

Atherogenic lipid profile and health behaviours in women post-menopause working in agriculture

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Abstract

Introduction and objective. There is a significantly higher risk of lipid disorders occurrence, including atherogenic dyslipidemia in women after menopause than it is in general population. The aim of the work was to investigate the correlation between health behaviours and the occurrence of lipid disorders in women after menopause working in agriculture.

Material and methods. The study was conducted in years 2015–2016 and included 843 post-menopausal women working in agriculture. The following were used: a questionnaire including socio-demographic data, laboratory lipid tests, inventory of health behaviours. The following were estimated: logistic regression models for serum lipids concentration versus frequency of health behaviours in the examined women.

Results. Adverse lipid profile was found in over a half of post-menopausal women working in agriculture, whereas the frequency of health behaviours were estimated at the average level, although the frequency of correct eating habits and health practices was significantly lower than preventive behaviours and positive psychological attitudes. A correlation was found between the frequency of health behaviours and the occurrence of lipid disorders in women after menopause working in agriculture: more frequent health practices co-existed with the lower concentration of total cholesterol and a higher concentration of HDL-cholesterol, more frequent preventive behaviours co-existed with lower concentration of LDL-cholesterol. Women with higher concentration of triglycerides undertook pro-health practices relatively more often.

Conclusions. The study revealed a high prevalence of lipid disorders in postmenopausal women working in agriculture. More effective health education programmes are necessary in the area of reduction the risk factors of CVD in the population of women working in agriculture.

Key words

atherogenic lipid profile, health behaviours, post-menopausal women

INTRODUCTION

What is understood by health behaviours are "any behaviours the frequency and intensity of which are not indifferent to health" [1]. The superior concept that is chiefly related to health behaviours is lifestyle, which comprises of decisions taken by individuals which concern their health, and which they may control to a lesser or greater degree [2]. According to Woynarowska, "pro-health lifestyle means (...) that people intentionally undertake actions that are aimed at increasing the potential of their health (...) and eliminate such behaviour that threatens it" [3]. One of the realms of lifestyle is behaviour related to maintaining health. There are two types of behaviours concerning health: health behaviours understood as an intentional actions undertaken by man in order to strengthen or increase the potential of their health regardless of the efficiency of such an action, and behaviours

related to health – understood as undertaking any activity with no conscious aim in mind, the results of which may be positive or negative. Dividing behaviours with relation to their consequences for health, we may outline positive types of behaviours, i.e. pro-health, which are beneficial to our health and negative ones, i.e. anti-health, detrimental and increasing the risk of a disease [3].

The health state of an individual and also society is conditioned by many factors that are closely related to each other and mutually interacting. In the opinion of specialists in the area of public health, they are health behaviours and lifestyle that have the greatest impact on man's health [4, 5]. Non-contagious chronic diseases are the main reason of demise in the developed countries. It is estimated that around 48% of deaths are caused by cardiovascular diseases, over 20% by cancer, about 12% by chronic respiratory system diseases and about 3% by diabetes. Majority of the above mentioned diseases is closely related to lifestyle and health behaviours [6, 7, 8]. Certain selected types of health behaviours may promote health (balanced diet, sport activity, maintaining cleanliness of both body and environment,

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undergoing regular preventive medical examinations) or hinder it (smoking, drinking alcohol excessively, using other psychoactive substances, risky sexual behaviours, activities favouring injuries and accidents) [9, 10, 11, 12, 13, 14, 15].

One of the most important risk factors in cardiovascular diseases that are directly related to lifestyle is atherogenic dyslipidemia [16]. This type of lipid disorders is characterized by high complexity, i.e. higher concentration of triglycerides, low concentration of cholesterol of HDL fraction and the presence of small dense LDL particles as well as higher concentration of cholesterol of LDL fraction. Atherogenic dyslipidemia is a major factor contributing to the development of atherosclerosis and often accompanies such diseases as diabetes; it is frequently present in metabolic syndrome [17, 18, 19].

While analysing the influence of lipid disorders on the frequency of occurrence of atherosclerosis diseases, special attention needs to be paid to women in post-menopause period. The risk of lipid disorders, including atherogenic dyslipidemia, is significantly higher in this group compared with the general population [20, 21, 22, 23]. The hormonal changes associated with menopause, e.g., low plasma levels of estrogen exert a significant adverse effect on metabolism of plasma lipids and lipoproteins. Estrogen has been found to have LDL subclass-specific effects and to shift the distribution of apolipoprotein (apo)E from HDL to VLDL. It needs to be emphasized that reduced estrogen levels resulting from the menopausal transition have been implicated in adverse effects on obesity and fat distribution and rheological properties of plasma and platelet function [24, 25]. Moreover, estrogen therapy changes serum lipid and lipoprotein levels including a decrease in serum levels of total cholesterol and LDL-cholesterol and increased serum HDL-cholesterol [26].

The aim of the work was to investigate the correlation between health behaviours and the occurrence of lipid disorders in women after menopause who work in agriculture.

MATERIAL AND METHODS

Study group

The study was conducted in the years 2015–2016 at the Institute of Rural Health in Lublin. The test group comprised of women after menopause who worked in agriculture. The tested came from all areas of Poland and volunteered for the test. The criteria of being included in the test were: the minimum time since the last period which was one year, work in agriculture.

843 women after menopause were tested, aged between 46 and 70, all working in agriculture.

The following were applied: a survey with socio-demographic data of the tested women, laboratory lipid tests, inventory of health behaviours.

