

Differences in achieving treatment goals with statin use in various regions of Poland – 3ST-POL study results

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Abstract

Introduction and objective. Dyslipidemia is the most common factor leading to ischemic heart disease, which is one of the leading causes of death. The use of statins is the most important preventative measure of ischemic heart disease; however, their efficacy in patients in Poland is still too low. The purpose of this study was to evaluate regional differences in achieving treatment goals in total cholesterol (TC) and LDL cholesterol levels in patients treated with statins on an outpatient basis.

Materials and methods. A survey was used to evaluate efficacy of treatment, completed by 49,950 patients in Poland treated with statins in 2008. The territory of Poland was divided into 4 research regions: the Northeast (NE), Northwest (NW), Southeast (SE), and Southwest (SW) regions.

Results. The largest group of patients resided in the SW region, the smallest in the SE region. Participants of the study suffered from hypercholesterolemia, on average, for at least a year before completing the study survey. Effective treatment leading to achievement of target TC was observed in less than 10% of the patients. Rate of achievement of target cholesterol levels was highest in the NE region, lowest in the NW region. Cardiologists were more successful in achieving therapeutic goals than GPs. Similar correlations between regions and doctors' specializations were observed for LDL values.

Conclusions. Significant differences in the efficacy of treatment with statins were observed among the study group and were evaluated based on achievement of target TC and LDL cholesterol levels. Better results achieved in the NE region may be because the region includes the Masovian province, which is the most economically developed region in Poland.

Key words

dyslipidemia, statins, ischemic heart disease

INTRODUCTION

Ischemic heart disease and its complications are the most common causes of death among populations in developing countries, including Poland [1]. According to epidemiological studies conducted in Poland in the last decade, such as the WOBASZ [2] and NATPOL [3] studies, dyslipidemia is the most common factor contributing to the development of ischemic heart disease. It is estimated that over 16 million people in Poland suffer from this disease.

Decreasing the risk of complications of dyslipidemia and other cardiovascular risk factors continues to be a controversial topic in scientific research. The results of studies demonstrate that modern medicine has at its disposal efficient, safe, and relatively cheap hypolipidemic drugs [4, 5]. Among those drugs, 3-hydroxy-3-methyl-glutaryl-CoA reductase inhibitors, i.e. statins, play the most important role in the prevention of ischemic heart disease [6]. Despite their undisputed importance in modern cardiological pharmacotherapy, in everyday clinical practice, the use of statins is still below the expected level [7, 8].

This study, the 3ST-POL [9] (Standards of use of statins in Poland) study, and other country-wide studies conducted

in Poland as part of the EUROASPIRE [10] and POLCARD SPOK [11] programs, provide unequivocal proof that the use of statins in the treatment of dyslipidemia is insufficient in outpatient care in Poland; however, as of today, there are no data with regard to the efficacy of statin treatment in patients in different regions of Poland. The purpose of the 3ST-POL study was to demonstrate the differences in treatment of dyslipidemia in various regions of Poland.

OBJECTIVE

The purpose of this study was to evaluate the efficacy of achieving therapeutic goals of total cholesterol (TC) and low-density lipoprotein (LDL cholesterol) levels among patients treated with statins as an outpatient in various regions of Poland.

MATERIALS AND METHODS

This study included 49,950 Polish patients who were treated on an outpatient basis in 2008. The patients were treated by GPs, cardiologists and diabetologists. The consecutive patients, who met both the inclusion and exclusion criteria, were enrolled to the study. The participants were selected based on the following criteria: treatment with statins for a

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minimum of 3 months before taking part in the study, aged between 40 and 85 years old, and consent to participate in the study. Other medical treatments did not constitute exclusion from the study. The research tool used in this study was a survey. The survey used, detailed inclusion criteria, and a description of the study group were included in a previous publication

To evaluate the efficacy of treatment of patients in various regions of the country, the provinces of Poland were divided into 4 regions: the Northwest (NW) region (West Pomeranian, Lubusz, Greater Poland, Pomeranian, and Kuyavian-Pomeranian provinces), the Southwest (SW) region (Lower Silesian, Opole, and Silesian, Łódź provinces), the Southeast (SE) region (Świętokrzyskie, Lesser Poland, Podkarpackie, and Lublin provinces), and the Northeast (NE) region (Masovian, Podlaskie, and Warmian-Masurian provinces).

The goals for lipid treatment were defined according to ESC (European Society of Cardiology)/EAS (European Atherosclerosis Society) guidelines of 2007 [12] (Table 1).

