Pattern of clinical benign euthyroid goitre in a tertiary care center in the Central Province of Sri Lanka from 1981-2011

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Abstract

Objectives To describe the pattern of clinical euthyroid-goitre in a tertiary care unit in Sri Lanka before and after iodination of salt in Sri Lanka.

Methods We reviewed our thirty-one year computerised database of patients with goitres, spanning iodination in 1995.

Results Prevalence of euthyroid clinical simple diffuse goitre did not reduce during the first thirteen years (p=0.822). However, it reduced in the latter four years from 2008 to 2011. There is significant reduction of prevalence in the younger age groups (p<0.001). A significant reduction of nodular change was observed in all groups within seven years after iodination (p<0.001).

Conclusions There was a significant reduction in the prevalence of clinical nodularity in the post-iodination era in all age groups. Reduction in prevalence of clinical euthyroid simple diffuse goitre was observed only during the period 2008-2011.

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Introduction

The implementation of compulsory iodination of salt as a national policy in 1995 has changed the pattern of thyroid malignancy in Sri Lanka [1]. That salt iodination can affect the pattern of benign euthyroid disease (BETD) is well documented [2,3,4]. Most studies from Sri Lanka which looked at prevalence of goiters show a reduction in prevalence of Grade I BETD after iodination. The surveys detected very few clinically significant (Grade II- visible goitre and above). There has been no published data on the change in prevalence of clinical goitre in Sri Lanka.We analysed a database of patients with BETD over a thirty one year period, which spans iodination of salt, to see if the changes in the patterns of presentation are salutary.

Methods

Six thousand three hundred and eighty three patients with thyroid disease were seen and examined by the first author and later by the fifth author or a trained Senior Registrar, in the General Surgical Clinic (GSC) of Teaching Hospital, Peradeniya over a thirty-one year period from 1981 to 2011.

The functional status of the gland was assessed both by clinical and biochemical means. Fine needle aspiration cytology (FNAC) and thyroid antibody status where indicated and available reinforced the diagnostic categorisation. As ultrasound assessment for subclinical nodules was not performed during the early years and this data was not taken into consideration. The detailed data of these patients were transferred on to a digitized format and recorded on a spread sheet at frequent intervals throughout this period.

From this group (n=6383) of patients, 1833 clinically diagnosed as having euthyroid simple diffuse goitre (ESDG) and 3718 with euthyroid multinodular goitre (EMNG) were selected for the study. Patients with clinical solitary or dominant nodules who had a FNAC diagnosis of a colloid nodule were classified into the EMNG group. The size of the thyroid was graded according to the WHO grading system.

The patients in both groups were divided into two main cohorts, those seen during the pre-iodination, era from 1981 to 1994 (Pre) and post iodination era from 1995 to 2011 (Post). These cohorts were further subdivided depending on the year of presentation. The time periods spanned from four to seven years to identify trends. These were Pre-1-1981 to 1987, Pre-2-1988 to 1994, Post-1-1995 to 2001, Post-2-2002 to 2007 and Post-3-2008 to 2011. The prevalence of goiter was structured according to time period and age group.

The age structured admissions to the GSC, as per year, during the respective period of the study, was recorded and taken into account, in calculating the relative prevalence of goitres as per year and age group.

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Statistical analysis was done using independent samples t test and chi-squared test using a SPSS 20 package. Approval was obtained from the Ethical Review Committee of the Faculty of Medicine, Peradeniya.

Results

One thousand eight hundred and thirty three patients had ESDG. The mean age at presentation was significantly higher (+1.49 years) in the post iodination cohort (p<0.001). There were more females in both pre and post iodination eras. Female to male ratio was higher in the post iodination era (Table 1 and Figure 1). During the initial thirteen years from 1981-1994, there was no significant reduction in prevalence of ESDG (p=0.877). However,the prevalence during 2008-2011 was significantly lower (p<0.001). The prevalence was significantly lower in the younger age groups (Table 2). The change in prevalence was similar among males and females.

