EFFECT OF PINEAPPLE ON GOITER SIZE AND TSH LEVEL

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ABSTRACT

BACKGROUND: Endemic goiter is a major worldwide problem and is a preventable disease. More than 12% of world population is affected. Ananas Comosus is considered to be a good source of iodine and vitamin c, which reduce the size of goiter.

OBJECTIVE: The study objectives were, 1.To measure the goiter size reduction between study and control groups at 4, 8, and ten weeks of intervention 2.Suppression of TSH level up to 25% from base line.

MATERIALS AND METHODS: The study design was Randomized control Trial and Simple Random sampling technique was applied. The Sample Size was 70; study group 35, control group 35. Dose Standardization was done by P.C.S.I.R laboratories complex Lahore. Exclusion Criteria. Subjects suffering from bleeding disorder, liver disease and thyrotoxicosis. History of thyroid surgery, solitary nodular goiter with history of pain and regional lymphadenopathy. Diabetes mellitis, History of use of iodized salt, contracting marriage. Goitrogenic food/marine foods intake, change in bowel habits

RESULTS: Subjects suffering from endemic goiter were selected from teaching hospital D.G Khan. Goiter size measurement and TSH estimation was done at 0, 4, 8 and 10 weeks of study. Goiter size reduction from baseline 4.41 ± 0.86 cm to 2.00 ± 1.02 after eight week of intervention was highly significant among study group $P < 0.000$, and TSH suppresses from baseline 2.63 ± 0.95 to 0.94 ± 0.84 after eight week $P < 0.000$. While changes in control group were non significant.

CONCLUSION: Ananas Comosus is good alternator remely for endemic goiter patients and a valuable goiter shrinkage agent.

KEY WORDS: PCSIR, Goiter, Ananas Comosus, TSH

INTRODUCTION

World Health Organization has declared endemic goiter a major world-wide problem and public health priority¹. It is a preventable disease, and threat to social and economic development of poor countries. More than 12% of world population is affected². Endemic goiter is more prevalent in hilly areas³. The fact that iodine deficiency plays a major role in the genesis of endemic goiter⁴. In Pakistan an alarming high prevalence of endemic goiter has been reported

from Northern Areas of country in laps of Himalyas⁵.

Unreliable assessment of iodine deficiency, poor iodine supplementation, inadequate education, publicity, cost effective are deadly sins, to be avoided in order to achieve sustainable elimination of iodine deficiency¹. National Utilization level of iodized salt is only 17% as projected in the Economic Survey of Pakistan. Which is drastically lower than W.H.O recommending level $> 90\%$ level due to non availability and high priece⁶.

People residing in goitrous areas can only obtain enough iodine by consuming sustainable portion of their food in form of marine food, foods from iodine rich regions and using iodized salt⁷. Iodine is unstable and has largely been replaced by iodate due to sublimation⁸. Effects of iodine deficiency are worsened if selenium level is low⁹.

Ananas comosus has been used for its medicinal properties for hundreds of years. It has broad spectrum of actions and a good source of iodine and vitamin C¹⁰.

Bromelain is an enzyme complex, present in fruit and stem of pineapple, which is key to pineapple medicinal use¹¹. Bromelain is an effective anti-inflammatory agent. Pineapple juice is used to treat morning sickness and sea sickness. Two slices of fresh pineapple (25mg) contain 1 mg of iodine and 100 mg of vitamin C is a recommended adult dose per day¹². It enhances the absorption and permeability of Amoxicillin and Tetracycline in diseased tissue so its synergistic effect is documented¹³.

Contact dermatitis is reported as side effect of prolong use of pineapple. Safety during pregnancy and lactation is not documented yet¹⁴.

MATERIALS AND METHODS

This study was conducted in the department of physiology postgraduate medical institute, Lahore. A total member of 70 female patients with goiter were included in this study. Patients were selected from DHQ Hospital, Dera Ghazi Khan. Planned visits were made to subjects homes, along with a female nurse, to explain study design and other details to each subject. Lists of foods and fruits of high iodine content was provided to the subjects and advised not to consume these foods during study period. Subjects were randomized and divided into two groups: Study Group and Control Group. After taking a formal written consent of the subjects, each participant of study group consumed 26.7 gm per day of fresh pineapple fruit. A blood sample of 5 ml was aseptically drawn from each subject for baseline levels of parameter to clot for 15-20 minutes. Then it was centrifuged for

