

## EPIDEMIOLOGY OF PALPABLE GOITER IN GREATER BUENOS AIRES IN AN IODINE-SUFFICIENT AREA

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**Abstract** The *Hospital de Clínicas* organized a free program of goiter detection by palpation. This campaign was aimed at the population of the metropolitan area of Greater Buenos Aires (11 million inhabitants), with the prerequisite that each participant should be quite unaware whether he/she was a carrier of any thyroid disease. Attendees were split into two groups, i.e., Random and Induced. The former consisted of 542 individuals who came to consultation due to mere curiosity, while the latter involved 500 subjects, comprising consanguineous family members of patients with thyroid disorders and also individuals who suffered from other ailments. Ages ranged from 2 to 85 years. In the Random Group, goiter prevalence of 8.7% was observed, while in the Induced Group it climbed to 14.4%. Since both groups were mostly made up of women (87.2%), a correction based on the masculinity index was applied to members of the Random Group. Thus, the total observed prevalence of goiter was 6%, diffuse goiters corresponding to 3.5% and nodular ones to 2.5%. The frequency of nodules increased with age, 90.5% occurring in those over 40 years. In the Induced Group, goiter prevalence among relatives of patients with thyroid disorders proved to be 13.1%, rising to 17.8% in those who suffered from other complaints. The epidemic data presented herein are the first arising from a screening survey carried out in a large iodine-sufficient population of the southernmost tip of the American continent. These results are useful to build up the world map of goiter prevalence in non-endemic areas.

**Key words:** epidemiology, goiter, thyroid, iodine, Buenos Aires, Argentina

**Resumen** *Epidemiología del bocio palpable en el Gran Buenos Aires en un área suficiente en yodo.* El Hospital de Clínicas organizó un programa gratuito para la detección de bocio por palpación. Esta campaña estuvo dirigida a la población del área metropolitana del Gran Buenos Aires, con el prerequisite de que cada participante debía desconocer si padecía alguna enfermedad tiroidea. De acuerdo a las motivaciones que llevaron a los pacientes a la evaluación, se dividieron en 2 grupos: Randomizado e Inducido. El primero consistió de 542 individuos que consultaron por mera curiosidad, mientras que el segundo involucró a 500 sujetos que tenían familiares con enfermedades tiroideas e individuos que sufrían otras enfermedades. Las edades oscilaron entre 2 y 85 años. En el Grupo Randomizado, la prevalencia de bocio fue del 8.7%, mientras que en el Grupo Inducido ascendió a 14.4%. Debido a que ambos grupos estaban compuestos en su mayoría por mujeres (87.2%), se realizó una corrección al Grupo Randomizado, basada en el índice de masculinidad. Luego de esta corrección, la prevalencia total de bocio fue del 6%: difusos 3.5% y nodulares 2.5%. La frecuencia de nódulos tiroideos se incrementó con la edad, el 90.5% de los sujetos con nódulos tenía más de 40 años. En el Grupo Inducido, la prevalencia de bocio entre familiares de pacientes con tiroideopatías fue del 13.1%, ascendiendo a 17.8% en aquellos que presentaban otros síntomas. Estos datos son los primeros presentados luego de un *screening* en una gran área suficiente en yodo de la región más austral del continente Americano y son útiles para construir el mapa mundial de prevalencia de bocio en áreas no endémicas.

**Palabras clave:** epidemiología, bocio, tiroides, yodo, Buenos Aires, Argentina

Among the activities of the *Hospital de Clínicas José de San Martín*, belonging to the School of Medicine, University of Buenos Aires, campaigns for the detection of diverse diseases are contemplated. This program is based on devoting one complete week to study the general popu-

lation free of charge, mainly of Buenos Aires City and the 24 Districts of Greater Buenos Aires, interested in the pathology chosen for the respective time slot. Thus, the corresponding Service organizes, within its logistical and economic resources, the type and scope of the mentioned weekly programs. Accordingly, the Endocrinology Division organized the Thyroid Survey Week (Detection of Goiter) from Monday 3 to Friday 7 of December 2001. This survey was exclusively intended for goiter detection in individuals who had no prior knowledge that they suffered from a thyroid disorder, but were interested in know-

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ing their condition. For such a reason, patients who knew in advance that they were carriers of some thyroid pathology, and were therefore under evaluation and/or treatment, were not included in the study.

