

DR. A. SIVAPATHASUNDARAM (INAUGURAL)
MEMORIAL LECTURE — 1990



“Factors influencing Malignancy in Northern Province”

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KRISHNARAJAH, V *

Mrs. Sivapathasundaram & children, other members of the family of (Late). Dr. Sivapathasundaram, Chairman, Members of the Memorial Committee, Ladies and Gentlemen, I thank the Memorial Committee for giving me the privilege of delivering the Dr. Sivapathasundaram (Inaugural) Memorial lecture. Unlike many other memorial lectures, this lecture is dedicated to one, who had his date with destiny, at a relatively young age and in a violent manner. To those of you, who hadn't the opportunity to meet or know him well, let me introduce, my friend, colleague and gentleman.

Dr. Sivapathasundaram was born to Somasundarampillai Arunasalam (who was a school master) and Valliammai on the 23rd of November 1939, at Puloly, Point Pedro and was named after his grand-uncle, the Late S. Sivapathasundaram, a former Principal of Victoria College and popularly known as Saiva Periyar. His elder brother is Mr. A. Somasundarampillai, well known and successful accountant, who is also Managing Director of Merchant Finance Ltd. I had the privilege of taking part in debates in the Senior Literary Association Meetings in Hartley College, with Mr. Somasundarampillai,

who was then teaching there, as the moderator. Of three sisters, the eldest is a housewife, the other, Dr. Mrs. Maheswary Thiagarajah, was in our student days teaching at Vadamaradchy Hindu Girl's College and is now Head of the Tamil Department at the University of Peradeniya. The youngest sister retired as a Graduate Teacher. His other brother is Mr. A. Rajasundaram, Consultant Engineer, United Nations Development programme in Fiji.

Dr. Sivapathasundaram had his primary education at Vadamaradchy Hindu Girls College and Secondary Education at Hartley College. While at Hartley, he obtained a number of prizes for oratory and took part in Dramatics also. His part in dramatics was not confined to College. His skill was portrayed in Radio Ceylon with Dr. Sivathamby and later with others. He also inspired the Hospital Staff welfare Society to produce drama, he playing the chief role.

He obtained the Diploma in Child Health (Sri Lanka) in 1970, proceeded to London afterwards and obtained the Diploma in Child Health (London) in 1975 and the Membership

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of the Royal College of Physicians in 1977. During his career, he served in Ratnapura, Balangoda, Ragama, Kuliya-pitiya, Matara, Lady Ridgeway Hospital for Children, Colombo and Chilaw before assuming duties as Consultant Paediatrician at Base Hospital, Point Pedro on 1st of June 1974. Having served nine years at Pt. Pedro, he was appointed Consultant Paediatrician to the Teaching General Hospital, Jaffna in Feb. 1983. Sad to say, his period of service was interrupted by his exemplary qualities, paving the way for his demise.

As a paediatrician, he was punctual disciplined, conscientious, kind and left no stone unturned in the treatment of his patients. His clinical skill was good and his interests in his patient was such that, he would even come to the operation theatre to know all about his patients referred to us, the Surgeons. It does not stop with that. Even after operation he would inquire about the progress of his patient and express his desire to be called to sort out any medical problems, if necessary. His dealings with Colleagues, junior doctors and other staff were very friendly but if the occasion demanded, he would be stern with the staff for the sake of the patient. He treated all patients alike and followed them up keenly. He took an interest in the welfare of the Hospital and would come out with meaningful suggestions at staff conferences. He was one of the signatories to a Memorandum to the former President on the need for a 1200 beds New Teaching Hospital. Everyone remembers the protest march against the

shelling of the hospital and the vehement protests he made at the office of the Government Agent.

He took a great interest in the activities of the Jaffna Medical Association, often taking part in the clinical demonstrations and discussions. One could then discern the ample knowledge and clarity of thought, he had. This was a great boon for the students who clerked under him. He was elected Secretary of the Association in July '87 and functioned efficiently for the short period before his demise. He was also Secretary of the Parents Teachers Association of Vembadi Girls College and I am made to understand that he never missed a meeting. Such was his interest in anything he undertook. He was a good chess player and used to beat many of his opponents.

As an individual, he was a highly religious person, who performed poojas every morning and evening. He was a highly principled, honest, sincere and forthright person, never afraid to express his opinion. He was energetic and always ready to fight for a cause. It was these qualities that earned him displeasure and criticism from just a few but he was unperturbed because he knew it was persons with such qualities, who are sometimes subject to baseless and even false criticisms. He was always ready to help anyone in distress or need.

