THE PREVALENCE OF GOITER IN ILLINOIS

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Simple goiter was noted by writers long before the Christian Era. Hindu records of 2000 B. C. describe thyroid enlargement. Confucius knew of it. The Egyptian, Greek and Roman physicians studied its clinical manifestations and left observations concerning swollen neck. Goiter has been known to exist as an endemic disease in the Alps since the time of Pliny. Marco Polo reported its presence in Central Asia in the thirteenth century.

The home of this disease on the continent of Europe is in Switzerland, but it is also prevalent in Austria, Spain, France, Germany, Russia and the Scandinavian Peninsula. The magnesium-limestone district of England has long been noted for the enlargement of the thyroid gland, which is known there as "Derbyshire neck." Asia, Africa and South America have their centers of this disease.

In Canada the malady is by no means infrequent in the Province of Quebec and in the city of Montreal. It is very common in the limestone regions at the end of Lake Ontario in the Province of Ontario. The early explorers of the Great Lakes frequently reported its occurrence among the Indians inhabiting their shores. In this locality its greatest prevalence tends to be co-incident with the hard water of the Niagara limestone. There are definite goiter areas in Oregon, Montana, Nevada, and Colorado. In fact, from the Atlantic to the Pacific and from the Great Lakes to the Gulf of Mexico there are sections of the country in which endemic goiter is prevalent.

Goiter is characterized by the enlargement of the thyroid gland, which occupies the lower portion of the neck anterior-laterally. There are two forms of this condition: simple goiter which is primarily a swelling of this gland, and exopthalmic goiter accompanied by the distention of the eyeballs, anemia, overactivity of the heart, tremor, muscle weakness, mental instability, and general organic disturbance.

The thyroid tends to enlarge during adolescence, but the great variation in its incidence in different localities and even in adjacent communities excludes age as the decisive factor. Its wide prevalence in children and in mature individuals in certain districts also discounts the influence of age. Goiter distribution points to an environmental cause which is now known to be a lack of iodine in water, soil, and food.

DISTRIBUTION IN ILLINOIS

On the basis of the total of 15,154 physical examinations, of which 10,829 were men and 4,325 were women high school graduates distributed over Illinois, it was found that the mean average of thyroid enlargement of the women for the five year period was 24.5%; the men, 4.6%. The attempt is made herewith to indicate the prevalence of endemic goiter in this state. Special considerations are presented in connection with its distribution.

The statistics presented are based upon the work of forty or more well-trained doctors, experienced in the making of physical examinations. While standard forms were used and definite directions were given, no attempt was made to direct special attention to the thyroid gland. The data is therefore more valuable, because it presents the concensus of opinion uninfluenced by over-emphasis or undue concentration upon a particular condition. It does, I believe, under rather than over-estimate the existence of simple thyroid enlargement in this state.

To show its relative prevalence in certain districts of Illinois the state was divided into three sections by irregular lines through the county boundaries from east to west, and into two parts by similar lines from north to south. Comparison of the incidence of goiter in men and in women in the divisions produced is shown in Table I.

TABLE I.

Incidents of Goiter in Certain Portions of the State.

	Women	Men	Total % of total number
	%	%	
North Section	43.5	9.6	21.2
Middle Section	36.7	6.7	13.1
South Section	27.8	5.2	12.4
East Section	31.1	5.5	17.0
West Section	39.6	8.2	15.2

These arbitrary divisions are interesting, because they show that the occurrence of thyroid enlargement, taking men and women together, tends to decrease from north to south and from east to west. While the directional tendency of reduction is definite, its explanation is not obvious. The decrease in prevalence with the increase in distance from the Great Lakes may indicate geological formation influencing iodine availability. In the comparison of goiter incidence in the east and west divisions of the state, the explanation would seem equally logical. It is seen by the Table that when men and women are separated in the east and west sections, the decrease runs from west to east. The change is due to the fact that three times as many students come to the University from the east side of the state. The percentage of the total number having thyroid is the more valuable figure in showing a comparison of the different sections of the state.

The state was also separated into fifteen sections by tiers of counties running east and west, and a curve plotted for men and women on the basis of the percentage of occurrence of thyroid enlargement. The result was an irregular curve, much alike for men and women but not entirely so. The following may be noted from Table II:

a. The usual marked disproportion in prevalence in men and in women.
b. Generally, wherever there is an increase or decrease in men in any tier, there is a similar increase or decrease in women, and vice versa, as would be expected where the same factors are operative in the case of both men and women.
c. In certain tiers, particularly in the southern part of the state, this similarity between incidence in men

and in women disappears. Here are found instances in which a rise in the prevalence in women may be followed by a fall in that in the case of men, or vice versa.

d. The drop of both men and women in tier No. 2 including Cook County may be an expression of the influences of iodine containing food shipped in from the outside.

e. With the exception of the tier including Cook County, the population per square mile shows considerable similarity to the goiter incidence in men and women. This is true until the southern part of the state is reached.

f. The variation in the lines of prevalence of goiter in men and women and the population density by the tiers of counties in the southern part of the state is disproportionately influenced by the small number examined and the relative importance of the presence or absence of enlarged thyroid in a few individuals.

TABLE II.

The Occurrence of Goiter by Tiers of Counties.