The summons to the population was carried out through informative brochures, posters displayed in the Hospital facilities, and mainly by mass press media (newspapers, radio and television). In the invitation to attend, stress was laid on apparently healthy family members of patients with thyroid disorders and also on carriers of other ailments liable to be associated to thyroid problems (e.g., vitiligo and rheumatoid arthritis, among others). At any rate, emphasis was also laid on the convenience that any citizen, without gender or age restrictions, was free to come to consultation due to mere curiosity, though lacking any predisposing family and/or personal history.

## Patients and Methods

### Campaign design

Individuals interested in participating in this campaign were initially subjected to an orientation consultation to check that those to be studied met the prerequisite of not knowing whether they suffered from any thyroid disease. In cases where the interested parties were aware of their thyroid pathology, they were invited to be seen at our Endocrinology Division, but automatically excluded from this survey of goiter detection. The individual who was admitted to the program, was palpated by one of the authors of this paper, and at the same time asked whether he/she had consanguineous family members (parents, children, siblings, grandparents and uncles/aunts) with any thyroid disease and what was the reason for having decided to participate in the study. Besides, it was proven that the participants were almost entirely permanent residents of the metropolitan area of Buenos Aires City and Greater Buenos Aires. Individuals palpated for goiter were at once referred to the medical endocrinology resident whose workplace was only a few meters from the physician in charge of palpation. This professional explained to the patient the meaning of the finding, recorded personal data, and requested the pertinent thyroid studies. The physician in charge of palpation classified the goiter type by means of a written code (see Table 1) that was given to the patient so that, in turn, it was handed over to the medical resident.

As part of the medical team, a total of 21 examiners (11 physicians and 10 medical undergraduates) participated in this survey. There were two teams in charge of palpation, working simultaneously. Each one of them had a physician in charge, seconded by a medical undergraduate who collabo-

rated with the conducted questionnaire and filling the corresponding form. Patients were derived to the physician in charge of palpation, alternatively, by the students in charge of the orientation consultation. Thus, either team examined 50% of the individuals that attended the campaign. Physicians in charge of palpation were the following authors: HN, MS, KD and FP.

### Patients

Drawn by the Thyroid Survey Week, around 1500 individuals, out of whom 1042 met the requirement of being unaware of their previous thyroid status, gathered in the Hospital. Among admitted and palpated individuals, whose ages ranged from 2 to 85 years, 909 (87.2%) were women and 133 (12.7%) men. According to the conducted questionnaire, they were split into two groups, i.e., Random and Induced. The former, comprising 542 members, attended the survey due to mere curiosity; the latter, comprising 500 members, had individual reasons to participate, 72% claiming to have consanguineous family thyroid disease carriers, while the remaining 28% adduced a variety of causes (obesity, goiter suspicion and/or neck complaints, asthenia, dermatological or gynecological history, among others).

## Results

Given the differences found between the Random and Induced Groups, and taking into account that due to their origin they should be considered separately, results achieved will be analyzed individually for each group. It should be pointed out that there were no differences in the quality and type of palpation performed by the physicians in charge of this task, so that no distinctions are made.

### Random Group

Out of the 542 subjects making up this group, there were 455 (83.9%) women and 87 (16.1%) men. Women's ages ranged from 2 to 83 years, while men's ranged from 5 to 85 years. Age distribution in the female and male gender is shown in Figure 1.

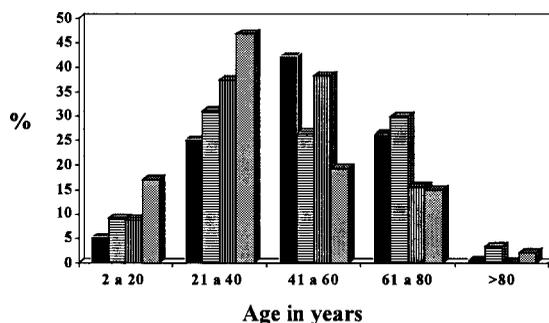


Fig. 1.— Distribution of Random and Induced Groups according to age and gender.

