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Assessment of cardiovascular disease risk factors in patients treated for schizophrenia

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Summary

Aim. The aim of the study was the analysis of the occurrence of cardiovascular risk factors (age, sex, smoking, level of cholesterol, systolic blood pressure, body mass index) among patients diagnosed with schizophrenia as well as searching for correlations between them and length of stay at long-term care facilities and clinical variables, such as severity of positive, negative and general symptoms of schizophrenia, illness duration, and type of pharmacotherapy (neuroleptic type and its dose).

Method. Medical data were collected from 71 patients (30 women and 41 men) aged between 40 and 86 years who were treated in the residential care facility due to paranoid schizophrenia. Information concerning patient's clinical status was collected during periodic check-ups. The examination consisted of standard anamnesis regarding patient's general feeling, psychiatric assessment using the PANSS and identifying number of smoked cigarettes. Somatic assessment included: physical examination, measuring blood pressure, pulse, capillary blood glucose levels, height, weight, and BMI.

Results. Statistical analysis did not reveal significant differences in length of stay at long-term psychiatric care facility between patients with normal BMI vs. overweight and obese patients ($p = 0.85$). Study results indicate that prevalence of central obesity, hypertension, abnormal total – and LDL-cholesterol is higher in patients who stay at the long-term psychiatric care facility for a longer period of time. There is at least one cardiovascular risk factor in 74.6% of examined patients treated for schizophrenia.

Conclusions. Imposing 'healthy' lifestyle as part of clinical management in long-term care setting in people treated with neuroleptics (atypical or typical) might reduce risk of body mass

increase. Undertaking action towards reducing modifiable cardiovascular risk factors remains highly recommended in mental health care, particularly in long-term care.

Key words: cardiovascular risk factors, schizophrenia

Introduction

For many years, cardiovascular diseases have been a major cause of mortality among the European citizens, particularly within Central and Eastern European countries. About five million people die in 28 European Union member countries each year, nearly two million (38%) of which due to circulatory conditions [1]. Poland is among the countries (beside Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Montenegro, Morocco, Romania, Serbia, Slovakia, Tunisia, and Turkey) with high risk of mortality due to cardiovascular diseases. Death toll due to cardiovascular diseases in patient group is twice higher compared to low risk countries and it is estimated as over 450 per 100,000 in male population, and among women reaches over 350. Despite intensified preventive measures and treatment advancements, 46% of deaths in Poland may be still attributed to circulatory problems [2]. In 2013, 95,000 women (51% of all deaths) and 82,500 men (41% of all deaths) died due to the above-mentioned conditions. A correlation between mortality rate due to cardiovascular diseases and age has been demonstrated by numerous studies. Cardiovascular diseases were responsible for 83% of deaths among patients over 65 years of age in the year 2013 (92% of women, 72% of men) [3].

In 2016, the European Society of Cardiology (ESC) and an expert group of ten further scientific organization's representatives redeveloped guidelines based on the scientific evidence, regarding prevention of cardiovascular disease in clinical practice [2]. These guidelines might be helpful in sharing information with patients about the cardiovascular risks, presenting benefits of adopting and maintaining healthy lifestyle habits and modifying cardiovascular risk factors, as well as provide solutions for propagating and executing prophylaxis programs [4].

Cardiovascular risk is defined as a probability of developing atherosclerotic cardiovascular event, fatal or not, over defined period of time. Risk rates are generally lower in women than in men, however, by the age of 50 years they become comparable in the two groups. Steady assessment of the global risk for coronary heart disease or cardiovascular disease (aging process, comorbidity) is highly advised due to dynamically changing approach to both the evaluation and prevention of circulatory problems [5]. Attitude towards the global risk should be rather flexible. In case of unsuccessful primary risk factor eradication, global cardiovascular risk may be reduced by intensified actions towards elimination of a distinct risk factor [2]. The highest risk patients are observed to require medical interventions more frequently, however, the majority of lethal events affect the subjects with lower risk rates, who constitute more numerous group. Implementation of public health measures to promote healthy lifestyle habits and decrease population cardiovascular risk is therefore of utmost importance.

Developed in the 1990s, the very first risk chart was based on Anderson's model [6]. There exist plentiful scoring systems that enable assessment of the cardiovascular risk: Systematic Coronary Risk Estimation (SCORE) scale, ASSIGN scale (estimation model proposed by the Scottish Intercollegiate Guidelines Network), Q-Risk algorithm, Prospective Cardiovascular Münster Study (PROCAM)-based scale, Reynolds Risk Score, CUORE project score, Pooled Cohort equations or Globorisk scale [2]. Employing the above-mentioned scales facilitate risk assessment in: healthy subjects with no documented history of circulatory problems; persons with high to very high cardiovascular risk (acute coronary syndrome, ischemic stroke, diabetes, chronic kidney disease); persons with several risk factors that might contribute to unexpectedly high global cardiovascular risk.