As a loving husband and father he discharged his family responsibility to their entire satisfaction. His burden was more because of the slight disability

of two of his four daughters, but his tender loving care kept them happy. His wife Mangaleswary comes of an educated family. Her father is a retired Principal of Arunodaya College, Alaveddy. She was always a source of inspiration, help and support to him in all his endeavours. We have lost such a great personality but I am sure his grateful patients, their parents and the community will remember him for ever.

Ladies and Gentlemen, I have tried to pay a fitting tribute to him the last few minutes, but as a person who was interested in the community there is no better tribute I can pay, than by delivering my lecture today on a subject concerning our community. "Factors influencing Malignancy (cancer) in Northern Province."

Panabokke. R. G¹, in his article (Ceylon Medical Journal) on "The Geographical pathology of Malignant Tumours in Sri Lanka", stated that the Northern Province showed the highest incidence (184 per 100,000 population) of malignant tumours in biopsy material among the nine provinces in Sri Lanka. Carcinoma of the oesophagus was 30 times higher, carcinoma of the liver 7 times and carcinoma of the buccal region, 6 times in the Northern Province when compared with the Southern province. This prompted the study of factors influencing malignancy in the Northern Province.

The Survey was started in mid-september 1986 and terminated in mid-June last year (1989), on the author availing of leave preparatory to

retirement. During this period of two years and nine months, 974 cases of malignancy were admitted to the Teaching General Hospital, Jaffna (to which all cases in the Province sought treatment) but data on 410 cases only were documented owing to the shortage of doctors and the trying conditions that prevailed. For the same reason, a controlled study planned initially, had to be abandoned. Documentation was on a protocol prepared by the author, with few suggestions from Prof. Sivagnanasundaram, then Dean, Faculty of Medicine, University of Jaffna, Dr. Pathmanathan, Consultant Pathologist and Dr. Mrs. Nagendra, Consultant Physician, Jaffna General Hospital.

The grouping of the cases according to the site of origin, is given in Table 1

The numbers are admittedly small but it was hoped that some light will be thrown for future study at least. Only those categories with 7 cases and above have been analysed.

The factors analysed are rather extensive and in order to save space, only those which have or seem to have some significance will be presented. To appreciate the remaining non-significant factors, all factors analysed are mentioned. They are: Age, Sex, Civil Status, Ethnicity, Village, Occupation, Family Income, Any malignancy in family or village, Age at Marriage, first pregnancy and menopause, No. of Children, No. of Children breastfed, Environment inclusive of Residential

Table 1 - Site of Origin

Site of Origin	No of Cases.	Site of Origin	No of Cases
Oesophagus	123	Thyroid	5
Oral Cavity	55	Ovary	5
Breast	41	Uterus	4
Lymphomas	27	Vagina	3
Cervix	26	Lung	3
Larynx	23	Penis	2
Stomach	19	Salivary Gland	1
Pharynx	16	Bone	1
Pyiform fossa	8	Skin	1
Pancreas	8	Gall Bladder	1
Colon & Rectum	8	Tonsil	1
Prostate	8	Epiglottis	1
Maxillary Antrum	7	Fibrous Tissue	1
Urinary Bladder	6	Secondaries (Primary not known)	6
			410

characters, surrounding, animals reared, cooking fuel, Betel chewing. Smoking, Use of snuff, Tooth Powder, Tooth paste, Irradiation prior to occurrence, Avitaminosis, Anaemia prior to and after occurrence, Dental Sepsis, Oral Sepsis, Prolonged use of drugs or contact with uncommon substances and Mental Stress. In the case of malignancy of Oral Cavity. Gastrointestinal tract and its appendages dietary factors were also analysed. These included Vegetarian or Non vegetarian, Frequency and amount of use of: Fats & Oils, Protein, Vegetables, Fruits, Spices, Pickles, Salted fish, Palmyrah root, flour, Peanuts Canned or packeted foods, Hot food, Stale food, Use of grinding stone, Coffee, Bottled drinks and alcohol.

Oesophagus

Let us first look at Cancer Of Oesophagus. 123 cases were available

for study. Table II shows Age and Sex distribution.

Age and Sex Distribution

Table II-Age & Sex Distribution

Oesophagus		
Age in Years	Number	Sex
21 to 30		
31 to 40		Male : 44
41 to 50	38	Female : 76
51 to 60	31	
61 to 70	34	
> 70	9	
Not Known	2	
	123	

112 out of 123 (91%) were above 40 years of age. It is well known that most malignancies occur in the older age group. There was a preponderance of females in the ratio 3 : 2. This is statistically significant ($p < 0.05$). This

is in variance with sex ratios in other parts of the world where more males were encountered.², but in conformity with Ganeshananthan's series of patients from Jaffna,³ - Table III.

