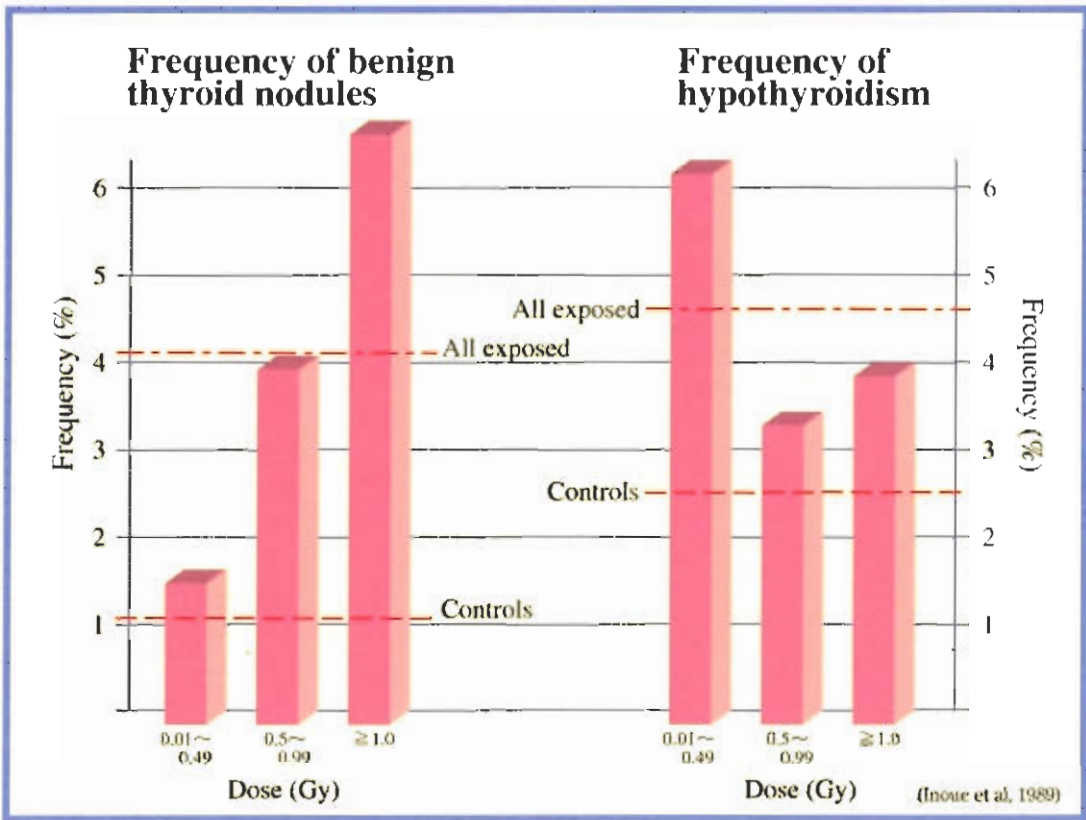


3

Endocrine and metabolic diseases



1. Thyroid disorders

The following describes current knowledge regarding the effect of atomic bomb radiation on the thyroid gland, which is a radiosensitive organ.

1. Benign thyroid nodules

Data concerning Nagasaki survivors shows an increase with dose, with the rate clearly high amongst individuals aged 20 or less at the time of bombing.