(■ Random Group women; ▨ Random Group men; ▤ Induced Group women; □ Induced Group men)

TABLE 1.— Palpation Codes

0	= normal thyroid
DG	= diffuse goiter
SN	= solitary nodule in normal gland
NDG	= single nodule in diffuse goiter
MNG	= multinodular goiter

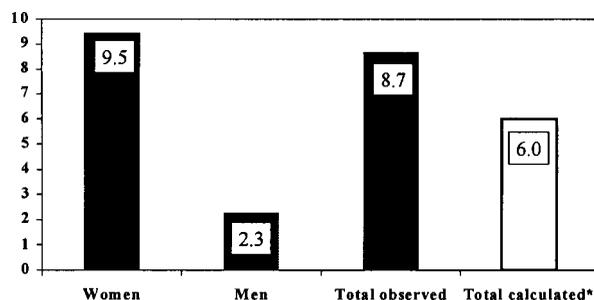


Fig 2.– Goiter prevalence in the Random Group, considered globally (total observed) or discriminated by sex. The calculated total \* refers to the application on the observed total of the masculinity index, established by the INDEC for the general population of the metropolitan Buenos Aires area (see text).

Total goiter percentage was 8.7%, reaching 9.5% for women and 2.3% for men, with a 4.1:1 female:male ratio. Had male and female populations been distributed according to the masculinity index (number of men per 100 women) that the INDEC (National Institute of Statistics and Censuses) has calculated to be 91.6 for the population of the Metropolitan Area of Buenos Aires (2001 National Population, Homes and Housings Census)<sup>1</sup>, the goiter percentage would have been 6% (Fig. 2).

When an attempt was made to correlate goiter frequency with patient age, and in order to assemble an appropriate number of individuals to allow reliable statistical analysis, it was decided to take men and women as a whole and split them into two groups: older and younger than 40 years of age. Thus, 175 individuals proved to be from 2 to 40 years old and 367 from 41 to 85 years. Goiter percentages were 9.7% for the younger and 7.9% for the older one. However, statistical analysis carried out by the chi square method failed to disclose any significant difference.

According to the criteria adopted in palpation guidelines (Table 1), 57.5% of goiters was exclusively diffuse and 42.5% belonged to some nodular goiter variant. With regard to the latter, only a quarter were single solitary nodules in a thyroid gland which, except for the nodule, was clinically normal. Figure 3 shows the frequency of each goiter variant in the Random Group and the hypothetical value in the general population (once values were extrapolated according to the INDEC masculinity index). Thus, the percentage of palpable nodules in the general population of Buenos Aires City and its surroundings area proved to be 2.5%.

The ages of patients with palpable thyroid nodules ranged from 21 and 82 years, while those of subjects with diffuse goiter had a range from 16 to 65 years. Overall, 90.5% of nodular goiter was observed in patients over 40 years of age, among whom only 42.3% diffuse goiter

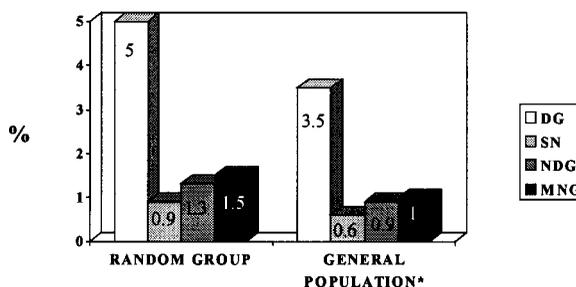


Fig. 3.– Prevalence of goiter variants in the Random Group. Abbreviations are explained in Table 1. The General Population was taken as the same Random Group, after correcting for the INDEC masculinity index (see text).