Table 1. ESC guidelines for levels of individual lipid fractions

Cholesterol fractions	General population	High risk patients*
Total cholesterol	< 190 mg/dl < 5 mmol/l	< 175 mg/dl** < 4.5 mmol/l
LDL	< 115 mg/dl < 3 mmol/l	< 100 mg/dl*** < 2.5 mmol/l
TG		< 150 mg/dl < 1.7 mmol/l
HDL (females)		> 45 mg/dl > 1.2 mmol/l
HDL (males)		> 40 mg/dl > 1.0 mmol/l

* confirmed CVD, DM, SCORE \geq 5

** < 155 mg/dl if attainable

*** < 80 mg/dl if attainable

Statistical analysis. The data gathered in the course of the study is presented by means of standard descriptive statistics: means and standard deviations, medians and quartiles for continuous data and frequency tables for discrete data.

ANOVA was performed and multiple pairwise comparisons completed with *post hoc* Tukey test ($\alpha = 0.05$).

The achievement of lipid profile levels consistent with the applicable ESC guidelines of 2007 was the defining point for effective treatment.

A significance level of 0.05 was adopted for analysis, which was conducted in Stata v10 software [cf: Stata Statistical Software: Release 10, College Station, TX, Stata Corporation].

A more detailed list of the statistical methods used in data analysis was described and published in the journal, *Polish Cardiology (Kardiologia Polska)* [13].

RESULTS

The largest group of participants came from the SW region, 31.1% of the total study group. The smallest groups came from the SE and NE regions, 20% and 20.5%, respectively (Tab. 3). Patients from the Silesian and Masovian provinces constituted the largest percentage of participants (14.8% and 14.2%, respectively), and patients from the Świętokrzyskie

Table 2. Geographical distribution of participants

Province:	n	%
Northwest (NW) Region		
total	13,665	28.9
Kuyavian-Pomeranian	2,949	6.2
Pomeranian	3,173	6.7
Lubusz	1,308	2.8
Greater Poland	4,115	8.7
West Pomeranian	2,120	4.5
Southwest (SW) Region		
total	14,825	31.1
Lower Silesian	2,957	6.2
Łódź	3,725	7.7
Opolskie	1,143	2.4
Silesian	7,000	14.8
Southeast (SE) Region		
total	9,248	20
Lublin	2,248	4.7
Lesser Poland	4,017	8.5
Podkarpackie	1,831	3.9
Świętokrzyskie	1,152	2.4
Northeast (NE) Region		
total	9,656	20.50
Masovian	6,711	14.2
Podlaskie	1,259	2.7
Warmian-Masurian	1,686	3.6

and Opole provinces constituted the smallest percentage of participants (both constituting 2.4% of the study group).

In all regions included in the study, the majority of patients were women and the age group most represented was 65 years and older. Patients younger than 49 years constituted the smallest percentage of all participants. In all regions, patients with secondary school and vocational education constituted the largest percentage of participants.

Among the participants in all regions, hypercholesterolemia was diagnosed, on average, 12 months before the beginning of the study. Patients who were diagnosed with hypercholesterolemia within less than 6 months of qualifying for the study constituted the smallest group of participants (Tab. 3).

The study group also had similar profiles with regard to the occurrence of risk factors, such as ischemic heart disease, history of heart attack, history of brain stroke, and type 2 diabetes.

Achievement of therapeutic goals (Tab. 4) of total cholesterol in all 4 regions was observed in less than 10% of the patients. The largest percentage of successful achievement of target total cholesterol was in patients of the NE region (9.88%), and the smallest percentage observed in patients of the NW region (6.76%) ($p < 0.01$). The study demonstrated a statistically significant higher rate of achieving target total cholesterol by cardiologists, as opposed to GPs in all regions. For diabetologists, a significantly higher rate of achieving the target total cholesterol was only observed in the SE region.