The percentage prevalence of ESDG according to grade in the pre-iodination period was Grade I=13.1%, Grade II=76.6% and Grade III=9.8%. The prevalence according to grade in the post iodination period was Grade I=21.1%, Grade II=73.6% and Grade III=5.1%. The percentage prevalence of ESDG related to general surgical clinic admissions according to grade in pre iodination period was Grade I=0.2%, Grade II=1.4% and Grade III=0.2%. The prevalence according to grade in the post iodination period was Grade I=0.3%, Grade II=1.0% and Grade III=0.1%

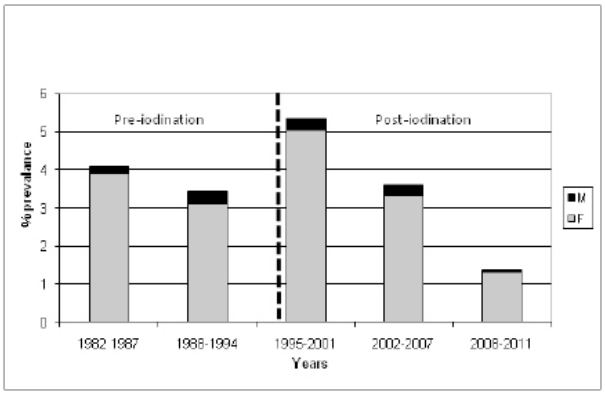

Figure 1. **Changes in percentage prevalence of euthyroid simple diffuse goitre from 1982 to 2011.**

Three thousand seven hundred and eighteen patients had EMNG. The mean age at presentation was significantly higher (+ 5.93 years) in the post-iodination cohort (p<0.001) (Table 3). Figure 4 shows that prevalence of EMNG declined in the period after iodination. To explore if younger age groups were presenting with less nodularity in the post-iodination period, the proportion of EMNG to all GSC admissions according to age group for the pre and post iodination eras was compared (Figure 2). Table 4 shows a significant reduction in the prevalence of clinical nodularity in the post-iodination era in all age groups. This was seen among both males and females. The percentage prevalence of EMNG according to grade in the post iodination period was Grade I=4.6%, Grade II=53.2% and Grade III= 3.3%.

The proportion of Grade II and III EMNG related to general surgical clinic admissions in pre iodination group was 2.2 for Grade II goitres and 2.2 for Grade III goitres. In the post-iodination period there was significant reduction in Grade II (1.5%) and Grade III (0.7%) goitres (p<0.001). There was also a reduction in the admissions of Grade IV goitres.

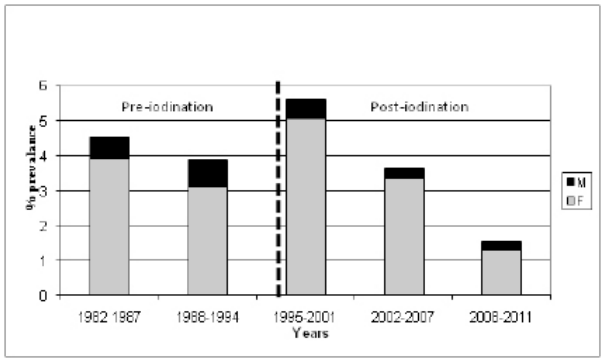

Figure 2. **Changes in prevalence of euthyroid multi nodular goitre from 1982 to 2011.**

Discussion

Table 1. Demography of euthyroid simple diffuse goitre – pre and post iodination

	Pre-iodination (1981-1994) (n=713)	*Pre-iodination* 1 (1981-1987) (n=240)	*Pre-iodination* 2 (1988-1994) (n=473)	*Post-iodination* (1995-2011) (n=1120)	*Post-iodination* 1 (1995-2001) (n=627)	*Post-iodination* 2 (2002-2007) (n=397)	*Post-iodination* 3 (2008-2011) (n=96)
Male: female	1:12	1:17.5	1:10.3	1:16	1:17.4	1:12.7	1:31
Mean age, SD (years)	22.28 (8.30)	22.42 (7.73)	22.21 (8.57)	23.77 (9.0)	23.16 (8.26)	24.17 (9.62)	26.15 (10.40)

