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A STUDY ON THE ENDEMIC GOITER IN MADJALENGKA DISTRICT OF THE REPUBLIC OF INDONESIA*

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Kichihei MIYASAKI, Masahito KAYAMA, Akihiko NAKANOIN and Takefumi MATSUO. *A Study on the Endemic Goiter in Madjalengka District of the Repulic of Indonesia.* Kobe J. Med. Sci. **13**, 181-220, September 1967——The Kobe University School of Medicine and Kobe Medical College continued yearly medical survey in summer in Indonesia since 1964 in an attempt to promote mutual friendship between Japan and Indonesia through medicine.

Between July and September 1966, we have conducted a medical survey and service on 812 patients in the mountain district of Madjalengka area, western part of Java including Nunuk, Tjibodas, Argalingga, Tjipulus, Kantjana, Madjalengka districts in Indonesia. Goiter was detected in 185 (22.7%) among them.

Each district showed a variation in the incidence of goiter even within the same part of the island. Goiter patients were frequently found in Nunuk (29.3%), Tjibodas (66.7%), and Argalingga district (38.2%), while scarcely any goiter was detected in Tjipulus, Kantjana, and Madjalengka districts.

Most of the goiter showed nodular adenomatous enlargement upon palpation, and an increase in size was noted with advancing age. Although no significant difference was found in the occurrence of goiter between males and females, goiter was frequently seen agmong ages of 20 and 50 years. In 22.1% of the goiter patients, other member of the family also had goiter.

From the functional aspects, most of the goiter belonged to euthyroid goiter, with the exception of a few cases with suspected hyper- or hypothyroidism. In 11

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* This study was co-operated with Dr. Susumu SAMOTO, Dr. Sadao KAMIDONO, Mr. Kimio MATSUNAGA and Mr. Nobuhiro OKAMOTO during our medical survey in the Republic of Indonesia.

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of the 181 cases malignant transformation of goiter into cancer was suspected. As for the cause of such endemic goiter, living environment of the district appears to be most important, iodine deficiency being one of them, though a definite conclusion has not been reached at present.

INTRODUCTION

Aschoff (1925) denied the presence of endemic goiter in the Japanese Mainland, and McLendon (1935) quoted Japan as the only non-endemic-goiter area in the world. Papellier (1938) also pointed out the lower frequency of goiter in Japan than in Germany. One of the authors, Miyasaki, studied pathology at the Department of Pathology, University of Freiburg, West Germany, from 1960 to 1962. During his stay in Germany, the frequent occurrence of goiter in autopsy and biopsy materials in Freiburg as compared with corresponding materials in Kobe profoundly impressed him. However, endemic goiter area does exist in Japan. Shichijo pointed out the presence of endemic goiter in Japan (1953). Hokkaido, Tohoku, Kanto, Chubu, and part of the Chugoku area are known to be the locations of endemic goiter in Japan.

We have stayed in the Republic of Indonesia from July to September 1966 as the third team of medical mission of Kobe University School of Medicine under the assistance of Department of Welfare, Republic of Indonesia, and the Bureau of Hygiene, Western Djawa and in cooperation with the School of Medicine, Padjadjaran University at Bandung, a medical survey and service was conducted in the state of Tjirebon, Madjalengka Prefecture. Since we have encountered many patients with goiter in these districts, the result of our survey on the goiter in Madjalengka district are reported as follows.

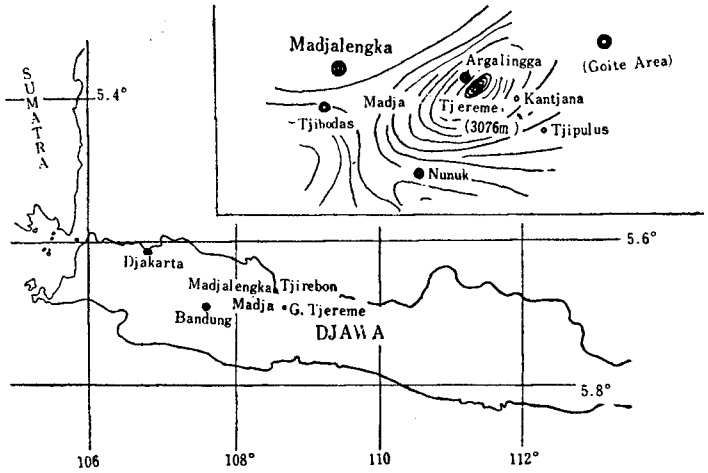
Concerning endemic goiter in the Republic of Indonesia, Kelly and Snedden (1958) concluded from the literature that the frequency of endemic goiter was rather high in the mountainous area of middle Djawa in Djawa island; Residency of Kedoe, the Dieng Plateau, the village around Wonosobo, and Garoeng and Magelang. High frequency was also found in the mountainous area of eastern Djawa, around Kediri and the Tengger mountains. However, no report is available to-date concerning the endemic goiter in the mountainous district of Madjalengka.

DISTRICT OF THE SURVEY

As shown in Fig. 1, Madjalengka district is located in the western part of the island of Djawa, Republic of Indonesia. Its location is about 100 km towards the mountain from the sea coast town Tjirebon facing Laut Djawa. The prefectural government of Madjalengka Prefecture is located at Madjalengka where we stayed throughout the whole period of survey team visited around Madjalengka.

The district surveyed is shown in Fig. 1. The town of Madjalengka where we stayed was a flat place, but all other districts were mountainous areas. Argalingga is located at the flank of Tjereme Mountain (3076 meters) approximately 1500 m above the sea level. Kantjana and Tjipulus is located at about 500 m at

Fig. 1.



the foot of Tjereme. Nunuk is located on the ridge of a mountain near Tjereme, at the height of approximately 300 m. Tjibodas is at the outskirts of Madjalengka slightly towards the mountain area. The inhabitants of these districts all live on agriculture. These districts are such remote places that it is already difficult to come out to the town of Madjalengka.

SUBJECTS AND METHODS

A survey was conducted on 205 inhabitants at Nunuk district, (110 males and 95 females) during the 4 day period from August 9, 1966 to August 12, 1966. The population of Nunuk was 792 (361 males and 431 females) and this district belongs to Tjingal area, which has the population of 2680 (1189 males and 1491 females). In the medical survey of Nunuk district, not only the inhabitants of Nunuk but also those of other Tjingal area were probably included.

On the single day of August 13, 1966, 51 inhabitants at Tjibodas district (13 males and 38 females) were surveyed. The population of Tjibodas was 700 (280 males and 420 females). Tjibodas belongs to Kulur area with the population of 4165 (2065 males and 2100 females).

During the 4 day period from August 15 to 19, 225 inhabitants in the Argalingga (86 males and 139 females) were surveyed. The population of Argamukti was 477 (230 males and 247 females), while the population of Argalingga was 3573 (1717 males and 1856 females).

On the single day of August 22, 1966, 71 inhabitants of Tjipulus village of Tjikiding districts (35 males and 36 females) were surveyed. The population of Tjipulus was 1300 (650 males and 650 females).

On the single day of August 23, 1966, 51 inhabitants of Kantjana village in the Tjikiding district (19 males and 32 females) were surveyed. The population of Kantjana was 1600 (780 males and 820 females).

On August 20 and August 24, 211 inhabitants of Madjalengka (97 males and 114 females) were surveyed at Madjalengka hospital. The population of Madjalengka was approximately 60,000 (35,600 males and 24,350 females).

Table 1 summarizes the population of the districts surveyed.

Table 1. POPULATION in Madjalengka Mountainous District.

	Tjingal			Numuk		
	♂	♀	total	♂	♀	total
Nunuk	1,189	1,491	2,680	361	431	792

	Kulur			Tjibodas		
	♂	♀	total	♂	♀	total
Tjibodas	2,100	2,065	4,165	280	420	700

	Argalingga			Argamukti		
	♂	♀	total	♂	♀	total
Argalingga	1,717	1,856	3,573	230	247	477

	Tjikidjing			Tjipulus		
				♂	♀	total
Tjipulus				650	650	1,300

	Tjikidjing			Kantjana		
				♂	♀	total
Kantjana				780	820	1,600

	Madjalengka		
	♂	♀	total
Madjalengka	35,600	24,350	59,950

Among the patients visiting our survey clinic, following items were studied in patients with goiter.

(1) Age and sex
(2) Body height and body weight
(3) Body temperature
(4) Classification of the size and consistency of the goiter
(5) Presnece or absence of tremor, exophthalmus, and eye signs
(6) Pulse rate and respiratory rate per minute
(7) Systolic and diastolic blood pressure

(8) Determination of BMR by simplified methods:

a) Read's Formel

$$BMR(\%) = 0.75 \text{ (pulse} + 0.79 \times \text{pulse pressure)} - 72$$

b) Takeda, Kano, Sengoku's Formel

$$BMR(\%) = 0.31 \text{ (pulse} + 1.6 \times \text{pulse pressure)} - 25$$

were used.

(9) Urine was tested with combistix concerning occult blood, protein, sugar, and pH.

(10) Peripheral blood was examined for RBC, WBC, and hemoglobin. Smear specimens were used to study differential count of WBC and the properties of red cells.

(11) In all cases diagnosed as goiter, patients themselves were questioned: a) presence or absence of excessive sweating, b) state of appetite, c) presence or absence of palpitation, d) presence or absence of tremor, e) presence or absence of goiter in the family.

(12) Serum of all subjects examined were obtained as long as possible to carry out trisorb-test and PBI determination at Kobe, Japan.

(13) Quantitative Analysis of iodine and fluorine contained in the drinking water and rock salt of Madjalengka district.

A) Quantitative analysis of iodine

Ten ml sample of drinking water was obtained from each source, and sealed into a capsule for irradiation of liquid. Approximately 100 mg of rock salt sample was weighed accurately and sealed tightly into a polyethylene bag. As the standard of iodine, 0.1 ml of 10 μg/0.1 ml aqueous solution of NH_4I was applied to a piece of filter paper and sealed tightly into a polyethylene bag. Material for determination and standard were placed into an identical capsule and irradiated through the first H.T.R. air tube (concentration of hot neutron stream 5.7×10^{11}n/cm^2 sec indensity) for 1 hour in drinking water sample and for 15 minutes in rock salt sample.

Each sample was isolated by respective method and the isolated AgI sample was sealed tightly into a polyethylene bag. The determination was carried out with a detector consisting of a 3″ × 3″ NaI (activated by TI) scintillator connected with RCL pulse height analyzer with 256 channels. The quantitive determination was performed by comparing the 0.455 Mev photoelectric peak emitted by I^{128} (half-life 25 minute) with that of the standard sample. Chemical yield was similarly determined by irradiating 40 mg of standard sample added as the carrier and the sample of determination with an identical air tube for 10 seconds.