ten minutes at 5,000 rpm. Serum was stored. At -20 C in serum cups. Microlab-300 Analyzer was used for serum TSH estimation by ELISA kits Human Germany. All subjects of study group had taken 27 gm of fresh Ananas comosus daily for a period of eight weeks. Fresh pineapple weighing 26.7 gm per day ingestion means ingesting one mg of iodine per day. This dose standardization was done by the PCSIR Laboratories Complex, Lahore (certificate No. FBRC/AJ/ANAL/REP/206 Dated 1-04-2010) which utilized the Pearson's composition and analysis of food 1992 method¹⁵.

Blood samples were drawn aseptically from both study and control groups for TSH estimation at 04, 08 and ten weeks of study. Goiter size was measured with vernier

Caliper at onset of study and subsequently at four, eight and ten weeks. Findings were recorded on evaluation proforma.

RESULTS

At the start of study, no significant difference was noted in age, T₃, T₄, TSH, goiter size and hemoglobin levels of both groups (Table 01).

Table 1 Baseline Characteristic on 1st day

Characteristics	Study group (n=29)	Control group (n=30)
Age in years	19.86 ± 3.96	19.27 ± 3.17*
Goiter size	4.41 ± 0.86 cm	4.33 ± 1.05 cm*
T ₃	1.29 ± 0.46 ng/ml	1.45 ± 0.46 ng/ml*
T ₄	7.78 ± 1.96 ug/dl	6.84 ± 2.17 ug/dl*
TSH	2.63 ± 0.95 miu/l	2.74 ± 1.44 miu/l
Hb%	11.10 ± 2.19 gm%	10.91 ± 2.35 gm%

Results are expressed as mean ± SD

- ----- P>0.05-Non significant
- ----- P<0.05-Significant
- ----- P<0.001-Highly significant

Every participant of study group consumed 26.7 gm per day of fresh pineapple fruit, while Control group did not consumed the pineapple during the study period.

After four and eight weeks of pineapple ingestion, reduction in goiter size was 31.25% and 54.83% respectively. While within control

group, changes in goiter size at four and eight weeks were non-significant ($P>0.5$). At ten week goiter size reduction in study group was 50.03%. No significant reduction was seen in control group.

TSH levels in the study group were highly significantly ($P<0.001$) reduced at four and eight

weeks after pineapple ingestion. After the cassation of pineapple ingestion at eight weeks, the TSH levels returned towards the baseline and they were non-significantly different from the baseline (Table 02).

Table 02: Comparison of Goiter Size and TSH levels within control and study groups at various points of study duration

Time	Control Group (n=30)		Study Group (n=29)		Control Group (n=30)		Study Group (n=29)	
	Goiter size (cm)	Reduction	Goiter Size (cm)	Reduction	TSH level	Reduction	TSH level	Reduction
Baseline	4.23 ± 1.05		4.41 ± 0.86		2.74 ± 1.44		2.63 ± 0.95	
4 Weeks	4.23 ± 1.09*	2.38%	2.99 ± 0.53***	31.25%	2.73 ± 1.37	0.95%	0.41 ± 0.19***	82.31%
8 Weeks	4.22 ± 1.04*	2.47%	2.00 ± 1.02***	54.83%	2.72 ± 1.30	2.45%	0.94 ± 0.84***	56.61%
10 Weeks	4.21 ± 1.15*	2.98%	2.17 ± 1.09***	50.03%	2.69 ± 1.57	4.36%	2.44 ± 0.70	3.17%

- ----- $P>0.05$ -Non significant
- ----- $P<0.05$ -Significant
- ----- $P<0.001$ -Highly significant

By applying independent sample t-test, the comparison between the two groups at four, eight and ten weeks, goiter size was highly significant ($P<0.001$) reduced in the study group as compared with the control group.

While comparing TSH levels between study and control groups, TSH levels reduced highly significantly ($P<0.001$) in the study group at four and eight weeks. At week ten the TSH levels were non significantly ($P>0.05$) different between study and the control group (Table 03).