Table 2. Proportion of euthyroid simple diffuse goitre to clinic admissions according to age

	Pre iodination prevalence % (n)		*Post iodination prevalence % (n)*			
Age (years)	1981-1987	1988-1994	1995-2001	2002-2007	2008-2011	
0-10	1.1 (4)	0.8 (12)	1.3 (11)	2.2 (9)	0.0 (0)	p=0.066
11-20	11.1 (104)	10.3 (226)	14.2 (257)	10.4 (142)	4.5 (31)	p<0.001
21-30	6.1 (103)	5.1 (175)	9.5 (266)	6.4 (172)	3.5 (45)	p<0.001
31-40	1.6 (19)	1.4 (42)	2.5 (62)	2.1 (47)	0.5 (8)	p=0.001
41-50	0.8 (6)	0.5 (11)	1.1 (24)	0.8 (19)	0.5 (9)	p=0.198
51-60	0.4 (3)	0.4 6)	0.3 (5)	0.3 (6)	0.1 (2)	p=0.721
Total	4.1 (239)	3.4 (472)	5.4 (625)	3.6 (395)	1.4 (95)	p<0.001

Table 3. Demography of euthyroid multi nodular goitre- pre and post iodination

	Pre-iodination	*Pre-iodination*	*Pre-iodination*	*Post-iodination*	*Post-iodination*	*Post-iodination*	*Post-iodination*
		1	2		1	2	3
	(1981-1994) (n=1588)	(1981-1987) (n=495)	(1988-1994) (n=1093)	(1995-2011) (n=2130)	(1995-2001) (n=1007)	(2002-2007) (n=785)	(2008-2011) (n=338)
Male: female	1: 10	1: 12.4	1: 9.2	1: 13.4	1:12.4	1:14.4	1:14.4
Mean age, SD (years)	34.55 (12.56)	33.31 (11.58)	35.11 (12.91)	40.48 (14.19)	38.07 (14.06)	41.89 (13.84)	44.35 (14.08)

Table 4. Proportion of euthyroid multi nodular goitre to clinic admissions according to age

	Pre iodination prevalence % (n)		*Post iodination prevalence % (n)*			*Significance*
Age (years)	1981-1987	1988-1994	1995-2001	2002-2007	2008-2011	
11-20	7.3 (68)	6.1 (133)	5.8 (104)	2.9 (39)	2.2 (15)	p<0.001
21-30	9.8 (166)	8.7 (297)	7.7 (215)	5.2 (140)	3.4 (43)	p<0.001
31-40	12.4 (148)	10.9 (329)	10.2 (257)	8.2 (184)	5.6 (81)	p<0.001
41-50	8.6 (68)	9.3 (193)	10.1 (221)	8.8 (203)	5.1 (85)	p<0.001
51-60	4.5 (37)	5.9 (93)	8.8 (136)	7.7 (145)	4.3 (68)	p<0.001
61-70	0.9 (4)	3.4 (35)	5.5 (52)	4.0 (54)	4.0 (38)	p=0.002
71-80	1.8 (3)	2.1 (8)	2.7 (10)	3.7 (17)	1.2 (5)	p=0.182
Total	8.2 (494)	8.0 (1088)	8.2 (995)	6.3 (782)	4.2 (335)	p<0.001

There was a significant reduction in the prevalence of clinical nodularity in the post-iodination era in all age groups. The reduction was marked seven years after iodination. Reduction in prevalence of clinical euthyroid simple diffuse goitre was observed only during the period 2008-2011. In contrast, in the post-iodination period euthyroid multinodular goiters were significantly smaller and less prevalent. This decline in EMNG was seen seven years after iodination and was observed in all age groups. We found a reduction in the prevalence of ESDG in the age groups 11-40 years. This may be because the iodination policy was implemented in 1995, and those who were teenagers at the time, would be in the 20 to 40 year age cohort.