B) Quantitative analysis of fluorine

One hundred mg of lithium carbonate obtained by concentrating ^{6}Li to 30% was sealed tightly into a polyethylene bag and irradiated with the same air tube for 2 hours. The lithium carbonate sample containing the produced F^{18} tracer was dissolved in water and placed into 100 ml volumetric flask. Exactly 1 ml was taken from this solution and placed as F^{18} tracer into each beaker. Twenty ml of the drinking water sample and approximately 200 mg of rock salt sample was accurately

measured and placed into each beaker. Furthermore, H_2O_2 solution, 1–2 ml, was added and the mixture was heated on a sand bath, to ensure the complete degradation of the sample. After cooling, the sample was passed through the column of R-OAC type anion exchange resin. Fluorine was eluted by 16 ml each of 0.1M, 0.2M, and 0.3M sodium acetate. In 16 ml of 0.2M sodium acetate eluate, 80–90% of the fluorine was contained. Among the eluates, 0.2M sodium acetate eluates were obtained to calculate chemical yield through the relative determination with the standard sample, using the extinguishing γ ray of 0.5/Mev emitted from F^{18} (half-life of 112 minutes) using the sample apparatus which was used for iodine determination. Fluorine was determined with lantan-aryzalin-complexon method in the portion corresponding to 0.2M sodium acetate.

RESULTS

1) Frequency of goiter according to districts in the Madjalengka district of the Republic of Indonesia.

For the determination of the size of goiter, Dieterle's method classifying types I-V (1913) is known. Shichijo (1953) modified this method. Khavin and Nikolayev also employed the classification into I-V (1962). According to WHO classification, endemic goiter is classified into I-III degrees, degree I representing invisible but palpable goiter, degree II indicating visible goiter, and degree III representing large goiter. We have classified the goiter according to this method.*

Among the mountainous districts of Madjalengka area, goiter was seen quite frequently in some area but was rare in others. The sum of cases which belong to degree I-III is shown in Table 2. In Nunuk (29.3%), Tjibodas (66.7%), and Argalingga (38.2%) many goiter patients were seen.

Table 2 Goiter Patients in Madjalengka Mountainous Districts.
(Goiter includes thyroid enlargement of I-, II-, III- degree by W.H.O. Classification.)

District	Total Patients			Goiter Patients			Percentage of Goiter Patients (%)
	♂	♀	total	♂	♀	total	
Nunuk	110	95	205	23	37	60	29.3
Tjibodas	13	38	51	8	26	34	66.7
Argalingga	86	139	225	17	70	87	38.2
Tjipulus	35	36	71	0	1	1	
Kantjana	19	32	51	0	1	1	
Madjalengka	97	114	211	0	2	2	
TOTAL	360	454	814	48	137	185	22.7

* When we have applied this classification, the borderline between degree I and II and that between degree II and III was extremely difficult to define. Some cases which should be classifield in degree II was classified in I. Since a subjective element inevitably influences the judgement, the same person (Nakanoin) always conducted the evaluation.

In Tjipulus, Kantjana, and Madjalengka only 1 or 2 goiter patients were seen in each district.

According to Shichijo (1953), up to degree II of Dieterle's classification might be found within the limit of normal fluctuation. Although it is questional in our classification whether degree I falls within the range of normal fluctuation, cases with goiter above degree II in Nunuk, Tjibodas, and Argalingga are summasized in Table 3.

Table 3 Goiter Patients with Thyroid Enlargement of II-, and III-degree in Madjalengka Mountainous District.

District	Total Patients			Goiter Patients			Percentage of Goiter Patients (%)
	♂	♀	total	♂	♀	total	
Nunuk	110	95	205	12	16	28	13.7
Tjibodas	13	38	51	8	21	29	56.9
Argalingga	86	139	225	13	34	47	21.9
TOTAL	209	272	481	33	71	104	21.6

Since the method of extraction of patient is difficult, it is hardly concluded statistically that these results represent the incidence of the occurrence of goiter among the inhabitants of this area. Moreover, it is possible that the inhabitant in general might have imagined that our survey team is surveying goiter as the main object, and goiter patients visited our survey clinic preferentially. Despite these difficulties in the statistitical treatment of the data, the assumption of the random visiting of the patient would give the incidence of goiter at Tjingal (Nunuk district) of 9.1—20.6% at the 95% confidence limit among 2680 population. In Kulur (Tjibodas district) the corresponding value was 53.9-60.1% at the 95% confidence limit among 4165 population, while 20.2-23.6% was obtained among 3573 population of Argalingga.

From these results, it might be assumed that *endemic goiter develops in Nunuk district (Tjingal district), Tjibodas district (Kulur district) and Argalingga district in the mountainous area of Madjalengka, while no endemic goiter apparently occurs in Tjipulus and Kantjane of Tjikidjing district and Madjalengka.*

According to our survey, it became clear that endemic goiter was seen in some part of the district but not in other part even within the same area.

2) *Frequency of occurrence of endemic goiter in each district according to sex and age.*

As stated above, endemic goiter was seen in the Nunuk, Tjibodas and Argalingga districts of the Madjalengka area. The difference according to age and sex in the incidence of goiter among these three districts was studied next.

Table 4 summarizes the incidence of goiter in Nunuk, Tjibodas, and Argalingga

districts according to sex and age. Changes above degree-I of thyroid enlargement were all treated as goiter.

Table 4 Incidence of Goiter Patients in Madjalengka Mountainous District.

District / Sex / Age	Nunuk		Tjibodas		Argalingga		Average (%)
	♂(%)	♀(%)	♂(%)	♀(%)	♂(%)	♀(%)	
0～ 9	15.4	37.5				40.0	12.3
10～19	16.7	76.5	50.0	40.0		53.8	51.1
20～29	29.2	56.5	100.0	100.0	28.6	52.5	46.1
30～39	32.0	19.0	100.0	71.4	30.8	67.6	59.5
40～49	8.0	15.0	75.0	88.9	31.6	45.5	31.3
50～59		40.0	100.0	80.0	7.1	20.0	23.3
60～	22.0			50.0	5.9	20.0	20.9
Average	20.0	40.0	61.5	68.4	18.6	50.4	37.4

Analysis of variance was conducted on these results to study the variation between groups, within groups, between classes, and within classes. No significant difference was obtained among the three districts of Nunuk, Tjibodas, and Argallingga or according to sex. However, difference according to age was significant in each district with the confidence limit of 1%.

Combined observation on the occurrence of goiter according to age and sex among the three districts of Nunuk, Tjibodas and Argalingga is summarized in Table 5. Figs. 2 and 3 illustrate these results. The peak of the occurrence of

Table 5

Age	Incidence of Goiter	
	♂(%)	♀(%)
0～ 9	5.1	25.8
10～19	22.2	56.8
20～29	52.6	69.7
30～39	54.3	52.7
40～49	38.2	49.8
50～59	35.7	46.7
60～	19.4	23.3
Average	31.1	46.4

goiter was seen between 20 and 40 years of age in males and between 10 and 50 years of age in females. No significant difference was noted in the occurrence of goiter between males and females.

Fig. 2.

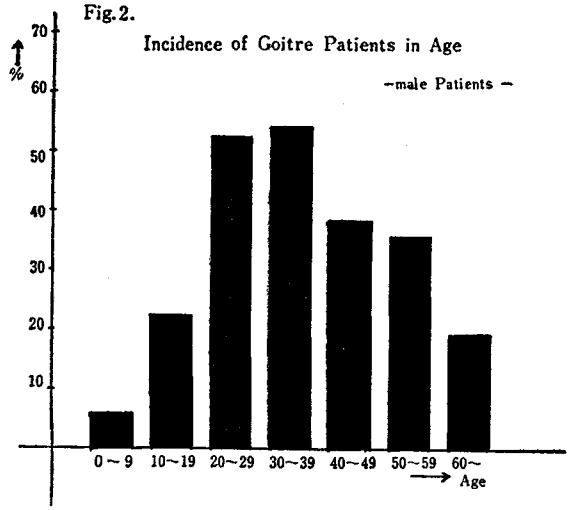
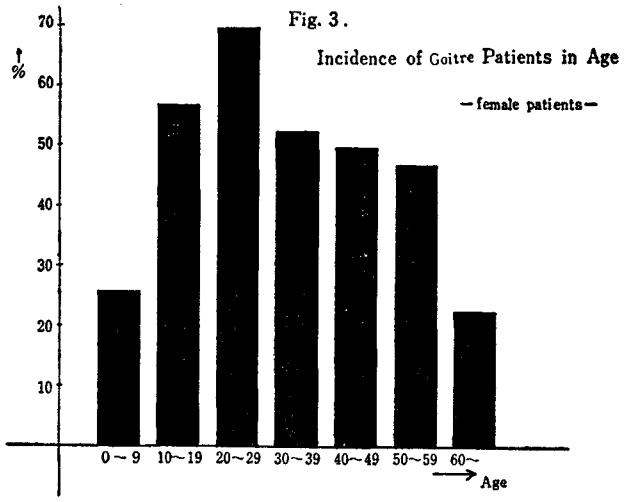


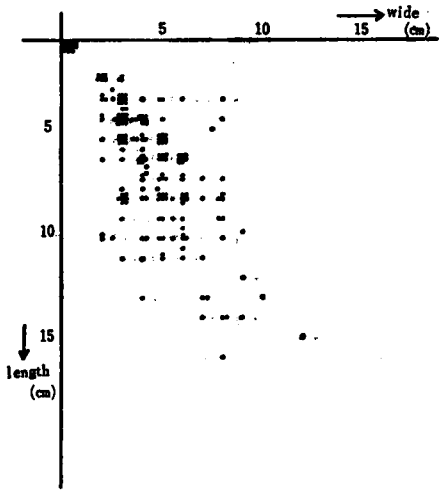
Fig. 3.



3) The relationship between macroscopic findings especially the size of endemic goiter and age.

Although it is extremely difficult to measure the size of the endemic goiter, the transverse and vertical diameter of the enlarged thyroid or nodule was measured as shown in Fig. 4.

Fig. 4. Palpable Size of enlarged Thyroid

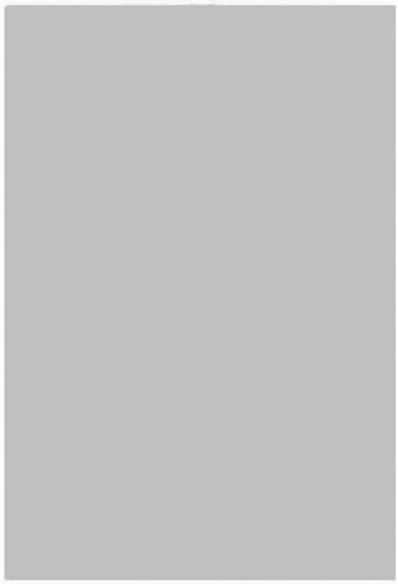


In 11 of 181 cases of goiter, the size of the goiter was unmeasurably small (ploted near the zero point in the Figure). Although these 11 cases might be the only ones to satisfy the criterion of degree I, and all others should have been classified as degree II, we have evaluated some thyroid enlargement of measurable size as degree I. In 13 of 181 cases, 1 patient had more than 2 nodules. The size of the goiter illustrated in this chart is shown by the longest diameter. We have determined the longitudinal and transveres diameter and height by actual measurement. Most of the goiters were less than 8×6 cm in size.

