails, falling-out hair, depressive moods, a feeling of being lost, a motor disability, and fatigue. Zinc deficiency may also reduce the sex drive, and lead to menstrual disorders, vaginal dryness and susceptibility to bacterial infections of the urinary tract. It is presumed that about 25% of disorders in the perimenopausal period is due to zinc deficiency [11, 12, 13].

An increasing consumption of highly processed foods and a decreasing intake of natural products make the modern people's diet poor in bio-elements. Also environmental pollution, stress, and especially the use of substances, such as cigarettes and alcohol, contribute to bioelements deficiency [14, 15].

The aim of this study was:

1. to assess the influence of substances on serum zinc levels in postmenopausal women.
2. to assess effects of MHT on serum zinc levels in postmenopausal women depending on the use of substances (cigarettes, alcohol).

Table I. Characteristics of serum zinc level [mg/l] distribution in study and control group women

Zn[mg/l]	Min-max	Median	(SD)	Significance level
Study group (n=76)	0.44 – 1.40	0.74	0.78 (0.20)	0.005
Control group (n=76)	0.43 – 1.18	0.67	0.69 (0.16)	

There was a significant difference between the study and control group women ($p=0.005$). The women taking hormone therapy had statistically significantly higher median values for zinc levels.

Table II. Characteristics of substance (cigarettes, alcohol) use distribution in study and control group women

Substances	Study group (n=76)		Control group (n=76)		Significance level
	n_1	%	n_1	%	
Cigarettes	15	19.7	15	19.7	0.84
Alcohol	9	11.8	10	13.2	1.0

n_1 – users of substances (cigarettes, alcohol)

There was no significant difference ($p>0.73$) in the frequency of using substances (cigarettes, alcohol) by study and control group women. It means that exposure to these harmful factors was similar in both groups.

Table III. Characteristics of Zn level distribution in female smokers in study and control group women

Characteristics of distribution	Zinc concentration	
	Study group (n=15)	Control group (n=15)
min - max	0.44 – 1.00	0.43 – 0.79
median	0.73	0.60
(SD)	0.76 (0.18)	0.60 (0.12)
Significance level	0.011	

Table IV. Characteristics of zinc level distribution in female alcohol drinkers in study and control group women

Characteristics of distribution	Zinc concentration	
	Study group (n=9)	Control group (n=10)
min - max	0.53 – 1.17	0.46 – 0.76
median	0.89	0.62
(SD)	0.88 (0.23)	0.64 (0.09)
Significance level	0.035	

Material and method

The study involved 152 postmenopausal women aged 42–69 years (mean age 55.5). The women were 1–16 years after menopause (8.5 years on average). The study exclusion criteria were chronic diseases, such as diabetes, tumours, liver diseases, renal insufficiency, hypertension, and thyroid diseases. Serum zinc levels were determined in all women. Additionally, sociometric data and information on the women's self-assessment concerning smoking and alcohol consumption were collected. The women included in this study were allocated to two groups depending on the use of MHT: study group (MHT users) and control group (MHT non-users). Each group consisted of 76 women. Both groups were homogeneous and had similar sociometric features. A sub-division criterion was the use of substances (cigarettes,

alcohol). The values of the variables in both groups were compared using the Mann-Whitney U test. Pearson's correlation coefficient, ANOVA (the One-Way Analysis of Variance for Independent Samples), and the Fisher statistic value (F) were used to measure effects of substances on serum zinc levels, as well as the power and direction of this correlation.

Results

The questionnaire analysis revealed that there were 30 (19.7%) women who smoked cigarettes and 19 (12.5%) who drank alcohol. Average zinc levels in their blood serum were: 0.68 mg/l and 0.76 mg/l respectively. There were 122 (80.3%) non-smokers and 133 (87.5%) non-drinkers. Average zinc levels in their blood serum were: 0.75 mg/l and 0.73 mg/l respectively.

