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Thyroid dysfunction and thyroid autoimmunity in a large unselected population of elderly subjects in Poland — the 'PolSenior' multicentre crossover study

Zaburzenia czynności tarczycy i występowanie przeciwciał przeciwtarczycowych w dużej polskiej populacji losowo wybranych osób w podeszłym wieku — wyniki wieloośrodkowego przekrojowego badania „PolSenior"

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Abstract

Introduction: Data on the thyroid function of a randomly chosen elderly population was collected during a multicentre study performed in Poland (PolSenior) in 2007–2010.

Material and methods: The population of 4,190 participants under study was divided into six age subgroups of > 65 to > 90 years of age and a younger group aged between 55 and 59 years. Assessment of thyroid function was based on hormonal measurements.

Results: Concentrations of both TSH and fT_4 were significantly higher in females than in males. No differences in TSH and fT_4 concentrations between different age groups were found. Thyroid dysfunction was revealed in more than10% of participants, hypothyroidism in 7.95%, and hyperthyroidism in 2.95%. Both types of dysfunction were more prevalent in women, and in more than 80% both dysfunctions were subclinical. In 1,542 participants, concentrations of TPOAb were measured. Increased TPOAb was revealed in 19% of the cohort and the prevalence of thyroid autoimmunity was higher in women and also more often found in participants with hypothyroidism.

Conclusions: Cross sectional survey revealed thyroid dysfunctions in over 10% of non selected elderly population. No age related differences were found in TSH concentrations, TPOAb positivity and prevalence of thyroid dysfunctions. **(Endokrynol Pol 2012; 63 (5): 346–355)**

Key words: *elderly population, thyroid dysfunctions, hypothyroidism, hyperthyroidism, thyroid hormones, thyrotropin, anti thyroid peroxidase antibodies, thyroid autoimmunity, gender differences*

Streszczenie

Wstęp: Podczas wieloośrodkowego badania przeprowadzonego Polsce w latach 2007–2010 (PolSenior) zgromadzono dane dotyczące czynności tarczycy w wybranej losowo populacji w podeszłym wieku.

Materiał i metody: Grupa badana licząca 4190 uczestników została podzielona na sześć podgrup w wieku od > 65 lat do > 90 i jedną podgrupę młodszych uczestników między 55. a 59. rokiem życia. Czynność tarczyc określano na podstawie wyników oznaczeń hormonalnych.

Wyniki: Stężenia TSH i fT_4 były znamiennie wyższe u kobiet niż u mężczyzn. Nie wykazano różnic w stężeniach obydwu tych hormonów między grupami wiekowymi. Zaburzenia czynności tarczycy stwierdzono u ponad 10% badanych, niedoczynność u 7, 95%, a nadczynność — u 2,95%. Obydwa typy dysfunkcji były częstsze u kobiet. W ponad 80% zaburzenia czynności tarczyc miały charakter utajony. U 1542 uczestników oznaczono stężenia TPOAb. Podwyższone wartości — marker autoimmunologicznej choroby tarczycy stwierdzono u 19% tej populacji. Podwyższone TPOAb stwierdzano częściej u kobiet niż u mężczyzn, najczęściej w grupie osób z hipotyreozą.

Wnioski: Zaburzenia czynności tarczycy stwierdzono u 10% losowo wybranych osób w podeszłym wieku. Nie stwierdzono zależnych od wieku różnic w stężeniach TSH ani w częstości występowania przeciwciał TPOAb i dysfunkcji tarczycy. **(Endokrynol Pol 2012; 63 (5): 346–355)**

Słowa kluczowe: *populacja w podeszłym wieku, dysfunkcje tarczycy, niedoczynność tarczycy, nadczynność tarczycy, hormony tarczycy, hormon tyreotropowy, przeciwciała przeciwko peroksydazie tarczycowej, autoimmunologiczna choroba tarczycy, różnice zależne od płci*

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Introduction

Thyroid diseases are the commonest endocrine disorders and their prevalence increases with ageing. Thyroid dysfunctions are about twice as frequent in the elderly compared to younger age groups. According to the previously published epidemiological data from different countries, overt and subclinical hypo-

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Table I. *Age and sex distribution in the study group*
Tabela I. *Rozkład wieku i płci w badanej populacji*

Age group)	Women		Men		All	
(years	n	%	n	%	n	%
55–59	314	55.6	251	44.4	565	13.5
65–69	318	51.2	294	48.04	612	14.6
70–74	344	49.6	350	50.4	694	16.6
75–79	291	46.04	341	53.9	632	15.1
80–84	258	46.04	302	53.9	560	13.6
85–89	270	43.9	345	56.1	625	14.5
≥ 90	260	50.7	253	49.3	513	16.65
All	2,055	49.05	2,135	50.95	4,190	100

thyroidism was found in 0.5 to 15% of the population while overt and subclinical hyperthyroidism in 0.5 to 8% of the population [1–5]. Greater prevalence in women was a constant finding. Autoimmune thyroid disease is the leading aetiological factor of endogenous thyroid failure. Earlier data from different countries and populations has produced divergent findings concerning the epidemiology of thyroid diseases and dysfunctions [6].