The size of the goiter was classified into three degrees, with the standard of evaluation as seen in photograph shown in Figs. 5–9. Goiters are clinically classified into diffuse enlargement, nodular adenomatous enlargement and mixed type. Except for 11 cases suggesting diffuse enlargement among degree I, all other 170 showed nodular adenomatous enlargement in our experience. The size illustrated in the Figure is always that of the nodule.

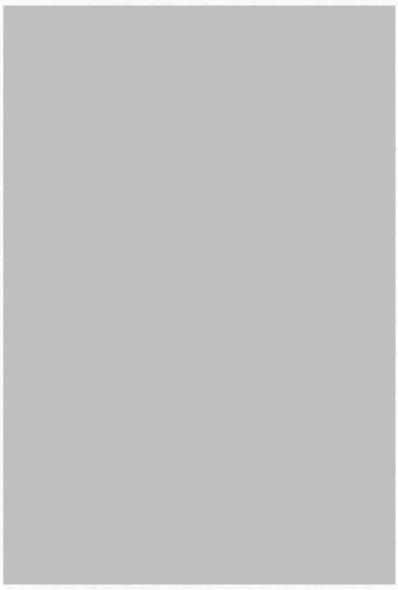
The consistency ranged from an extremely hard one to elastic soft consistency. Among 181 goiters, 18 were hard, 59 were elastic firm, and 92 were elastic soft. However, one nodule was hard and other nodule was elastic soft in a single patient on some occasions. According to our results of the survey, elastic soft goiter

Fig. 5 II-degree of Thyroid Enlargement



10 years old, female.

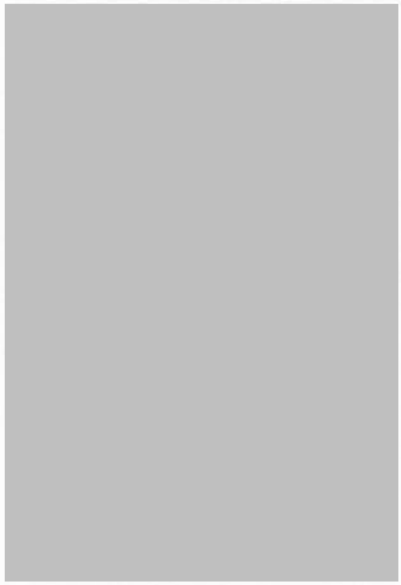
6×5×3cm
elastic, hard.



23 years old, female.

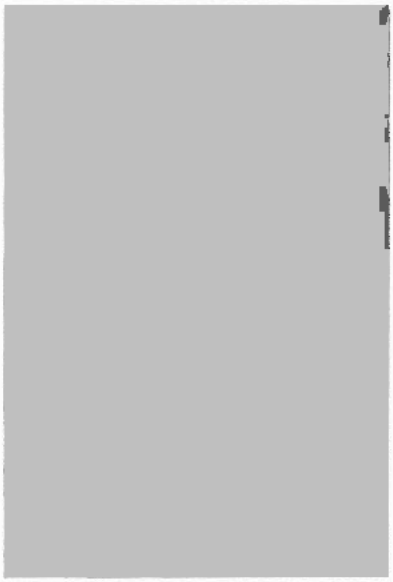
4×3cm
elastic, hard.

Fig. 6 II-degree of Thyroid Enlargement



35 years old, female.

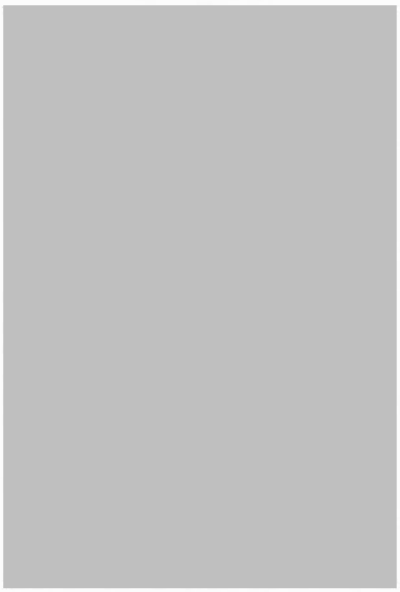
7×4×3cm
elastic, hard.



45 years old, female.

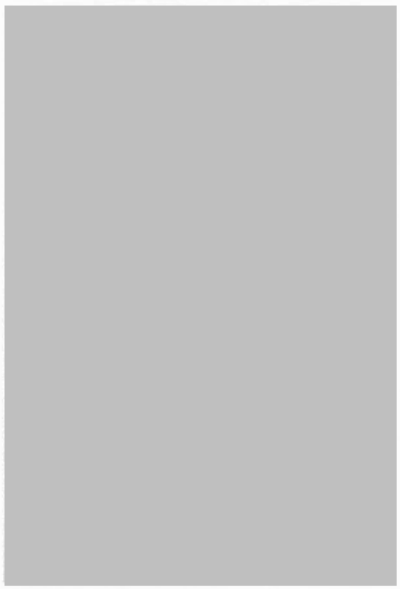
4×4×2cm
hard.

Fig. 7 II-degree of Thyroid Enlargement



25 years old, male.

13×4×2cm
relative soft.

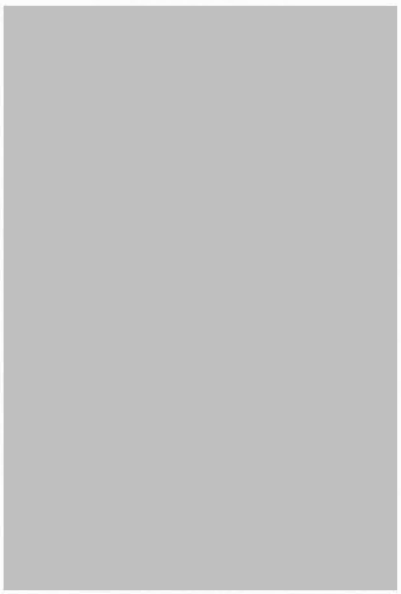


50 years old, male.

6×5×2cm
elastic, hard.

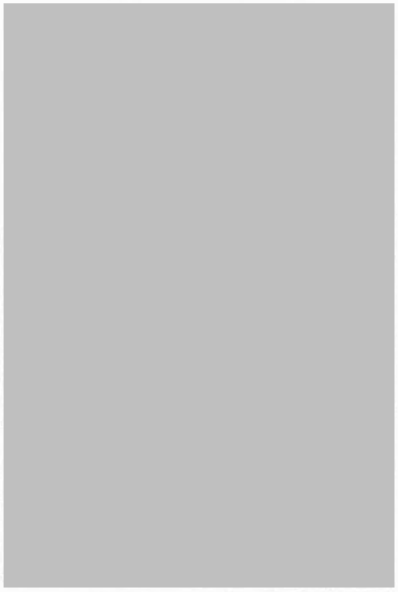
Fig. 8-a III-degree of Thyroid Enlargement

7×8×4 cm
elastic, hard.



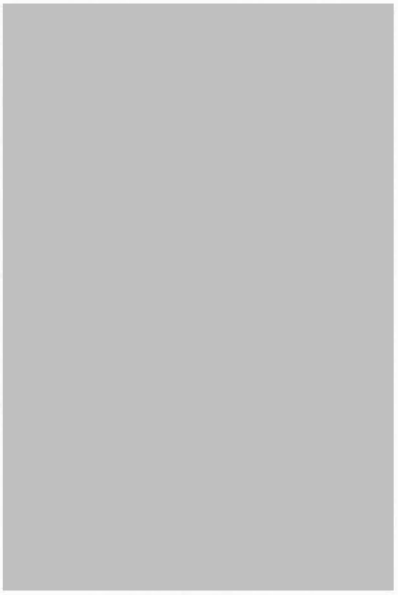
35 years old, female.

13×7×4 cm
elastic, hard.

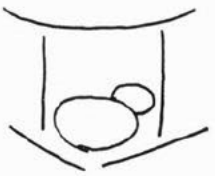


42 years old, male.

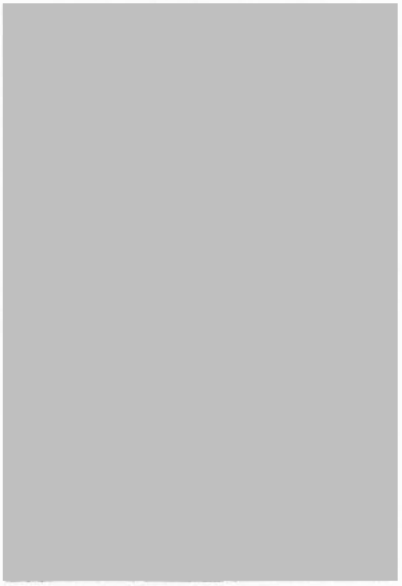
Fig. 8-b III-degree of Thyroid Enlargement



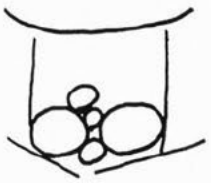
35 years old, female.



8×8×6cm
elastic, hard.

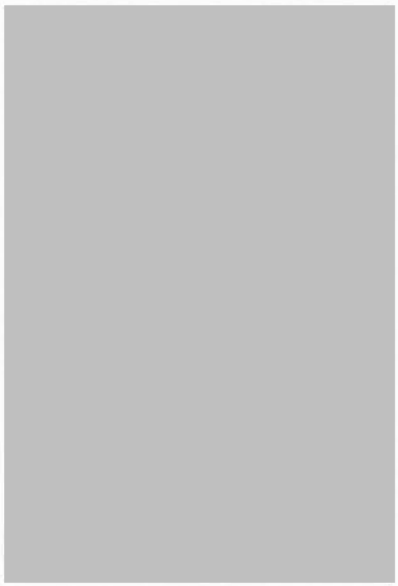


45 years old, female.

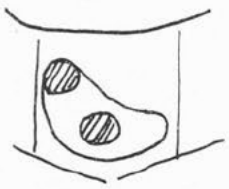


10×8×4cm
hard.

