Endokrynologia Polska/Polish Journal of Endocrinology
Tom/Volume 63; Numer/Number 2/2012
ISSN 0423–104X

Work of the Polish Council for Control of Iodine Deficiency Disorders, and the model of iodine prophylaxis in Poland

Działalność Polskiej Komisji ds. Kontroli Zaburzeń z Niedoboru Jodu i model profilaktyki jodowej w Polsce

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Abstract

The Polish Council for Control of Iodine Deficiency Disorders (PCCIDD) was established in 1991 in Krakow at the Chair and Dept. of Endocrinology, Jagiellonian University, Collegium Medicum, following the example of the International Council for Control of Iodine Deficiency Disorders (ICCIDD) in Charlottesville, USA. The PCCIDD co-operates with the European Co-ordinating Centre in Pisa, Italy. The PCCIDD comprises a group of experts in endocrinology, iodine prophylaxis, the technology of salt and food iodisation, and Polish representatives of several organisations: WHO, UNICEF, the Polish Consumers Federation, and the Spokesman for Children's Rights.

The strategic goal of the Polish Council is to solve the problem of iodine deficiency in Poland realising the Programme for Elimination of Iodine Deficiency financed by the Ministry of Health. The Polish model of iodine prophylaxis contains obligatory iodisation of household salt (20–40 mg KI/1 kg) and neonates' formula (10 μg/100 mL of milk), and additional supplementation for pregnant and breastfeeding women with 150–200 μg of iodine as pharmacotherapy.

The model is very effective: endemic goitre in schoolchildren has been eradicated, the prevalence of goitre in pregnant women has fallen from 80% to 19%, the frequency of transient hypothyroidism in neonates has dropped from 2.0% to 0.16%, and the observed increase of incidence rate of thyroid cancer in women over 40 years old has diminished markedly. In 2008, a WHO Collaborating Centre (WHOCC) for Nutrition was designated at the Department of Endocrinology, UJCM in Krakow. The main goal of the WHOCC is to sustain effective iodine prophylaxis in Poland in the light of the latest WHO recommendations on the necessary reduction of daily salt intake as a risk factor for hypertension and arteriosclerosis. Therefore, additional standardised carriers of iodine (milk, mineral water) have been introduced into the food market. **(Pol J Endocrinol 2012; 63 (2): 156–160)**

Key words: *iodine deficiency, iodisation of salt, iodine prophylaxis*

Streszczenie

Polska Komisja ds. Kontroli Zaburzeń z Niedoboru Jodu została powołana przy Klinice Endokrynologii UJCM w Krakowie, na wzór Międzynarodowej Komisji ds. Kontroli Zaburzeń z Niedoboru Jodu (ICCIDD) w Charlotesville (Stany Zjednoczone). W skład Polskiej Komisji wchodzą eksperci z dziedziny endokrynologii, technologii jodowania produktów spożywczych oraz polscy reprezentanci organizacji międzynarodowych: WHO, UNICEF, Federacji Konsumentów oraz Biura Rzecznika Praw Dziecka. Głównym zadaniem Polskiej Komisji jest realizacja Programu Eliminacji Niedoboru Jodu finansowanego przez Ministerstwo Zdrowia. Polski model profilaktyki jodowej polega na obowiązkowym jodowaniu soli kuchennej (20–40 mg KI/1 kg), formuły noworodków (10 μg/100 ml mleka) oraz dodatkowej suplementacji kobiet w ciąży i kobiet karmiących w dodatkowa dawkę jodu 150–200 μg/dzień. Model ten okazał się bardzo efektywny. Wole endemiczne u dzieci szkolnych zostało całkowicie wyeliminowane, częstość wola u kobiet w ciąży zmniejszyła się z 80% do 19%, częstość przejściowej niedoczynności tarczycy u noworodków obniżyła się z 2,0% do 0,16%, a obserwowany wzrost częstości raka tarczycy u kobiet powyżej 40. roku życia wydatnie się obniżył. W 2008 roku przy Klinice Endokrynologii UJCM w Krakowie powołano Ośrodek Współpracujący z WHO (WHOCC) w zakresie Żywienia. Głównym zadaniem Ośrodka jest utrzymanie efektów profilaktyki jodowej w świetle ostatnich rekomendacji WHO na temat konieczności zmniejszenia spożycia soli jako czynnika ryzyka nadciśnienia tętniczego i miażdżycy. W tej sytuacji na rynek żywnościowy wprowadzono dodatkowe nośniki jodu — mleko i wody mineralne. **(Endokrynol Pol 2012; 63 (2): 156–160)**