The most commonly used SCORE chart allows for estimation of the 10-year global risk of fatal atherosclerotic disease (myocardial infarction, ischemic stroke, other arterial occlusive disease including sudden cardiac death) in healthy subjects on the basis of gender, smoking status, total cholesterol, and systolic blood pressure [7]. The SCORE system is based on a large, representative European cohort and the SCORE chart has undergone external validation. The use of the SCORE chart in assessing cardiovascular risk has been advised since 2003 [8]. Charts calibrated to each country's needs are available on-line (http://www.heartscore.org). The Polish Cardiac Society recommends adopting Pol-SCORE 2015 chart [2]. Further therapeutic interventions – counseling, lifestyle changes or pharmacotherapy – depend on the SCORE risk calculations. Implementing the SCORE chart aids therapeutic decision-making process by reducing the risk of inadequate or excessive treatment. The chart is not applicable for high to very high cardiovascular risk patients (e.g., diabetes, chronic kidney disease) as they require immediate therapeutic intervention. In addition, there exist certain limitations to the use of the SCORE system. Low absolute risk levels in younger patients may obscure high relative risk estimations. The use of relative risk chart or calculating 'risk age' may therefore be helpful in terms of intensified preventive measures. SCORE outcomes in persons over 60 years of age should be interpreted less restrictively, as high risk levels noted in this population may be attributed largely to age, even though the remaining cardiovascular risk factors are normal. Pharmacotherapy should not be introduced in elderly patients with cardiovascular risk exceeding the 10% cut-off value.

The main disadvantage of the SCORE risk estimation in schizophrenic patients is its limited applicability (age over 40 years). Taking into consideration the age of onset (second decade) and impact the illness exerts on health-related behaviors (lifestyle, physical activity, nutrition) of patients with schizophrenia, early identification (before the age of 40) of the cardiovascular risk factors and taking adequate preventive measures is crucial in further management of diagnosis and therapy.

The aim of the study was the analysis of the occurrence of cardiovascular risk factors (age, gender, smoking, level of cholesterol, systolic blood pressure, body mass index) among patients diagnosed with schizophrenia as well as searching for correlations between them and length of stay at long-term care facilities and clinical variables,

such as severity of positive, negative and general symptoms of schizophrenia, illness duration, and type of pharmacotherapy (neuroleptic type and its dose).

Materials and methods

Data were collected from paranoid schizophrenia patients hospitalized for at least seven months in either one of the two psychiatry departments (40-beded ward and 68-beded ward, respectively) of a residential care facility. There were 71 subjects included in the study (30 women and 42 men) aged between 40 and 86 years (mean age 60.75±10.5 years). The diagnosis of psychiatric disorder was confirmed by a facility specialist according to DSM-5 criteria [9]. None of the patients had a documented history of a cardiovascular disease (confirmed clinically or by unequivocal diagnostic imaging, i.e., acute myocardial infarction, acute coronary syndrome, arterial revascularization, ischemic stroke, transient ischemic attack, aortic aneurysm or peripheral artery disease). Subjects neither had family history of premature cardiovascular disease nor familial hyperlipidemia.

During their stay at the residential care facility, the studied patient population was provided with the following:

- medical care (psychiatric, general medicine or other specialist consultation) and pharmacological treatment – depending on health problems;
- health education focused on promoting healthy lifestyle habits;
- physical activity – at least 15 minutes daily of light physical exercise (all patients participated in the 15-minute morning gymnastics, and additional form of physical activity were walks and individual training under physiotherapist's supervision);
- individual diet plans (conventional, diabetes, low calorie) composed of three assorted meals served at regular intervals during the day, with mean calorie content of 2100–2300 kcal/day and including: fruit and vegetables (at least twice per day) and fish (at least once per week);
- no alcohol consumption.

Opportunity of unhealthy food (i.e., salty snacks, sweets or sweet, non-alcoholic beverages) consumption was also limited. Patients were in position to do their shopping (itinerant trade) once every fortnight. Due to financial issue, their additional shopping was rather limited. Occasionally, additional food products were supplied by visitors, however, this did not concern most of the patients. During our observation, the majority of patients consumed only meals served in the ward therefore the assessment of daily caloric input was easy to calculate in general. However, sporadic deviations related to the consumption of additional products or eating only part of the meal might have occurred.

Each tobacco-addicted patient smoked a precisely defined, fixed number of cigarettes daily (depending on economical situation of particular subjects). The lowest

amount of cigarettes was equal to 1, and the highest was 20 per day (mean number 8.83±4.53).