Informed consent for participation in the study was obtained from all women.

Consent for the study was obtained from the Ethical Commission at the Institute of Rural Health in Lublin, Poland.

Lipid tests

Blood samples were taken from the tested in order to mark such blood parameters as total cholesterol, HDL cholesterol,

triglycerides (TG). Blood samples were immediately delivered to the laboratory. Markings were performed at the accredited Laboratory of Medical Analyses ALAB. LDL cholesterol was calculated = total cholesterol – HDL cholesterol – 1/5 triglycerides. The standards were as follows: total cholesterol 115–190 mg/dL, HDL cholesterol > 45 mg/dL, LDL cholesterol < 115 mg/dL, triglycerides < 150 mg/dL.

Inventory of health behaviours

Health behaviours were tested using Inventory of Health Behaviour [27] which included 24 statements describing various types of behaviours related to health. The tested person marked how often they performed the listed activities over the last year using a 5 – point scale: 1 – almost never; 2 – rarely; 3 – from time to time; 4 – often; 5 – almost always. The total sum of numerical values marked by the examined provides the general index of health behaviours intensity. It may assume values between 24 and 120 points. The higher the result, the greater the intensity of health behaviours. The general result of health behaviours intensity index is then converted into sten scores and these are evaluated in three ranges of results: low, average and high. The intensity of four categories of health behaviours intensity are calculated separately, these categories being: eating habits, preventive behaviours, positive psychological attitude, health practices. Their indicators are the average points gained from answers provided by the examined to individual statements.

Statistical analysis

Statistical analysis was performed using SPSS package.

For quantitative variables, arithmetic means (M) and standard deviation (SD) were calculated. For categorical variables, the absolute numbers (n) and percentages (the ratio of the number of units within a given variant to the sample size expressed in %) were calculated.

Logistic regression models for serum lipids concentration was estimated, considering the following: total cholesterol, LDL and triglycerides above normal, and HDL below normal vs. frequency of health behaviours in the respondents. The tables provide also the odds ratios (OR) together with Wald test, and then relative differences for odds ratio were calculated [OR-1(%)].

The assumed level of significance was 0.05.

RESULTS

The respondents were between 46 and 70 years old (average age was 57.8 ± 5.5 years). The vast majority of the women was married (85.53%) and the rest were single. Most of the respondents had basic vocational or high school education (35.47% and 37.72%, respectively). 2.85% of the examined had university degree, 23.96% had complete or incomplete primary school education.

Total cholesterol concentration above normal in blood serum was detected in 74.61% of the respondents, LDL cholesterol above normal in 61.57% of the examined, and triglycerides above normal in 19.81% of the examined. HDL concentration in blood serum below normal was found in 7.71% of the respondents.

The general index of intensity of health behaviours for the respondents was on average 83.90 ± 14.04 . Following normalization and conversion into sten score, the general

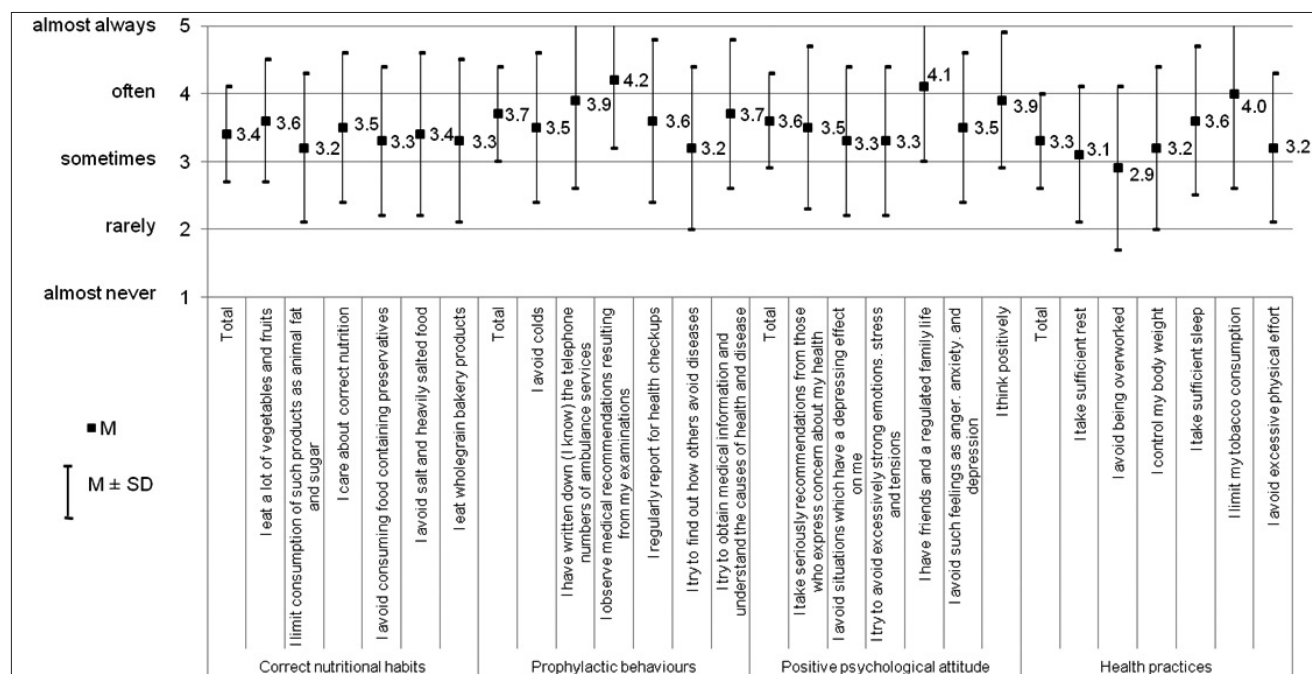


Figure 1. Average of the four categories and 24 types of health behaviours in the examined women

index of intensity showed that 33% of the respondents had low, 37% had average and 30% had high intensity of health behaviours.