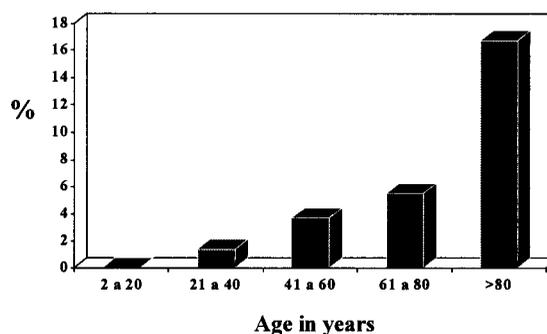


Fig. 4.– Prevalence of thyroid nodules in Random group individuals subdivided according to ages.

was found. When the prevalence of nodular goiter was calculated as a function of age, there was a definite increase with more advanced age (Fig. 4). Younger individuals (up to 40 years of age) had a 1.2% frequency of thyroid nodules, but those over 40 years of age reached, as a group, 4.6% of nodular goiter. In contrast, the prevalence of diffuse goiter was lower in elder subjects, reaching 8.8% in the younger group and 3.0% in the one over 40 years of age.

*Induced Group*

With a total of 500 individuals, this group comprised 453 women (90.6%) and 47 men (9.4%). Female ages ranged from 2 to 82 years, and male ones from 3 to 83 years. The age distribution of women and men is shown in Figure 1. The total percentage of goiter was 14.4%, reaching 15.5% for women and 4.3% for men. Male: female goiter ratio was 3.6: 1, slightly smaller than that of the Random Group. The greater goiter prevalence in the Induced Group, compared with that of the Random Group, proved statistically significant in the chi square test ( $p < 0.005$ ).

Among individuals over 40 years of age, goiter prevalence was 13.4%, while in the younger group it reached

TABLE 2.— *Reasons for consultation of the Induced Group patients who had no family history of thyroid disease*

	%
Obesity	32.1
Goiter suspicion and/or neck complaints	15.7
Predisposing dermatological history	11.4
Menstrual cycle alterations	7.1
Asthenia	5.0
History of heart disease	4.3
History of rheumatic disease	2.1
Other causes	22.1

14.6%, a difference lacking statistical significance. None of the Induced Group individuals presented multinodular goiter, exclusively diffuse goiter proving the most frequent variant (73.6%), followed by solitary nodules in normal thyroid (20.8%) and, finally, by single nodules in diffuse goiters (5.6%). The frequency of each goiter variant in the total Induced Group population were as follow: 10.6% for diffuse goiter, 3% for solitary nodules and 0.8% for nodules that appears in the context of a diffuse goiter. As in the Random Group, the prevalence of thyroid nodules was substantially higher in patients over 40 years of age, this subgroup comprising 89.5% of cases. A 26-year-old patient presented, besides a diffuse goiter, a thyroglossal cyst.

When the Induced Group was split into two populations with and without a family history of thyroid disease, it was observed that goiter percentage was 13.1% for the former and 17.8% for the latter. Although failing to reach significance level ( $p=0.06$ ), this differential trend could end up by becoming meaningful with a larger number of individuals. The reason for consultation of subjects without a family history of thyroid pathology was varied. Table 2 lists the causes reported by these individuals to attend the goiter detection campaign.

## Discussion

The epidemiology of goiter remains a relevant issue in areas where inhabitants suffer an environmental deficit of iodine. For more than three decades, Law 17259/67 compels Argentine salt companies to iodize salt for human and animal consumption throughout the national territory<sup>2</sup>. The metropolitan area of Buenos Aires never had a severe lack of iodine prior to the compulsive use of iodized salt<sup>3</sup>. However, an epidemiological survey conducted in Buenos Aires before establishing prophylactic measures found a 14.8% goiter prevalence<sup>4</sup>. Starting from 1970, it became a region where iodine deficiency disap-

peared<sup>5</sup>, presenting an average urinary iodine excretion of roughly 200  $\mu\text{g}/\text{day}$ <sup>6</sup> and goiter prevalence decreased to 8.5%<sup>4</sup>. Thus, the present campaign of goiter detection affords the opportunity to determine its prevalence regardless of the variations that depend on dietary iodine content. For such a reason, gleanings of these epidemic, previously unavailable data in our environment, was part of the main goals that prompted us to organize the so-called Thyroid Survey Week.