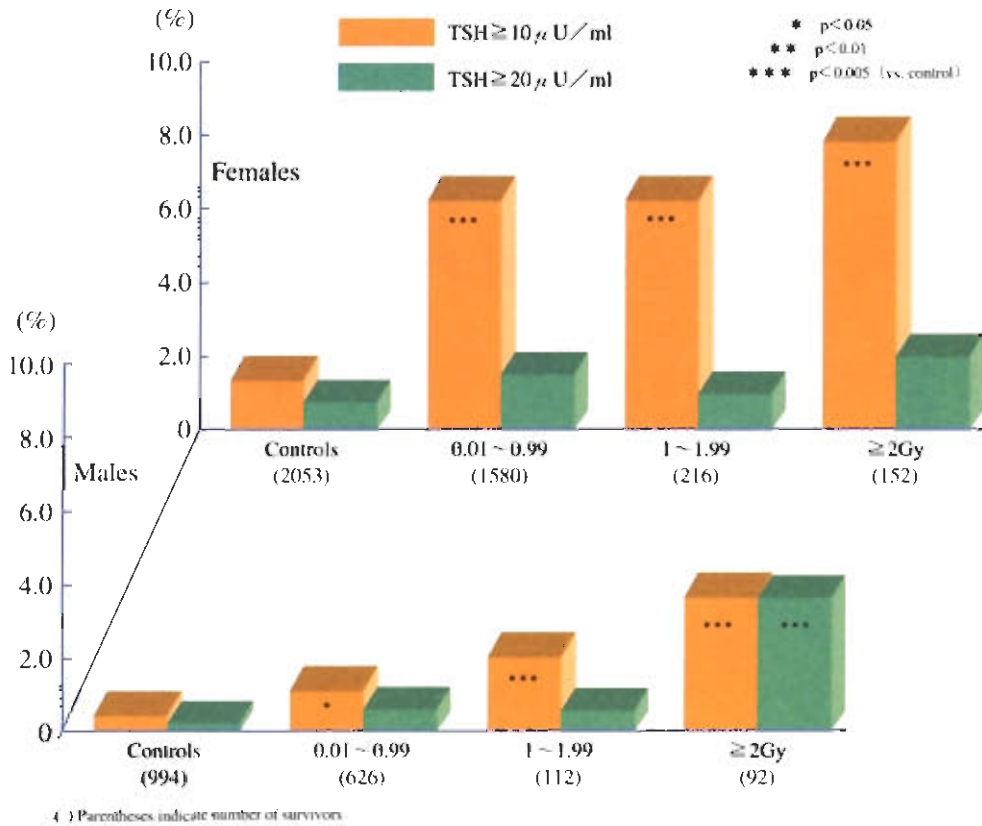
2. Thyroid function

Investigations on the frequency of hypo-

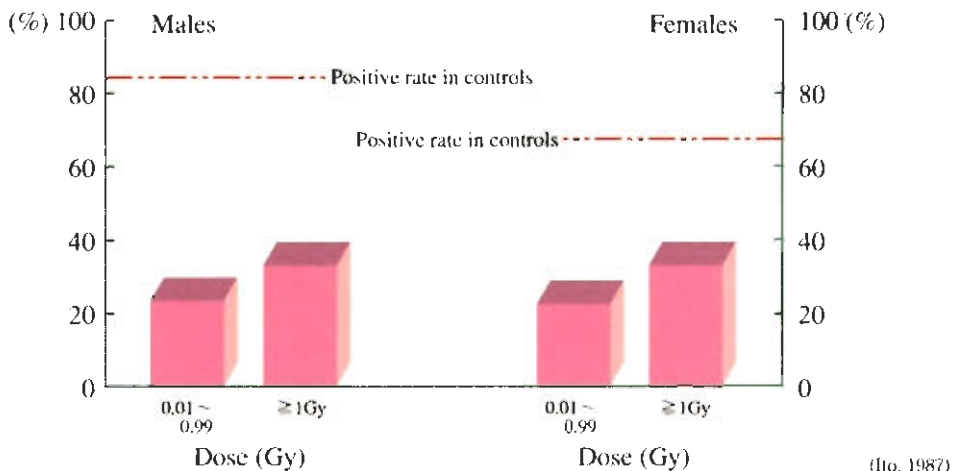
thyroidism among Hiroshima atomic bomb survivors using serum levels of thyroid stimulating hormone (TSH) as an index showed an increase with radiation dose, with mild hypothyroidism cases exhibiting a dose-dependent increase. Among the hypothyroidism cases, the exposed population exhibited a lower autoantibody positive rate than the controls. Similar results were reported for Nagasaki survivors, who demonstrated a significantly high rate of hypothyroidism, particularly among women exposed while young.

