

SIMPLE GOITRE

THE INCIDENCE OF THYROID ENLARGEMENT IN WINNIPEG SCHOOL CHILDREN

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PART II*

THE MATERIAL USED

IN the present investigation the author has endeavoured to cover practically all factors which might affect the pathology of the thyroid gland, with the exception of hours of sleep and play. The survey covers all school children attending grade and high schools in Winnipeg. All children herein reported were examined under the auspices of the Winnipeg School Board. The routine examination of all children is made about every second year, special attention being paid to septic tonsils, diseased teeth, thyroid enlargement, cervical adenitis, nutritional disturbances, and heart and lung diseases. In addition, special examinations are made from time to time of cases reported by the school nurses.

For the past five years, following Hamilton's survey,¹ goitre has been studied more assiduously by the profession at large. It has become a matter of public health. Thyroid clinics also have been established, and as a result children are more carefully checked over and a higher percentage have had treatment.

CLASSIFICATION OF THYROID ENLARGEMENT

Before it is possible to state the percentage incidence of thyroid enlargement, it is necessary to have a standard of classification. For this I have adopted Marine's original classification, glands being graded as normal, slight, medium or large.

Normal.—(a) Not visible as a bulging across the trachea. (b) The isthmus can barely be detected across the trachea. (c) The lobes are either not palpable or barely palpable.

Slight.—(a) Visible bulging of the isthmus over the trachea. (b) A wide band of tissue extending across the trachea. (c) Readily palpable lateral lobes.

Medium.—Those with moderately large palpable lateral lobes and a well marked isthmus.

Large.—Those with large palpable lateral lobes and a well marked isthmus.

It is very interesting to watch the different methods used in examining a thyroid gland. It is essential, not only in surveys of this nature but also in private practice, to have a correct method of estimating the size and consistency of a thyroid gland. To have any idea of the actual size of a thyroid lobe one must actually palpate the lobe between one's fingers and thumb. This can only be done by using a very definite technique. The best method is for the examiner to face his patient, preferably standing up. To palpate the right lobe he must place his right hand on the left shoulder, palm downward, and with the thumb gently applied against the left lateral wall of the trachea. Displace this structure together with the thyroid over to the right side. The examiner next places the finger of his left hand on the right side of the neck behind the posterior border of the sterno-mastoid muscle. The thumb naturally falls in front of the anterior border. In this way the finger and thumb surround the sterno-mastoid, and the right lobe of the thyroid is very easily picked up, lying just postero-medial to it. It is now an easy matter to define its outline, whether smooth or nodular, and to determine whether it is firm and granular, or soft and elastic. In some cases tenderness will be elicited. Normally, on asking the patient to swallow, the finger and thumb can be made to meet below the lower pole and one can in this way fix the thyroid high in the neck. After a short experience one becomes quite accurate in measuring the length, width and breadth by simple palpation. To palpate the left lobe, one simply reverses the process. Any failure to cover all the above mentioned points is liable to lead to faulty conclusions.

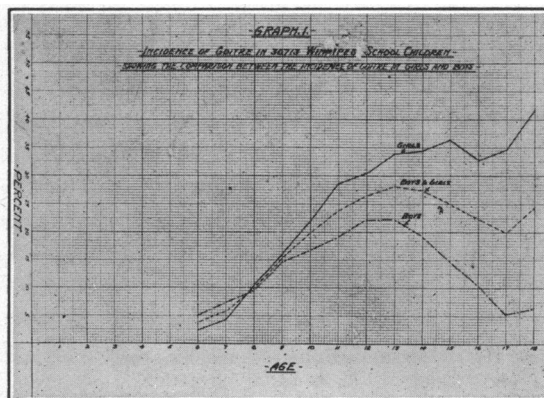
* Part I of this research can be found in the *Journal*, 1932, 27: 8.

No attempt has been made to keep a separate note on all glands containing adenomatous nodules. In my experience these are moderately rare, yet they do occur. I have one child, now ten years of age, in my own private practice, who has had a well defined adenoma in her right lower pole since six years of age.