Tier *	Men	Women	Population (Hundreds of People per Square Mile)
	%	%	
1	10.3	52.7	543.7
2	9.8	33.3	3710.5
3	8.9	44.3	823.7
4	14.4	25.6	446.0
5	4.9	33.9	288.5
6	5.2	50.3	528.5
7	6.8	44.8	488.9
8	4.3	30.0	477.3
9	4.4	35.7	342.5
10	8.3	22.2	456.6
11	3.1	42.3	246.0
12	5.0	20.5	303.7
13	2.9	31.0	333.3
14	2.8	15.6	150.4
15	8.8	35.2	239.6

* Tiers number from north to south, No. 1 being the farthest north.

EXTENT OF ENLARGEMENT

Table III shows the general degree of thyroid enlargement in both men and women for a period of five years. It reveals that while nearly three-fourths of the men

have only slight enlargement, less than half of the women are included in this group. Only about one-half as many men as women having thyroid enlargement have moderate sized goiters. Approximately three times as many women as men have marked thyroid enlargement. Simple goiter in females is more frequent, more marked, and more persistent than in males. In the men, the condition tends to be slight and to disappear rather promptly with the appearance of adolescence and maturity.

TABLE III.

Degree	Men %	Women %
Slight	72.8	47.6
Moderate	25.0	46.2
Marked	2.2	6.2

From Table IV is seen that there is little difference between the incidence of goiter in the rural and urban portions of the state. The differentiation between city and country is based upon 5,000 population. This arbitrary division is not satisfactory for this purpose, because in many small towns and villages much of the food consumed in them and in their vicinity is brought in from the outside, and the effect of local iodine deficiency is not reflected by the presence of thyroid enlargement. The women, who are more susceptible to iodine deficiency than men, promptly show a smaller percentage of simple goiter where the food is shipped in.

TABLE IV.

	Men %	Women %
Urban	12.1	37.7
Rural	8.6	40.1

PREVENTION

The early Greeks treated goiter by the internal administration of the ashes of burned sea sponges. Among mediaeval physicians Roger of Salerno, who practiced about 1170, was the first to recommend treatment of the condition by the giving of the burnt residue of seaweeds and sponges. It was not until 1820 that iodine was first knowingly used by Coindet as a means of treating en-

largement of the thyroid gland. He also demonstrated that iodine was a substance in seaweed that made it valuable in the treatment of thyroid hypertrophy.

Chatin, a Frenchman, in 1850 was the first to show that small amounts of iodine would prevent endemic goiter and cretinism. Marine, after years of experimentation in using iodine prophylactically in animal experimentation, began its administration to children in the schools of Akron, Ohio. Later, both he and Kimball so clearly demonstrated the value of iodine in the prevention of simple goiter that its use has rapidly spread through the goiter regions of the Great Lakes. In Switzerland, the results with iodine were so extraordinary that its administration as a preventive has been recommended as a public health measure.

For the purpose of goiter prevention, iodine is given in chocolate wafers containing ten milligrams of an organic iodine, as iodized salt (one part of potassium iodide to 5,000 parts of salt), by adding sodium iodide to the water supply, and through foods containing iodine. A convenient method in dealing with children is to give them one chocolate wafer or tablet once a week throughout the year. The danger involved in such doses is practically nil. In exopthalmic goiter, iodine should be taken only under the direction of a physician. Even in this disease its value has been shown by Boothby, Plummer, and others.

COMMENTS

1. Simple goiter is very common among boys and girls of high school age in Illinois. Approximately 5% of the former and 25% of the latter have some hypertrophy of the thyroid gland.

2. This condition in boys tends to be slight and to disappear with the approach of adolescence and maturity. It is, however, far more frequent in males than is generally supposed.

3. Goiter is more common, more persistent, and more marked in girls than in boys.

4. In Illinois, the incidence of goiter tends to decrease from the north southward and from the east, westward.

5. In this state there seems to be some tendency for goiter prevalence and population density to show coincident rise and fall.

6. There is not much difference in the prevalence of goiter in rural and urban sections. Although the greatest population density is in the northern part of the state, the section with the highest goiter incidence, fewer women in the city than in the country have goiter. This fact, taken in connection with the decrease in thyroid enlargement in both men and women in the tier of counties containing Cook County, may be an expression of food variation, greater accessibility to sea food, and better medical attention to be found in cities.

7. In the comparison of the occurrence of goiter in men and in women in the city and in the country, it is not apparent why, in each instance, the prevalence in men should be the reverse of that in women, who are peculiarly susceptible to iodine deficiency. There may be some dietetic difference not evident. It is not uncommon for diseases due to food inadequacy to show a remarkable tendency in sex selection. For example, in Italy pellagra is about equally prevalent in men and in women; in the United States, more than twice as frequent in women as in men.

8. The regional distribution of goiter and the direct relation of the thyroid to physical and mental characteristics and its inter-relation with other glands of internal secretion may be a means by which certain districts stamp their local color upon the personality of its inhabitants.

9. The reason for more marked influence of iodine deficiency in women than in men is not clear. The fact that thyroid often shows enlargement coincident with adolescence, menstruation and pregnancy indicates a functional relationship to sex that is still not clearly defined.

10. As administration of amounts of iodine, too small to produce harmful results except in the most unusual cases, will prevent hypertrophy of the thyroid, every girl between eleven and sixteen and every pregnant woman in endemic goiter regions should be given enough iodine in chocolate wafers, as iodized salt, Lugol's solution, sodium iodide, or shipped-in food containing iodine, to protect them against goiter.