Figure 1 presents the average intensity of four categories of health behaviours: eating habits, preventive behaviours, positive psychological attitude and also average intensity of individual health behaviours in the respondents.

The respondents more frequently applied preventive behaviours (mean 3.7) and positive psychological attitude (3.6) than correct eating habits (3.4) or health practices (3.3).

Among the correct eating habits, the respondents stated that they consumed plenty of vegetables and fruit (mean 3.6), took care of their diet (3.5), avoided salt and heavily salted food (3.4), avoided consuming food with additives and preservatives, ate whole-wheat bread (3.3); products that they limited consumption of to the lowest degree were animal fats and sugar (3.2).

Among preventive behaviours, the respondents listed following doctors' orders resulting from their medical tests (mean 4.2), they had emergency services telephone numbers noted (or they knew them), tried to gain some medical information and understand the reasons for becoming ill (3.7), had regular medical check-ups (3.6), avoided getting colds (3.5) and were least interested in learning how others avoid illnesses (3.2).

Among the positive psychological attitudes, the respondents most frequently listed friends and regulated family life (mean 4.1), and they thought positively (3.9), whereas they took advice from people concerned about their health least seriously or avoided such emotions as anger, anxiety or depression (3.5), they also avoided situations that influenced them negatively and tried to avoid too strong emotions, stress or tension (3.3).

As for the health practices, the respondents most frequently reduced smoking (mean 4.0), slept long enough (3.6), they controlled their body weight less frequently and avoided too strenuous physical activities (3.2), rested enough (3.1) and avoided overstraining themselves (2.9).

Women who more regularly reported for a medical check-up had a lower chance of total cholesterol to be above normal (18.8%), in those who more frequently applied health practices this chance was lower by 23.0%, in those who rested and slept enough this chance was lower by 13.2% and 11.8%, respectively, and by 16.7% in those who avoided too strenuous physical activities (Table 1).

The chance of LDL cholesterol to be above normal was lower on average by 21.2% in women who undertook preventive actions, by 12.5% in those who had emergency telephone numbers noted or known, by 20.5% in those who regularly had medical check-ups (Table 2).

HDL cholesterol was more likely to be below normal in women who avoided colds and salt or heavily salted food by 17.6% and 19.7%, respectively, by 15.4% in those who had emergency telephone numbers noted or known, but higher by 24.0% in those who tried to avoid too strong emotions, stress and tension, by 49.5% in those more frequently applying health practices, and in those avoiding overworking and too strenuous physical activities and resting enough by 25.6%, 26.9% and 29.5%, respectively (Table 3).

The likelihood of triglycerides being above normal was lower by on average 12.3% in women who avoided colds was higher by on average 20.1% in those who regularly underwent medical check-ups, it was also higher by 19.4% in those who seriously took advice of those concerned about their state of health, higher by 26.4% in those who applied health practices, higher by 12.1%, 15.2% and 22.2% in those who avoided overworking and too strenuous physical activities, and who rested enough, respectively (Table 4).

DISCUSSION

Cardiovascular diseases (CVD) are the main cause of demise in Poland. It is estimated that about 40% of men and 50% of women die due to those diseases in our country [28]. Lipid disorders such as hypercholesterolemia or higher

Table 1. Model of total cholesterol concentration below normal as opposed to normal, depending on the frequency of health behaviours in the examined women

Health behaviours	OR	OR-1 (%)	significance	
			χ^2	p
General indicator	0.856	-14.4	1.318	0.251
Correct nutritional habits				
Total	0.962	-3.8	0.121	0.728
I eat a lot of vegetables and fruits	1.130	13.0	2.072	0.150
I limit consumption of such products as animal fat and sugar	0.915	-8.5	1.524	0.217
I care about correct nutrition	0.979	-2.1	0.078	0.780
I avoid consuming food containing preservatives	1.018	1.8	0.067	0.796
I avoid salt and heavily salted food	0.901	-9.9	2.379	0.123
I eat wholegrain bakery products	1.021	2.1	0.091	0.763
Total	0.967	-3.3	0.084	0.772
Prophylactic behaviours				
I avoid colds	1.083	8.3	1.346	0.246
I have written down (I know) the telephone numbers of ambulance services	1.014	1.4	0.055	0.814
I observe medical recommendations resulting from my examinations	1.026	2.6	0.106	0.745
I regularly report for health checkups	0.821	-17.9	8.284	0.004
I try to find out how others avoid diseases	1.050	5.0	0.515	0.473
I try to obtain medical information and understand the causes of health and disease	0.965	-3.5	0.235	0.628
Total	0.917	-8.3	0.599	0.439
Positive psychological attitude				
I take seriously recommendations from those who express concern about my health	0.979	-2.1	0.095	0.758
I avoid situations which have a depressing effect on me	1.089	8.9	1.460	0.227
I try to avoid excessively strong emotions, stress and tensions	0.967	-3.3	0.229	0.632
I have friends and a regulated family life	0.905	-9.5	1.710	0.191
I avoid such feelings as anger, anxiety, and depression	0.926	-7.4	1.167	0.280
I think positively	0.908	-9.2	1.369	0.242
Total	0.770	-23.0	5.502	0.019
Health practices				
I take sufficient rest	0.868	-13.2	3.841	0.049
I avoid being overworked	0.963	-3.7	0.303	0.582
I control my body weight	0.908	-9.2	2.003	0.157
I take sufficient sleep	0.882	-11.8	3.841	0.048
I limit my tobacco consumption	0.958	-4.2	0.546	0.460
I avoid excessive physical effort	0.833	-16.7	6.823	0.009