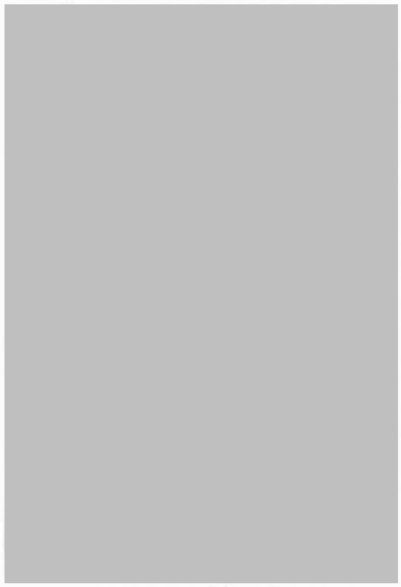
Fig. 9 Suspicious of Thyroid Cancer
(Ⅲ-degree of Thyroid Enlargement)



45 years old, female.



9.5×6×3cm
solid.



45 years old, male.

10×10×6cm
solid.

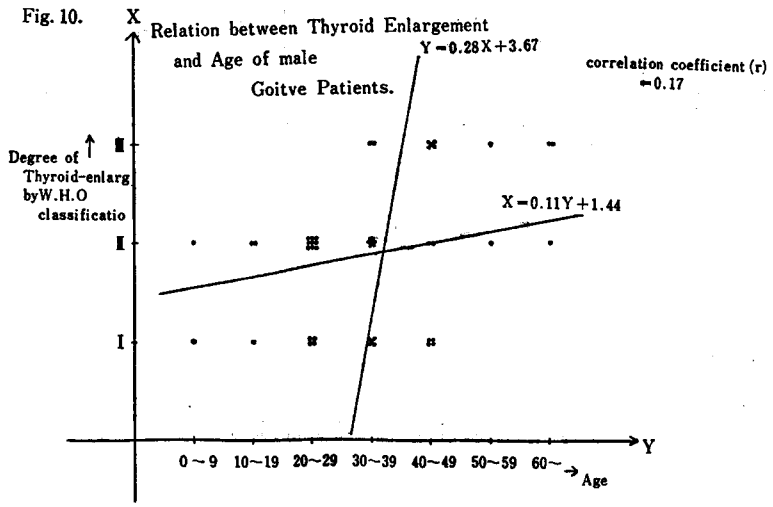
was seen rather frequently. In 11 cases findings suggesting malignant tumors were found but confirmation through biopsy was not carried out.

The relationship between goiter classification (I - III) and the age was tabulated according to sex in Table 6. (This result is the summary of the results in Nunuk, Tjibodas, and Argallinga districts). From these results, a difference was seen in the incidence of goiter between males and females. Even among males, a difference in incidence was apparently present between grade I and II. However, statistical analysis between the rates of incidence in I and II failed to reveal a significant difference. No significant difference was similarly found between males and females in goiters of grade II.

Table 6 Goiter Patients in Madjalengka Mountainous District.

Goiter degree	I		II		III		Total
Age \ Sex	♂	♀	♂	♀	♂	♀	
0～ 9	1	6	1	3			11
10～19	1	12	2	8		1	24
20～29	4	22	9	13		1	49
30～39	5	13	7	13	2	6	46
40～49	4	6	2	9	5	6	32
50～59		3	1	3	1	2	10
60～			1	4	2	2	9
Total	15	62	23	53	10	18	181

The age group and the size WHO classification of the goiter were compared according to sex. The correlation coefficient was 0.17 in males and 0.42 in females. (Figs. 10 and 11) As the result, the correlation coefficient in the mother population



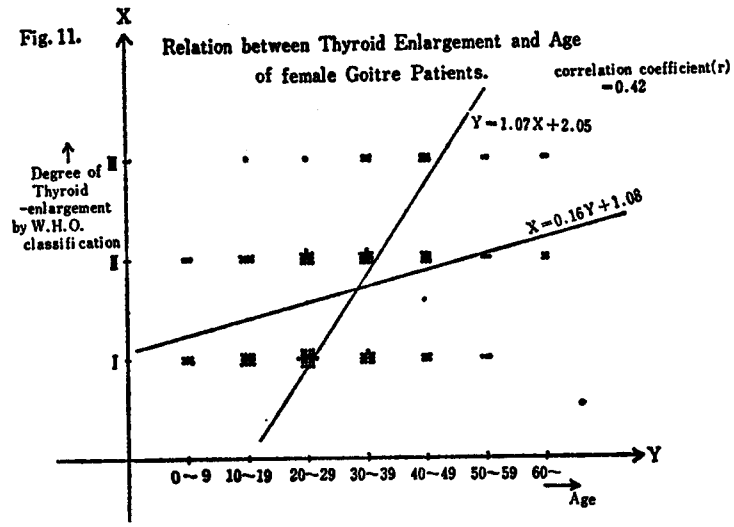


Fig. 11. Relation between Thyroid Enlargement and Age of female Goitre Patients. correlation coefficient(r) =0.42

of males proved to be 0, while that in females was not, with only 1% limit of the danger of error. In females, the correlation coefficient of the mother population at the limit of confidence at 95% was 0.55–0.256.

In the results of Table 6, when the correlation between age group and the size of the goiter was calculated regardless of the sex, results in Fig. 12 were obtained. The correlation coefficient was 0.41, and the 95% confidence limit in the mother correlation coefficient in mother population was 0.53 - 0.28. From these results, *the size of the endemic goiter was correlated with age and higher the age was, the larger was the goiter.*

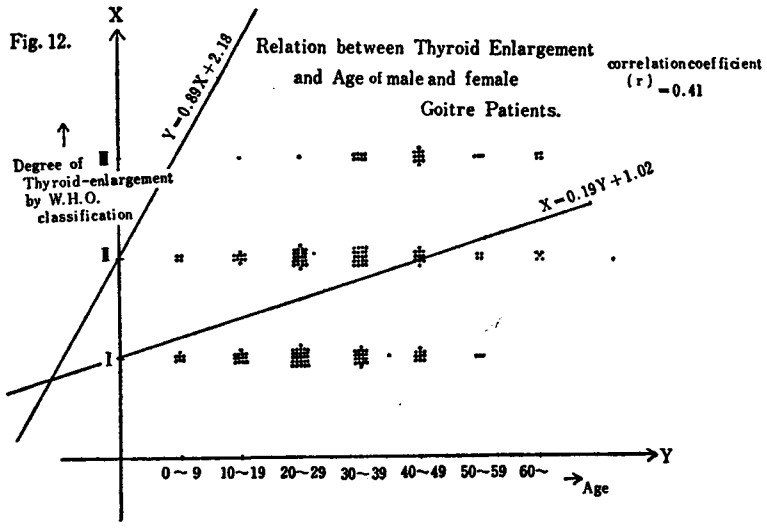


Fig. 12. Relation between Thyroid Enlargement and Age of male and female Goitre Patients. correlation coefficient (r) =0.41

In the mountainous area of Madjalengka, ① Goiter frequently occurred in some districts, while scarcely any goiter occurred in other district. ② In the district where the goiter occurs frequently, goiter develop regardless of the sex. ③ Goiter was seen in each age group, and most frequently between ages of 20 and 40. ④ The size of the goiter showed a positive correlation with age especially in females. Larger goiter was seen in the higher age group.

In the districts where endemic goiter frequently occurred (Nunuk, Tjibodas, and Argalingga), patients with endemic goiter were furthermore studied on clinical findings and laboratory tests as follows.

4) History of patients with endemic goiter

In patients in whom the diagnosis of goiter was given, the history was taken twice especially on 1) whether the patient showing sweating, 2) if the patient was always hungry, 3) if the patient felt palpitation, and 4) whether patient found tremor of fingers frequently.

Table 7 Goiter Patients complained of "profuse perspiration" by our questions.

Goiter degree	I		II		III		Total
Sex / Age	♂	♀	♂	♀	♂	♀	
0～ 9			1/1				1/11
10～19		2/12	1/2	4/8			7/24
20～29	2/4	4/22	1/9	4/13			11/49
30～39		4/13	1/7	5/13	1/2		11/46
40～49	1/4	2/6		3/9		2/6	8/32
50～59		1/3		2/3		1/2	4/10
60～				3/4			3/9
Total	3/15	13/62	4/23	21/53	1/10	3/18	45/181 (24.9%)

Table 8 Goiter Patients complained of "palpitation of the heart" by our question.

Goiter degree	I		II		III		Total
Sex / Age	♂	♀	♂	♀	♂	♀	
0～ 9							
10～19	1/1	2/12		2/8		1/1	6/24
20～29	1/4	5/22	2/9	6/13			14/49
30～39	1/5	5/13	1/7	4/13		3/6	14/46
40～49	1/4	1/6	1/2	3/9	2/5	5/6	13/32
50～59		1/3	1/1	2/3		2/2	6/10
60～				1/4		1/2	2/9
Total	4/15	14/62	5/23	18/53	2/10	12/18	55/181 (30.4%)

Profuse perspiration was complained in 45 of 181 cases (24.9%), and palpitation of the heart in 55 of 181 (30.4%). The results are classified according to age, sex, and degree of the thyroid enlargement as shown in Table 7 and 8. On the contrary, relatively few patients complained of hunger and tremor. Hungry feeling was complained in 14 of 181 cases (7.7%), whereas tremor was complained in 19 of 181 cases (10.6%). These results are tabulated in Table 9 and 10. As stated in the subsequent chapter, only 8 actually demonstrated tremor upon clinical examination. It is therefore dangerous to trust the history to represent the true state of the patient.

Table 9 Goiter Patients complained of "hunger feeling" by our question.

Goiter degree	I		II		III		Total
Sex / Age	♂	♀	♂	♀	♂	♀	
0～ 9			1/1				1/11
10～19		2/12		1/8		1/1	4/24
20～29				3/13			3/49
30～39			2/7				2/46
40～49				1/9	1/5	1/6	3/32
50～59							
60～				1/4			1/9
Total		2/62	3/23	6/53	1/10	2/18	14/181 (7.7%)

Table 10 Goiter Patients complained of "finger tremor" by our questions.