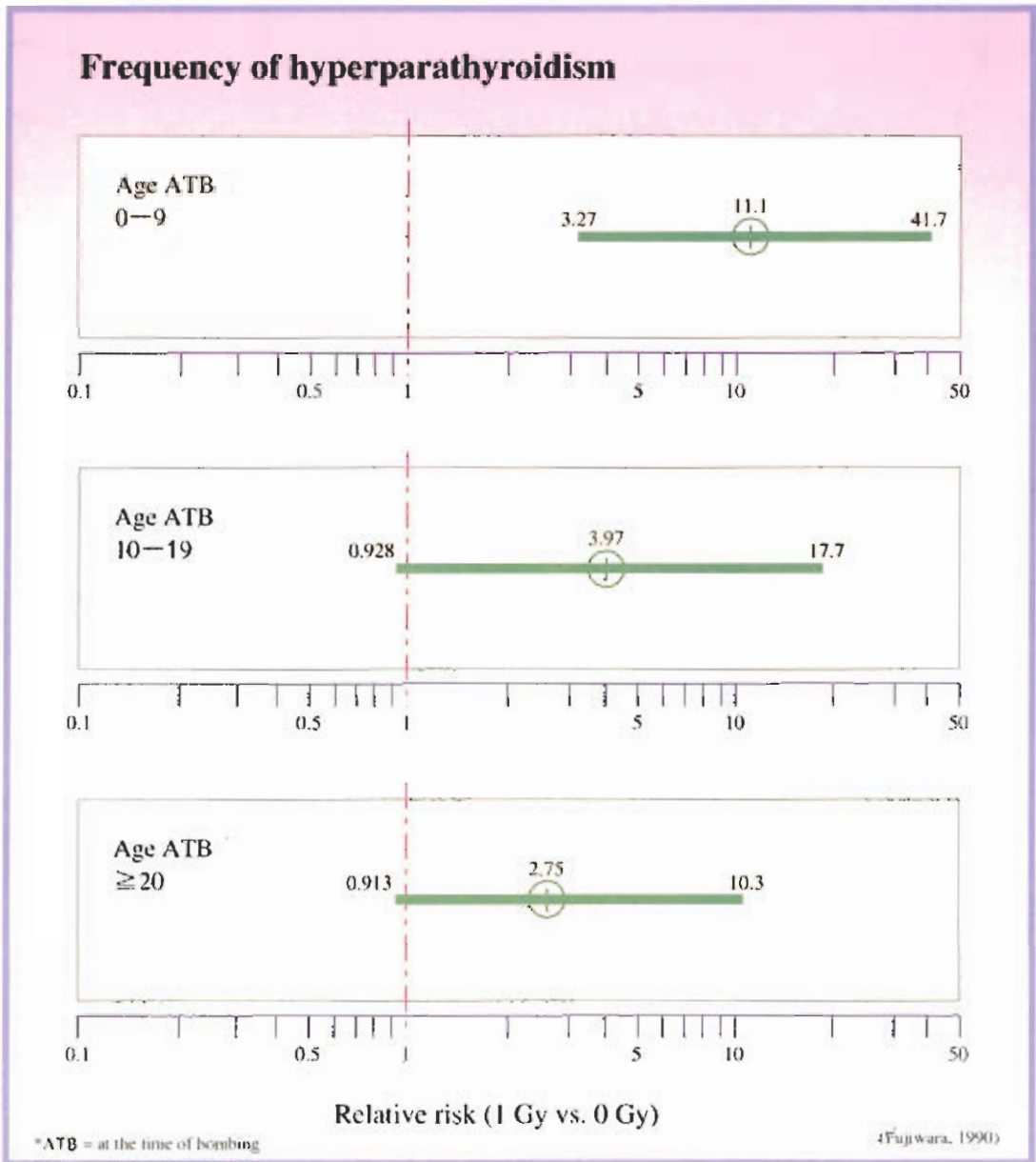
Atomic bomb exposure was thus found to result in increased prevalences of benign thyroid nodules and hypothyroidism.