Table 2. Model of LDL cholesterol above normal as opposed to normal, depending on the frequency of health behaviours in the examined women

Health behaviours	OR	OR-1 (%)	significance	
			χ^2	p
General indicator	0.847	-15.3	1.857	0.173
Correct nutritional habits				
Total	0.927	-7.3	0.588	0.443
I eat a lot of vegetables and fruits	0.969	-3.1	0.170	0.680
I limit consumption of such products as animal fat and sugar	0.985	-1.5	0.058	0.810
I care about correct nutrition	0.968	-3.2	0.233	0.629
I avoid consuming food containing preservatives	0.976	-2.4	0.158	0.691
I avoid salt and heavily salted food	0.936	-6.4	1.217	0.270
I eat wholegrain bakery products	0.981	-1.9	0.105	0.746
Total	0.788	-21.2	5.327	0.021
Prophylactic behaviours				
I avoid colds	1.003	0.3	0.002	0.961
I have written down (I know) the telephone numbers of ambulance services	0.875	-12.5	5.916	0.015
I observe medical recommendations resulting from my examinations	0.954	-4.6	0.418	0.518
I regularly report for health checkups	0.795	-20.5	47.769	<0.001
I try to find out how others avoid diseases	1.020	2.0	0.108	0.743
I try to obtain medical information and understand the causes of health and disease	0.902	-9.8	2.417	0.120
Total	0.977	-2.3	0.054	0.816
Positive psychological attitude				
I take seriously recommendations from those who express concern about my health	0.935	-6.5	1.197	0.274
I avoid situations which have a depressing effect on me	1.071	7.1	1.162	0.281
I try to avoid excessively strong emotions, stress and tensions	0.967	-3.3	0.275	0.600
I have friends and a regulated family life	0.969	-3.1	0.228	0.633
I avoid such feelings as anger, anxiety, and depression	1.051	5.1	0.620	0.431
I think positively	0.948	-5.2	0.529	0.467
Total	0.887	-11.3	1.466	0.226
Health practices				
I take sufficient rest	0.890	-11.0	2.771	0.096
I avoid being overworked	0.989	-1.10	0.032	0.859
I control my body weight	0.903	-9.7	2.839	0.092
I take sufficient sleep	1.005	0.5	0.007	0.934
I limit my tobacco consumption	0.997	-0.3	0.004	0.951
I avoid excessive physical effort	0.930	-7.0	1.363	0.243

level of triglycerides are one of the most important factors contributing to the risk of cardiovascular diseases occurrence [29]. It needs to be noted also that lipid disorders as a risk factor in CVD are most tightly related to the pre-mature occurrence of CVD [30, 31]. Data from clinical tests prove that lowering cholesterol concentration, particularly LDL fraction, lowers the risk of cardio-vascular incidents [32, 33]. The level of cholesterol that is currently assumed as correct one, is significantly lower than it was indicated 50 years ago. In 1963, in the article published in *New England Journal of Medicine*, the correct level of total cholesterol was estimated as 150–280 mg/dL [34]. Recommending such a high level

of cholesterol resulted from the fact that the standard was established on the basis of the average for total cholesterol in the tested group of respondents, which was very high in those days. Between 2011–2014, the average level of total cholesterol in serum in adult Americans was 193 mg/dL and 197 mg/dL for the Canadians [35]. As can be seen from the study, lowering the level of cholesterol explains significantly the decrease in mortality as a result of coronary diseases in many European countries, including Poland [36, 37, 38, 39, 40]. In the light of international research carried out in this field, it can be assumed that cholesterol standards that are recognized as correct and thus not posing a risk

Table 3. Model of HDL cholesterol concentration below normal as opposed to normal, depending on the frequency of health behaviours in the examined women