Another common cause of thyroid disorders worldwide is iodine deficiency. Poland had been a country of mild or moderate iodine deficiency for several decades. In 1997, obligatory salt iodisation was reintroduced in Poland, so our country is now iodine sufficient. This change of iodine status might influence the epidemiology of thyroid diseases in Poland. The measurable effect of obligatory salt fortification in our country was the reduced occurrence of goitre in children and pregnant women, and of neonatal hypothyroidism.

Previous observations in different populations have documented the transient increase of thyroid antibodies positivity and iodine induced thyroid dysfunctions in the adult population after an increase of iodine supplementation, although discordant data has been presented [5–8].

There has been no previous nationwide study on the epidemiology of thyroid disorders in a Polish population. The present study was focused on elderly subjects.

This paper presents the results of PolSenior, a publicly funded research project designed to describe several aspects of life of a non selected population aged over 65. Multidimensional data concerning many aspects of socioeconomic as well as general health data of an ageing population was collected. All participants were interviewed and examined in their homes. Trained nurses collected information from the respondents [9, 10].

Thyroid function assessment in a representative ageing population was part of this multicentre nationwide project. Some of the data was published before the end of the project [10].

Material and methods

The cohort of 5,695 subjects from the randomly chosen, unselected population consented to take part in the study. Participants were between 65 and 90-plus years of age; the reference group was younger, between 55 and 59. They lived in urban, rural and mixed urban–rural areas in nine of Poland's 16 provinces.

In 4,190 participants, thyroid data was eligible and this group is described in this paper. The elderly cohort was divided into six age groups ranging from > 65 to > 90 years of age. The reference group consisted of subjects 55–59 years old. The number of participants in age groups was comparable. The population consisted of 50.8% males and 49.2% females. The distribution of sexes in most groups was nearly equal. The study was cross-sectional, and held between the years 2007–2010. The methodology has been described in earlier publications [9, 10].

The distribution of age, sex, and types of places of dwelling of the study group are presented in Tables I and II.

The study involved the social, economic, psychological and health related aspects of the life of elderly people in several regions of Poland. Thyroid function was assessed based upon the results of TSH measurements. In the majority of subjects, free thyroxine concentrations in serum were also measured. Because of the very wide range of aspects concerning living and health status investigated in the project, clinical data concerning thyroid status was scarce. Nevertheless, information concerning thyroid medication use and iodine rich preparations was available.

Table II. *Dwelling places of residence of the PolSenior study participants whose TSH and thyroxine were measured*
Tabela II. *Miejsca zamieszkania uczestników badania PolSenior , u których oceniono czynność tarczycy*

Sex		Towns — number of inhabitants (thousands)					Villages	All	
		< 20	> 20–50	> 50–200	> 200–500	> 500		N	%
Males	n	293	270	316	108	308	840	2055	
	%	6,68	5,39	6,42	2,43	8,02	20,10		49,05
Females	n	280	226	269	102	336	842	2135	
	%	6,68	5,39	6,42%	2,43	8,02	20,10		50,95
Both sexes	n	573	496	585	210	644	1682	4190	
	%	13,68	11,84	13,96	5,0	15,37	40,14		100

Respondents were interviewed and examined in their homes. Samples of venous blood were transported in vacuum containers and transferred to a local laboratory within two hours. After centrifugation, samples of serum were frozen and stored at –80°C and then delivered to the Central Laboratory where measurements were performed.

Thyrotropin concentration was measured by IRMA (Immunotech, Czech Republic). In this method, the reference values were 0.2–4.5 mIU/L; free thyroxine with RIA (Siemens US), reference values were 10.3–25.7 pmol/L. Measurements were carried out with a gamma scintillation counter Wizard 1470. Thyroid status was defined based upon the results of thyrotropin (TSH) and free thyroxine (fT_4) concentrations in the serum.

Stages of thyroid function were defined on the basis of TSH results. Participants with a TSH value of < 0.2 mIU/L were defined as the hyperthyroid group, > 4.5 as hypothyroid, and those with TSH between 0.2 and 4.5 mIU/L were considered euthyroid.