In spite of the use of Marine's classification it is still a matter of individual judgment as to "when is a thyroid gland enlarged?" It is quite true that a normal functioning gland in a Winnipeg school girl may be larger than the gland of a Toronto school girl of the same age, weight, etc. Hunziker states that the size of the normal thyroid is not known. Hertzler believes that the normal thyroid is just palpable to experienced hands, while Cabot states it can rarely be felt. It is therefore evident that, in our series of cases, glands must be classified in an arbitrary fashion. Borderline cases such as are classified as "slight" in this series, in the judgment of another practitioner might be classified as normal. I fully realize that these might be classified as simply physiologically enlarged or normal glands. It seems to me however, that these are at least in the pre-thyroid-enlargement state and require attention. In a survey in Michigan this group was classified as normal. Only glands visibly enlarged were counted. Even after eliminating this group in the Michigan survey, 53.8 per cent of thyroid glands in girls were enlarged. This visual method of classification is very fallacious. Much depends on the architectural structure of the child's neck. Often one finds a very large gland, lying deeply placed under the prominent and heavy sterno-mastoid muscles, which is quite invisible on inspection. Moreover, the thyroid surgeon knows that so often at operation he finds a gland much larger than he expected. This is often due to a large part of the gland being substernal or intra-thoracic. As a result of this we are forced to conclude that actual palpation between thumb and finger, as stated by Plummer, is the only exact way of estimating thyroid enlargement.

Graph I shows the incidence of thyroid enlargement in (a) 15,176 girls, (b) 15,525 boys, (c) a composite graph of 30,701 boys and girls. It will be seen that thyroid enlargement in children 6 years of age is under 5 per cent. It gradually rises until at 12 it reaches 30 per

cent in girls and 22 per cent in boys. At this point the incidence changes. The enlargement in girls continues until at 15 the incidence is 36 per cent; in boys it has decreased to 14.9 per cent. In girls of 18, it has reached 41.5 per cent, but this exceedingly high figure is based on a small number of children. The incidence in boys steadily decreases until it has reached 5 per cent at the age of 17.



One must naturally assume that the home conditions, food and general hygienic surroundings are equal in the two sexes. Up to 12 years of age the incidence curve for boys and girls is about equal, as one would expect to find in an endemic area. How then can one explain the variance in incidence after the age of twelve? One is forced to assume that, apparently at the onset of puberty, some metabolic or endocrine upset occurs which is much more profound in girls than boys. The onset of menstruation and its attending psychic influences no doubt have a profound effect.

A comparison with surveys by other men is interesting. In the majority of surveys found in the literature, exact methods of classification have not been used. This makes comparison of only relative value. In some however very precise methods were adopted. Cohen² made an interesting survey in New York in 1924, sponsored by the department of Physical Training and Educational Hygiene, Board of Education, New York City. He used Marine's classification. He omitted examining for tonsillar and tooth infection, but checked up menstrual function closely. In the series of 9,978 white girls in New York proper, 20.28 per cent had thyroid enlargement. Previous surveys, using less exact standards, had reported approximately 3 per cent enlargement.

TABLE I.