Table 03 Comparison of Goiter Size ad TSH levels between control and study group

Time	Goiter Size		TSH level	
	Control Group (n=30)	Study Group (n=29)	Control Group (n=30)	Study Group (n=29)
Baseline	4.23 ± 1.05	4.41 ± 0.86*	2.74 ± 1.44	2.63 ± 0.95*
4 Weeks	4.23 ± 1.09*	2.99 ± 0.53***	2.73 ± 1.37	0.41 ± 0.19***
8 Weeks	4.22 ± 1.04*	2.00 ± 1.02***	2.72 ± 1.30	0.94 ± 0.84***
10 Weeks	4.21 ± 1.15*	2.17 ± 1.09***	2.69 ± 1.57	2.44 ± 0.70*

- ----- $P>0.05$ -Non significant*
- ----- $P<0.05$ -Significant**
- ----- $P<0.001$ -Highly significant***

DISCUSSION

Visible goiter causes cosmetic disfigurement of neck. Iodine deficiency leads to decreased serum T_3 , T_4 , which results in high TSH level. That causes enlargement of thyroid leading to goiter¹⁶. No study was found on literature search which described the effects of fruits like pineapple on

goiter size and TSH levels. This study is actually a pioneer study in this field. So, no direct comparison is possible with other studies. In our study, subjects in control and study groups were non-significantly different, as far as goiter size and thyroid status is concerned.

After the ingestion of pineapple by study group for eight weeks, goiter size and TSH levels were

compared for each subject. At four and eight weeks, (during pineapple ingestion) goiter size was significantly reduced during pineapple ingestion in the study group and goiter size remained reduced after the cessation of pineapple ingestion at ten weeks.

As shown in Table 03, goiter size and TSH levels were non-significantly different at baseline between the control and study groups. At four and eight weeks goiter size and TSH levels were significantly reduced in the study group as compared with the control group.

At ten week the goiter size in the study group remained decreased significantly in the study group as compared with the control group. The TSH levels at week ten in the study group returned towards its baseline and were non significantly different from that in the control group.

Numerous studies have been carried out, using various chemical substances to determine their effects on goiters size and TSH levels. But evidently no study appears to evaluate effects of natural substances especially fruits like pineapple and strawberries on development or otherwise of goiters.

Guglielmi et al (2004) established the role and efficiency of per-cutaneous Ethanol injection (PEI) in benign thyroid lesions. Fifty eight recurrent cystic nodules and soft autonomous functioning nodules were treated by PEI for six years¹⁷ while in our study seventy female patients having goiter were studied. Iqbal et al (2006) concluded that significant TSH suppression was noted with thyroxin supplementation for one year which was given 50-100 ug/day among interventional group. In our study pineapple was ingested for only 8 weeks. So, duration of treatment with pineapple can be reduced significantly¹⁸.

In our study significant TSH suppression was noted in study group just after four weeks of intervention. Brenta et al (2003) described comparison of therapeutic efficacy in L-Thyroxin and Tri-iodo-Thyro acetic acid (TRIAC) in non toxic and nodular goiters. Thirty six women were studied for eleven months after randomization. After II months, goiter size was

reduced to 42% in TRIAC group, while in our study goiter size reduction was more than 50% of initial size. In comparison with study of Brenta et al (2003)¹⁹ pineapple ingestion produced more reduction in size within four weeks. Findings of our study also conform to recommendations of Food and Drug Administration (2013) for TSH monitoring at 6-8 weeks interval until normalization²⁰. Our study showed significant suppression in serum TSH levels and highly significant goiter size reduction with 8 weeks of pineapple ingestion.

Zimmermann MB (2008) while tracing history various studies during last century or so, referred to a study of Marine and Kimball involving iodine intervention in school children of Akren and Ohio, USA. They treated young girls by 200 mg of sodium iodide for 10 days, equivalent to 1700 mg of iodine in total, while double dose was given to older girls, while in our study 26.64 gm / day of fresh pineapple containing 1 mg iodine was ingested by young females for eight weeks. In our study goiter size was reduced significantly with a given safe dose.

Zimmermann et al (2005) reported that iodine intake for short period in doses 500-1000mg/day have inhibitory effect on Thyroid function. In our study safe but effective dose of iodine (1 mg/day) as fresh pineapple was given for short period of eight weeks, which resulted in significant goiter size reduction and significant TSH inhibition²².

Fresh pineapple can be taken as a food item and is cost effective in quantity required. It can act as a good therapeutic agent for endemic goiter patients. It is suggested that further studies should focus to compare the relative efficacy of pineapple as source of iodine supplementation with other iodine supplementation agents.

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