Health behaviours	OR	OR-1 (%)	significance	
			χ^2	p
General indicator	1.110	11.0	0.221	0.638
Total	0.933	-6.7	0.146	0.702
Correct nutritional habits				
I eat a lot of vegetables and fruits	1.056	5.6	0.147	0.701
I limit consumption of such products as animal fat and sugar	1.079	7.9	0.418	0.518
I care about correct nutrition	1.064	6.4	0.256	0.613
I avoid consuming food containing preservatives	1.000	0.0	0.000	0.997
I avoid salt and heavily salted food	0.803	-19.7	4.135	0.042
I eat wholegrain bakery products	0.924	-7.6	0.524	0.469
Prophylactic behaviours				
Total	0.864	-13.6	0.631	0.427
I avoid colds	0.824	-17.6	3.841	0.049
I have written down (I know) the telephone numbers of ambulance services	0.846	-15.4	3.841	0.048
I observe medical recommendations resulting from my examinations	0.989	-1.1	0.007	0.933
I regularly report for health checkups	1.188	18.8	2.379	0.123
I try to find out how others avoid diseases	0.962	-3.8	0.121	0.728
I try to obtain medical information and understand the causes of health and disease	0.975	-2.5	0.047	0.829
Positive psychological attitude				
Total	1.094	9.4	0.243	0.622
I take seriously recommendations from those who express concern about my health	1.001	0.1	0.000	0.993
I avoid situations which have a depressing effect on me	1.075	7.5	0.381	0.537
I try to avoid excessively strong emotions, stress and tensions	1.240	24.0	3.841	0.049
I have friends and a regulated family life	0.918	-8.2	0.548	0.459
I avoid such feelings as anger, anxiety, and depression	1.094	9.4	0.583	0.445
I think positively	0.912	-8.8	0.501	0.479
Health practices				
Total	1.495	49.5	4.828	0.028
I take sufficient rest	1.295	29.5	4.019	0.045
I avoid being overworked	1.256	25.6	4.218	0.040
I control my body weight	0.985	-1.5	0.019	0.890
I take sufficient sleep	1.088	8.8	0.515	0.473
I limit my tobacco consumption	1.160	16.0	2.135	0.144
I avoid excessive physical effort	1.268	26.8	4.261	0.039

Table 4. Model of triglycerides concentration above normal as opposed to normal, depending on the frequency of health behaviours in the examined women

Health behaviours	OR	OR-1 (%)	significance	
			χ^2	p
General indicator	1.231	23.1	1.955	0.162
Total	1.063	6.3	0.253	0.615
Correct nutritional habits				
I eat a lot of vegetables and fruits	1.113	11.3	1.263	0.261
I limit consumption of such products as animal fat and sugar	1.080	8.0	0.957	0.328
I care about correct nutrition	1.043	4.3	0.266	0.606
I avoid consuming food containing preservatives	1.045	4.5	0.335	0.563
I avoid salt and heavily salted food	0.957	-4.3	0.359	0.549
I eat wholegrain bakery products	0.972	-2.8	0.153	0.696
Prophylactic behaviours				
Total	1.090	9.0	0.474	0.491
I avoid colds	0.877	-12.3	3.065	0.050
I have written down (I know) the telephone numbers of ambulance services	1.100	10.0	1.993	0.158
I observe medical recommendations resulting from my examinations	1.021	2.1	0.055	0.815
I regularly report for health checkups	1.201	20.1	6.038	0.014
I try to find out how others avoid diseases	0.993	-0.7	0.009	0.925
I try to obtain medical information and understand the causes of health and disease	0.995	-0.5	0.004	0.947
Positive psychological attitude				
Total	1.199	19.9	2.178	0.140
I take seriously recommendations from those who express concern about my health	1.194	19.4	5.412	0.020
I avoid situations which have a depressing effect on me	1.062	6.2	0.588	0.443
I try to avoid excessively strong emotions, stress and tensions	1.060	6.0	0.556	0.456
I have friends and a regulated family life	1.016	1.6	0.038	0.846
I avoid such feelings as anger, anxiety, and depression	1.065	6.5	0.662	0.416
I think positively	1.076	7.6	0.659	0.417
Health practices				
Total	1.264	26.4	3.713	0.050
I take sufficient rest	1.222	22.2	5.412	0.020
I avoid being overworked	1.191	19.1	5.502	0.019
I control my body weight	1.011	1.1	0.024	0.878
I take sufficient sleep	1.135	13.5	2.554	0.110
I limit my tobacco consumption	0.962	-3.8	0.398	0.528
I avoid excessive physical effort	1.152	15.2	3.431	0.050

of CVD will continue to lower in the years to come. From the analysis performed for this study it can be seen that $\frac{3}{4}$ of the respondents had total cholesterol above normal, over 60% had LDL cholesterol above normal, every fifth examined respondent had a higher level of triglycerides and over 7% of the surveyed presented incorrect level of HDL cholesterol. The examined group of women presented high level of lipid disorders, which is undoubtedly related to the fact that all of them were in their post-menopause stage. As can be seen from international studies, menopause is a significant and independent risk factor of lipid disorders in women [21, 22, 41, 42]. In the light of the presented

facts, it is crucial to undertake immediate actions aimed at achieving correct levels of cholesterol and triglycerides in the population of women after menopause and working in agriculture. Due to the methodology of the selected sample group – voluntary participation in the test – it can be assumed that the respondents were characterized by a higher level of health awareness in comparison to the general population of women after menopause who work in agriculture. Thus it seems legitimate to assume that the prevalence of lipid disorders in other women is indeed higher. Therefore, implementing health education programmes dedicated to women after menopause who work in agriculture which

would be directed at eliminating risk factors of CVD may significantly contribute to lowering morbidity and mortality resulting from CVD in this population. The efficiency of such interventions in lowering mortality index resulting from CVD has been widely described in literature. Comprehensive programmes promoting health and including elements of education, promoting proper diet and increasing the level of physical activity lower the level of total cholesterol, LDL and triglycerides significantly, they also contribute to lowering the risk of metabolic syndrome occurrence – an additional risk factor that appears in women after menopause more frequently [43, 44, 45, 46]. In order to increase the efficiency of interventions, the age of menopause in women should be included. Actions should be directed at those women who were the first ones to go through the menopause period. As studies suggest, the level of cholesterol concentration in post-menopause period is significantly higher in women who went through menopause at an early age as opposed to those who experienced that later on in life. Thus, the risk of CVD occurrence is higher in women who began their menopause period earlier [47].