Słowa kluczowe: *niedobór jodu, jodowanie soli, profilaktyka jodowa*

Introduction

The Polish Council for Control of Iodine Deficiency Disorders (PCCIDD) was established in 1991 in Krakow by the Polish Society of Endocrinology upon consultation with the Ministry of Health as a consulting body to the Minister of Health with respect to iodine deficiency. The Council has joined a group of similar organisations in Europe and in the world, and co-operates with the European Co-ordinating Centre in Pisa, Italy, (Prof.

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A. Pinchera) and the International Council for Control of Iodine Deficiency Disorders (ICCIDD) in Charlottesville, USA.

The strategic goal of the Polish Council is to solve the problem of iodine deficiency at a population level by implementing the programme designed by the Council — the National Programme for Elimination of Iodine Deficiency — and in this way fulfilling the declaration that Poland signed at the World Health Assembly in New York in 1990. The Council is located at the Chair and Department of Endocrinology, Jagiellonian University, Collegium Medicum,University Hospital in Krakow, and is affiliated at the Polish Society of Thyreology in Łódż. The chairman of the Council and co-ordinator of the Programme is Prof. Zbigniew Szybiński — ICCIDD expert.

The discontinuation of iodine prophylaxis during Martial Law in Poland in 1980 produced certain health consequences on the population level: an increased incidence of goitre in schoolchildren — in some areas up to 41% [1], an increased incidence of goitre in adults of up to 30% [2] and in pregnant women of up to 80% [3, 4], transient hypothyroidism in neonates of up to 2.0% [5, 6], and a 3–5-fold increase in the incidence of differentiated thyroid carcinomas in women over 40 years of age [7]. The PCCIDD decided to carry out epidemiological studies in 1992/1993 involving school children, neonates and pregnant women [1, 3], and took part in 1994 in an international campaign by the ICCIDD and WHO entitled 'Thyromobil' aimed at school children [8]. In compliance with the ICCIDD standards, the PCCIDD defined iodine deficiency in Poland as moderate, and only in the coastal area as slight. The studies also revealed that the Carpathian and Sudeten endemics could progress to become severe endemics.

The model of iodine prophylaxis in Poland

In 1996, because of the endemic situation, the PCCIDD proposed to the Ministry of Health mandatory kitchen salt iodisation (20–40 mg KI/1 kg), and this disposition was put into operation at the beginning of 1997. The Council defined the remaining components of the Polish model of iodine prophylaxis: additional iodisation of formula for neonates (10 μg/100 ml of milk) and additional pharmacotherapy 150 μg I/daily in pregnant and breastfeeding women [9].

The Ministry of Health approved the National Programme for Elimination of Iodine Deficiency in 1999–2003 assuming that the final analysis of the programme would identify new tasks of the programme [10]. The consecutive years 1999, 2000, 2001 and 2002 witnessed a significant improvement in all study indicators: the incidence of goitre in schoolchildren decreased by 30–80% compared to 1992/93, and in the youngest group of 6–8 year olds, it was 2.6% on average, i.e. below endemic level [11]. The incidence of thyreotropinaemia in neonates over 20 mUI/mL decreased from 2.0% to 0.16% [5, 6], the incidence of goitre in pregnant women fell from 80% to 19% [12], and the progress rate of differentiated thyroid carcinoma in women was also decreased [13]. The findings were approved by the conference of experts from ICCIDD, UNICEF and WHO held at the Ministry of Health on 1 February 2002, and the Polish model was considered as effective and safe. There was no population risk of iodine-induced hyperthyroidism and hypersensitivity due to iodine consumption [14]. However, the final goals of the programme have not been achieved. In older schoolchildren, goitre still occurs in 7–8% with regional variability, and frequency of ioduria over 100 μg I/L has not reached the desired value of 50% [15]. No more than 70% of pregnant women receive the recommended iodine dose [8], and although the progress rate of thyroid carcinoma in women is slower, its incidence is still 3–4 times higher than in 1990 [7]. The quality of salt iodisation has reached 96% of the normal limits [16].