Table III - Male to Female Ratios in Oesophageal Cancer.

Country	Male/Female
Sri Lanka (Jaffna)	
—Ganeshananthan's series	0.5 : 1
Sri Lanka (Northern Province)	
—Present Series	0.6 : 1
Japan	2.6 : 1
Finland	0.9 : 1
England & Wales	1.4 : 1
U. S. A	3.3 : 1
Canada	2.2 : 1
Sweden	2.1 : 1

The preponderance of females is possibly due to dietary deficiency as one factor, accentuated by having to feed more children too, with a limited income. (22 had one or two children,) 35, 3 to 4 and 22 more than 4 children,

Residential area

The distribution of cases according to the village from which they come is shown in Figure I.

62 patients are concentrated in a small area (compared to the rest of the province) embracing Jaffna Town, Vaddukoddai, Chankanai, Manipay, Chunnakam, Kopay, Kondavil and Kaithady. This is in accordance with Ganeshananthan's series. (Fig 2).

There was a preponderance of females in these areas with 7 entirely

females from Pungudutivu and 5 females to one male from Kaithady and 4 females entirely from Tellipallai and 5 from Kilinochchi.

The concentration of patients from the areas shown, cannot be due to the proximity to the Jaffna Hospital as Oesophageal cancer is one that leads to intense suffering with no possibility of cure by indigenous medicine and there being no Surgeons for long periods in other hospitals such as Vavuniya, Mannar, they, (if they had cancer) would have come to Jaffna Hospital showing a substantial number in those areas too. Therefore some accessory factors (other than dietary deficiency) common to this area such as Salinity, nitrate and nitrite concentrations and other chemical constituents of ground water, have to be considered.

Ground water

The maximum allowable concentration of chlorides is 600 mgm / l, according to W. H. O. International Standards and many areas with more oesophageal cancer patients have chloride values above 600mg/l. (Table IV)⁴. Ganeshananthan too pointed this out and Salinity is a possible additional factor.

The role of nitrates and nitrites in increasing the incidence of cancer, has been accepted. The Maximum allowable values according to W. H. O. Standards are 45 mgm/L as Nitrate and 10 Mgm/L as Nitrogen. A perusal of the values for ground water from Domestic wells in the Peninsula, as determined