Goiter degree	I		II		III		Total
Sex / Age	♂	♀	♂	♀	♂	♀	
0～ 9							
10～19	1/1	2/12		1/8			4/24
20～29	2/4	1/22				1/1	4/49
30～39		2/13	2/7	2/13		1/6	7/46
40～49				1/9		1/6	2/32
50～59			1/1				1/10
60～				1/4			1/9
Total	3/15	5/62	3/23	5/53		3/18	19/181 (10.6%)

5) *Family history in endemic goiter patients*

When the family history of the patients upon simultaneous questioning was studied, 40 of 181 (22.1%) admitted the presence of similar goiter in the family. When this was seen according to the district, 5 of 60 patients with goiter (8.3%)

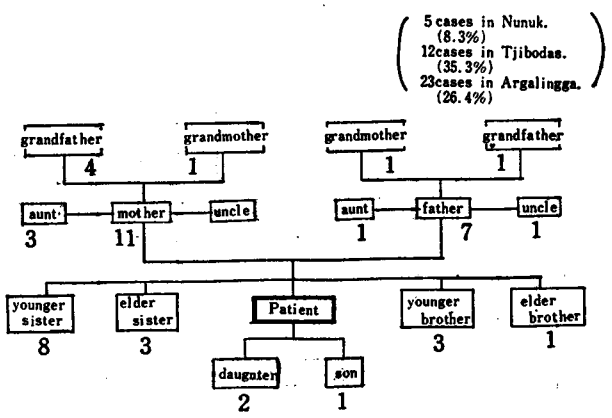
in Nunuk district, 12 of 34 cases (35.3%) in Tjibodas district and 23 of 87 cases (26.4%) in Argalingga gave the family history of goiter. It may therefore be assumed that family goiter frequently occurs in Tjibodas and Argalingga. The patients with goiter with positive family history of goiter are summarized in Table 11.

Table 11 Familial Goiter Patients in Madjalengka Mountainous District.

Goiter degree	I		II		III		Total
Age \ Sex	♂	♀	♂	♀	♂	♀	
0～ 9				1/3			1/11 (9.1%)
10～19		3/12	1/2	2/8			6/24 (25.0%)
20～29		3/22	6/9	6/13			15/49 (30.6%)
30～39	1/5	1/13	1/7	2/13	1/2	1/6	7/46 (15.2%)
40～49		2/6	1/2	1/9	1/5	3/6	8/32 (25.0%)
50～59		1/3					1/10 (10.0%)
60～				2/4			2/9 (22.2%)
Total	1/15 (6.7%)	10/62 (16.1%)	9/23 (39.1%)	14/53 (26.4%)	2/10 (20.0%)	4/18 (22.2%)	40/181 (22.1%)

In 40 patients with family history of goiter, the presence of goiter among individual members of the family was reviewed, as shown in Fig. 13. In 18 patients, goiter was seen in parents, while in 15 goiter was seen in the siblings. Among the

Fig. 13. Familial Goitre Patients in Madjalengka Mountainous District.

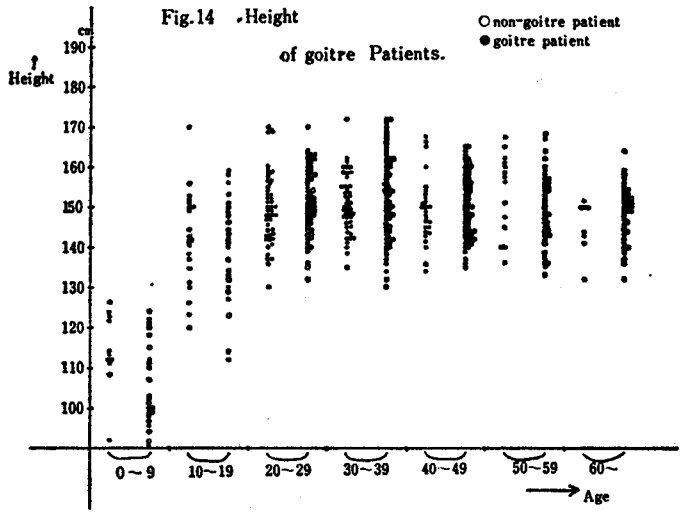


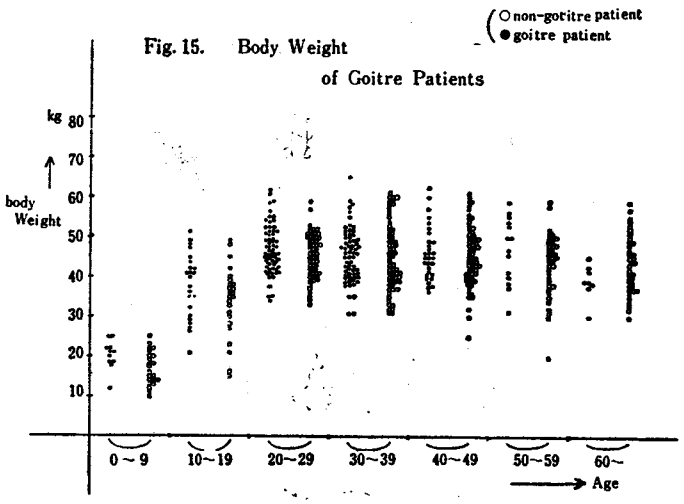
parent, father had the goiter in 15 cases, while mother had goiter in 33 cases, females giving a slight preponderance.

6) Body height and body weight of endemic goiter patients

Schichijo (1953) measured the body height of school children in Gunma Prefecture in Japan, demonstrating that the body height tended to be lower in Gunma Prefecture with endemic goiter than in Fujisawa city in Japan without endemic goiter.

When the body height and body weight of goiter patients in the endemic goiter district was compared with those of inhabitants in district with scarcely any goiter, results shown in Fig. 14 and 15 were obtained. The body height and body





weight of patients with endemic goiter in the mountainous area of Madjalengka district did not show a remarkable difference from other inhabitants.

7) Respiratory rate and pulse rate

The result of determination of respiratory rate at rest in goiter patients is shown in Fig. 16. No findings characteristic to goiter patients wese found, The results of measurement of pulse rate per minute at rest in goiter patients are shown in Fig. 17. In some patients, tachycardia without body temperature elevation is seen. Since tachycardia is a characteristic finding in hyperthyroidism, some of the goiter patients might be functionally hyperthyroid. Problem of hyperthyroidism will be discussed in the subsequent chapter.

Fig. 16. Frequency of Respiration of Goitre Patients.

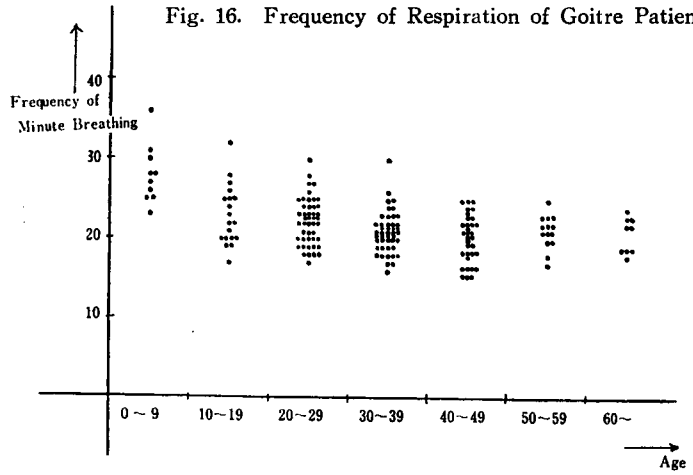
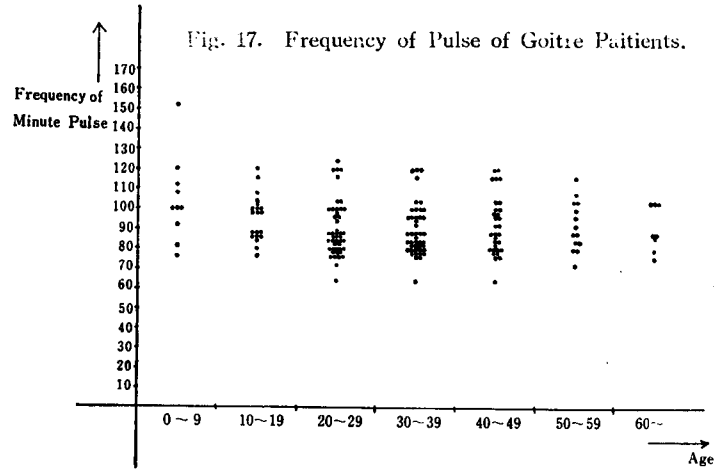


Fig. 17. Frequency of Pulse of Goitre Patients.



8) Blood pressure

Determination of blood pressure in goiter patients gave results shown in Figs. 18 and 19. Except for some patients with hypertension, no relationship was generally found with endemic goiter.

Fig. 18. Systolic Blood Pressure of Goitre Patients.

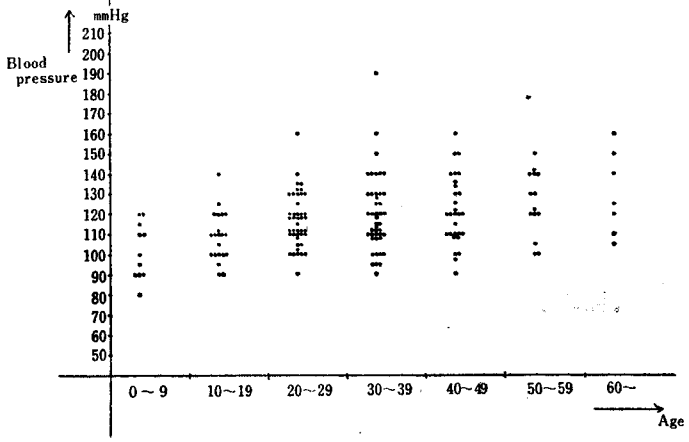
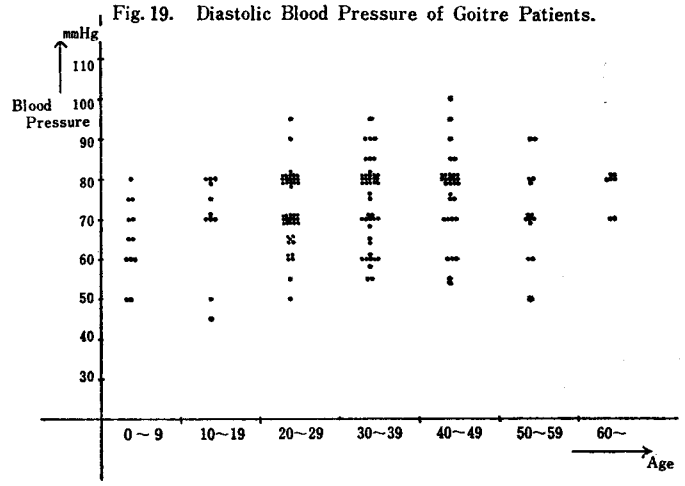


Fig. 19. Diastolic Blood Pressure of Goitre Patients.



9) Urinary finding

Although not all the subjects were studied concerning urine, urine was entirely negative for occult blood and sugar in 126 patients with goiter. Urine pH ranged from 5 to 8. Urine pH was 5 in 65 cases (51.6%), 6 in 26 cases (20.6%), 7 in 27 cases (21.4%), 8 in 6 cases (4.8%) and 9 in 2 cases (1.6%), indicating the predominance of weakly acidic urine which is not characteristic to goiter patient.