As widely recognized, goiter is the common denominator of many thyroid disorders, and is present in nearly 90% of untreated thyroid pathology, so that its detection encompasses a broad spectrum of thyroid diseases commonly found in the general population. Perhaps, the only subgroup of autoimmune thyroiditis that develops without goiter is a small part of its hypothyroid variant<sup>7</sup>, proving the single thyroid disorder that, in practice, is not detected in the monitoring modality carried out in this campaign. Lastly, the rare cases of hyperthyroidism of the elderly with normal thyroid palpation and, obviously, carriers of thyroid incidentalomas, could be added to the group of non-goiter patients.

The division into two groups (Random and Induced) of the examined individuals was intended to gain an accurate idea, on the one hand, of what occurs in the general population not subjected to any bias and, on the other, to discern the true extent of thyroid pathology in subjects who may be classified as a population at risk. Therefore, it is quite reasonable to observe differences in goiter prevalence between both groups (Fig. 5).

On analyzing their percentage in the Induced subgroup lacking a family history of thyroid disease, as compared with the Random group, we observed that goiter frequency proved two-fold. This finding is of considerable interest because it supports the need to search for thyroid pathology in all individuals consulting for other causes, but whose non-endocrinological disorder may be related, either directly or indirectly, with thyroid gland disease. Following this line of thought, our results also advocate moni-

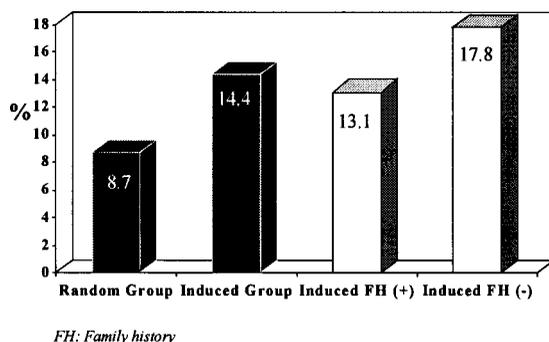


Fig. 5.— Goiter prevalence in each group, Random and Induced [black bars], and in subgroups (with and without a family history of thyroid disease) of the Induced Group [white bars].

toring consanguineous family members of thyroid disease carriers, in whom a simple neck palpation may prove relevant.

In the worldwide literature, there are several reports on the incidence and prevalence of goiter in the general population<sup>8-10</sup>. However, as far as we have been able to ascertain, there are none available where an Induced population is compared with one of a Random nature, as that carried out by us during the Thyroid Survey Week. The classic United Kingdom Whickham survey<sup>8</sup> disclosed that goiter prevalence diminished with patient age, since a follow-up survey conducted 20 years after the first one showed significantly lower frequencies. In 1993, the latter report documented 10% frequency in women and 2% in men. These figures closely tally with ours, as we recorded similar percentages of goiter in Random Group subjects, i.e., 9.5% in women and 2.3% in men. In the Framingham study, Vander et al.<sup>9</sup> found a 4.2% prevalence of palpable nodules in a population whose ages ranged from 30 to 59 years, in comparison with our 2.5% figure for nodular pathology for the general population (corrected by the INDEC masculinity index). However, such frequency approached 4% in individuals comprised within the age slot from 41 to 60 years, proving very similar for age-matched subjects of the Framingham study.

As well documented, the prevalence of nodules in a community varies according to the methodology used for their detection. Thus, the greatest frequency is observed in autopsy specimens (13-65%), followed by echography (19-35%) and lastly by palpation (0.2-5.1%)<sup>10</sup>. In all likelihood, palpation performed by experienced hands disclosed with greater certainty the group of nodules with clinical relevance. Except for a minor percentage of incidentalomas, detected by echography, the great majority proves no more than a simple finding of doubtful significance.

As regards exclusively diffuse goiters, the cases that we have seen should have been mostly in patients with thyroiditis. This statement is based on the fact that autoimmune thyroid pathology is, in the adult, the most common cause of diffuse enlargement of the thyroid gland<sup>7</sup>. Another cause of diffuse goiter is simple goiter<sup>11</sup>. Quite likely, these two pathologies were responsible for the almost entirety of the observed diffuse goiters, except for a couple of cases of hyperthyroidism due to Graves' disease that belonged to the Induced Group without a family history of thyroid disease. It should be highlighted that one of these patients attended due to menstrual alterations, while the other one did so due to palpitations. In both cases, they related their symptoms with the thyroid through the press information that one of us (H.N.) provided before television media to promote the campaign. In a single case, also belonging to the Induced Group, a thyroglossal cyst was detected in a carrier of a

diffuse goiter. This finding confirms the very low prevalence of these cysts in the general population<sup>12</sup>.