Authority	Location	Number Examined	Incidence in Percentage			Ages	Remarks
			Children	Girls	Boys		
*Marine and Kimball.....	Ohio, Akron	3,872	....	56.41	....	10 to 20	Precise standards.
*Olesen (<i>Cincinnati Pub. Health Rep.</i> , July, 1924).	Ohio, Cincinnati.	47,493	32.0	39.8	26.6	6 to 17	Greatest prevalence between 11 and 13 years: one frank case of exoph. goitre; three tentative cases.
Olin (<i>J. A. M. A.</i> , April 26, 1924, 82: 1328).	Michigan, 4 counties.	31,612	47.2	53.8	40.5	5 to 18	Liberal standards used: only visible glands included.
*Olesen and Clark (<i>Pub. Health Rep.</i> , Oct. 10, 1924).....	Minnesota.	4,061	57.9	71.0	40.9	5 to 23	Precise standards.
Foard (<i>Pub. Health Rep.</i> , September, 1924, 39: 2354).	Montana, 7 counties.	13,937	21.6	32.0	13.4	6 to 20	Liberal standards: only distinctly enlarged glands included.
*Wallace (<i>California and West. Med.</i> , 1924, 22: 431).	Utah.	69,256	42.7	54.3	30.0	5 to 20	Elementary and high schools: precise standards.
*Hall, Hotrickter and Mohr (<i>Endocrinology</i> , 1925, 9: 137).	Washington, Seattle.	3,160	39.3	43.4	35.5	6 to 15	Precise standards.
Palmer (<i>J.A.M.A.</i> , May 10, 1924, 82: 1568).	New York, Syracuse.	25,875	18.0	....	....	....	High school pupils, 20 per cent: grammar school pupils, 16 per cent.
*Olesen (<i>Pub. Health Rep.</i> , January, 1925, 40: 1).	Colorado, Denver.	9,656	27.3 (white) 26.3 (negro)	....	....	8 to 22	Precise standards.
*Klein (<i>München. med. Wchn-schr.</i> 1924-1925, 72: 1244).	Germany, Essen.	8,033	57.9	54.5	....	12 to 13	Precise standards:
*Abbott, A. C.....	Canada.	30,713	18.5	22.4	14.7	6 to 18	present survey.

One would naturally expect a low incidence here owing to the fact that New York, being situated on the sea coast, has a good amount of iodine in the air, a plentiful supply of sea food, and its water supply is rich in iodine (110 parts of iodine in 100 billion parts of water). Table I is interesting as it shows the incidence of thyroid enlargement found by other observers. Only in those marked with an asterisk were precise methods used.

Table II shows the total number of children examined for each year from 6 to 18 years. It is interesting to note that from 6 to 14 about the same number of children for each year are in attendance at school. Apparently at 15, children begin leaving school. Column 2, Table II, shows the number of children with goitre, and column 3 is the same expressed in percentage. Twenty-eight decimal one per cent of boys and girls combined at the age of 13 have goitre, thus representing the age when

TABLE II.

Age	Number of Children Examined	Number of Children with Goitre	Percentage of Children with Goitre
6	2,572	94	3.6
7	3,065	180	5.8
8	2,977	294	9.8
9	2,990	459	15.2
10	2,972	573	19.2
11	3,156	750	23.7
12	3,064	803	26.2
13	3,069	863	28.1
14	2,636	705	27.4
15	2,070	518	25.0
16	1,312	292	22.2
17	612	122	19.9
18	218	53	24.3

goitre is most prevalent in Winnipeg school children. As I have shown in Graph I, the incidence in girls increases after this age while in boys it rapidly declines.

In the Utah survey³ there was a greater difference in incidence in boys and girls. In boys, the greatest incidence (Table III) was

TABLE III.

INCIDENCE OF THYROID ENLARGEMENT IN UTAH SURVEY

Age groups.....	5-9	10-14	15-19	20-
Males.....	27.2	37.3	29.1	28.6
Females.....	41.5	60.0	65.3	58.6

From Beatty & Wallace (Utah Goitre Survey).

between 10 and 14; in girls, between 15 and 19. As in our series, however, after 14 the incidence in boys decreased while in girls it increased, to the alarming percentage of 58.6 per cent in girls over 20. It would appear therefore that at puberty there is a relative insufficiency of the thyroid gland. This manifests itself by some compensatory enlargement of the gland of varying degree. It would also seem that there is a tendency to spontaneous regression after puberty. This is in some way offset in the female, in whom the enlargement is prone to increase rather than diminish.

TABLE IV.