The socio-demographic and clinical data were obtained from medical documentation. Data were collected between January and December 2016 from patients hospitalized for at least six months in either one of the two psychiatry departments of a residential care facility. All participants underwent the same procedure – assessment of both psychiatric and somatic status in the following time periods: January-March and October-November) and due to organizational reason it lasted several weeks (at the same time 5–8 people were examined by doctors, patients were provided with transport to have additional check-up done, time of total assessment was prolonged due to waiting time for biochemical and radiological tests results). The periodic examination consisted of typical anamnesis regarding patient's well-being (general and mental) and precise number of smoked cigarettes. Somatic assessment included: physical examination, measuring blood pressure, heart rate, capillary blood glucose levels, height and weight, calculating Body Mass Index (BMI). Mental status evaluation included: routine psychiatric examination, assessment using the Positive and Negative Syndrome Scale (PANSS), observation and functional evaluation by the department's medical personnel. Health examination was performed by of internal medicine specialist – somatic condition, and psychiatrist – mental condition. Additional serum biochemistry tests were ordered by the internist, based on patient's present clinical status and history of comorbidities (lipid profile and blood glucose levels were assessed in all the study subjects). Anthropometric measurements were conducted by the trained nursing personnel. Waist circumference was measured in a standing position, at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Blood pressure and heart rate readings were taken in left arm twice, at one minute interval, with an electronic device (Omron HEM-7211). Patient had to be at rest and sitting. A mean value was further obtained from the measurements. Height and body mass values (electronic scale with height rod, Lubelska Fabryka Wag TP150/1) were used for calculating BMI.

The following variables were used for statistical analysis: length of stay at long-term psychiatric care facility, illness duration, type of pharmacotherapy, mean neuroleptic dose in chlorpromazine equivalents.

Database and statistical analysis were performed using Statistica 12.0 (StatSoft, Poland). Quantitative variables were presented as mean, median and standard deviation, whereas categorical data were presented as absolute frequencies and percentages. Normality of distribution was assessed using the Shapiro-Wilk test for numerical variables. The Mann-Whitney U test and the Kruskal-Wallis test were applied to compare two and >2 independent groups, respectively. Spearman's rank correlation coefficient was used to assess statistical dependence between the variables. A chi-square test of homogeneity was performed for independent categorical variables, whereas a chi-square test of independence was used to determine significant relationships between the investigated variables. Statistical significance was indicated by a value of $p < 0.05$.

Results

The length of stay in the long-term psychiatric care facility ranged from 7 months to 28 years (mean value 13.27±7.32 years; median = 12.64 years). Only two persons had shorter stay than a year (over seven and eight months). Taking into consideration all inclusion criteria (all patients diagnosed with paranoid schizophrenia, treated on two psychiatric wards) the two above-mentioned patients were also recruited. Incidence of the health risk factors predisposing for cardiovascular events among the studied population of patients with schizophrenia are listed in Table 1.

Table 1. **Health risk factors predisposing for cardiovascular events in the studied group of patients (n = 71)**

		Abnormality incidences	
		yes n (%)	no n (%)
Impaired fasting glucose		25 (35.21%)	46 (64.79%)
Diabetes mellitus under treatment		18 (25.35%)	53 (74.65%)
Abnormal blood pressure readings		30 (42.25%)	41 (57.75%)
Hypertension under treatment		30 (42.25%)	12 (57.75%)
Central obesity (waist circumference)		48 (67.61%)	23 (32.39%)
Overweight and obesity		35 (49.3%)	36 (50.7%)
Abnormal cholesterol levels	total	18 (25.35%)	53 (74,65%)
	LDL	10 (14.08%)	61 (85,92%)
	HDL	20 (28.17%)	51 (71,83%)
	triglycerides	47 (66.20%)	24 (33,80%)
Smoking		48 (67.6%)	23 (32.4%)

Evaluation by the SCORE chart was impossible in 25 persons due to excessively low systolic blood pressure values (below 120 mmHg). Nonetheless, 10 of them were under treatment for diabetes. One patient could not be assessed by the SCORE chart due to age limit (age below 40 years). Distribution of cardiovascular risk within studied population is presented in Table 2.

Table 2. **Cardiovascular risk among the studied population of patients with schizophrenia**

Cardiovascular risk	SCORE result (points)	Total n (%)	Women n (%)	Men (%)
None		18 (25.4%)	12 (40%)	6 (14.6%)
Low	less than 1	2 (2.8%)	1 (3.3%)	1 (2.4%)
Moderate	1–5	12 (16.9%)	8 (26.7%)	4 (9.8%)
High	5–10	17 (23.9%)	6 (20%)	11 (26.9%)

table continued on the next page

Very high	10 and more	14 (19.7%)	1 (3.3%)	13 (31.7%)
	diabetes	8 (11.3%)	2 (6.7%)	6 (14.6%)
	total	22 (31%)	3 (10%)	19 (46.3%)

33 study subjects followed single, 27 – double and 11 – triple antipsychotic drug regimen. Typical neuroleptic medications were used in 41 persons: haloperidol in 17 patients, zuclopenthixol and perazine – in 8 patients, levomepromazine – in 5 patients, fluphenazine – in 2 patients. In addition, atypical antipsychotic agents were employed: olanzapine in 29 patients, clozapine – 27 patients, risperidone – 16, sulpiride and aripiprazole – 2 patients each. The mean neuroleptic dose in chlorpromazine equivalents was equal to 683.1±502.31 mg.