Urine protein was weakly positive in 23 of 126 cases (18.2%). In these 23 cases, clinical fiindings other than goiter were exhibited by 5. Positive urine protein in goiter patients was therefore found in 18 (14.9%) of 121 cases. When the appearance of urine protein and goiter was reviewed, no patients with degree III of thyroid enlargement showed positive protein, 12 showed positive protein among patients with degree I goiter, and 6 showed positive protein among patients with degree II goiter. No relationship was found between urine protein and the size of the goiter. Milder goiter might be often associated with positive urine protein.

10) Hemoglobin concentration, red cell count, white cell count and differential white cell count of peripheral blood

Fig. 20.

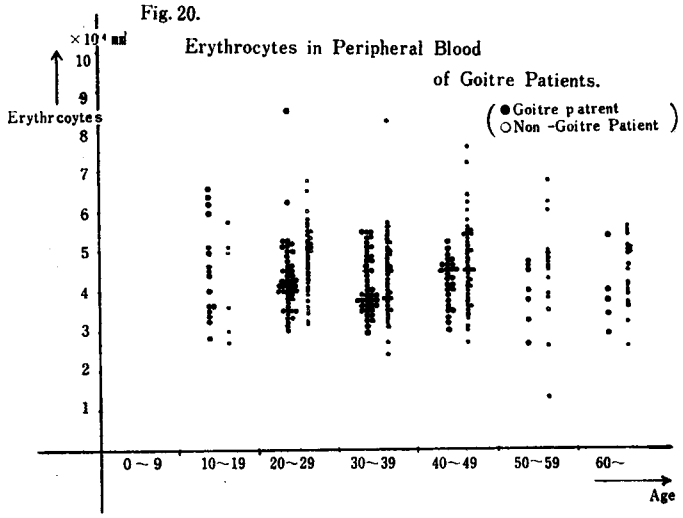
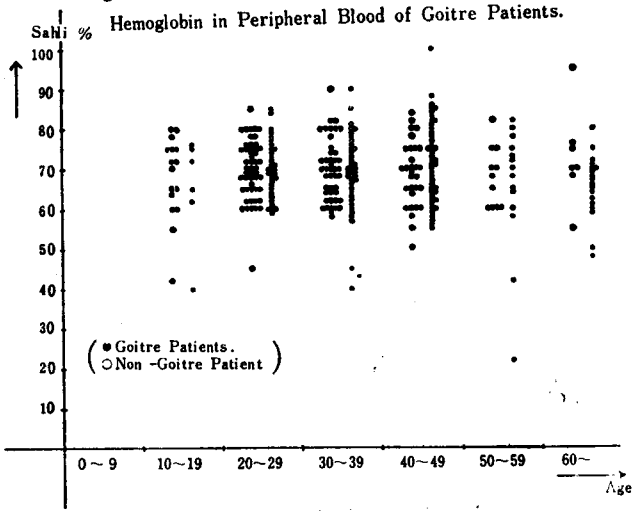
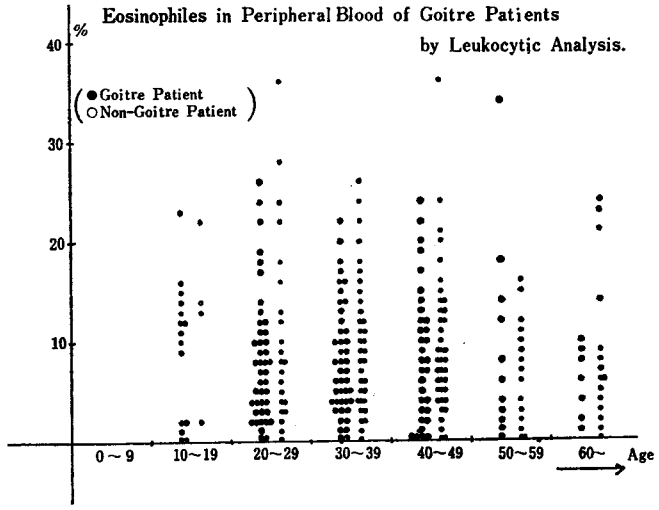


Fig. 21.



RBC and hemoglobin in peripheral blood of goiter patients are shown in Fig. 20 and 21. No difference was found between patients with and without goiter. No findings characteristic to endemic goiter were found in RBC and hemoglobin.

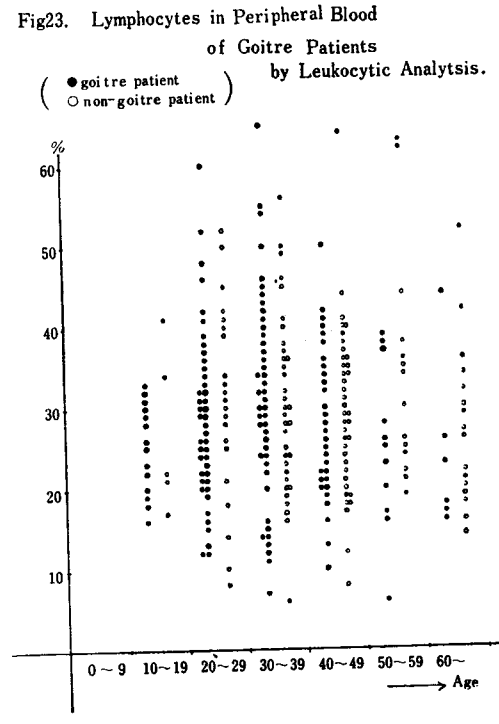
Fig. 22.
Eosinophiles in Peripheral Blood of Goitre Patients by Leukocytic Analysis.



Although no characteristic findings were found in WBC of the peripheral blood, eosinophils and lymphocytes among the differential count of WBC are shown in Fig. 22 and 23. A relative increase of eosinophils was noted in goiter patients, but similar phenomenon was also seen in non-goiter inhabitants as well. Similar results were also obtained in lymphocytes. Relative increase or decrease of lymphocytes was seen in goiter patients, and similar tendency was also seen in non-goitrous inhabitants.

Even if some authors have reported the relative increase in eosinophils in the peripheral blood of patients with endemic goiter, such eosinophilia does not appear to be characteristic to endemic goiter according to our results. The customs and status of inhabitants (parasitic

Fig23. Lymphocytes in Peripheral Blood of Goitre Patients by Leukocytic Analytsis.



infestation etc.) probably have deeper influence. According to the unpublished personal communication of Dr. Sri Oemijati of Department of Parasitology, Universitas Indonesia, parasitic infection is seen in 100% of the population in the rural areas of the Republic of Indonesia. Eosinophlia therefore might be due to such parasitic disease but no fecal examination was carried out to establish this assumption.

11) Basal metabolic rate

Basal metabolic rate was only measured by simplified methods; Read's formula and Takeda, Kano and Sengoku's formula. The results are summarized in Fig. 24 and 25. While most of the goiter patients gave normal basal metabolic rate,

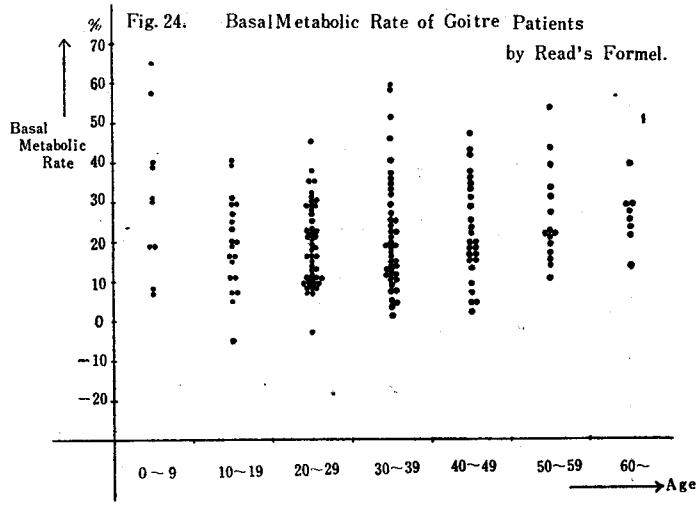


Fig. 24. Basal Metabolic Rate of Goitre Patients by Read's Formel.

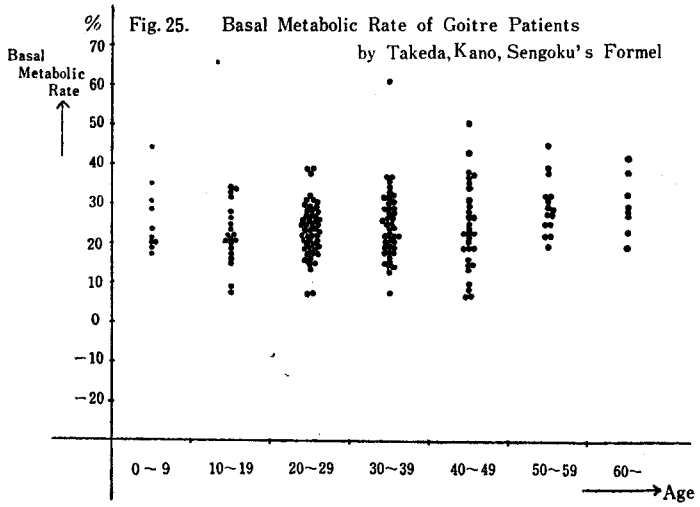


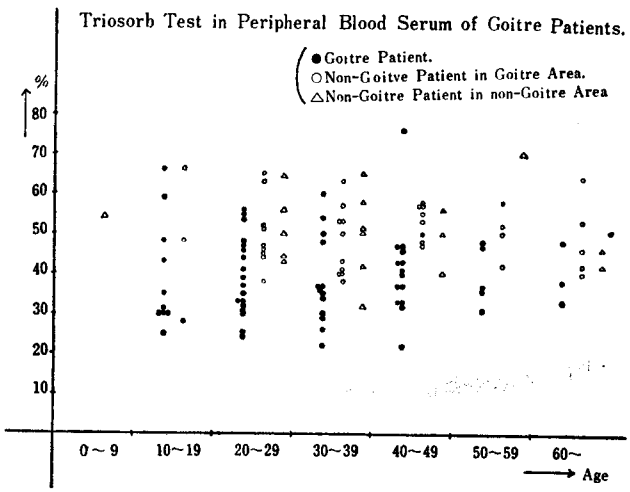
Fig. 25. Basal Metabolic Rate of Goitre Patients by Takeda, Kano, Sengoku's Formel

somewhat higher values were exhibited by some goiter patients. Most of the patients with endemic goiter in Madjalengka district therefore appear to be functionally euthyroid.

