8. SUMMARY.

Iodine deficiency has been pronounced by the World Health Organization a major factor affecting the health of humans. The most common consequence of iodine deficiency that occurs at any time in man’s life is simple goiter, which reaches endemic proportions in areas with considerable iodine deficiency. The scarcity of this element is difficult to eliminate solely through changing nutritional habits. The most effective, inexpensive and commonly employed method of iodine supplementation in the diet is the widespread iodization of common salt.

Iodine deficiency disorders (IDD) pose a significant public health problem in many countries. In 1990, the 43rd World Health Conference held in New York passed a resolution on the need to eradicate IDD’s by the year 2000.

Within the past dozen or so years, in Poland there has occurred a fundamental change in iodine supply at the population level, from a non-obligatory model of common salt iodization introduced before 1980 and reintroduced in 1986 and associated with moderate iodine deficiency to the model of obligatory iodine prophylaxis (1997), which in principle should meet the standards formulated by ICCIDD.

In the obligatory model of iodine prophylaxis, especially soon after its introduction, there emerges a possibility of excessive iodine supply of iodine originating from other sources, what may lead to such adverse side effects as iodine-induced hyperthyroidism or autoimmune thyroid disease developing in genetically predisposed individuals.

The most reliable measures of dietary iodine deficiency in population studies as recommended by WHO/ICCIDD are as follows: evaluation of the thyroid gland volume performed ultrasonographically and possibly - as a supplementary method - by palpation, iodine determinations in morning urine samples, as well as TSH and thyreoglobulin determinations.

Adult population is not the major group at risk of iodine deficiency disorders, since this vulnerable population subset includes newborns, schoolchildren and pregnant women, who best reflect the degree of iodine deficiency. Periodical check-ups of adults are of a great importance for the general assessment of health status of a given population; they also constitute a significant element in the evaluation of iodine supply and thyroid gland morbidity in iodine deficient areas, especially in view of the increasing incidence of thyroid cancer in adult population.
The present investigations are a fragment of a larger study initiated in Poland following the Chernobyl disaster, carried out in the years 1989-90 and 1997-99 and coordinated by Professor Janusz Nauman, MD, Ph.D.

The aim of the present study was to define the status of iodine deficiency and goiter prevalence, as well as thyroid gland morbidity in adult population (18-78 years of age) of the city of Cracow followed up for two years (1998-1999) and to compare the results with the data obtained in the same group investigated in the period 1989-90.

The analysis included the results obtained from 891 individuals, 571 females and 320 males aged 18-78 years. The mean age of female subjects was 44.08 ± 15.62 years of life, while the mean age of males was 42.89 ± 17.53 years.

The mean thyroid gland volume in females was determined as 15.8 ml and in males - as 18.3 ml; thus, the results were practically within the accepted WHO standards.

By palpation, the prevalence of goiter in the investigated population was assessed as 22.8%; the percentage reached 24.1% in female subjects and 20.3% in males. In the investigated adult population of the city of Cracow, the prevalence of goiter detected by ultrasonography was determined as 25%.

The assessment of the diagnostic validity of thyroid palpation vs. thyroid ultrasound regarded as a reference test yielded the following results: sensitivity of 74.6 % and specificity of 89.4%. The complete agreement between the results of thyroid palpation and ultrasonography was observed in 86.1% of cases.

While comparing the results of thyroid gland palpation in the same individuals investigated in Cracow in the years 1989-90 and 1998-1999, one noted a distinct drop in goiter prevalence from 39.1% to 22.8%. A 50% decrease of goiter prevalence in women was particularly striking.

In view of the fact that between 1989-1990, thyroid ultrasonography was performed solely in 230 subjects, in order to compare the results, the same individuals were identified in the group investigated in the period 1998-1999. The results confirmed a drop in mean goiter prevalence from 26.2% to 21.8%.

The lowest goiter prevalence rate in the years 1998-99, i.e. 12.7%, was detected in the youngest age group that included patients aged 18-28 years. In the same period, the highest percentage of individuals presenting with goiter was noted among women above 50 years of life and in males within the 40-49-year age bracket.

Parenchymatous goiter was diagnosed by ultrasound in 14% of individuals investigated between 1998 and 1999; the group included only 9% of females and 23% of male subjects.
The prevalence of parenchymatous goiter in the women belonging to the subset of 230 individuals subjected to repeated ultrasound examinations closely approximated the results obtained in the entire population of females (10.6% vs. 9.0%); the respective value was markedly lower in male subjects (13.8% vs. 23%).