RELATIVE INCIDENCE OF SLIGHT, MODERATE AND LARGE THYROID ENLARGEMENTS IN CHILDREN

Age	Slight	Moderate	Large	Total
6	65	29	0	94
7	135	42	3	180
8	229	62	3	294
9	344	103	12	459
10	435	123	15	573
11	558	173	19	750
12	555	225	23	803
13	615	228	20	863
14	514	173	18	705
15	397	111	10	518
16	235	54	3	292
17	112	10	0	122
18	45	7	1	53
	4,239	1,340	127	5,706

Table IV shows the relative incidence of slight, moderate and marked thyroid enlargement at various ages in Winnipeg school children. Out of a total of 5,706 children with thyroid enlargement, 4,239, or 74.3 per cent, have only slight increase in the size of the gland. There were 1,340, or 23.5 per cent, with moderate enlargements, and 127, or 2.2 per cent, with large goitres. It will be seen, therefore, that only 25.7 per cent of the thyroid enlargements are moderate or large grades.

It is at this point that the question "When is a gland goitrous?" might be asked. There are 4,239 children classified in the slight thyroid enlargement group. Assuredly I am not classifying these as goitre, but merely as

thyroid enlargement. Is this a pathological or physiological enlargement? Is it an enlargement, or is it the normal size at that stage of development? Undoubtedly, no one can say that a child of 6 years, of such a height and weight, should have a thyroid of set dimensions. There is no hard and fast division between the size of a normal gland and of a goitrous gland. One must formulate his own standards, based upon comparison with what he finds in many other children. In this survey they are based upon the actual palpation by the author of thousands of glands, most of which were classified as normal. It is surprising the number of children one finds in which it is a very difficult matter to palpate the gland. In many the gland is readily palpable, but undoubtedly very small. Over and above these come the "slight enlargement" group. These are just a little larger, thicker and more readily palpable, something more concrete to palpate between finger and thumb. It is this group that I classify as slight enlargements. I do not claim they are goitres, but they are in the pre-goitrous state. They therefore require the care of a physician, and it is in the early stage, when the gland for some reason is under some additional burden, that most can be done to return the gland to normal.

The second and third group, moderate and large enlargements, are frankly pathological glands. The great majority of these glands were symmetrically enlarged, smooth, and contained no nodules. No effort was made to differentiate between or classify those symmetrically enlarged and those with one side distinctly greater than the other. A small number were found to contain adenomatous nodules, but they were not tabulated as such. Two important facts are to be noted from this survey. The first is that only 25.7 per cent of the thyroid enlargements present can be definitely defined as pathological. The second is that if one bases this number on the total number of children examined, he find that only 4.7 per cent of Winnipeg school children have pathological thyroid glands.

Unfortunately this survey is only of children. McCarrison⁴ greatly emphasizes the value of complete surveys of men, women and children in selected areas, that is, complete cross-section surveys. In this way one gets a composite idea

of the relation between the thyroid enlargements met with in children and its incidence in later life. Richards⁵ also emphasizes this. His experience is best set forth by quoting directly

TABLE V.