Aiming at estimation of the prevalence of autoimmune thyroid disease in this elderly population, the presence of thyroid antiperoxidase antibodies (TPOAb) was measured. TPOAb was measured using RIA (Immunotech, Czech Republic); according to the reference data, results between 0 and 20 IU/L are defined as normal and values exceeding 20 IU/L are abnormal and suggest the presence of autoimmune thyroid disease.

Statistical analysis of data was performed using Statistica 9.2 program, and Kruskal Wallis and U Mann Whitney tests were used for comparisons.

Results

Hormone assays

TSH was measured in 4,051 blood samples. Arithmetical mean of TSH in the population was 2.55 ± 6.7 mIU/L and median 1.6 mIU/L. There were gender specific differences in the TSH concentrations. Mean TSH in women was 2.9 ± 8.6 mIU/L and was significantly higher than in male subjects, where it was 2.2 ± 4.6 mIU/L ($p = 0.01$). Median values were higher in women (1.7 *v.* 1.55 mIU/L. The distribution of TSH in the whole population was not normal; there was a slight shift of the curve to the right (Fig. 1).

Mean concentration of free thyroxine in the whole population under study was 16.8 ± 8.5 pmol/L with median value 16.4 pmol/L. Gender dependent differences in free thyroxine concentrations were present. In women, mean fT_4 was higher than in males: respectively 17.1 ± 11.5 pmol/L *v.* 16.5 ± 3.6 pmol/L ($p = 0.01$). Median values of fT_4 were 16.5 pmol/L in females and 16.2 pmol/L in males.

Concentrations of TSH and fT_4 in age groups are presented on Figures 2 and 3.

No significant differences were found in the concentrations of TSH and fT_4 between the six age subgroups above 65 years. The values in TSH and fT_4 between the younger group (55–59 years) and above 65 years group did not differ significantly.

Concentrations of TSH and free thyroxine in serum were significantly negatively correlated: $r = –0.3066$, $p = 0.000$) in the whole group. Correlation was weaker in the younger population 55–59 years of age $r = –0.1668$, $p = 0.0240$ than in the older group > 65 years of age: $r = –0.3249$, $p = 0.000$.

Thyroid dysfunctions

According to the defined TSH criteria, 7.9% of respondents from the whole cohort were classified as hypothyroid, 2.9% as hyperthyroid, and 89.1% were euthyroid (Tab. III). Hypothyroidism was more prevalent then hyperthyroidism and the incidence of thyroid dysfunctions was greater in women (13.87% *v.* 8.01%).

In most respondents, thyroid dysfunctions were subclinical. In participants with thyroid dysfunctions, thyroid failure was overt in only 11% and hyperthyroidism in about 20%.

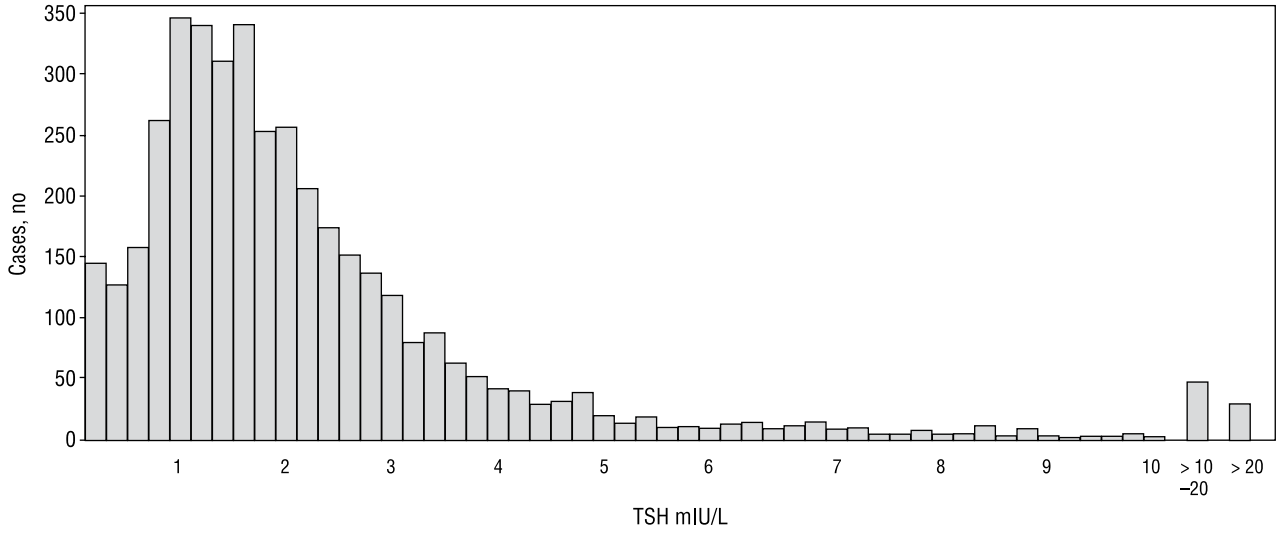

Figure 1. *TSH distribution in an elderly Polish population (n = 4,051)*
Rycina 1. *Rozkład wartości TSH w populacji ludzi starszych (n = 4051)*