The conducted study demonstrated the correlation between the selected types of behaviours and the lowered risk of lipid disorders among the respondents. However, not all results provide a consistent picture of dependencies between presenting some selected types of health behaviours and the frequency of occurrence of lipid disorders. The conducted research showed that there is a dependency of the selected pro-health types of behaviour and the lowered risk of lipid disorders in the examined women. In the group of women who declared undergoing regular check-ups, a significantly lower risk of higher total cholesterol and LDL was noted, whereas the ratio of higher triglycerides in this group was relatively higher. Probably, this was related to the fact that regular medical check-ups resulted from lipid disorders among the respondents and were related to taking various medicines, including statins which efficiently lower concentration of total cholesterol and LDL, however, they present moderate effectiveness on lowering the level of triglycerides [48, 49]. The results of the analysis carried out for the purpose of this work showed that a significantly increased risk of incorrect level of HDL cholesterol and a higher level of triglycerides occurred in women who declared that they rest enough, avoid overworking and too strenuous physical activities. Declarations listed above that were obtained from the respondents give rise to the assumption that these women were characterized by the lower level of physical activity, which would explain the significantly higher odds ratio in the incorrect HDL results and triglycerides in those women. Literature on the subject describes the influence of regular physical activity on lowering the level of triglycerides and the increased HDL cholesterol level in detail. The impact of physical activity on lowering the risk of cardiovascular diseases occurrence is contributed mainly to its positive influence on the level of lipoproteins of high density in plasma [50, 51, 52, 53, 54]. However, it needs to be emphasized that in women after their menopause, the protective activity of HDL cholesterol is probably lower than in women in their pre-menopausal period [55].

What is of particular importance, is the fact that every third respondent presented low pro-health behaviours, which provide great possibilities to implement complex and multi-profile preventive actions directed at eliminating lipid disorders in women after menopause working in agriculture.

CONCLUSIONS

1. Health behaviours of women after menopause working in agriculture were on an average level. The respondents relatively often applied pro-health types of behaviour and a positive psychological attitude than proper eating habits and health practices.
2. Most of the respondents had incorrect results of lipid concentration.
3. Frequency of health behaviours correlated with the occurrence of lipid disorders in women after menopause working in agriculture:
 - a) More frequent health practices co-existed with lower concentration of total cholesterol and a higher concentration of HDL cholesterol;
 - b) More frequent preventive behaviours co-existed with LDL cholesterol;
 - c) More frequent health practices co-existed with lower concentration of triglycerides.
4. More effective health education programmes are needed in the area of reduction of the risk factors of cardiovascular diseases in the population of women working in agriculture.

REFERENCES

1. Luszczyńska A. Zmiany zachowań zdrowotnych: dlaczego dobre chęci nie wystarczają? [Changes in health behaviours: why are good intentions not enough?]. Gdańsk: Gdańskie Wydawnictwo Psychologiczne; 2004 (in Polish).
2. Gniazdowski A. Zachowania zdrowotne: zagadnienia teoretyczne, próba charakterystyki zachowań zdrowotnych społeczeństwa polskiego [Health behaviours: theoretical issues, an attempt to characterize the health behaviours of Polish society]. Łódź: Instytut Medycyny Pracy; 1990 (in Polish).
3. Woynarowska B. Edukacja zdrowotna [Health education]. Warszawa: Wydawnictwo Naukowe PWN; 2007 (in Polish).
4. Lalonde M. A new perspective on the health of Canadians. Department of National Health and Welfare. Ottawa; 1974
5. Śmigielski J, Bielecki W, Drygas W. Health and life style-related determinants of survival rate in the male residents of the city of Łódź. *Int J Occup Med Environ Health*. 2013; 26(3): 337–348. doi: 10.2478/s13382-013-0104-4
6. World Health Organization. A comprehensive global monitoring framework for NCDs and voluntary global targets for the prevention and control of NCDs. Geneva: WHO; 2011.
7. van Strien T, Koenders PG. How do life style factors relate to general health and overweight? *Appetite*. 2012; 58(1): 265–270. doi: 10.1016/j.appet.2011.10.001.
8. Rzeźnicki A, Stelmach I, Kowalska A, Krakowiak J, Żebrowski M, Stelmach W. Complying with the smoking ban by students before and after introducing legislative intervention. *Int J Occup Med Environ Health*. 2015; 28(2): 369–378. doi: 10.13075/ijomh.1896.00273.
9. Kaleta D, Polańska K, Rzeźnicki A, Stelmach W, Wojtyśiak P. Tobacco use patterns, knowledge, attitudes towards tobacco and availability of tobacco control training among school personnel from a rural area in Poland. *Tob Induc Dis*. 2017 Jan 11; 15: 3. doi: 10.1186/s12971-016-0110-y.
10. Han TS, Correa E, Lean ME, Lee DM, O'Neill TW, Bartfai G, et al. Changes in prevalence of obesity and high waist circumference over four years across European regions: the European male ageing study (EMAS). *Endocrine* 2017; 55: 456.
11. Janssen I, Katzmarzyk PT, Ross R. Body mass index, waist circumference, and health risk: evidence in support of current National Institutes of Health guidelines. *Arch Intern Med*. 2002; 162: 2074–2079.
12. Min D, Cho E. Associations among health behaviors, body mass index, hypertension, and diabetes mellitus: A path analysis. *Medicine (Baltimore)*. 2018; 97(22): e10981. doi: 10.1097/MD.00000000000010981.
13. Catalano RF, Fagan AA, Gavin LE, Greenberg MT, Irwin CE, Jr, Ross DA, et al. Worldwide application of prevention science in adolescent health. *Lancet*. 2012; 379: 1653–1664.