Wang and Crapo<sup>10</sup> have pointed out that the prevalence of hidden thyroid cancer differs by two logarithms when comparing it with clinically evident thyroid cancer, from which they inferred that most hidden carcinomas never reach clinical relevance. In a study carried out over a decade ago, while searching for the incidence of thyroid cancer in the metropolitan area of Buenos Aires, we found that this was one of 35 new cases per million inhabitants per year<sup>13</sup>. Bearing in mind that the statistical probability that a thyroid nodule should be cancerous is nearly 5%<sup>14</sup>, in the present study, where we recorded 2.5% of nodules in the general population, perhaps only one out of every 3 or 4 palpable malignant neoplastic nodules are finally diagnosed as such. The query posed is therefore: What happens to the other 2 or 3? Although the answer is uncertain, it is reasonable to believe that such patients would hardly ever experience any outcome attributable to those tumors.

Interestingly, within the Induced Group, a slightly higher frequency of goiter was disclosed in subjects lacking a family history of thyroid disease, when compared to those with such a history. Perhaps the explanation is that such subgroup had a greater risk for the type of ailments that prompted them to participate in the goiter detection campaign.

Another absorbing finding of our study arises from the observation that the percentage of solitary nodules, in glands apparently normal to palpation, proved three-fold higher in the Induced Group as compared to the Random Group (3.0% vs. 0.9%). In a recent report<sup>15</sup>, we have stressed that follicular adenomas present a greater risk of developing in glands affected by thyroid autoimmunity than in absolutely normal glands. In that work, we only studied adenomas presenting as single nodules in an apparently normal thyroid. Assuming that Induced Group patients probably have a greater frequency of thyroid autoimmunity than those in the Random Group, it may readily be inferred that findings from both studies would bear a logical inter-correlation.

To sum up, it may be stated that the "Thyroid Survey Week" campaign rendered valuable information to discern the status of goiter among the inhabitants of Buenos Aires metropolitan area, disclosing significant differences between Random and Induced Group individuals. Furthermore, given the paucity of available data on the epidemiology of goiter in this South American population, these results are useful to build the world map of goiter prevalence in non-endemic areas. Moreover, such data support the recommendation that thyroid palpation should be included in the clinical examination of all patients, regardless of the specialty of the attending physician. Although palpation, even when performed by the highly skilled, lacks the sensitivity of ultrasound in search-

ing for small nodules, it still affords the advantage of negligible economic cost and, when carried out by expert hands, is able to detect most of the clinically relevant thyroid pathology.

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## LA PORTADA

### Cultura Santa María. Hacha ceremonial

**Hacha ceremonial.** Hacha de bronce, realizada con vaciado en molde, radiada y con gancho. Tiene motivos geométricos y antropomorfos, 31 cm x 26 cm x 0,3 cm. Procede de Salta. Cultura Santa María, Valliserrana, del período de los Desarrollos Regionales, 900-1470 d.C. [37017]. Museo Etnográfico Juan B. Ambrosetti FFyL UBA. Director: Dr. José A. Pérez Gollán. Foto: Cristina Fraire. Selección de imagen y epígrafe: Lic. Vivian Spoliansky (Archivo fotográfico y documental).

**Cultura Santa María:** Período Tardío, posterior al Imperio Tiahuanaco (Tiwanku) o de los Desarrollos Regionales, 900 a 1400 d.C.. Yacimientos arqueológicos en valles Calchaquíes (Santa María, del Cajón, de Tafí, Calchaquí), provincias de Catamarca, Salta y Tucumán. Comunidades agricultoras con animales domésticos (camélidos, cobayo, chinchilla), usaron la irrigación artificial. Técnica metalúrgica elaborada. Influenciada por la cultura de La Aguada. Cerámica con decoración pintada, no incisa. Al finalizar este período el Imperio Incaico domina los valles del Oeste, construye caminos con paradores (tambos) y fortalezas (pucarás).