The National Programme for Elimination of Iodine Deficiency Disorders was interrupted between 2003 and 2005, although the disposition on mandatory iodisation of kitchen salt and neonatal TSH screening according to the ICCIDD recommendation [17] continued. The Programme was put into operation again in 2006, and continues today.

The Chair and Department of Endocrinology, Collegium Medicum, Jagiellonian University in Kraków — head Prof A. Hubalewska Dydejczyk MD PhD — is the chair of the Polish Council for Control of Iodine Deficiency Disorders, which is an advisory body of the Ministry of Health. University Hospital in Krakow is the financial co-ordinating centre of the Programme for Elimination of Iodine Deficiency in Poland. The principal co-ordinator of the National Programme for Elimination of Iodine Deficiency in Poland is Prof. Zbigniew Szybiński MD, PhD, chairman of the PCCIDD, and expert of the International Council for Control of Iodine Deficiency Disorders (ICCIDD). The project manager is M. Trofimiuk MD, PhD [10]. The Department of Endocrinology has continuously co-ordinated and supervised the Programme since 1992.

Co-operation with the World Health Organisation (WHO)

Europe is an iodine deficiency area. Only 13 of 40 European countries apply mandatory iodisation of salt and iodine deficiency remains a serious public health problem. However, Poland is now in the group of European

countries with optimal supplementation of iodine at the population level [18, 19]. The main carrier of iodine in the prophylactic system is iodisation of household salt. The World Health Organisation (WHO) issued a recommendation, the Technical Consultation: Paris 2006 [20], Luxembourg 2007 [21] that increased salt consumption, as a risk factor for hypertension and atherosclerosis, should be restricted.

The European Commission looked to adhere to this recommendation by creating the High Level Group on Nutrition and Physical Activity. According to WHO recommendations, a daily allowance of 5 g NaCl (i.e., 2 g Na) for individual salt consumption should not be exceeded [20]. This has been confirmed in clinical studies [22–25]. In Poland, preventive measures were also undertaken [27–29]. The National Food and Nutrition Institute in Warsaw issued a Position Statement [30] on the general strategy of salt intake reduction in Poland. Accordng to WHO's data, daily intake of NaCl in European countries is from 8 to 10 g/day/person [20]. At present, mean individual salt consumption in Poland totals 13.5 g, of which salt used in households constitutes 8.8 g [26]. The results of the population based study in Poland on prevalence of goitre [14–16], resulted in mandatory iodisation of household salt with 20–40 mg KI/1 kg, and iodisation of neonates' formula introduced in 1997 [17, 18]. An additional dose of 150 μg of iodine is recommended for pregnant women [19, 20]. This model is very effective, and endemic goitre in schoolchildren has been eradicated [15]. The main indicators of the effectiveness of iodine prophylaxis are: thyroid volume, concentration of iodine in urine, and neonatal TSH in serum [19]. To evaluate the actual situation in terms of the prevalence of goitre in schoolchildren, we devised the new normative values of thyroid volume measured by means of USG in a selected group of 6––12 year-old schoolchildren from the Polish coastal region without goitre and with UI over 100 μg/L [31]. Current efforts aimed at preventing iodine-deficiency look to increase consumption of other iodine-rich products, mainly milk [32], and mineral water with standardised levels of iodine [14].