14. Leitzmann MF, Park Y, Blair A, Ballard-Barbash R, Mouw T, Hollenbeck AR, et al. Physical Activity Recommendations and Decreased Risk of Mortality. *Arch Intern Med.* 2007; 167(22): 2453–2460.
15. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004; 364: 937–952.
16. Arsenault BJ, Rana JS, Stroes ES, Després JP, Shah PK, Kastelein JJ, et al. Beyond low-density lipoprotein cholesterol. Retrospective contributions of non-high-density lipoprotein cholesterol levels, triglycerides, and total cholesterol/high-density lipoprotein cholesterol ratio to coronary heart disease risk in apparently healthy men and women. *J Am Coll Cardiol.* 2010; 55: 35–41.
17. Cybulska B, Kłosiewicz-Latoszek L. Aterogenna dyslipidemia jako czynnik rezydualnego ryzyka po optymalnym leczeniu hipercholesterolemii [Atherogenic dyslipidemia as a residual risk factor after optimal treatment of hypercholesterolemia]. W: Mamcarz A, editor. *Terapia skojarzona [Combination therapy]*. Medical Education, Warszawa; 2009: 107–124 (in Polish).
18. Krauss RM. Lipids and lipoproteins in patients with type 2 diabetes. *Diabetes Care* 2004; 27: 1496–1504
19. Dunn FL. Management of dyslipidemia in people with type 2 diabetes mellitus. *Rev Endocr Metab Disord.* 2010; 11: 41–51.
20. Di Donato P, Giulini NA, Bacchi Modena A, Cicchetti G, Comitini G. Factors associated with total cholesterol levels in women around menopause attending menopause clinics in Italy. *Climacteric.* 2004; 7(1): 86–91.
21. Hak AE, Witteman JC, Hagens W, Keyzer JJ, Pop VJ, Uitterlinden AG, et al. The increase in cholesterol with menopause is associated with the apolipoprotein E genotype. A population-based longitudinal study. *Atherosclerosis.* 2004; 175(1): 169–176.
22. Sultan N, Nawaz M, Sultan A, Fayaz M, Baseer A. Effect of menopause on serum HDL-cholesterol level. *J Ayub Med Coll Abbottabad.* 2003; 15(3): 24–26.
23. Matthews KA, Crawford SL, Chae CU, Everson-Rose SA, Sowers MF, Sternfeld B, et al. Are changes in cardiovascular disease risk factors in midlife women due to chronological aging or to the menopausal transition? *J Am Coll Cardiol.* 2009; 54(25): 2366–2373.
24. Sacks FM, Walsh BW. Sex hormones and lipoprotein metabolism. *Curr Opin Lipidol.* 1994 Jun; 5(3): 236–40.
25. Gorodeski GI. Impact of the menopause on the epidemiology and risk factors of coronary artery heart disease in women. *Exp Gerontol.* 1994 May-Aug; 29(3–4): 357–75.
26. Sai AJ, Gallagher JC, Fang X. Effect of hormone therapy and calcitriol on serum lipid profile in postmenopausal older women: association with estrogen receptor- α genotypes. *Menopause.* 2011 Oct; 18(10): 1101–12.
27. Juczynski Z. Narzędzia pomiaru w psychologii zdrowia [Measurement tools in health psychology]. *Prz Psychol.* 1999; 42(4): 43–56 (in Polish).
28. Wojtyniak B, Goryński P. Sytuacja zdrowotna ludności polski i jej uwarunkowania [The health situation of the Polish population and its determinants]. Warszawa: Narodowy Instytut Zdrowia Publicznego – Państwowy Zakład Higieny; 2016 (in Polish).
29. Anderson TJ, Grégoire J, Pearson GJ, Barry AR, Couture P, Dawes M, et al. Canadian Cardiovascular Society Guidelines for the Management of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult. *Can J Cardiol.* 2016; 32(11): 1263–1282. doi: 10.1016/j.cjca.2016.07.510.
30. D'Agostino RB, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation.* 2008; 117: 743–753.
31. Lloyd-Jones DM, Nam BH, D'Agostino RB, Levy D, Murabito JM, Wang TJ, et al. Parental cardiovascular disease as a risk factor for cardiovascular disease in middle-aged adults: a prospective study of parents and offspring. *JAMA* 2004; 291: 2204–2211
32. Collins R, Reith C, Emberson J, Armitage J, Baigent C, Blackwell L, et al. Interpretation of the evidence for the efficacy and safety of statin therapy. *Lancet.* 2016; 388: 2532–2561.
33. Heart Protection Study Collaborative Group. MRC/BHF heart protection study of cholesterol lowering with simvastatin in 20,536 high-risk individuals: a randomised placebo-controlled trial. *Lancet.* 2002; 360: 7–22.
34. Castleman B, Kibbee BU. Case records of the Massachusetts General Hospital: weekly clinicopathological exercises: normal laboratory values. *N Engl J Med.* 1963; 268: 1462–1469.
35. Waters DD. Cholesterol Lowering Guidelines: From Whence We Came and Where We Are Now. *Can J Cardiol.* 2018; 2: S0828–282X(18)30995–4.