There was a weak, right, statistically significant correlation between an increase in serum zinc levels in the non-smokers and smokers ($r_{xy}=0.159$; $p>0.05$). There was no statistically significant correlation between serum zinc levels in the drinkers and non-drinkers ($r_{xy}= -0.038$; $p>0.05$). To verify a hypothesis that smoking affects zinc levels, the authors used ANOVA and the Fisher statistic value (F). The result ($F = 3.865$; $p>0.05$) suggests a statistically significant relationship between smoking and lower zinc levels in the women analysed. Also the consumers of alcohol had lower zinc levels, however the difference was statistically insignificant ($F = 1.293$; $p>0.05$).

The users of substances (cigarettes, alcohol) who did not take MHT had significantly lower serum zinc levels than those who took this therapy.

Discussion

Zinc deficiency caused by environmental pollution and smoking cigarettes can intensify climacteric symptoms such as: vaginal dryness, lower libido, fatigue, depressive moods, poor hair, skin and nails and many others [6,8,11].

A normal Zinc level in blood serum is about 1 mg/l. Average serum zinc levels in study and control group women were 0.8 mg/l and the 0.7 mg/l respectively. This corresponds with the levels obtained by other authors, which also were below the accepted norms. Research on zinc urinary excretion conducted in Japan by Ikeda et al. on the group of nearly 14 thousand women aged 40-59 years demonstrated that zinc levels considerably decreased with age [16]. Also the research of Hong et al. showed that zinc levels in hair negatively correlated with age [17].

In the presented study, zinc levels in postmenopausal women were below the accepted norms.

Tubek analysed differences in Zn levels between pre- and postmenopausal women, which in his opinion could result from age discrepancy. Positive correlations between a decrease in zinc level and an increase in the arterial blood pressure observed in his study before menopause may suggest that in this period compensation mechanisms co-exist with arterial hypertension [18].

In women, however, zinc levels are affected not only by age but also the postmenopausal period and a related decline in the estrogen level [19, 20]. Some data imply protective effects of MHT on serum zinc levels [21], which is confirmed by this study (women taking MHT had considerably higher zinc levels). A zinc level is also influenced by the use of substances (cigarettes, alcohol).

Significantly higher urinary excretion of this element is observed in smokers, though Benes et al., who analysed zinc levels in erythrocytes, have not confirmed this effect [19].

The results presented here prove that the use of substances, such as cigarettes and alcohol considerably contributes to a decrease in serum zinc levels. They also prove that MHT prevents this decline. The female users of the above mentioned substances who took MHT had significantly higher zinc levels than those who did not take this therapy. It is accepted that smoking cigarettes is one of relative contraindications for MHT administration, but perhaps this view should be verified. It is possible that also smokers with severe climacteric symptoms would benefit from MHT if only administration route and doses of hormone drugs were reconsidered.

One method to increase serum zinc levels is supplementation with this element. According to Mutlu et al. zinc levels are significantly lower in women with osteoporosis, therefore these authors recommend supplementation for women in the perimenopausal period. Also Kotkowiak indicates to significant differences in serum zinc levels between healthy women and women with osteoporosis (the mean age was 56.7 years). Lopes et al. in their study on the population of Lisbon demonstrated that serum zinc levels were higher in men than in women [20,21,22].

The experts of the Polish Gynaecological Society took a stance on selective supplementation for pregnant women with D vitamin, folic acid, and micro elements such as iodine and iron, which increases the chances of a healthy pregnancy course. Supplementation with zinc may help to alleviate troublesome symptoms experienced by older women [23]. Especially those smoking cigarettes and drinking alcohol, in different phases of the perimenopausal period.

Conclusions

1. The use of substances (cigarettes, alcohol) contributes to the lowering of zinc levels in blood serum.
2. MHT positively affects serum zinc levels in postmenopausal women regardless of whether they use substances (cigarettes, alcohol) or not.

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