Once they achieve an iodine concentration of 0.1–0.2 mg/L, these products can easily supplement any decrease in physiological iodine levels resulting from reduced salt consumption. Also required are wide-ranging educational campaigns which will be co-ordinated by the WHO Collaborating Centre for Nutrition at the Department of Endocrinology at Jagiellonian University, Collegium Medicum in Krakow [33], set up in 2008. Its main terms of reference focus on iodine prophylaxis and the necessity of increasing consumption of alternative iodine-rich products such as milk and iodised mineral water with a controlled concentration of iodine of 0.1–0.2 mg/L. These products can easily supplement any decrease of iodine daily intake resulting from reduced salt consumption, and may become a constant component of the everyday diet [14].

Iodine prophylaxis and its effectiveness in Poland are co-ordinated and controlled by the Polish Council for Control of Iodine Deficiency Disorders within the National Programme for Elimination of Iodine Deficiency financed by the Polish Ministry of Health.

Description of the Programme for Elimination of Iodine Deficiency

Task 1
Prevalence of goitre and urinary iodine concentration in children: the 'Thyromobil' campaign

Performer: University Hospital in Krakow, Chair and Department of Endocrinology, Collegium Medicum, Jagiellonian University; Prof. Filip Gołkowski MD, PhD

Methods

The Thyromobil van is equipped with a USG device (Siemens Sonoline I–400 and a 7.5 MHz linear array transducer). Thyroid volume is calculated as the sum of both lobe volumes according to the formula: width × depth × length × 0.479 = V (mL), without isthmus. The prevalence of goitre is calculated according to the reference values of the WHO/ICCIDD 1997 standard. All examinations are performed by experienced doctors under the supervision of the co-ordinating centre headed by a person trained by the ICCIDD. The casual morning urine samples taken from each child are collected, deep frozen, and sent to the laboratory under the supervision and control of the referencing laboratory at the Institute of Food and Nutrition in Warsaw. Additionally, a special questionnaire concerning thyroid pathology and iodine intake in everyday diet is filled out, with the help of parents.

Task 2
Incidence of goitre and ioduria in pregnant women

Performer: Clinical Hospital No 3 Medical University, Department of Thyreology in Łodz; Prof. Andrzej Lewiński MD, PhD

Pregnant women belong to a major risk group, and the study of the incidence of goitre and ioduria in pregnancy is important. Analysis carried out in 2002 revealed a significant decrease in goitre prevalence in pregnant women, from 80% in 1990 to 19% in 2002. A questionnaire administered by the Institute of Mother and Child revealed that 40% of pregnant women in Poland did not receive iodine supplementation.

Methods

Iodine urinary concentration is determined using the Sandell-Kolthoff method in co-operation with the control laboratories, as above. A USG device is equipped with a 7.5 MHz linear array transducer. Thyroid volume is calculated as the sum of both lobe volumes according to the formula: width × depth × length × 0.479 = V (mL), without isthmus. Thyroid hormones (total and free fraction) are determined by means of the LIA–MAT system (Byk-Sangtec, Dietzenbach, Germany); anti-TPO and anti-TGB antibodies are detected by means of electrohemiluminiscency method — system Roche.

Task 3
Analysis of TSH level in neonates

Performer: Institute of Mother and Child, Warsaw; Ass. Prof. Mariusz Ołtarzewski MD, PhD

Neonatal screening (300,000–400,000 neonates per year) covers over 90% of the country. Within the Programme of Elimination of Iodine Deficiency, we analyse the frequency of TSH level corresponding to so-called transient hypothyroidism in neonates (5–20 IU/mL).

Methods

TSH in the blood of neonates is determined between 2––5 days of life by means of Neonatal TSH LIA-MAT system (Byk-Sangtec, Dietzenbach, Germany). Questionnaires (6,000–8,000 per year) on the frequency of additional supplementation with iodine in the course of pregnancy will be distributed among pregnant women in whom blood was sampled for TSH measurements.

Task 4
Registry of thyroid carcinoma

Performer: University Hospital in Krakow, Chair and Department of Endocrinology; Prof. Alicja Hubalewska Dydejczyk MD, PhD

The standardised registry of thyroid carcinoma will be continued in 11 centres: Szczecin, Gdańsk, Olsztyn, Białystok, Poznań, Warsaw, Łódź, Gliwice, Rzeszów, Kraków, and Nowy Sącz, covering a population of more than 16 million. The incidence rate of thyroid cancer is calculated as the number of newly-diagnosed thyroid cancers based on the classification ICD-10 per 100,000 inhabitants per year.