While comparing ultrasound results in 230 individuals tested in the years 1989-90 and 1998-99, two divergent tendencies were observed: a decrease in parenchymatous goiter prevalence and a clear increase in the prevalence of nodular goiter. The observed drop in the prevalence of parenchymatous goiter in the investigated population was markedly more significant among women (from 24% to 10.6%) as compared to men.

The prevalence of nodular goiter detected by ultrasound in the entire population was 19.9% (23.3% of females and 13.8% of males). The results markedly corresponded to nodular goiter prevalence among the subset of 230 individuals (23.9% among women and 13.7% among men). In comparison to ultrasonographic examinations performed in the period of 1989-1990, examinations carried out between 1998 and 1999 revealed a striking increase in the prevalence of nodular goiter in female subjects, from 9.9% to 23.9%, and an even higher increase in males, from 1.1% to 13.7%.

The mean ioduria value in the adult population of the city of Cracow amounted to 105 μg/l; among females the value was 98 μg/l and among males - 118 μg/l. Ioduria above 100 μg/l was noted in 35.4% of women and 55.8% of men.

To compare iodine concentration levels in morning urine samples of adult inhabitants of Cracow, the present investigations were based on mean ioduria values for sex and age groups reported by Dłużniewska et al. (41). An increase of mean urinary iodine levels was demonstrated in corresponding sex and age groups; the elevation was the most distinct in males aged 19-39.9 years of life (in the period 1989-90, Me for ioduria - 50 μg/l, while between 1998-99, the respective value was 117 μg/l). The mean ioduria values were higher in males as compared to females (118 μg/l vs. 98 μg/l).

Both in the present investigations, and in other regions of Poland, the mean ioduria values in individuals of both sexes showed that the safe upper level of daily iodine supply had not been exceeded.

No significant differences were observed in the present investigation in the mean ioduria value in goiter-free adults as compared to individuals presenting with goiter.

No correlation was noted between the presence of thyroid nodules and urinary iodine concentration levels.
In the years 1998-99, investigations of the adult population of the city of Cracow revealed hyperthyroidism only in females (2.1%). Toxic nodular goiter was diagnosed in 0.5% of the investigated women and Graves’s disease - in 1.1%. The results were slightly higher when compared to the investigations carried out in the years 1989-90 (by 0.2% and 0.7%, respectively), but did not indicate a clear, endemic in character increase at the population level.

In the present investigations, hypothyroidism was demonstrated to occur more frequently as compared to the 1989-90 study (3.2% vs. 1.4% among females and 0.6% vs. 0% in males).

After the exclusion of hyperthyroidism and hypothyroidism, the mean TSH level was determined as 1.48 μU/ml in female subjects and 1.36 μU/ml in males (a statistically significant difference p=0.01); in both sexes, the TSH values were significantly higher as compared to data obtained between 1989 and 1990 (females - 1.33 μU/ml; males - 1.25 μU/ml).

As seen from the present results, over the investigated 10-year period, in the Cracow population, there occurred a clear, statistically significant (p< 0.001) increase of the percentage of individuals with an elevated ATMA antibody titer (3.8% vs. 11.8%); the increase was four-fold in females. Of interest was also the observation that the above phenomenon was accompanied by an increased mean TSH level in the entire population, as well as by an increased prevalence of asymptomatic hypothyroidism in individuals with Hashimoto’s goiter (0.7 vs. 1.5% among females and 0 vs. 0.3% in male subjects). No correlation was observed in the present investigation between ATMA and ioduria levels.

Based on the present results, beneficial results of iodine prophylaxis were demonstrated, the said advantageous effects being expressed in a decreased prevalence rate of parenchymatous goiter in adult population and an increase in the mean ioduria values, which reached the expected level of approximately 100 μg/l. No adverse side effects of iodine prophylaxis were observed, since no endemic iodine-induced hyperthyroidism was noted, nor allergic reactions that might have been associated with an increased daily iodine supply at the population level. A clear increase was noted in the prevalence of thyroid nodules in both sexes, as well as a lack of noticeable effect of iodine prophylaxis on the development of thyroid nodules; the incidence of the latter is, however, associated with general goiter volume. The demonstrated differences in the mean thyroid volume in Poland and in other countries with appropriate iodine supply may justify the necessity of determining separate thyroid volume standards for the Polish population.