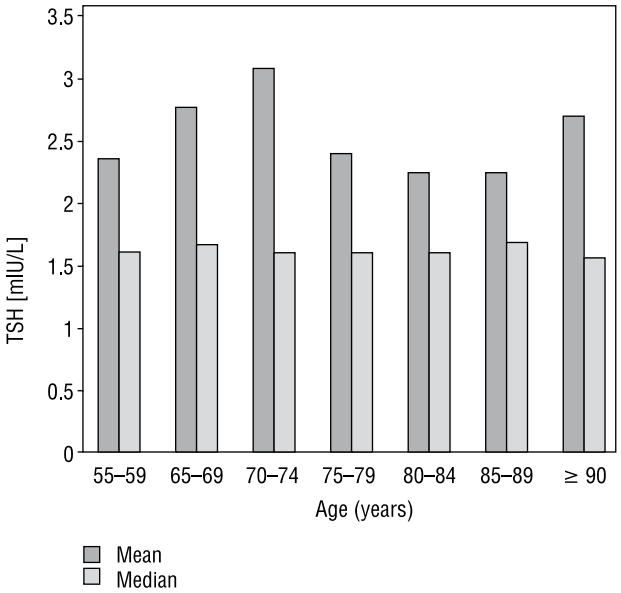

Figure 2. *TSH in age groups of elderly population (n = 4,051)*
Rycina 2. *Rozkład wartości TSH w grupach wiekowych (n = 4051)*

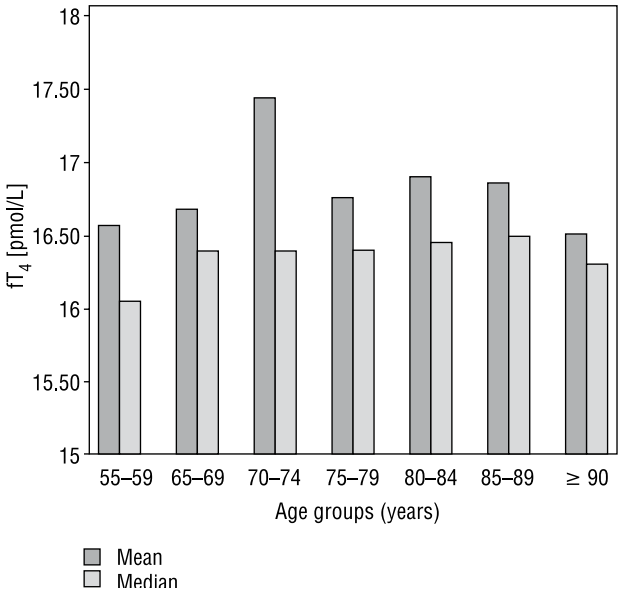

Figure 3. *Free thyroxine in age groups of elderly population (n = 4,154)*
Rycina 3. *Rozkład wartości wolnej tyroksyny w grupach wiekowych (n = 4154)*

Table III. ***Thyroid dysfunctions in relation to gender (n = 4,051)***
Tabela III. ***Zaburzenia czynności tarczycy w zależności od płci (n = 4051)***

Thyroid function		Euthyroid	Hyperthyroid	Hypothyroid	Number of subjects
Whole cohort	Number	3,610	119	322	4,051
	%	89.11	**2.94**	**7.95**	
Females	Number	1,715	70	206	1,991
	%	86.13	**3.52**	**10.35**	
Males	Number	1,895	49	116	2,060
	%	91.99	**2.38**	**5.63**	

Table IV. *Thyroid function in relation to age*
Table IV. *Czynność tarczycy w zależności od wieku*

Age group/years	Hypothyroidism	Hyperthyroidism	Euthyroidism	Number
55–59	7.65	1.82	90.52	549
65–69	6.94	2.54	90.52	592
70–74	8.04	3.72	88.24	591
75–79	7.88	2.13	89.98	673
80–84	8.47	1.84	89.69	602
85–89	7.29	3.73	88.98	590
≥ 90	9.7	4.85	85.85	495
All	7.95	2.94	89.11	4,051

Occurrence of abnormal thyroid function did not change significantly with increasing age. There was a tendency towards a greater prevalence of advanced thyroid dysfunctions in the oldest. In the group aged > 90 years, hyperthyroidism occurred in 4.85% and hypothyroidism in 9.7%. In the youngest subjects, 55–59 years old, the prevalence of hyperthyroidism was lowest: 1.8% *v.* 2.94% in theelderly. These differences between subgroups had no statistical significance (Table IV).