Statistical analysis did not reveal significant differences in length of stay at long-term psychiatric care facility between patients with normal BMI vs. overweight and obesity group ($p = 0.85$). Study results indicate that prevalence of central obesity ($p = 0.82$), hypertension ($p = 0.70$), abnormal total cholesterol ($p = 0.12$) and LDL cholesterol ($p = 0.73$), normal HDL cholesterol ($p = 0.35$) and normal fasting glucose ($p = 0.45$) is higher in persons who stay at the long-term psychiatric care facility for a longer period of time.

The mean PANSS score was equal to: 21.73±6.10 on positive subscale, 30.92±6.71 on negative subscale and 54.48±10.10 on the general psychopathology scale. Statistical analysis did not show significant differences in the PANSS score between genders or age groups ($p > 0.05$). However, negative symptoms were considerably more pronounced in the group of patients over 60 years of age than in the group of patients below 60 years of age ($t = – 2.09$; $p = 0.04$), whereas no correlations were fond for positive and general psychopathology scales ($p > 0.05$). No correlations were proved between the PANSS score and the following variables: BMI, central obesity or smoking status ($p > 0.05$). Scores on the positive symptoms subscale were significantly higher for subjects with normal glucose levels compared to patients with elevated glucose concentrations ($t = 2.1$; $p = 0.04$). Statistical analysis indicated a significant relationship between the positive symptoms subscale and intensity of metabolic disturbances ($r = – 0.24$; $p = 0.04$). No significant difference was observed between the above-mentioned variables and scores on negative or general symptoms subscales ($p > 0.05$).

Discussion

The presence of mental disorder is listed amid psychosocial cardiovascular risk variables that increase the incidence rate and are associated with worse prognosis in circulatory problems [2]. Mentally ill patients are characterized by higher comorbidity and premature death rates. Despite advances in antipsychotic treatment, lifespan of persons suffering from schizophrenia is 15–20 [10] or even 25 years [11] shorter compared to individuals with good mental health, and the difference is still growing [12]. An increasing discrepancy in mortality rates between schizophrenic individuals

and general population is observed as well. Death rates noted among patients with schizophrenia are 3.5 times higher than in general population [10]. Although suicidal acts are a significant cause of mortality, circulatory problems are the most frequent cause of death in the discussed population of patients [13]. According to the study by Chiu et al. [14], nearly 90% of schizophrenic individuals presented with at least one cardiovascular risk factor, whereas approximately 40% of patients had at least three coexisting factors.

High mortality rate due to cardiovascular problems is influenced by unhealthy lifestyle habits that comprise numerous modifiable cardiovascular risk factors, i.e., diet, body mass, physical activity, and smoking status. The risk of developing circulatory problems is affected by eating habits. Human organism should be supplied with such energy amounts that allow to maintain and/or achieve healthy weight values [15], thus positively influencing: blood pressure, metabolic variables (lipid and glucose concentrations) and reducing the cardiovascular risk. Healthy diet is recommended as a basis of cardiovascular prevention and should include daily portions of:

- fatty acids: saturated (that should constitute less than 10% of total energy intake) and unsaturated trans (that should constitute more than 1% of total energy intake and be derived from natural source);
- table salt whose optimal and maximal amounts are 3 g and 5 g, respectively (sodium chloride intake reduction by 1 g/day results in lowering the systolic blood pressure by 3.1 mmHg in hypertensive patients and by 1.6 mmHg in those with normal blood pressure [16]);
- 30–45 g of dietary fiber preferably derived from whole grain products (increase in fiber consumption by 7 g/day decreases the risk of coronary artery disease by 9% [17]);
- at least 200 g of fruit and vegetables (in 2–3 portions);
- 30 g of unsalted nuts;
- fish – once or twice a week (including one portion of a fatty fish);
- no alcoholic (maximum dose of 20 g of ethanol for men and 10 g for women is acceptable) or sweetened beverages.

Healthy diet should facilitate achieving normal indices of: waist circumference – below 94 cm for men and below 80 cm for women; blood pressure – below 140/90 mmHg; lipid levels – LDLc in particular as well as HDL and triglycerides; glucose – glycated hemoglobin below 7% (53 mmol/l) [2].

Overweight and obesity increase both the risk of death due to circulatory disease and overall mortality rate (the lowest rates are observed for persons below 60 years of age whose BMI ranges between 20 and 25 kg/m^2). Optimum body mass values tend to be higher for older adults compared with the young and middle-aged ones [18]. In 2002, 40–50% of men and 25–40% of women in Europe were overweight, whereas 10–20% of men and 10–25% of women suffered from obesity [19]. Data from 2004

indicate that BMI indices of 26.6% of the Polish population ranged between 20 and 25 kg/m^2, whereas they exceeded the value of 25 kg/m^2 in 12.5% of cases. Estimated prevalence of obesity and central obesity among schizophrenic patients is equal to 50–80% and 58–73%, respectively [20, 21].

Schizophrenia is associated with higher prevalence of metabolic syndrome. The condition is observed in 40.9–42.7% (35% of men and 50% of women) [20], or even 54.8% [22] of persons treated for schizophrenia. Impaired glucose tolerance and type 2 diabetes occur twice as frequently in the investigated population [20,21].