The finding that there was no reduction in the prevalence of clinical euthyroid simple diffuse goiter in the first decade after iodination contrasts with the findings of two previous surveys carried out on schoolchildren,

islandwide in 2001 and 2005 [5,6]. These showed that the prevalence of goitres reduced not only in the Central Province from 24.3 to 11.3%, but nationally as well from 20.9 to 3.6% [5,6]. Another survey done in 1998 and again in 2001 also on schoolchildren in Sri Lanka showed an improvement in the urinary concentration of iodine and a reduction in the ultrasound assessed thyroid volumes [7]. The goitres observed in these surveys were almost all ESDG and 99% were grade I quite in contrast to the more easily assessable grade II or larger goitres which were predominantly seen in our clinic sample [5,6]. It is important to discuss why the prevalence of ESDG in our study only began to decline midway into the second decade after iodination.

The reason why the prevalence rate did not decline initially in the Central Province, from where most of ourpatients came, maybe reflected in the urinary concentrations of iodine in schoolchildren in the Central Province [5,6]. It was reported as being less than ideal, the proportion of children so affected increased from 38 to 43.5% in the Central Province during the two five year, post iodination periods of 1995-2000 and 2001-2005. This period spanned the early part of this study [5,6]. This suggests that the iodination programme may have been inadequate during the early years. This raises the question should we look again at the effectiveness of iodination of salt in the Central Province.

Studies have shown that salt packs sold in the retail market in the Central Province with an iodine content of less than 25 ppm reduced from 47.4% in 2000 to 29.6% in 2005 [5,6]. Nationally the recommended minimum iodine content was reduced to 15 ppm and only 5.6% of salt packs sampled were below this level. One wonders whether the dietetic iodine needs in the Central Province was underestimated. It may have been miscalculated based on wrong estimates of household salt consumption or inaccurate estimations of loss during cooking.

Studies from India and Cotre d'Ivoire have shown persistence of goitre in the post iodination era [8,9]. It is also possible that goitrogens such as seleniumin red rice and fluoride may be responsible for goitres which could explain the occurrence of goitres even with normal urinary iodine concentrations [10,11]. Studies have shown a lag period after mandatory iodination of salt. However in our study there was a lag period of more than thirteen years before we began to observe reduction of ESDG [12]. It is interesting to speculate as to what caused the lag in the reduction of prevalence of goitres. Could it be due to the onset of subclinical thyroiditis that is well known to follow iodination? A study of iodine deficiency done in 2010 shows that the percentage of children with low urinary iodine concentrations was 37.9% [13].

The significant reduction in the prevalence of clinical EMNG in all age groups, seems to suggest, effective iodination in the first decade of post-iodination. It is possible that lower concentrations of iodine, though not reducing rates of ESDG, are able to inhibit nodular change. The reduction in the rate of clinical EMNG alone is no doubt a salutary change brought on by iodination, not only from a cosmetic point of view, but also as it reduces complications such as retrosternal and retrotracheal extensions with their inherent risks of obstruction as well as, secondary toxicity and possible malignant change.

There are several limitations to our study. The inter-observer variation in the evaluation of the thyroid both in community survey and in a clinical setting can be minimized by the use of ultrasound assessment. We did not use ultrasound assessment but all patients were assessed by consultants or senior registrars. This study is based on data from a single surgical unit. It is possible that presentation to other units and other hospitals in the Central Province are different. Since data were collected over many periods it is also possible that extraneous factors such as access to health care influence presentations to hospitals.

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Conflicts of interest

There are no conflicts of interest.

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