Name of School	Percentage	Nationality
1. Sir Sam Steele...	38.1	German and Ruthenian.
2. Lord Nelson.....	35.8	Polish and Ruthenian.
3. Isaac Newton (Jun. High)	34.2	Polish, Ruthenian, Ukrainian, Jewish.
4. Florence Nightin- gale.....	31.1	Ruthenian, Polish, Ukrainian.
5. King Edward.....	30.9	Jewish, Ruthenian.
6. Norquay.....	30.7	Ruthenian.
7. Wm. Whyte.....	30.1	Jewish.
8. Faraday.....	28.3	German, Ruthenian, Polish.
9. Alexandra.....	28.0	Canadian (British).
10. Aberdeen.....	25.5	Jewish.
11. David Living- stone.....	25.48	Polish, Ruthenian, Jewish.
12. Marg. Scott.....	25.43	Ukrainian, Ruthenian, Polish, German.
13. Victoria.....	22.7	Canadian (British).
14. Dufferin.....	22.3	Canadian (British).
15. Hugh John Mc- Donald.....	21.6	Canadian (British).
16. Cecil Rhodes.....	20.5	Canadian (British).
17. Machray.....	20.1	Jewish.
18. Earl Grey.....	19.8	Canadian (British).
19. Gordon Bell (Jun. High)...	18.55	Canadian (British).
20. General Wolfe...	18.52	Canadian (British).
21. Luxton.....	17.89	Canadian (British) some Jewish.
22. Strathcona.....	17.80	Jewish, Ruthenian, a few German.
23. George V.....	17.68	Canadian (British) and Ger- man.
24. LaVerendrye....	17.1	Canadian (British).
25. Argyle.....	16.9	Canadian (British), Ruthen- ian, Jewish.
26. Gladstone.....	16.8	Canadian (British).
27. Ralph Brown....	15.5	Canadian (British) and Ger- man.
28. Pinkham.....	15.29	Canadian (British).
29. Montcalm.....	15.23	Canadian (British).
30. Lord Roberts....	14.5	Canadian (British).
31. Isbister.....	13.7	Canadian (British).
32. Wolseley.....	13.35	Canadian (British).
33. Isaac Brock....	13.32	Canadian (British).
34. John M. King...	12.9	Canadian (British).
35. Elmwood.....	12.8	German, a few British Can- adian.
36. Julia Clarke....	12.3	Mixed.
37. Riverview.....	12.1	Canadian (British).
38. Greenway.....	11.6	Canadian (British).
39. Albert.....	11.2	Canadian (British).
40. Wellington.....	11.0	Canadian (British).
41. Anna Gibson....	10.8	Canadian (British).
42. Carlton.....	10.7	Canadian (British).
43. Champlain.....	10.0	Canadian (British), some Jewish.
44. Laura Secord....	9.7	Canadian (British).
45. Somerset.....	9.5	Canadian (British).
46. Fort Rouge....	9.1	Canadian (British).
47. Glenwood.....	8.9	Canadian (British), a few German.
48. Mulvey.....	8.6	Canadian (British).
49. Grosvenor.....	8.2	Canadian (British).
50. Principal Sparl- ing.....	7.5	Canadian (British).
51. Robt. H. Smith..	6.2	Canadian (British).

Canadian (British) means children born in Canada of British descent.

from a personal communication from him. "One thing in particular was enlightening to me as I had the opportunity to examine every individual in a goitrous town. In seventy-odd school children all but two had goitres. The two without goitres had recently moved to the community. In the entire group there was one adenomatous goitre. These children were all of the grammar school age. Among the adult women there was over 80 per cent of goitre. Four out of five of the goitres were of the adenomatous type. This is an interesting observation of the transition of the endemic goitre in children, with the smooth contour and soft consistency, developing under constant conditions into such a high percentage of adenomatous goitre. As adenomatous goitre is very common in Winnipeg, the value of such a survey is apparent.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of goitre in Winnipeg is most interesting. I have arbitrarily divided the city into four school districts.

1. All schools west of the Red River and south of the Assiniboine.

2. A large district bounded on the south by the Assiniboine, on the east by the Red River, and on the north by the Canadian Pacific Railway tracks.

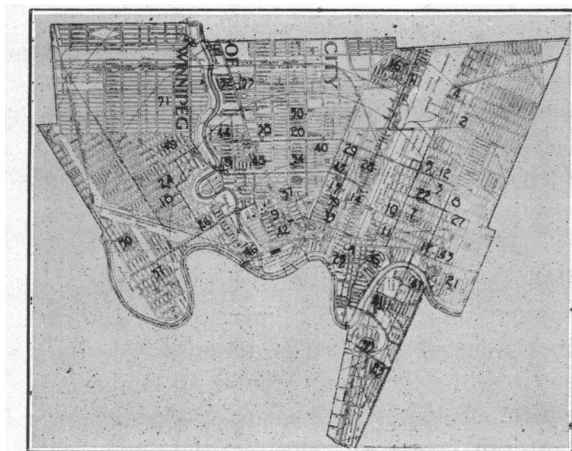
3. A large district north of the Canadian Pacific Railway tracks and west of the Red River.

4. A small district east of the Red River, namely Elmwood.

Table V is the incidence of thyroid enlargement found in Winnipeg schools. The schools are arranged in their order of highest incidence. Opposite each school one finds the predominating nationality in attendance at that institution noted. It is interesting to note that in the schools in which goitre is most prevalent children of foreign extraction are in the majority.