Systematic physical activity is an essential aspect of cardiovascular disease prevention. Weekly recommendations include at least 150 minutes of moderate (30 minutes over 5 days/week) or 75 minutes of vigorous-intensity (15 minutes over 5 days/week) aerobic exercise. Physical activity contributes to reduction of the overall and cardiovascular-related mortality rates; lower risk of the adverse health events in persons with risk of coronary artery disease, cardiology patients and healthy population [23]. In addition, it improves both physical and mental fitness and positively affects a number of cardiovascular risk factors, i.e., blood pressure, low-density lipoprotein (LDL-C) and non-HDL fractions of cholesterol, body mass, and type 2 diabetes [24]. Sedentary lifestyle is perceived as one of the major risk factors for developing cardiovascular disease independently of the physical activity [25]. Combining medical care with physical activity, recreation and sport is the key point in both ambulatory and stationary therapy [26].

The use of nicotine is another significant, independent risk factor of circulatory disease. Cessation of any tobacco habits (pipe, e-cigarette, passive smoking) is highly advised [27]. Even a small number of cigarettes has a negative impact on cardiovascular risk [28]. The life expectancy of a smoker is shortened by approximately ten years compared with a non-smoking person [29]. Short interventions, including smoking cessation consultation, nicotine replacement therapy and the use of bupropion and varenicline, exert positive effects according to the literature [30]. The results of analysis indicate that the use of nicotine replacement products has a positive impact on treatment outcomes in patients with heart diseases. Therefore, such nicotine reduction therapy is advised in persons who are incapable or unwilling to quit smoking [31].

The cardiovascular-related mortality rate in general population has decreased over the past 30 years. Reduced cholesterol and blood pressure levels, as well as decreased prevalence of smoking have contributed to more than 50% of the effect [32]. Unfortunately, at the same time, an increase in prevalence of obesity and type 2 diabetes was observed in both the general population – by 11 and 24%, and in persons with schizophrenia – by 39 and 71%, respectively [14]. Society aging may be perceived as another determinant of the elevated cardiovascular risk [33]. Solutions that promote healthy lifestyle habits, e.g., reduced salt intake, tobacco smoking prohibition, are efficacious (also cost-effective) measures of cardiovascular prevention [34]. Lowering cholesterol with statins [35] and improving blood pressure control are cost-effective as well [36]. It should be stressed that a substantial number of patients receiving hypolipidemic or

hypotensive treatment is not compliant and does not achieve therapeutic goals [37], thus contributing to clinical and economic implications [38]. In 2003, Wald et al. [39] formulated a hypothesis according to which as much as 80% of circulatory incidents [39] can be prevented in a cost-effective manner [40], given that the whole population over 55 years of age would take a combination of cardiovascular risk reducing medications in one pill (so-called polypill).

Mortality rates due to circulatory problems in persons with schizophrenia are also affected by the nature of the psychiatric disorder and pharmacotherapy [41]. The heterogeneous group of antipsychotic medications may influence the appetite control mechanism, patterns of fat distribution and metabolism (carbohydrate and lipid metabolism) and, thus, negatively impact the cardiovascular risk [42]. In addition, some literature data indicate no correlation between the use of neuroleptics and mortality rate due to cardiovascular problems [43]. Nonetheless, monitoring adverse metabolic effects in patients under antipsychotic treatment is suggested [44]. Neuroleptic agents may induce an increase in body weight (strong effect – clozapine, olanzapine, aliphatic phenothiazines; moderate to strong effect – risperidone, quetiapine, sertindole, zuclopenthixol; weak effect – haloperidol, fluphenazine, amisulpride), have very little effect or even lead to reduction of body mass (trifluoperazine, ziprasidone, aripiprazole) [45]. The effects of antipsychotic drugs on body weight are principally observed during the first months of therapy. Neuroleptic change should be considered for weight gain exceeding 5% of baseline body mass [46]. It should be remembered that the effects of antipsychotic treatment on body weight lead to health consequences and affect both patient's compliance in therapeutic rehabilitation process as well as their quality of life.

Since adopting prevention strategies may contribute to at least 80% reduction of the cardiovascular risk [47], everyone should be encouraged to acquire healthy lifestyle habits [5]. Healthcare professionals play an essential role in executing these concepts in clinical practice [48], as multimodal behavioral interventions implemented by the multidisciplinary medical teams (physician, nurse, dietitian, psychologist, rehabilitation specialist) [49] provide optimization of preventive actions (behavioral changes including: nutrition, physical activity, relaxation training, controlling body weight or smoking cessation programs for resistant smokers) [50].

Cognitive behavioral therapy plays a supportive role in a decision-making process concerning lifestyle modifications [49]. Implementing the 'motivational dialogue technique', which strengthens motivation and perception of self-efficacy, is also useful [51].