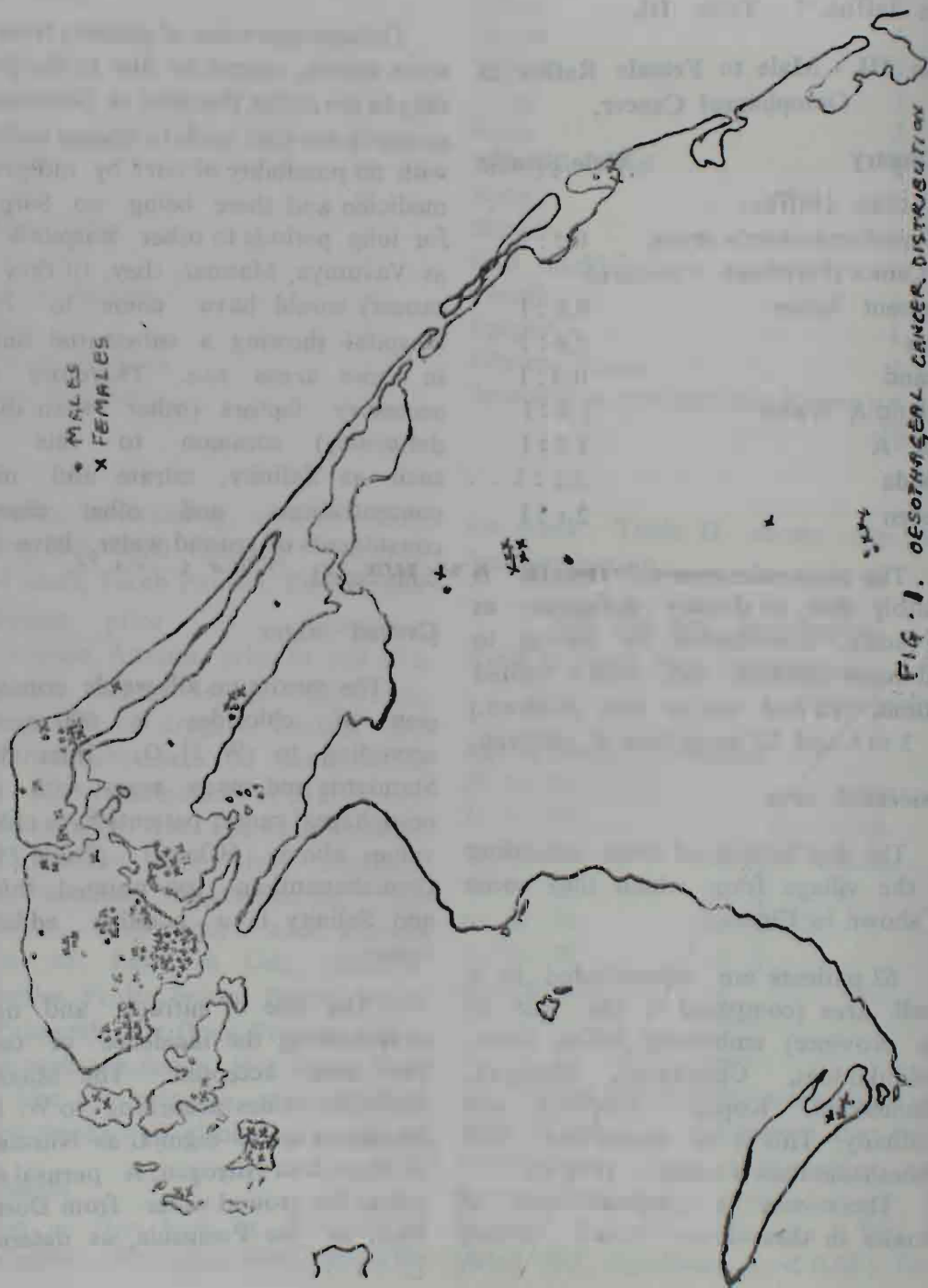


FIG. 1. OESOPHAGEAL CANCER DISTRIBUTION

Fig 2.

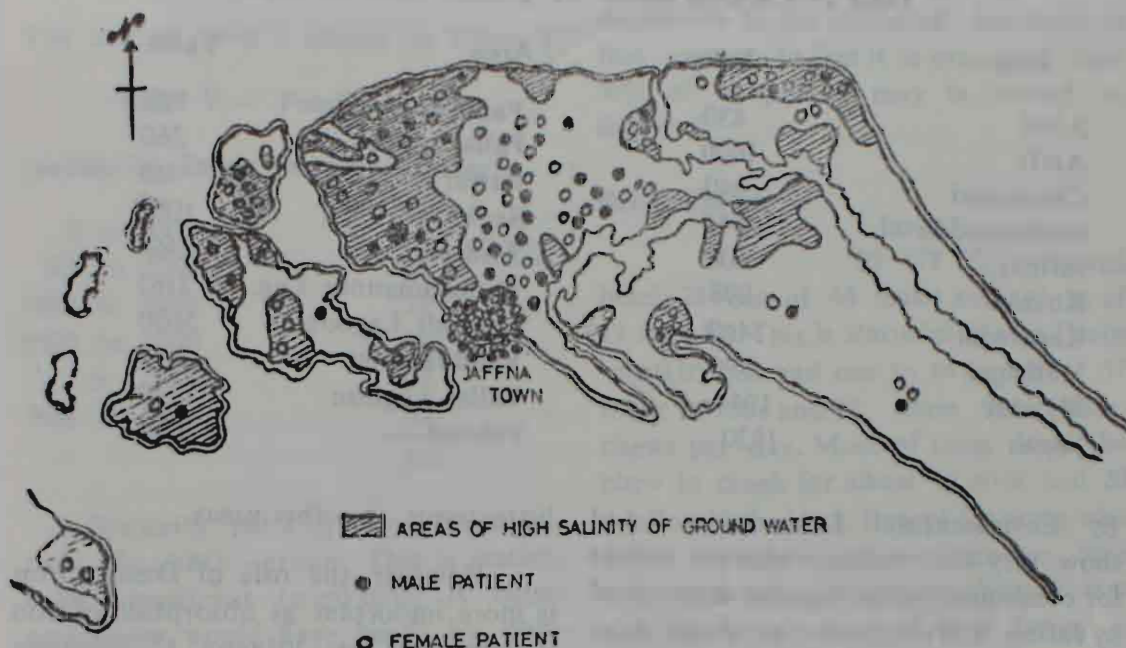


Fig 2. Salinity of Ground Water (By Kind permission, Editor Ceylon Medical Journal)

Fig 3.