Similar to results for total cholesterol, the largest percentage of patients whose target concentration LDL-fraction was

Table 3. Overview of participants by region

Region	NW		SW		SE		NE	
	n	%	n	%	n	%	n	%
Gender								
Women	7,165	50.85	8,062	53.87	4,915	52.37	5,417	55.74
Men	6,925	49.15	6,905	46.13	4,470	47.53	4,302	44.26
Age								
18-49	2,268	16.55	2,184	15.04	1,155	12.55	1,423	14.95
50-54	2,615	19.08	2,335	16.08	1,510	16.41	1,618	17
55-59	2,633	19.21	2,802	19.3	1,643	17.86	1,660	17.44
60-64	2,345	17.11	2,455	16.91	1,709	18.58	1,522	15.99
65+	3,847	28.06	4,745	32.68	3,183	34.6	3,294	34.61
Education								
Primary	158	12.01	1,655	12.08	1,190	13.86	1,187	13.31
Vocational	4,025	30.59	4,022	29.53	2,378	27.69	2,133	23.91
Secondary	5,336	40.55	5,629	41.07	3,519	40.98	384	43.04
High	2,218	16.86	2,399	17.5	1,501	17.48	1,761	19.74
Duration of hypercholesterolemia								
Last 6 months	1,724	12.7	2,247	15.19	1,211	13.26	1,302	13.56
6-12 months	2,534	18.66	2,597	17.56	1,491	16.33	1,905	19.84
1-3 years	3,458	25.46	3,858	26.09	2,302	25.21	243	25.31
3-5 years	2,792	20.56	2,686	18.16	1,803	19.75	1,757	18.3
More than 5 years	3,072	22.62	3,402	23	2,324	25.45	2,207	22.99
Diagnosed Ischaemic Heart Disease								
No	7,796	57.68	7,617	52.23	422	46.5	5,144	54.86
Yes	572	42.32	666	47.77	4,855	53.5	4,232	45.14
Heart attack in the past								
No	10,336	78.59	1,133	80.71	6,813	78.84	7,333	81.17
Yes	2,816	21.41	2,708	19.29	1,829	21.16	1,701	18.83
Stroke in the past								
No	11,507	88.12	12,567	90.15	7,785	91.29	8,230	91.82
Yes	1,552	11.88	1,373	9.85	743	8.71	733	8.18
Diagnosed type 2 diabetes								
No	8,729	64.9	9,884	68.89	5,814	65.95	6,357	68.79
Yes	4,720	35.1	4,464	31.11	3,002	34.05	2,884	31.21

achieved was in patients from the NE region, and the lowest efficacy of treatment was observed in patients from the NW region ($p < 0.05$). The differences in rates of achieving the target LDL plasma concentration among the patients treated by cardiologists, in comparison to GPs, were statistically significant. In all regions, a nominal number of cases achieving therapeutic goals for target LDL was higher for diabetologists, in comparison to GPs, although the difference was statistically significant only in the NE region.

The mean dosages of statins (atorvastatin and simvastatin) most commonly used by doctors of different specializations are presented in Table 5. The highest dosages of atorvastatin were recommended in the NW region and the lowest in the NE region ($p < 0.01$). For simvastatin, the highest doses were used in the NE region and the lowest in the SE region ($p < 0.01$). Cardiologists used higher dosages of both statins in comparison to GPs in all regions except the SW region.

Table 4. The achievement of therapeutic goals of LDL and TC concentrations by doctors of different specializations by region of Poland

		NW Region		SW Region		SE Region		NE Region	
		No	Yes	No	Yes	No	Yes	No	Yes
TC									
GP	n	10,154	610	11,227	888	5,928	422	7,192	702
	%	94.33	5.67	92.67	7.33	93.35	6.65	91.11	8.89
Cardiologist	n	1,709	215	1,741	245	1,922	207	1,191	192
	%	88.83	11.17 [^]	87.66	12.34 [^]	90.28	9.72 ^{^^}	86.12	13.88 [^]
Diabetologist	n	552	75	531	68	641	102	321	60
	%	88.04	11.96	88.65	11.35	86.27	13.73 ^{^^}	84.25	15.75
Total	n	12,415	900	13,499	1,201	8,491	731	8,704	954
	%	93.24	6.76	91.83	8.17	92.07	7.93	90.12	9.88 [*]
LDL									
GP	n	6,985	649	7,964	977	3,867	463	5,297	774
	%	91.50	8.50	89.07	10.93	89.31	10.69	87.25	12.75
Cardiologist	n	1,318	215	1,346	245	1,270	239	926	175
	%	85.98	14.02 [^]	84.60	15.40 [^]	84.16	15.84 [^]	84.11	15.89 [^]
Diabetologist	n	423	55	379	87	440	92	169	71
	%	88.49	11.51	81.33	18.67	82.71	17.29	70.42	29.58 ^{^^}
Total	n	8,726	919	9,689	1,309	5,577	794	6,392	1,020
	%	90.47	9.53	88.10	11.90	87.54	12.46	86.24	13.76 ^{**}

Statistical significance is marked by * $p < 0.01$ and ** $p < 0.05$ among total mean dosages of two statins used by doctors of different specializations.