Despite the reported improvements, inequalities in the access to healthcare services are still observed, in particular concerning cardiovascular prophylaxis in patients with mental disorders [52]. Regardless of statistically more frequent hospitalization and higher mortality rate due to circulatory problems, persons suffering from schizophrenia are less frequently diagnosed with ischemic heart disease or hypertension compared with control group (5% and 8.2% vs. 15.8% and 21.6%, respectively) [53]. Such situation might be explained with insufficient (not properly insightful?) diagnosis

and treatment of persons with schizophrenia, monitoring cardiovascular risk factors, adopting programs that promote healthy lifestyle habits, behavioral interventions and pharmacotherapy should play a central role in managing both healthy individuals and schizophrenic patients [54]. However, in 2018 Chiu et al. [14] demonstrated that the measures aimed at cardiovascular risk reduction in persons with schizophrenia are not as effective as in general population. There might exist a need for preventive interventions and strategies concerning circulatory disease, that are more oriented towards the investigated population of patients [14]. Hjorth et al. [41] executed a 30-month program which aimed at reducing circulatory risk factors in patients suffering from schizophrenia. Implementation of these actions among women (study subjects) resulted in the reduction of: waist circumference, fast food and sweetened non-alcoholic beverages intake, number of smoked cigarettes, as well as increase in low-intensity physical activity [41].

Persons with mental disorders should be subjected to a physical examination for the presence of cardiovascular risk factors at least once a year. This would allow early preventive and/or therapeutic interventions to be taken [12]. Social support is an important factor in the prevention of coronary heart disease and a positive predictive determinant of the course of cardiovascular disease [55]. Therefore long-term care in inpatient setting (e.g., long-term care facilities) or at domestic setting, as a form of social support, is to have positive effects in both prevention and treatment of cardiovascular diseases.

Conclusions

1. There is at least one cardiovascular factor in over 74.6% of people treated for schizophrenia.
2. Imposing 'healthy' lifestyle by implementing dietetic regime, regular supply of constant and specified quantity of meals of specified calorific value (e.g., during a stay at a long-term care facility) may have a beneficial effect on body weight of people undergoing pharmacotherapy with antipsychotics (atypical and typical).
3. Undertaking action towards reducing cardiovascular risk factors in long-term care, such as: increase in physical activity which might cause reducing abdominal obesity, improving blood pressure and metabolic parameters (carbohydrate and lipid metabolism), is highly recommended.

References

1. Townsend N, Nichols M, Scarborough P, Rayner M. *Cardiovascular disease in Europe – Epidemiological update 2015*. Eur. Heart J. 2015; 36(40): 2696–2705.
2. Piepoli MF, Hoes AW, Agewall S, Albus Ch, Brotons C. et al. *Wytyczne ESC dotyczące prewencji chorób układu sercowo-naczyniowego w praktyce klinicznej w 2016 roku*. Kardiologia Polska. 2016; 74(9): 821–936.
3. *Rocznik Statystyczny Rzeczypospolitej Polskiej 2015*.

4. World Health Organization. *Global status report on noncommunicable diseases 2010*. Geneva: World Health Organization; 2011.
5. Perk J, De Backer G, Gohlke H, Graham I, Reiner Ž. et al. *European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts)*. Eur. Heart J. 2012; 33(13): 1635–1701.
6. Bjarnason-Wehrens B, McGee H, Zwisler AD, Piepoli MF, Benzer W. et al. *Cardiac rehabilitation in Europe: Results from the European Cardiac Rehabilitation Inventory Survey*. Eur. J. Cardiovasc. Prev. Rehabil. 2010; 17(4): 410–418.
7. Piepoli MF, Corrà U, Abreu A, Cupples M, Davos C. et al. *Challenges in secondary prevention of cardiovascular diseases: A review of the current practice*. Int. J. Cardiol. 2015; 180: 114–119.
8. Aktas MK, Ozduran V, Pothier CE, Lang R, Lauer MS. *Global risk scores and exercise testing for predicting all-cause mortality in a preventive medicine program*. JAMA. 2004; 292(12): 1462–1468.
9. American Psychiatric *Association. Diagnostic and Statistical Manual of Mental Disorders (5th ed.)*. Arlington, VA: American Psychiatric Association Press; 2013.
10. Hjorthøj C, Stürup AE, McGrath JJ, Nordentoft M. *Years of potential life lost and life expectancy in schizophrenia: A systematic review and meta-analysis*. Lancet Psychiatry. 2017; 4(4): 295–301.
11. Ritchie S, Muldoon L. *Cardiovascular preventive care for patients with serious mental illness*. Can. Fam. Physician. 2017; 63(11): 483–487.
12. Kritharides L, Chow V, Lambert TJR. *Cardiovascular disease in patients with schizophrenia*. Med. J. Aust. 2017; 206(2): 91–95.
13. Crump C, Winkleby MA, Sundquist K, Sundquist J. *Comorbidities and mortality in persons with schizophrenia: A Swedish National Cohort Study*. Am. J. Psychiatry. 2013; 170(3): 324–333.
14. Chiu M, Rahman F, Vigod S, Wilton AS, Kurdyak P. *Temporal trends in cardiovascular disease risk factor profiles in a population-based schizophrenia sample: A repeat cross-sectional study*. J. Epidemiol. Community Health. 2018; 72(1): 71–77.
15. European Heart Network. *Diet, Physical Activity and Cardiovascular Disease Prevention in Europe*. Brussels: European Heart Network; 2011.
16. He FJ, MacGregor GA. *Effect of modest salt reduction on blood pressure: A meta-analysis of randomized trials. Implications for public health*. J. Hum. Hypertens. 2002; 16(11): 761–770.
17. Threapleton DE, Greenwood DC, Evans CE, Cleghorn ChL, Nykjaer C. et al. *Dietary fibre intake and risk of cardiovascular disease: Systematic review and meta-analysis*. BMJ. 2013; 347: f6879.
18. Berrington de Gonzalez A, Hartge P, Cerhan JR, Flint AJ, Hannan L. et al. *Body-mass index and mortality among 1.46 million white adults*. N. Engl. J. Med. 2010; 363(23): 2211–2219.
19. Limosin F, Gasquet I, Leguay D, Azorin J-M, Rouillon F. *Body mass index and prevalence of obesity in a French cohort of patients with schizophrenia*. Acta Psych. Scand. 2008; 118(1): 19–25.
20. McEvoy JP, Meyer JM, Goff DC, Nasrallah HA, Davis SM. et al. *Prevalence of the metabolic syndrome in patients with schizophrenia: Baseline results from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) schizophrenia trial and comparison with national estimates from NHANES III*. Schizophr. Res. 2005; 80(1): 19–32.
21. Rabe-Jabłońska J, Pawełczyk T. *Zespół metaboliczny i jego składowe u uczestników badania EUFEST*. Psychiatr. Pol. 2008; 42(1): 73–85.