Task 5
Quality control of salt and neonates' formula iodisation; consumption level of kitchen salt

Performer: Institute of Food and Nutrition, Warsaw; Prof Katarzyna Stoś PhD

The Institute of Food and Nutrition established a reference laboratory to measure iodine levels in kitchen salt. The role of the programme is to control the execution of the disposition of the Ministry of Health. Monitoring kitchen salt consumption at the population level is a strategic issue in the face of the necessity of reducing daily intake as a preventive measure against hypertension.

Methods

The concentration of KI in kitchen salt samples (300––400 per year) and on the consumer and producer level will be examined by means of the Sandell-Kolthoff method.

Task 6
Post-graduate teaching and health promotion on iodine supplementation in pregnancy

Performer: Chair and Department of Endocrinology, Jagiellonian University, Collegium Medicum in Krakow; Prof. Zbigniew Szybiński, MD, PhD

Within the framework of post-graduate teaching in all districts of the country will be organised lectures on iodine deficiency and prophylactic measures in pregnancy, targeting primary health care physicians, endocrinologists and gynaecologists. In accordance with this action, suitable materials will be published and sent to radio and TV programmes.

Summary

The Polish Council for Control of Iodine Deficiency Disorders accredited at the Department of Endocrinology, UJCM in Krakow, is the body of experts tasked with realising the National Programme for Elimination of Iodine Deficiency.

The Council's work has resulted in organisation of an effective model of iodine prophylaxis that has brought about the eradication of endemic goitre in schoolchildren and optimal supplementation of iodine at the population level.

Designated at the Department of Endocrinology, UJCM in Krakow, the WHO Collaborating Centre for Nutrition realises the new model of iodine prophylaxis, adhering to the latest WHO recommendations on the necessary reduction of daily salt intake.