Statistical significant difference between achieving of therapeutic goals of LDL and TC by cardiologists or diabetologists vs. GP's in different regions [^] $p < 0.01$ and ^{^^} $p < 0.05$.

Table 5. Mean dosages (mg) of the two statins most commonly used by doctors of different specializations by region of Poland

	NW Region		SW Region		SE Region		NE Region	
	Atorva statin	Simva statin	Atorva statin	Simva statin	Atorva statin	Simva statin	Atorva statin	Simva statin
GP	21.06	24.48	20.76	23.87	19.89	22.78	20.06	25.45
Cardiologist	22.58 ^{^^}	25.64 ^{^^}	20.88	24.60	21.55 [^]	26.55 [^]	22.88 ^{^^}	28.34 [^]
Diabetologist	23.65	23.15	21.59	23.19	22.19	22.22	18.23	21.00
Total	21.45 [*]	24.62	20.81	23.97	20.53	23.62	20.36	25.82 [*]

Statistical significance indicated by * $p < 0.01$ among total mean dosages of the two statins used by doctors of different specializations.

Statistical significant difference between dosages administered by cardiologist vs. GP's in different regions [^] $p < 0.01$ and ^{^^} $p < 0.05$.

DISCUSSION

Statins play a key role in the treatment of dyslipidemia. Although alternative treatment options and adjuvants for statins have been actively studied in recent years, the role of statins in current cardiological treatment remains unchanged. Studies on the efficacy of prevention and treatment of diseases caused as a result of lipid disorders and inflammation, show strong proof of the efficacy of statins in decreasing cardiovascular risks with regard to both primary and secondary prevention.

To maximize the efficacy of treatment of lipid disorders, the European Society of Cardiology regularly publishes guidelines for therapeutic goals and the treatment of dyslipidemia [14]. In the presented study, to ensure the proper evaluation of efficacy of treatment, patient results were compared with guidelines from 2007.

The participants in this study were patients whose treatment included the use of statins on an outpatient basis in Poland. The need for the use of statins and the increasing percentage of patients aged 60 years and older accounts for the frequent occurrence of risk factors and co-existing diseases among the study group. The rates of occurrence of ischemic heart disease, diabetes, and the number of patients who experienced a cardiovascular and/or cerebral-vascular event in the past were higher than for the general population in Poland. However, the data obtained in the study show no significant differences for various regions.

The difference in the success rate of achieving target total cholesterol between the NW region and the remaining regions was statistically significant. The lowest efficacy was observed in the NW region. A similar correlation was observed in achievement of recommended LDL-fraction concentrations. In the NW region, the large positive difference in achieving target therapeutic results of LDL and TC may be due to the influence of the Masovian province (69%). The Masovian province has the highest urbanization rate in Poland and is the most economically developed in the region. These factors may directly contribute to the quality of life of the inhabitants and the education of both patients and doctors. Regarding the remaining regions, no evident correlation among regions was observed according to income.

The statins most commonly used in the study were atorvastatin and simvastatin. Rosuvastatin was not included in the study because it was not available on the Polish market at the time of the study. The correlation between mean dosages of the two most commonly used statins and the efficacy of treatment in various regions was not evident. This may be due to regional differences in compliance with the recommended treatment, as well as differences resulting from other factors that may have an impact on the results, e.g. cultural differences or differences in regional culinary traditions. Due to the nature of this study, the authors were unable to access the initial cholesterol levels in the studied regions, making it impossible to determine unequivocally the net efficacy of treatment in the study. However, a significant correlation between the above-mentioned factors was observed in the data analyzed for all the participating patients.

Among the participants in all regions, the dosages of statins used by cardiologists were significantly different from the dosages used by GPs, with the exception of dosages of simvastatin, recommended by cardiologists in the SW region. Evidently, this influenced the frequency of achieving therapeutic goals, both with regard to total cholesterol and LDL levels.

CONCLUSIONS

Significant differences with regard to achieving the target values of TC and LDL were observed in the study group. Based on the results of the study, it is impossible to determine the causes of the described differences, as they are likely to be complex.

It is essential to discuss the limitations of this study to ensure proper interpretation of the reported results. These limitations were published in the journal *Kardiologia Polska (Polish Cardiology)*. Our publication lists only a number of the most important study limitations. This study was conducted using a survey, and some of the obtained data were of a declarative nature. It is possible that the dosages of drugs were overestimated, as adherence and compliance with the recommended treatment were not included in the study.

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