22. Galletly CA, Foley DL, Waterreus A, Watts GF, Castle DJ. et al. *Cardiometabolic risk factors in people with psychotic disorders: The second Australian national survey of psychosis*. Aust. N Z J. Psychiatry. 2012; 46(8): 753–761.
23. Moore SC, Patel AV, Matthews CE, Berrington de Gonzalez A, Park Y. et al. *Leisure time physical activity of moderate to vigorous intensity and mortality: A large pooled cohort analysis*. PLoS Med. 2012; 9(11): e1001335.
24. Physical Activity Guidelines Advisory Committee. *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC: Department of Health and Human Services; 2008.
25. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT, Lancet Physical Activity Series Working Group. *Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy*. Lancet. 2012; 380(9838): 219–229.
26. Campbell F, Messina J, Day M. *National Institute for Health and Clinical Excellence (NICE) public health intervention guidance physical activity: BA for adults in primary care. Review of effectiveness evidence*. London: National Institute for Health and Clinical Excellence; 2012.
27. He J, Vupputuri S, Allen K, Prerost MR, Hughes J, Whelton PK. *Passive smoking and the risk of coronary heart disease – A meta-analysis of epidemiologic studies*. N. Engl. J. Med. 1999; 340(12): 920–926.
28. Prescott E, Scharling H, Osler M, Schnohr P. *Importance of light smoking and inhalation habits on risk of myocardial infarction and all cause mortality. A 22 year follow up of 12 149 men and women in the Copenhagen City Heart Study*. J. Epidemiol. Community Health. 2002; 56(9): 702–706.
29. Doll R, Peto R, Boreham J, Sutherland I. *Mortality in relation to smoking: 50 years' observations on male British doctors*. BMJ. 2004; 328(7455): 1519.
30. Cahill K, Stevens S, Perera R, Lancaster T. *Pharmacological interventions for smoking cessation: An overview and network meta-analysis*. Cochrane Database Syst. Rev. 2013; 5: CD009329.
31. Woolf KJ, Zabad MN, Post JM, McNitt S, Williams GC, Bisognano JD. *Effect of nicotine replacement therapy on cardiovascular outcomes after acute coronary syndromes*. Am. J. Cardiol. 2012; 110(7): 968–970.
32. Unal B, Sözmen K, Arık H, Gerçeklioğlu G, Altun DU. et al. *Explaining the decline in coronary heart disease mortality in Turkey between 1995 and 2008*. BMC Public Health. 2013; 13: 1135.
33. Roth GA, Forouzanfar MH, Moran AE, Barber R, Nguyen G. et al. *Demographic and epidemiologic drivers of global cardiovascular mortality*. N. Engl. J. Med. 2015; 372(14): 1333–1341.
34. Moreira PV, Baraldi LG, Moubarac J-C, Monteiro CA, Newton A. et al. *Comparing different policy scenarios to reduce the consumption of ultra-processed foods in UK: Impact on cardiovascular disease mortality using a modelling approach*. PLoS One. 2015; 10(2): e0118353.
35. McConnachie A, Walker A, Robertson M, Marchbank L, Peacock J. et al. *Long-term impact on healthcare resource utilization of statin treatment, and its cost effectiveness in the primary prevention of cardiovascular disease: A record linkage study*. Eur. Heart J. 2014; 35(5): 290–298.
36. Stevanović J, O'Prinsen AC, Verheggen BG, Schuiling-Veninga N, Postma MJ, Pechlivanoglou P. *Economic evaluation of primary prevention of cardiovascular diseases in mild hypertension: A scenario analysis for the Netherlands*. Clin. Ther. 2014; 36(3): 368–384.
37. Banegas JR, López-García E, Dallongeville J, Guallar E, Halcox JP. et al. *Achievement of treatment goals for primary prevention of cardiovascular disease in clinical practice across Europe: The EURIKA study*. Eur. Heart J. 2011; 32(17): 2143–2152.