12) Trisorb test of the peripheral blood

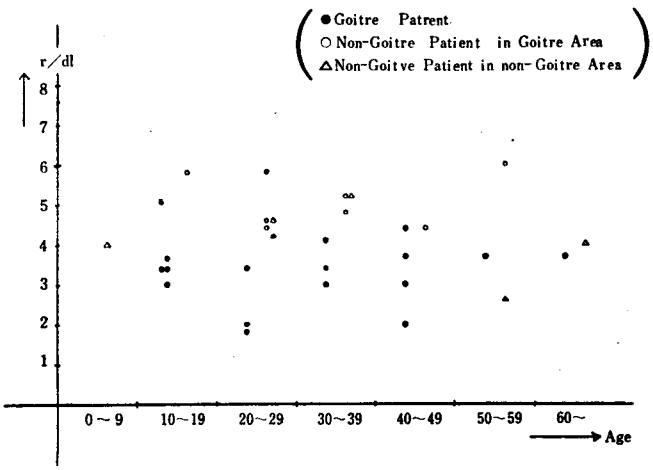
The normal value of trisorb test is between 25 and 35%. Some of the goiter patients showed values above 35%, but non-goiter patients in non-goiter area showed also similar tendency. Most of goiter patients were normal (functionally euthyroid) by trisorb test. Results are summarized in Fig. 26.

Fig. 26.



13) Protein-bound iodine (PBI) of the peripheral blood

Fig. 27. Protein-bound iodine(PBI) in Blood of Goitre Patients.



Normal PBI values are between 3.5 and 8.0 γ/dl. Rather low values are frequently encountered in our determination. However, the number of determinations were so small that statistical analysis was not possible. The results are illustrated in Fig. 27.

14) Complication of goiter patients

Among 181 cases of goiter, complications of other diseases were rather rare. Leprosy was found in 5 cases, tuberculosis (pulmonary tuberculosis, tuberculous lymphadenitis) was found in 5 cases, yaws were found in 2 cases and hypertension, asthma, and syphilis were found in 1 case each.

In 11 cases of goiter, malignant transformation was suspected. Findings of myxedema were found in 2 cases, and those of cretinism in 2 cases. Generally speaking, however, definite complications are rather rare in endemic goiter patients.

15) Iodine and fluorine contained in drinking water and rock salt.

In both drinking water and rock salt, content of fluorine was similar to the blank (less than 0.1×10^{-6}g/g in drinking water and less than 8×10^{-6}g/g in rock salt), indicating the undetectable level.

It was not possible to determine the iodine in rock salt due to an intense interference of NaCl, especially Cl^{38} (half-life – 37.3 minutes), because I^{128} decreased and decayed during the procedure of complete removal of Cl. However, in view of the almost neglegible photoelectric peak emitted by I^{128}, scarcely any iodine might seem to be present in the rock salt in each district. The amount of iodine contained in the drinking water in each district is shown in Table 12. The well water of Gondok* near Tjibodas gave the highest concentration of iodine. In goiter area, Tjibodas and Argalingga, the content of iodine was slightly small, even if iodine content was similar in both drinking water in Nunuk (goiter area) and in Kautjana (non-goiter area).

Table 12 Quantitative Analysis of Drinking Water in Madjalengka Mountainous District.

Drinking Water in:	Iodine content (10^{-9} g/g)
Nunuk	1.25
Argalingga	0.91
Tjibodas	0.57
The Well of "Gondok"	3.15
Kantjana	1.35
Tjipulus	2.3

* Gondok means goiter in Indonesian language.

DISCUSSION AND SUMMARY

1) From the literature on endemic goiter in Java island, Republic of Indonesia

Studies on endemic goiter in the Republic of Indonesia were mainly carried out during the administration of Holland, the old governing country, and were scarcely carried out after the independence. Because all the results during Dutch administration were reported in Dutch, the details are rather difficult to understand. Fortunately F. C. Kelly and W. W. Snedden (1958) reported on the endemic goiter throughout the world with the title of "Prevalence and Geographical Distribution of Endemic Goiter" mentioning the goiter in Java island in the Republic of Indonesia based on the literature.

Endemic goiter is mainly found in the Residency of Kedoe, the Dien Plateau, and villages around Wonosobo, Garoen and Magelang in middle Java. Many cases are also found around Kediri between Kelud Mountain (1731 m) and Wilis Mountain (2169 m) and around Tengger Mountains in eastern Java. However, this paper does not refer to the endemic goiter in western Java at all. No systematic reports therfore appears to be present concerning the goiter in Madjalengka area around Tjireme Mountain.

According to the report of Kelly and Snedden in 1958, about 60% of school children suffered from goiter in Kediri, while goiter patients were seen in 80 to 100% in some of the surrounding villages of Kediri. According to the result of Eerland (1934) on the detailed survey on Kediri district, 126 cretins, many cretinoids as well as about 200 cases of deaf-mutes were found.

In the report of Eerland (1936) the normal thyroidal weight in Javanese with the average of 11.9 g is lower than that of Europeans. However, in Kediri district where goiter occurs frequently, so-called normal thyroidal weight reaches 52 g on average in males and 57 g in females. In 67 of 249 goiter patients, the thyroidal weight was above 500 g. The maximum weights of the goiter were 2850 g and 2930 g. From this report, the size of goiter in Kediri district appears to be extremely large. The endemic goiter in Madjalengka district where we have surveyed was apparently not as large as that in Kediri district.

In the report of Kelly and Snedden (1958), a kind of superstition is believed as the cause of the goiter. At one time the goiter image comes into the water of wells and rivers and drinking such water leads to the development of goiter. The same kind of superstition was experienced by us in Madjalengka district. There is a well in Tjibodas district, called "the well of Gondok". By their superstition, drinking from this well leads to the development of goiter. The water of this well was brought back to Japan for analysis of iodine and fluorine content. The amount of iodine was larger than drinking water from other sources. (see Table 12)

According to Eerland (1934), toxic goiter is rather rare in Java. While endemic goiter is mainly seen in the mountainous district of Java Island as stated above, some patients visiting the University Hospitals in Djakarta and Bandung also show endemic goiter. From our experience of biopsy specimens of the thyroid at the Departments of Pathology, Universitas Padjajaran at Bandung and Universitas Indonesia at Djakarta with the courtesy of Dr. Topo Harsono, Prof. Sutomo, and

Dr. Tiang, following results indicating the frequent visiting of goiter patients were obtained. (Table 13, 14 and 15) In the 471 cases of thyroid biopsy over a 5 year period between 1960 to 1964 at the Department of Pathology, Universitas Padjadjaran (Dr. Topo Harsono), 380 cases (80.7%) showed the finding of adenomatous goiter. In 187 cases of thyroid biopsy during the year 1965 at the Universitas Indonesia in Djakarta (Prof. Sutomo and Dr. Tiang), 128 cases (69%) showed the finding of

Table 13 Biopsy Cases of Thyroid Gland at University of Padjadralan in Bandung in 1960—1964.

—Data from Department of Pathology (dr. Topo Harsono)—

Adenomatous goiter	380 cases
Struma basedowiana	15
Adenoma	42
Carcinoma	34
Total	471

	Adenomatous goiter		Carcinoma	
Age \ Sex	♂	♀	♂	♀
11~20	5	31	1	0
21~30	14	114	1	4
31~40	4	102	1	5
41~50	12	58	4	5
51~60	7	19	5	3
61~	2	2	4	1
Total	44	336	16	18
TOTAL	380		34	

Table 14 Biopsy Cases of Thyroid Gland at University of Indonesia in Djakarta in 1965.

—Data from Department of Pathology (Prof. Sutomo)—

Adenomatous goiter	128 cases
Struma basedowiana	20
Thyroid tissue hyperplasia	1
Adenoma	12
Cystadenoma	2
Hürtle cell adenoma	1
Thyroiditis subacuta	1
Tuberculosis	1
Carcinoma	21
TOTAL	187

adenomatous goiter. Many people have come out from the rural areas to Djakarta and Bandung, and many inhabitants of the rural area visit these cities for medical examinations, so that these data alone might be insufficient to draw a conclusion of the frequent occurrence of goiter in Djakarta and Bandung. However, the assumption that a considerable number of goiter patients are found in western Java island might be supported.

Table 15 Incidence of Adenomatous Goiter by Biopsy Cases in University of Indonesia. Djakarta, 1965.

Race	Indonesian		Chinese		other Races		Total
Sex / Age	♂	♀	♂	♀	♂	♀	
0～ 9							
10～19	2	8	1	2			13
20～29	1	29	2	8		3	43
30～39	3	19		12			34
40～49	1	12	2	7		1	23
50～59	1	6	2	1			10
60～				3			3
Total	8	74	7	33		4	
TOTAL	82		40		4		126

2) *Pathologic physiology of goiter in Madjalengka mountainous district*

Endemic enlargement of the thyroid might be classified into diffuse enlargement, nodular adenomatous enlargement, and the mixed type. According to the result of our palpation, all showed nodular adenomatous enlargement except for 11 cases in which the enlargement was so mild that the measurement of the size was impossible. In cases with an extreme enlargement of the thyroid, it was not possible whether the classification of mixed type was justified.

These findings were further confirmed by the pathohistology of the biopsy specimens at Djakarta and Bandung. All goiter specimens we have studied showed the histological findings of adenomatous goiter.

Endemic goiter is also classified into euthyroid, hyperthyroid and hypothyroid goiter according to the functional state of the thyroid and the individual. In euthyroid goiter, thyroid function is not unusual and no specific complaints are found. Hyperthyroid goiter or thyrotoxic nodular goiter is frequently found in areas with low prevalence of goiter, characterized by hyperthyroidism. Hypothyroid goiter showing hypothyroidism, on the other hand, is commonly seen in the area of high prevalence of goiter.

From the results of our survey on goiter patients examined, most of them belong to euthyroid goiter functionally. Scarcely any functional disorder is detected except for the enlargement of the thyroid.

Table 16 Goiter Patients suspicious of Hyperthyroidism.

Age	Sex	Size of enlarged Thyroid	Exoph-thalmus	Other eye Symptoms of Hyperthy-roidism	Tremor	Frequency of Pulse	Basal Metabolic Rate		complication
							by Read	by Takeda et al	
20	♂	9×3cm	+	±	+	96	27.75%	29.56%	
30	♀	4×3	+	+		76	1.25	13.44	Lepra
25	♀	8×3	+	+		76	12.75	23.30	
32	♀	10×4	+	+		100	27.9	28.3	
60	♀	3×3, 3×3, 2×2, 5×5	+	+		104	22.6	22.1	
23	♀	6×4×3	±			88	10.65	17.16	
40	♀	4×3		±	+	116	46.53	37.84	malignant?
45	♀	2×3			++	88	54.95	56.87	Hypertension (180/70)
65	♀	14×7×7			++	88	28.4	41.96	malignant?
32	♀	5×3×1			+	84	18.75	25.84	
55	♀	10×6×4			+	108	42.29	38.24	
45	♀	10×8×4			+	120	42.9	34.52	
30	♀	10.5×6×4			+	84	24.3	30.8	
35	♂	10×2		+		96	11.59	17.07	Tropicaloid Ulcer

Table 17 Goiter Patients suspicious of Hyperthyroidism.