Thyroid medications

In 4,126 respondents, data concerning both thyroid function and medication was available. 186 subjects, about 4.5% of the cohort, were on thyroid medications. Among 441 subjects with abnormal thyroid function, about 42% were treated with thyroxin or antithyroid medications. This means that less than half of the patients with thyroid dysfunctions were being treated. Nevertheless, it has to be stressed that 88% of cases of hypothyroidism and over 80% of hyperthyroidism were mild and probably did not need therapy. On the other hand, results of already treated patients were far from satisfactory because only in 68.8% of subjects were the expected appropriate values of TSH achieved. In this group, only 73% of 41persons on antithyroid drugs and 61% of 145 on levothyroxine medication were euthyroid by laboratory criteria.

Thyroid autoantibodies

For logistical and financial reasons, we measured TPOAb only in 1,594 respondents i.e. about one third of the cohort. TPOAb levels were distributed between 4.2 and 9,995 U/L. Positive laboratory marker of thyroid autoimmunity i.e. TPOAb > 20 U/L was present in 17.4% of subjects from the whole cohort. Prevalence of TPOAb positivity was higher in females than in males (26.6% *v.*15.5%). Thyroid hormones were not available in all these subjects. Data of the whole cohort is presented in Figure 4 and Table V.

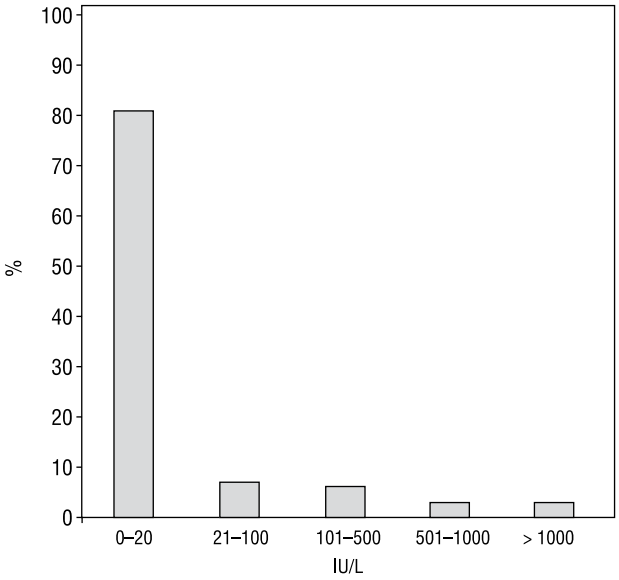

Figure 4. *Distribution of TPOAb values in the whole study group (n = 1,594)*
Rycina 4. *Rozkład stężeń TPOAb w grupie badanej (n= 1594)*

No significant differences in TPOAb values between age groups of elderly subjects were found. In addition, no statistically significant differences were found in the prevalence of TPOAb positivity between the younger reference group aged 55–59 years, and the population over 65 years (26.9% *v.* 23.6%).

Among 1,542 subjects with known concentrations of both TPOAb and thyroid function, 1,110 were euthyroid (72%), 317 hypothyroid (20.6%), and 115 hyperthyroid (7.4%). Positive results of TPOAb (*i.e.* exceeding 20 U/L) were unevenly distributed between subgroups with different levels of thyroid function. Prevalence of positive TPOAb results was significantly higher in subjects with both thyroid dysfunctions

Table V. *TPOAb concentrations of elderly subjects with known thyroid function: mean and median values and TPOAb positivity in age groups (n = 1,542)*

Tabela V. *Stężenia TPOAb w grupach wiekowych u osób z określoną czynnością tarczycy wartości średnie , mediany i częstość występowania podwyższonych stężeń (n = 1542)*

	TPOAb concentration IU/L			
Age group/years	**Median**	**Mean**	**Range**	**% elevated**
55–59	10.0	180.6	6–2,085.4	26.9
65–69	9.8	168.6	4.7–3,032.8	24.6
70–74	10.25	196.1	6.1–2,931.9	25.9
75–79	10.4	127.0	5.2–2,032	25.3
80–84	10.3	140.4	6.0–2,701.8	21.5
85–89	10.4	147.4	4.2–9,995.4	20.8
≥ 90	10.7	117.2	5.9–2,461.3	23.0
All	10.3	150.2	4.2–9,995.4	23.9