38. Cherry SB, Benner JS, Hussein MA, Tang SS, Nichol MB. *The clinical and economic burden of nonadherence with antihypertensive and lipid-lowering therapy in hypertensive patients*. Value Health. 2009; 12(4): 489–497.

39. Wald NJ, Law MR. *A strategy to reduce cardiovascular disease by more than 80%*. BMJ. 2003; 326(7404): 1419.

40. Gaziano TA, Opie LH, Weinstein MC. *Cardiovascular disease prevention with a multidrug regimen in the developing world: A cost-effectiveness analysis*. Lancet. 2006; 368(9536): 679–686.

41. Hjorth P, Juel A, Hansen MV, Madsen NJ, Viuff AG, Munk-Jørgensen P. *Reducing the Risk of Cardiovascular Diseases in Non-selected Outpatients With Schizophrenia: A 30-Month Program Conducted in a Real-life Setting*. Arch. Psychiatr. Nurs. 2017; 31(6): 602–609.

42. Rzewuska M. *Metabolic risk during antipsychotic treatment in patients with schizophrenia*. Psychiatr. Pol. 2007; 41(4): 457–472.

43. Tornianen M, Mittendorfer-Rutz E, Tanskanen A, Björkenstam C, Suvisaari J. et al. *Antipsychotic treatment and mortality in schizophrenia*. Schizophr. Bull. 2015; 41(3): 656–663.

44. Early Psychosis Intervention Ontario Network. From EPI Clinical Practice to Evaluation & Monitoring From EPI Clinical Practice to Evaluation & Monitoring: *Metabolic Monitoring Tool for Professionals*. Early Psychosis Intervention Ontario Network; 2016.

45. Godlewska B, Olajossy-Hilkesberger L, Marmurowska-Michałowska H, Olajossy M, Landowski J. *Przyrost masy ciała spowodowany działaniem atypowych leków przeciwpsychotycznych*. Psychiatr. Pol. 2006; 40(5): 995–1007.

46. Center for Quality Assessment and Improvement in Mental Health. *Metabolic monitoring*. Cambridge, MA: Center for Quality Assessment and Improvement in Mental Health; 2007.

47. Liu K, Daviglus ML, Loria CM, Colangelo LA, Spring B. et al. *Healthy lifestyle through young adulthood and the presence of low cardiovascular disease risk profile in middle age: The Coronary Artery Risk Development in (Young) Adults (CARDIA) study*. Circulation. 2012; 125(8): 996–1004.

48. Cooney MT, Dudina A, Whincup P, Capewell S, Menotti A. et al. *Reevaluating the Rose approach: Comparative benefits of the population and highrisk preventive strategies*. Eur. J. Cardiovasc. Prev. Rehabil. 2009; 16(5): 541–549.

49. Artinian NT, Fletcher GF, Mozaffarian D, Kris-Etherton P, Van Horn L. et al. *Interventions to promote physical activity and dietary lifestyle changes for cardiovascular risk factor reduction in adults: A scientific statement from the American Heart Association*. Circulation. 2010; 122(4): 406–441.

50. Piepoli MF, Corrà U, Benzer W, Bjarnason-Wehrens B, Dendale P. et al. *Secondary prevention through cardiac rehabilitation: from knowledge to implementation. A position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation*. Eur. J. Cardiovasc. Prev. Rehabil. 2010; 17(1): 1–17.

51. Rubak S, Sandbaek A, Lauritzen T, Christensen B. *Motivational interviewing: A systematic review and meta-analysis*. Br. J. Gen. Pract. 2005; 55(513): 305–312.

52. Ritchie S, Muldoon L. *Cardiovascular preventive care for patients with serious mental illness*. Can. Fam. Physician. 2017; 63(11): e483–e487.

53. Gur S, Weizman S, Stubbs B, Matalon A, Meyerovitch J. et al. *Mortality, morbidity and medical resources utilization of patients with schizophrenia: A case-control community-based study*. Psychiatry Res. 2017; 260: 177–181.

54. Sanchez-Martinez V, Romero-Rubio D, Abad-Perez MJ, Descalzo-Cabades MA, Alonso-Gutierrez S. et al. *Metabolic Syndrome and Cardiovascular Risk in People Treated with Long-Acting*

Injectable Antipsychotics. Endocr. Metab. Immune. Disord. Drug Targets. 2018; 18(4): 379–387. Doi: 10.2174/1871530317666171120151201.

55. Barth J, Schneider S, Känel von R. *Lack of social support in the etiology and the prognosis of coronary heart disease: A systematic review and meta-analysis*. Psychosom. Med. 2010; 72(3): 229–238.

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