Age	Sex	Size of enlarged Thyroid	Triosorb Test (%)	PBI (r/dl)	Basal Metabolic Rate		Pulse	complication
					by Read (%)	by Takeda (%)		
40	♂	8×6×3cm	76		36.0	35.76	116	Asthma
68	♀	5×5×2	66		13.42	19.64	88	
35	♀	9×8×3	60		10.2	19.64	80	
19	♀	2×2	59		31.21	20.32	108	Lepra
25	♀	6×5	56		9.9	7.16	80	
25	♀	11×5×1	55		16.2	22.1	96	
25	♀	5×3	55		10.2	19.64	80	
30	♀	6×5×3	54		45.75	36.60	120	
8	♀	6×3			65.25	44.64	152	
8	♀	6×6×3			40.1	32.04	120	
9	♀	5×3			57.3	44.4	128	
17	♀	2×2 2.5×2.5			40.2	32.04	120	
25	♀	7.5×4×0.5			45.7	38.0	120	
35	♀	7×8×4			59.4	50.64	116	
35	♀	8×8×6			40.2	32.04	120	

Table 18 Goiter Patients suspicious of Hypothyroidism.

Age	Sex	Size of enlarged thyroid	PBI (r/dl)	Trio-sorb Test (%)	Basal Metabolic Rate by Read (%)	Basal Metabolic Rate by Takeda (%)	Tempe-rature (°C)	Pulse	Blood Pressure (mmHg)	Erythro-cytes (X10⁴)	Hemo-globin (%)	Albumi-nuria	Height (cm)	Weight (kg)	Note
15	♀	3×3cm		48	19.65	20.68	35.8	100	100/70			trace	123	26	Myxedema
25	♀	8×7×3		41	10.2	11.64	36.0	80	105/65	412	68		130	34	Myxedema
15	♀	8×5.5×5			−4.1	8.48	36.4	76	100/80	360	60	—	135	36	Myxedema
25	♀	9×6×5 8×6×3		47	27.98	29.32	36.5	100	125/80	458	75	trace	152	41	Myxedema
24	♀	8×3	1.8	24	28.2	27.08	36.6	104	130/90	334	72	—	136	51	
45	♂	7×6×4	2.0	33	15.42	22.86	36.1	84	98/54	445	65	trace	155	46	
20	♀	6×6×3	2.0	39	22.42	23.16	36.4	100	115/80	501	70	—	146	43	
19	♀	11×2	3.0	30	4.65	14.68	37.1	80	110/80	655	55		156	49	Lymphadenitis tuberculosa?
37	♂	5.5×4×1	3.0	50	21.3	29.56	36.0	80	140/80	460	68	trace	158	52	
40	♀	3×5 5×5	3.0	43	15.71	24.6	36.4	80	130/80	490	68	—	152	48	
25	♂	5×2			−2.2	14.0	37.3	64	110/70	350	80	trace	169	49	

For the clinical picture of hyperthyroidism, Meseburger Trias (thyroid enlargement, exophthalmus, and tachycardia) together with tremor gives the ground for the diagnosis of Basedow's disease, while toxic goiter (Plummer's disease) lacks exophthalmus and tremor according to the general concept. In hyperthyroidism, eye signs such as Moebius, Graefe, Stellwag, Iellinek, Dalrymple, Rosenbach, Riesman, Enrroth, Joffroy, Topolanski, and Sainton signs are said to be present. In the subjects studied by us in the present survey, 14 cases showed exophthalmus, tremor, or eye signs of hyperthyroidism as shown in Table 16. Among these 14 cases, only one case showed exophthalmus, tremor, and other eye singns together (the 1st case). In the 8th case with an extreme tremor, hypertension was present as complication. This tremor was probably due to hypertension and not due to goiter. In the 7th, 11th, and 12th cases, tremor without exophthalmus, tachycardia and elevation of basal metabolic rate were seen. Details of 8 patients with high value of Trisorb test in peripheral blood and 7 patients with high basal metabolic rate are seen in Table 17.

On the contrary, cases suggesting hypothyroidism are summarized in Table 18. The first and second case clinically represent cretinism, while the third and fourth case myxedema. Six cases showed low PBI values, and one case showed a slight decrease in basal metabolic rate and bradycardia. However, whether all of these cases show hypothyroidism or not is quite difficult to decide.

Pathohistological findings of the biopsy specimens obtained at Djakarta and Bandung are shown in Table 19. Among the thyroid biopsy specimens, struma basedowiana was seen in a rather high proportion. In Djakarta the ratio between adenomatous goiter and struma basedowiana was 6.4 : 1, while in Bandung the ratio

Table 19 Biopsy Cases of Struma basedowiana in Djakarta and in Bandung.

	Universitas Indonesia 1965	Universitas Padjadjaran 1960~1964
Adenomatous goiter	128 cases	380 cases
Struma basedowiana	20	15
ratio	6.4 : 1	25.3 : 1

Biopsy Casesof Struma basedowiana in Universitas Indonesia, Djakarta in 1965.

Age	0~ 9		10~19		20~29		30~39		40~49		50~59		60~	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
cases			1	2		6	2	5	1	1		2		
Total			3		6		7		2		2			

was 25.3 : 1. In pathological anatomy, hyperthyroid goiter patients showing nodular thyroid enlargement are considered to be toxic goiter rather than Basedow's disease. So that, the goiter with hyperthyroidism previously mentioned may be all regarded as endemic goiter accompanied by hyperthyroidism.

3) Endemic goiter and thyroid gland carcinoma

In the statistics of Beahrs et al. (1951) at Mayo clinic, carcinoma was found in 4.8% of endemic goiter with nodular enlargement. Thyroid cancer occurs in the goiter area 20–30 times more frequently than in the non-goiter area. No accurate data are at present available concerning the proportion of cases showing transformation into cancer among patients of endemic goiter.

According to our experience of thyroid biopsy specimens in Djakarta and Bandung, the ratio between adenomatous goiter and thyroid cancer was 6.1 : 1 in Djakarta and 11.2 : 1 in Bandung as shown in Table 20. Cancer occupied 21/128 (16.4%) among the whole cases of thyroid biopsy in Djakarta and 34/380 (8.9%) in Bandung.

Table 20 Biopsy Cases of Thyroid Gland Carcinoma in Djakarta and in Bandung.

	Universitas Indonesia 1965	Universitas Padjadjaran 1960~1964
Adenomatous goiter	128 cases	380 cases
Carcinoma	21	34
ratio	6.1 : 1	11.2 : 1

Age	Sex	Universitas Indonesia 1965		Universitas Padjadjaran 1960~1964	
0~ 9	♂				
	♀				
10~19	♂			1	1
	♀				
20~29	♂	2	6	1	5
	♀	4		4	
30~39	♂		4	1	6
	♀	4		5	
40~49	♂	1	4	4	9
	♀	3		5	
50~59	♂	1	4	5	8
	♀	3		3	
60~	♂		3	4	5
	♂	3		1	
Totoal			21		34

Table 21 Goiter Patients suspicious of Thyroid Gland Carcinoma.

Age	Sex	Size of enlarged thyroid cm	Height cm	Weight kg	Temperature °C	Tremor	Frequency of Pulse	Blood Pressure	Erythrocytes ×10⁴	Leukocytes	Hemoglobin %	Albuminuria	Basal Metabolic Rate	
													by Read	by Takeda
40	♀	14×9×10	150	40	36.8		92	110/70	370	4400	70	+	19.2	23.36
45	♀	9.5×6×3	150	43	36.7		84	160/100	327	9400	65	−	24.3	30.8
45	♂	10×10×6	167	52	36.1		88	150/80	442	7200	75	+	33.0	37.0
49	♀	4×3×0.5	145	40	36.2		92	120/80	390	7600	62	−	19.2	23.36
50	♀	12×9×9 4×3	149	45			96	190/80	265	8000	60		58.05	59.32
60	♂	8×8×8 5×5	156	52	36.0		72	130/70	535	5200	95	−	15.30	27.04
65	♂	3×2.5	151	45			88		400	8000	55		21.75	27.08
70	♂	14×8×3	158	54	36.0		76	150/80	341	7000	68	−	27.0	33.28
72	♀	3×3 4×5	132	30	36.2		104	120/80	470	7600	65	trace	28.2	27.08
40	♀	4×3	146	60	36.8	+	116	140/80	462	7200	70	+	46.53	37.84
65	♀	14×7×7	144	39	36.1	++	88	160/80		7800	76	trace	28.4	41.96

In 11 cases among the goiter cases of our survey malignant transformation into thyroid cancer was suspected as shown in Table 21. Although biopsy was not performed and the confirmation of thyroid cancer could not be made, the very presence of 11 cases would indicate the necessity of the treatment of endemic goiter.

4) Etiology of endemic goiter

As stated before, endemic goiter signified thyroid enlargement in a specific district characterized by iodine deficiency. However, many other factors such as drinking water, geographical conditions, influences of various metals and compounds, biological specificities, parasitic diseases, special living conditions, avitaminosis, intoxication due to various causes, heredity, infectious toxic influence, or infections will be also considered as causes of endemic goiter in the mountainous district of Madjalengka.

The positive family history in 40 of 181 cases (22.1%) of goiter patients may indicate the possibility of hereditary occurrence of goiter and the frequent occurrence of goiter in inhabitants under same living conditions.

In the results of studying the relationship between the size of goiter and age, the correlation coefficient was between 0.53 and 0.28, suggested the increase in size of the goiter in advancing age. This would suggest that some factor is continuously acting on inhabitants living in an identical place to cause the goiter.

Even if the endemic goiter appeared slightly more frequent in females, there was no statistical significance between males and females. This would indicate the same probability with which all inhabitants in the endemic goiter area suffer from goiter. In these points, the occurrence of goiter in the endemic goiter area may be most profoundly related with the living environment of the district.

Many reports point to iodine deficiency in endemic goiter. The results of determination of iodine and fluorine in drinking water and rock salt brought back from these districts failed to show a district difference between goiter and non-goiter areas. However, in Argalingga and Tjibodas districts where goiter occurred most frequently, the iodine value in the drinking water gave a value, suggesting some participation of iodine deficiency. Moreover, Dr. Lie's iodine administration resulted in the improvement of goiter in these districts according to our actual experience.

The goiter in Madjalengka mountainous district is probably most deeply with the living conditions of the district. However, which condition is most responsible is at present still undecided.

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