Map I shows the geographical position of the various schools. It will be seen that in that area north of the Canadian Pacific Railway tracks (district 3), goitre is most prevalent, especially the west end of the area, districts 1 and 4 are by far the least affected. It is interesting to note, however, that one school in Elmwood ranks first in the thyroid incidence in

marked contrast to the rest. This school is largely attended by German and Ruthenian children. District 2 has a well marked incidence of thyroid enlargement, especially in the area between Notre Dame and the Canadian Pacific Railway tracks.



Map I, of Winnipeg, showing the distribution of thyroid enlargement. The numbers on the map correspond to the numbers of the schools in Table V.

TABLE VI.

COMPARING HAMILTON'S SURVEY WITH THE PRESENT SURVEY

School	Hamilton	Abbott
Norquay.....	76.3	30.7
Livingstone.....	83.2	25.4
Mulvey.....	51.4	8.6
Lord Roberts.....	27.6	14.5
Carlton.....	23.6	10.7
Pinkham.....	77.9	15.2
Sam Steele.....	72.8	38.1

Table VI is a comparison of the incidence of thyroid enlargement found in Hamilton's and Abbott's surveys. In practically all cases the incidence now is less than half of that found by Hamilton. What is the reason? It might be that Hamilton classified glands as enlarged which in this survey have been said to be normal. This is unlikely. The explanation is probably twofold. As before stated, thyroid

clinics have been established and a great number of children have received thyroid treatment at these clinics. Then, again, many have been treated privately. Last and not least is the widespread sale of iodized salt. At the present time iodized salt is the salt sold to customers unless they specifically ask for non-iodized salt. At least one might say that in the past four years great success has been attained in the reduction of the incidence of thyroid enlargement in children.

SUMMARY

1. Thyroid enlargement is endemic in Winnipeg, as shown by its equal distribution in girls and boys.
2. The incidence in boys tends to decrease after twelve and increase in girls.
3. This would point to the fact that puberty has a much more profound effect on the thyroid in girls than in boys.
4. Slight thyroid enlargements are to be regarded as physiological, but are best kept under observation by a physician.
5. Medium and large thyroid enlargements are to be regarded as pathological and should be treated as such.
6. The relationship between thyroid enlargements in school children and goitre in adults has not been estimated.
7. Goitre is more prevalent in Winnipeg in those districts inhabited by peoples of foreign extraction.
8. Prophylactic thyroid therapy in Winnipeg has apparently reduced the incidence of thyroid enlargement more than 50 per cent in four years. The widespread use of iodized salt is possibly one of the greatest factors in the decrease.

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1. HAMILTON AND McRAE, *Canad. M. Ass. J.*, 1925, 15: 1017.
2. COHEN, *Am. J. Dis. Child.*, 1926, 31: 676.
3. BEATTY AND WALLACE, Utah State Board of Health Goitre Survey.
4. McCARRISON, Coonor, India, personal communication.
5. RICHARDS, Salt Lake City, personal communication.

LOCAL ANÆSTHESIA IN FRACTURE REDUCTION.—C. E. Stewart records four cases illustrating the simplicity and efficacy of local anæsthesia in the reduction of fractures. He injects 15 c.cm. of adrocaïn around the broken bone ends; this abolishes pain and muscular resistance, rendering the correct apposition and fixation of the fragments easy. The injection takes about twenty minutes to achieve its effect. The most scrupulous asepsis is essential, and the finest and sharpest needle must be

used. This procedure renders it possible to perform reduction by the roadside in the case of an accident, to transport the patient to hospital without risk of complicating the injury further, and thus to ensure a final completely satisfactory adjustment in the best possible conditions. The dangers and after-effects of general anæsthesia are avoided, prolonged muscular relaxation is obtained, less assistance is required, and the patient's full cooperation in any manipulation is ensured.—*Med. J. Australia*, September 12, 1931, p. 330.