Table VI. *The distribution of elevated TPOAb in subgroups with different levels of thyroid function (n = 1,542)*

Table VI. *Występowanie podwyższonego stężenia TPOAb w zależności od stanu czynnościowego tarczycy (n = 1542)*

TSH range [mIU/mL]		< 0.2	0.2–5.4	> 4.5
	n	115	1110	317
TPOAb > 20 U/L	%	23.4	16.6	50.2
	n	27	184	159

Table VII. *Elevated levels of TPOAb in treated (T) and untreated (NT) subjects with different thyroid function*

Tabela VII. *Podwyższone stężenia TPOAb u osób leczonych (T) i nie leczonych (NT) z różnym stanem czynnościowym tarczycy*

TSH range [mIU/L]	**< 0.2**		**0.2–4.5**		**> 4.5**		**All**	
	NT	T	NT	T	NT	T	NT	T
TPOAb > 20 IU/L %	20.6	43.7	16.05	32.4	20.6	43.7	22.5	46.8

than in the euthyroid group ($p < 0.05$) and was highest in those with hypothyroidism (Table VI).

There was a tendency towards a greater prevalence of TPOAb positivity in treated subjects compared to untreated ones with a comparable level of thyroid function (Tab VII).

Discussion

Results presented in this paper represent a crossover study of a large randomly chosen cohort of ageing people from an unselected population. The strength of this study is the recruitment of a large number of elderly people from several urban and rural regions of the country, on the basis of population listing. The rural population was underrepresented, comprising only 5% of the cohort. Subjects included were recruited from an epidemiological survey and not from clinical practice. This population which included more than 4,000 aging subjects and was representative for elderly people.

There were some limitations of this study. Assessment of thyroid function was based solely on the results of the hormonal measurements. The study protocol was strict, so data collected in the questionnaires did not precisely inform beyond the patient's past history and family background. No information on thyroid size, morphology or previous treatments, with the exception of thyreoidectomy, was available. Collected data contained information about presently used thyroid medications and iodine containing medications. There was little data concerning coexisting pathologies.

We are conscious that there is doubt in diagnosing thyroid dysfunction on the basis of a single TSH measurement only, without the analysis of all clinical data. It is obvious that TSH concentrations may be influenced by numerous factors, among them medications and chronic or acute extra thyroidal diseases. At the time of sampling, some participants might have had temporarily abnormal TSH. These factors may cause discrete variations of the results of hormonal measurements. Therefore, our data on the prevalence of thyroid dysfunctions may be slightly overestimated, because of the

lack of precise clinical data analysis in individual cases. On the other hand, in our present study the reference range of TSH was wide, so this markedly diminished the possibility of misclassification of thyroid function.

Mean and median values of TSH in this project were higher than those published in data concerning selected American, Italian and Brazilian populations free of thyroid disease [4, 11–15]. These results are barely comparable with our cohort which was randomly chosen from unselected lists. Our study revealed gender differences in TSH and fT_4 values — both were significantly higher in women than in male subjects.

The upper limit of normal TSH levels is a matter of debate [16–19]. Some American endocrinologists have suggested that the upper level of the normal reference range should be changed, because in over 90% of healthy Americans, TSH levels do not exceed 2.5 mIU/L. This data may not apply to non-American populations. This opinion does not find wide support among endocrinologists, especially in Europe, because differences in environmental and ethnic factors, and as well as iodine sufficiency, may have a strong impacts on thyroid function. The debate on this subject is still ongoing. [20–22]. It must be stressed that any lowering of the upper range of reference values would result in a remarkable increase in the diagnosis of subclinical hypothyroidism [18]. In addition, epidemiological data from the US suggests that the upper level of the reference range of TSH for an older population should be increased with advancing age [14]. On the contrary, reports from European iodine deficient regions have revealed a tendency of TSH to decrease with ageing, resulting probably from the growing incidence of nodular goitre and thyroid autonomy [4, 11].

In a non selected Polish population, presented in this paper, TSH concentrations were as follows: arithmetical mean 2.55 mIU/L, median 1.6 mIU/L. In this cohort, 26% of the results exceeded 2.5 mIU/L, which had been suggested as the upper limit of normal [23]. There have been no previous large population findings regarding thyroid epidemiology in Poland, with the exception of a post-Chernobyl study which recruited a much younger population exposed to environmental irradiation from that nuclear accident.