36. Laatikainen T, Critchley J, Vartiainen E, Salomaa V, Ketonen M, Capewell S. Explaining the decline in coronary heart disease mortality in Finland between 1982 and 1997. *Am J Epidemiol.* 2005; 162(8): 764–773.
37. Aspelund T, Gudnason V, Magnusdottir BT, Andersen K, Sigurdsson G, Thorsson B, et al. Analysing the large decline in coronary heart disease mortality in the Icelandic population aged 25–74 between the years 1981 and 2006. *PLoS One.* 2010; 5(11): e13957.
38. Bruthans J, Cífková R, Lánská V, O'Flaherty M, Critchley JA, Holub J, et al. Explaining the decline in coronary heart disease mortality in the Czech Republic between 1985 and 2007. *Eur J Prev Cardiol.* 2014; 21(7): 829–839.
39. Bandosz P, O'Flaherty M, Drygas W, Rutkowski M, Koziarek J, Wyrzykowski B, et al. Decline in mortality from coronary heart disease in Poland after socioeconomic transformation: modelling study. *BMJ.* 2012; 344: d8136
40. Björck L, Rosengren A, Bennett K, Lappas G, Capewell S. Modelling the decreasing coronary heart disease mortality in Sweden between 1986 and 2002. *Eur Heart J.* 2009; 30(9): 1046–1056.
41. Pasquali R, Casimirri F, Pascal G, Tortelli O, Morselli Labate A, Bertazzo D, et al. Influence of menopause on blood cholesterol levels in women: the role of body composition, fat distribution and hormonal milieu. *Virgilio Menopause Health Group. J Intern Med.* 1997; 241(3): 195–203.
42. Agrinier N, Cournot M, Dallongeville J, Arveiler D, Ducimetière P, Ruidavets JB, et al. Menopause and modifiable coronary heart disease risk factors: a population based study. *Maturitas.* 2010; 65(3): 237–243
43. Randall OS, Feseha HB, Illoh K, Xu S, Ketete M, Kwagyan J, et al. Response of lipoprotein(a) levels to therapeutic life-style change in obese African-Americans. *Atherosclerosis.* 2004; 172(1): 155–160.
44. Lyu S, Su J, Xiang Q, Wu M. Association of dietary pattern and physical activity level with triglyceride to high-density lipoprotein cholesterol ratio among adults in Jiangsu, China: a cross-sectional study with sex-specific differences. *Nutr Res.* 2014; 34(8): 674–681.
45. Retterstol K, Svendsen M, Narverud I, Holven KB. Effect of low carbohydrate high fat diet on LDL cholesterol and gene expression in normal-weight, young adults: A randomized controlled study. *Atherosclerosis.* 2018; 279: 52–61.
46. Netjasov AS, Vujović S, Ivović M, Tancić-Gajić M, Marina L, Barać M. Relationships between obesity, lipids and fasting glucose in the menopause. *Srp Arh Celok Lek.* 2013; 141(1–2): 41–47.
47. Akahoshi M, Soda M, Nakashima E, Tsuruta M, Ichimaru S, Seto S, et al. Effects of age at menopause on serum cholesterol, body mass index, and blood pressure. *Atherosclerosis.* 200; 156(1): 157–163.
48. Baigent C, Keech A, Kearney PM, Blackwell L, Buck G, Pollicino C, et al. Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90,056 participants in 14 randomised trials of statins. *Lancet.* 2005; 366(9493): 1267–1278.
49. Vallejo-Vaz AJ, Fayyad R, Boekholdt SM, Hovingh GK, Kastelein JJ, Melamed S, et al. Triglyceride-Rich Lipoprotein Cholesterol and Risk of Cardiovascular Events Among Patients Receiving Statin Therapy in the TNT Trial. *Circulation.* 2018; 138(8): 770–781.
50. Maron DJ. The epidemiology of low levels of high-density lipoprotein cholesterol in patients with and without coronary artery disease. *Am J Cardiol.* 2000; 86(12A): 11L–14L.
51. Kodama S, Tanaka S, Saito K, Shu M, Sone Y, Onitake F, et al. Effect of aerobic exercise training on serum levels of high-density lipoprotein cholesterol: a meta-analysis. *Arch Intern Med.* 2007; 167: 999–1008.
52. Gouveia ER, Ihle A, Kliegel M, Freitas DL, Jurema J, Tinôco MA, et al. The relationship of physical activity to high-density lipoprotein cholesterol level in a sample of community-dwelling older adults from Amazonas, Brazil. *Arch Gerontol Geriatr.* 2017; 73: 195–198.
53. O'Donovan G, Stensel D, Hamer M, Stamatakis E. The association between leisure-time physical activity, low HDL-cholesterol and mortality in a pooled analysis of nine population-based cohorts. *Eur J Epidemiol.* 2017; 32(7): 559–566.
54. Zwald ML, Akinbami LJ, Fakhouri TH, Fryar CD. Prevalence of Low High-Density Lipoprotein Cholesterol Among Adults, by Physical Activity: United States, 2011–2014. *NCHS Data Brief.* 2017; 276: 1–8.
55. Woodard GA, Brooks MM, Barinas-Mitchell E, Mackey RH, Matthews KA, Sutton-Tyrrell K. Lipids, menopause, and early atherosclerosis in Study of Women's Health Across the Nation Heart women. *Menopause.* 2011; 18(4): 376–384.