Frequency of hypothyroidism by dose



Positive rate of thyroid autoantibody in hypothyroidism cases by dose



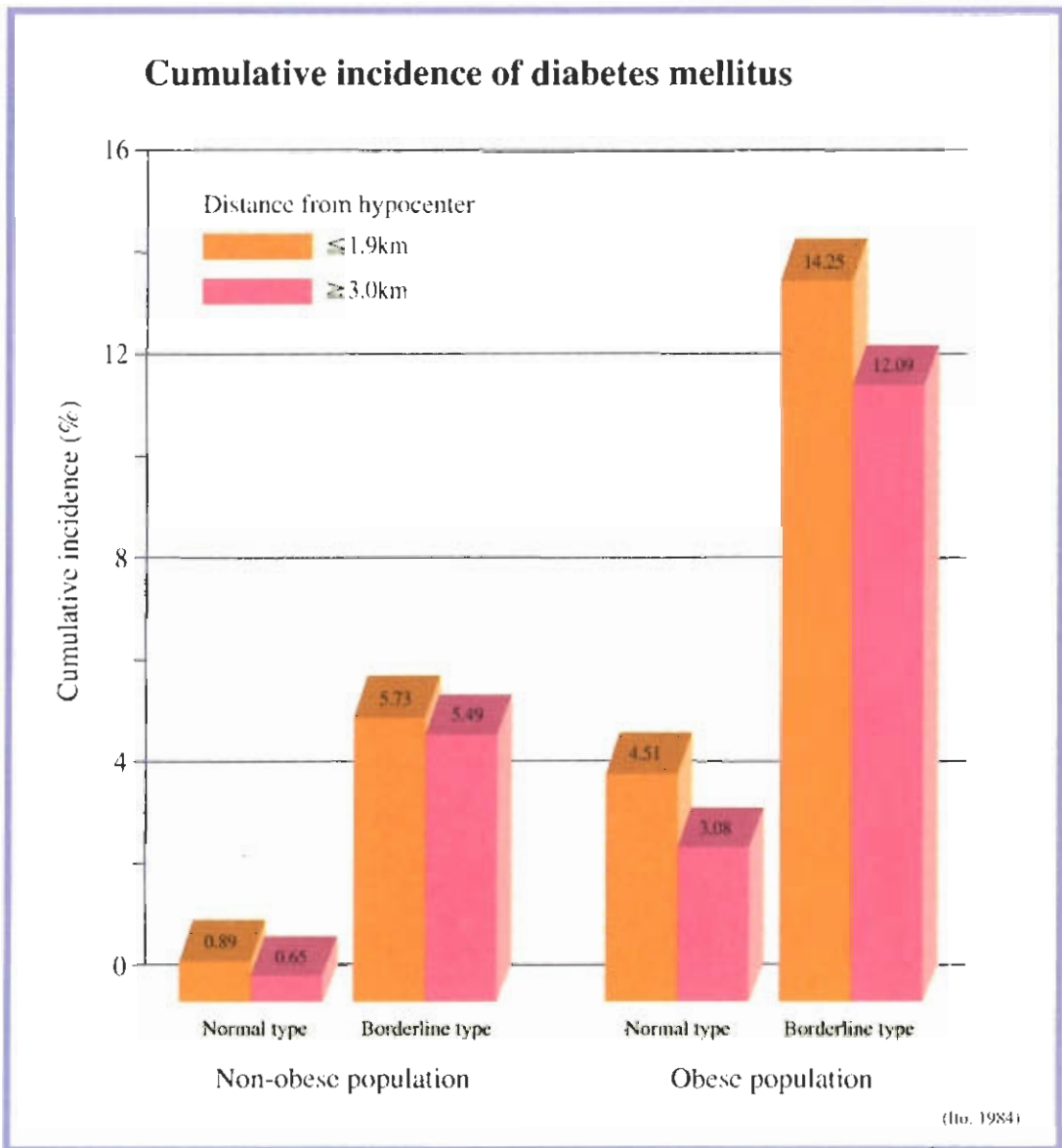


2. Hyperparathyroidism

Parathyroid adenoma is reported to be common among proximally and heavily exposed individuals. Almost all these adenomas display hyperparathyroidism, with many detected by chance due to high serum calcium levels.

Between 1986 and 1988, serum calcium

levels were determined in approximately 6,000 Hiroshima and Nagasaki survivors; those displaying hypercalcemia were then tested for parathyroid hormone. Hyperparathyroidism was found to increase with dose, with the frequency increasing with decreasing age at the time of bombing. Pathohistologically, adenomas accounted for approximately 80% of the hyperparathyroidism.



3. Diabetes mellitus

The number of diabetes mellitus patients in Japan is increasing, and the prevalence among atomic bomb survivors is approximately 10%; the disease has therefore assumed importance with regard to health management.

Comparison of diabetes frequency by exposure status and dose failed to show a high rate among the heavily and proximally exposed populations, and no correlation with atomic

bomb radiation was observed.

Survivors who underwent direct proximal exposure (<1.9 km) were compared with others who received direct distal exposure (≥ 3.0 km), but no dose effect was observed between diabetes mellitus cumulative incidence and distance from the hypocenter.

Current reports on the incidence of diabetic complications similarly show no correlation between radiation exposure and either the prevalence and incidence of diabetes mellitus, or the rate of complications.