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References

1. Szybiński Z, Żarnecki A. Prevalence of goiter, iodine deficiency and iodine prophylaxis in Poland. Pol J Endocrinol 1993; 44: 373–388.
2. Nauman J. Results of studies performed within MZ-XVII Program. Pol J Endocrinol 1991; 42: 153–167.
3. Krzyczkowska-Sendrakowska M, Zdebski Z, Kaim I et al. Iodine deficiency in pregnancy in area of moderate endemic goiter. Pol J Endocrinol 1993; 44: 367.
4. Szybiński Z, Zdebski Z, Lewiński A et al. Influence of iodine supplementation on the incidence of goiter and ioduria in pregnant women with iodine deficiency. Pol J Endocrinol 1998; 49: 151–162.
5. Tylek-Lemańska D, Rybakowa M, Kumorowicz-Kopeć M et al. Iodine deficiency disorders incidence in neonates based on the experience with mass screening for congenital hypothyroidism in southeast Poland in the years 1985–2000. J Endocrinol Invest 2003; 26 (Suppl 2): 32–38.
6. Ołtarzewski M, Szymborski J. Neonatal hypothyroid screening in monitoring of iodine deficiency and iodine supplementation in Poland. J Endocrinol Invest 2003; 26 (Suppl 2): 27–31.
7. Szybinski Z, Huszno B, Zemla B et al. Incidence of thyroid cancer in the selected areas of iodine deficiency in Poland. J Endocrionol Invest 2003; 26 (2 Suppl): 63–70.
8. Delange F, Benker G, Caron P et al. Thyroid volume and urinary iodine in European schoolchildren. Eur J Endocrinol 1977; 136: 180–187.
9. Recommendations of the Polish Council for the Control of Iodine Deficiency Disorders and the Polish Society of Endocrinology. Pol J Endocrinol 1998 (Suppl): 3, 39, 201.
10. Szybiński Z, Lewiński A. National Program for the Elimination of Iodine Deficiency Disorders in Poland (1999–2003). Pol J Endocrinol 1998; 49: 203–212.
11. Delange F, Lewiński A et al. A programme of iodine supplementation using only iodized household salt is efficient — the case of Poland. Eur J Endocrinol 2001; 144: 331–333.
12. Position Paper on Undertaking Initiatives Aimed at Reduction of Salt Consumption in Poland. Food and Nutrition Institute in Warsaw 2009.
13. Lewiński A, Szybiński Z, Bandurska-Stankiewicz E. et al. Iodine induced hyperthyroidism — an epidemiological survey several years after introduction of iodine prophylaxis in Poland. J Endocrinol Invest 2003; 26 (2 Suppl): 57–62.
14. Szybiński Z, Jarosz M, Hubalewska-Dydejczyk A. et al. Iodine-deficiency prophylaxis and the restriction of salt consumption — a 21st century challenge. Pol J Endocrinol 2010; 61: 136–140.
15. Szybinski Z, Gołkowski F et al. Effectiveness of the model of iodine prophylaxis adopted in Poland. J Endocrionol Invest 2008; 31: 309–313.
16. Szponar L, Kundzicz M, Stos K et al. Primary prevention of iodine deficiency in bottle-fed infants. Pol J Endocrinol 1998; 49: 45–54.
17. Delange F. Serum TSH in the neonates as an indicator of iodine deficiency. Pol J Endocrinol 1998; 49 (Suppl 3): 1–8.
18. WHO — Iodine deficiency in Europe: a continuing public health problem. WHO, 2003.
19. WHO/UNICEF. Iodine Deficiency in Europe. WHO, 2007.
20. WHO Forum and Technical Meeting on Reducing Salt Intake in the Population. Paris, France. October. WHO, 2006.
21. WHO, Report of a WHO Expert Consultation Salt as a Vehicle for Fortification, Luxembourgh 21–22 March. WHO, 2007.
22. Cappucio FP, Markandu ND, Carney C et al. Double-blind randomised trial of modest salt restriction in older people. Lancet. 1997; 350: 850–854.
23. Cook NR, Kumanyika SK, Cutler JA et al. Dose-response of sodium excretion and blood pressure change among overweight non-hypertensive adults in a 3-year dietary intervention study. J Hum Hypertens 2005; 19: 47–54.
24. Mac Gregor GA, Markandu ND, Sagnella GA et al. Double-blind study of three sodium intake and long-term effects of sodium restriction in essential hypertension. Lancet 1989; 2: 1244–1247.
25. INTERSALT Cooperative Group. Intersalt: an international study of electrolyte excretion and blood pressure. Br Med J 1988; 297: 319–328.
26. Sekuła W, Ołtarzewska M, Banysz A. Ocena spożycia chlorku sodu w Polsce na podstawie wyników budżetów gospodarstw domowych. Żywienie Człowieka i Metabolizm 2008; 35: 265.
27. Europejskie wytyczne dotyczące prewencji chorób sercowo-naczyniowych w praktyce klinicznej. Kardiol Pol 2008; 66 (Suppl 1): S1–S48.
28. Zdrojewski T, Szpakowski P, Bandosz P et al. Arterial hypertension in Poland in 2002. J Hum Hypertens 2004; 18: 557–562.
29. Stolarz-Skrzypek K, Kawecka-Jaszcz K. Ograniczenie spożycia soli kuchennej jako metoda prewencji nadciśnienia tętniczego. Post Nauk Med 2009; 1: 28–33.
30. Position Paper on Undertaking Initiatives Aimed at Reduction of Salt Consumption in Poland. National Food and Nutrition Institute in Warsaw 2009.
31. Szybiński Z, Trofimiuk M, Buziak-Bereza M et al. Reference value for thyroid volume established by ultrasound in Polish schoolchildren. Pol J Endocrinol 2012; 63: 104–109.
32. Brzóska F, Szybiński Z, Śliwiński B. Iodine concentration in Polish milk — variations due to season in the region. Pol J Endocrinol 2009; 60: 449–454.
33. Szybiński Z, Breda J. Summary from the European Meeting of WHO Collaborating Centres for Nutrition, Kraków, 23–24 June 2010. Pol J Endocrinol 2011; 62: 1–3.