Our study did not reveal a tendency of TSH to change with increasing age. Mean TSH and fT_4 values were comparable in the whole population over 65 years and the younger reference group as well as within the age subgroups of elderly participants. It has to be stressed that this study was cross-sectional and concerned an unselected population; a longitudinal project might allow a better estimation of the trends of changes in hormonal levels with increasing age. Divergent results were obtained in epidemiological studies. Previous data had shown a tendency to both a decrease and an increase of TSH with ageing. Data on this subject is discordant [13, 24–26].

Prospective studies have revealed that over the years, a slightly abnormal TSH value may remain on the same level or return to normal but in some subjects abnormalities may progress to more advanced dysfunctions [27–29]. Some prospective observations have revealed the progression of subclinical to overt hypothyroidism in 17–40% of old age subjects [7, 40]. Higher TSH and/or TPOAb positivity predict progression from subclinical to overt hypothyroidism [26]. Some recent reports have shown that implementation of salt fortification may influence the epidemiology of thyroid diseases [7].

The criteria used in our study resulted in defining close to 90% of the elderly participants as euthyroid, nearly 3% as hyperthyroid, and 8% as hypothyroid. No significant differences in the distribution of thyroid dysfunctions were found in the population aged over 65 years old, with the exception of the very oldest, where advanced 'laboratory' hypo- and hyperthyroidism were more prevalent.

It would be very difficult to compare our data on the epidemiology of thyroid dysfunctions in the elderly with other studies. There were differences in the methods of inclusion of participants to population studies. There were ethnic differences and different conditions of iodine sufficiency. Previously described groups included volunteers, outpatients of GP practices, and populations randomised for epidemiological projects. Methods used and the quality of TSH measurement as well as criteria of normal values vary widely from study to study. This results in a diversity of laboratory criteria of thyroid dysfunction and consecutive estimation of incidence of hyperthyroidism and hypothyroidism [3, 15, 30, 31]. These facts strongly influence our understanding of the epidemiology of thyroid dysfunctions.

Data concerning the epidemiology of thyroid diseases is scarce. No relations concerning an ageing of the Polish population were available. Over the past decade, several papers have been published reporting an increasing prevalence of thyroid dysfunctions in Europe. In inhabitants of the Tayside region of Scotland, the incidence and prevalence of both hypothyroidism and hyperthyroidism in people of both sexes increased over a ten year period [32, 33].

It is not clear why the incidence and prevalence of thyroid disorders has a tendency to increase. It is obvious that this is in part the result of performing many more thyroid tests and of their greater sensitivity. Some recent data suggests an influence of salt fortification on the epidemiology of thyroid dysfunctions [7]. As the autoimmune process is the leading cause of endog-

enous thyroid diseases, this growing number of thyroid dysfunctions might be the effect of autoimmunity [34].

Previous publications have suggested an increasing prevalence of thyroid dysfunctions with advancing age. The age span in some studies was greater than in this study, from relatively young to old age. The range of age presented in our paper involved only ageing people, so our observations cannot be simply compared to others. We found a tendency towards more advanced and more frequent thyroid dysfunctions in the very oldest; in this age group, thyroid medications were prescribed less frequently. Symptomatology of thyroid disorders in very old people can be masked by the process of ageing and coexistent diseases, so the possibility of the presence of thyroid disease in these patients may be less obvious to some general practitioners [35].

Our project included an assessment of the prevalence of autoimmune thyroid disease in an elderly population on the basis of the occurrence of antithyroid peroxidase antibodies. Tests for TPOAb were performed in nearly 1,600 subjects.

Overall, the 17.4% incidence of TPOAb positivity and increased prevalence in women in our cohort is relatively high, but it is comparable to some previous data. According to the earlier papers, autoimmune thyroid disease affects about 2% of the population, but antithyroid antibodies may be present in up to 20% [3, 14, 36, 37].

As might be expected, TPOAb positivity was higher in persons with thyroid dysfunctions (over 40%), particularly in hypothyroid subjects (52%). Such results suggest that autoimmunity to thyroid antigens plays an important role in the aetiology of thyroid dysfunction, especially thyroid failure in this elderly population.

The distribution of elevated TPOAb within the age subgroups was similar. We are fully conscious that our study was crossover not longitudinal, but our data did not support theories about the changing activity of autoimmune processes during ageing in humans. Marriotti et al. have shown an age dependent increase of incidence of thyroid antibodies in a population between 7 and 85 years of age. The prevalence in 70–85 years old was significantly greater than in those aged below 50 years, but at the same time in a small group of 34 healthy centenarians aged 100–106 years, the occurrence of thyroid antibodies was similar to that in subjects less than 50 years old [38]. The observations of Roos et al. have revealed an increased prevalence of thyroid antibodies with age, particularly in women aged over 60 [37].

In the presented material, within three groups with different thyroid functions, a tendency was found to a higher prevalence of TPOAb positivity in treated than in untreated responders. This observation includes subjects who were successfully treated and euthyroid. One might speculate that subjects with higher levels of antibodies might have had more advanced, overt clinical dysfunction so their diagnosis and treatment took place early. There is no data suggesting that antithyroid drugs and levothyroxine might stimulate thyroid autoimmunity. On the contrary, there is some data suggesting their suppressive action on antithyroid antibodies. It is worth mentioning that in some former experimental and clinical studies, methimazole was found to have some immunosuppressive action and in some observations treatment with levothyroxine resulted in a decrease of antithyroid auto antibodies. For understandable reasons, we have no data on pretreatment thyroid antibodies in the group which is on thyroid medications.

Nearly 60% of subjects with thyroid dysfunction were not treated; the majority presented with subclinical forms of hypo- or hyperfunction. It is to be stressed that until now there are no arguments speaking for the need and benefits from treatment of mild thyroid dysfunction, especially of hypothyroidism. Although treatment of mild thyroid failure with thyroid hormones results in the improvement of cardiovascular disease risk factors, there are no proven benefits resulting in longer survival. However, positive changes in quality of life have been achieved in some trials [39].

In addition, the decision about starting treatment must be considered cautiously. Longitudinal observations revealed that slightly abnormal TSH values may in time return to normal values, may remain on the same level, or progress to a more advanced abnormality [40].

However, the results of a prospective 10-year study of the population consisting of nearly 1,200 subjects over 60 years of age have shown that a single result of low serum thyrotropin (< 0,5 mIU/L) is associated with increased risk of all causes mortality, mainly from cardiovascular system diseases by 2.2 to 3.3 in consecutive years. Best curves of survival were recorded in a cohort with TSH > 5 mIU/L [41].

Some reports have pointed to an increased risk of aortic atherosclerosis, myocardial infarction and heart failure in mildly hypothyroid patients, having TSH > 4mIU/L and normal fT_4 [42, 43].

Meta-analysis published by Razvi et al. including over 27,000 unselected community dwelling subjects, observed for at least ten years, disclosed that subclinical hypothyroidism negatively influences cardiovascular risk in individuals < 65 years old, but not in older ones. [43]

New data appears to suggest that higher TSH values and lower free thyroxin levels in ageing people might favour longer life [44, 45]. This observation concerned selected families known for longevity and also some

unselected populations described in published papers [46]. It is difficult to estimate the importance of these relations, because the criteria of classification of thyroid function parameters and characteristics of populations in these papers were different. [11, 43, 47, 48]

In older males, higher free thyroxin levels seem to be a risk factor of frailty and morbidity [49].

Our study revealed that among subjects with overt thyroid dysfunctions, the most advanced abnormalities were in the very oldest. This finding reminds us of the necessity of thorough clinical analysis, including the possibility of thyroid disease in ageing people, because in them the symptomatology of thyroid dysfunction can be misinterpreted as a result of ageing. It concerns such findings as decreasing intellectual functions, deterioration of activity or their general condition, and cardiovascular instability. It is generally known that both thyroid failure and hyperactivity may negatively influence the risk of cardiovascular diseasess, and their correction may result in improvement of the course of coexisting diseases.

Our paper presents a review of laboratory parameters of thyroid function status in a large ageing unselected population. Subjects with known, past or present, thyroid disease and positive family history of thyroid disease and TPOAb positive patients were not excluded from the cohort. It is clear that our results of hormonal measurements cannot serve as reference values, because they were assessed in an unselected population.

It has to be stressed that among the respondents treated for thyroid dysfunctions, only about 60% were euthyroid. It is possible that TSH levels might not exactly indicate their present thyreometabolic status, because some of them might have started treatment recently before blood sampling. Nevertheless, our observations confirm facts known from previous papers from different countries, that a large part of a treated population does not achieve normal TSH levels. [3, 50, 51].

The practical conclusion is that thyroid therapy in the aged should be carefully monitored in order to prescribe adequate dosing of medicine and avoid potential complications of inappropriate dosing. It is particularly important in elderly subjects, in whom dysthyroid status can increase cardiovascular risk.

Conclusions

1. A cross-sectional survey of a non selected elderly population did not reveal differences of TSH concentrations related to age.
2. Thyroid dysfunctions occur in over 10% of the elderly Polish population.
3. The prevalence of thyroid antibodies positivity in an elderly population does not change with age.
4. Only about a third of the elderly subjects treated for thyroid dysfunction achieved normal TSH levels.

Final remarks

Thyroid disease in elderly people, especially the very oldest, may be under-diagnosed.

Regular monitoring of elderly patients on thyroid medications is important.

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