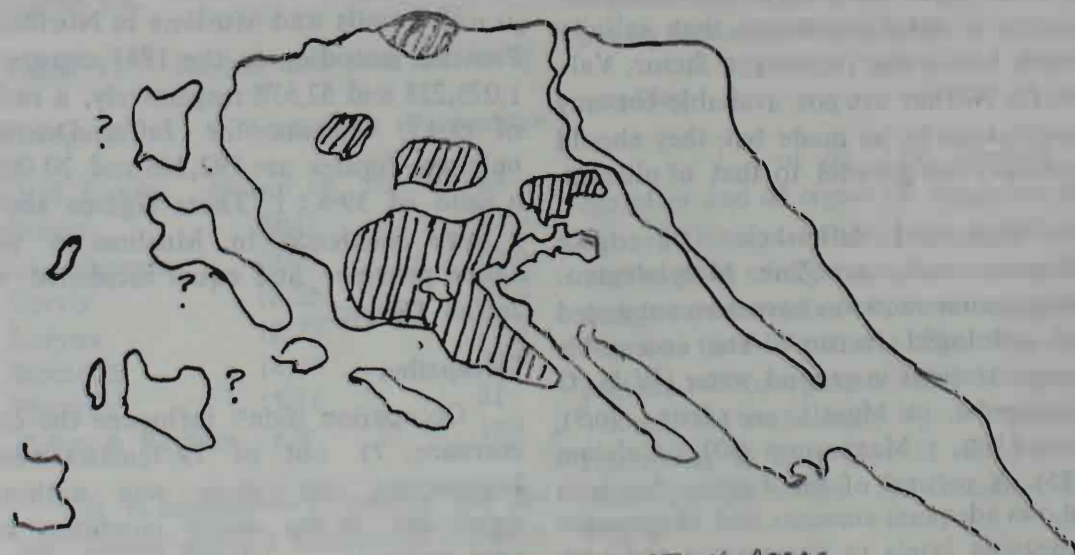


FIG. 3 - NITRATE CONCENTRATION AREAS
($> 50 \text{ mgm/L as NO}_3$)

Table IV-Chloride values of ground water in Mgm/L

Area	Value	Area	Value
Alvai	830	Pannalai	779
Araly	1000	Pallai	260
Chankanai	240	Puttur	488
Eluthumadduval	2845	Sankuveli	1008
Jaffna	600	Sarasalai	2460
Kokuvil	998	Thondamannar Lag.	2165
Karaveddi	3400	Thayadi Lagoon	5690
Mathagal	896	Vaddukoddai	1500
Myliddy	1944	Vallai Lagoon	7230
Navali	1820	Velanai	620

by Environmental Laboratories Ltd show very low values, whereas values for community water supplies determined by Jaffna University, 5 Years ago reveal very high values. values for Kondavil and Tinnevely determined recently show values more than allowable levels. This is confirmed by values determined in 1984 and obtained from the Water Resources Board. Also the areas with high values tally with the case distribution (Figure 3) It is therefore fairly certain that nitrate content is more responsible than salinity which too is one important factor. Values for Nitrites are not available for any conclusions to be made but they should generally run parallel to that of nitrates.

Prolonged deficiencies of trace elements such as Zinc, Molybdenum, Magnesium and Iron have been suggested as aetiological factors⁵. The acceptable concentrations in ground water (W.H. O standards) in Mgm/L are : Iron (6.3), zinc (5.0), Magnesium (50), Calcium (75). A perusal of the figures for Iron shows adequate amounts and Magnesium adequate levels in some areas and very

little levels in other areas.

However the role of Dietary iron is more important as absorption of iron is dependent on Vitamin C. Selenium in diet available through plants is another important constituent. Figures for this are not available.

Ethnicity

There were 120 Tamils and 3 Muslims, a ratio of 40:1 The population of Tamils and Muslims in Northern Province according to the 1981 census is 1,023,228 and 52,638 respectively, a ratio of 19.4:1 whereas for Jaffna District only the figures are 792,246 and 20,001, a ratio of 39.6:1 These figures show a lower incidence in Muslims in the entire province and equal incidence in Jaffna District.

Occupation

Occupation didn't influence the occurrence. 71 out of 79 females were housewives, but there was nothing significant in the home condition or surroundings.

Family Income

The income level is shown in Table V.

Table V - Family Income

Income in Rs per month	Number
0 to 500	50
501 to 1000	24
1001 to 2000	39
2001 to 3000	04
> 3000	02
Not Known	04
	<hr/> 123

Majority (60.2%) were from less than Rs. 1000/- group. This is statistically significant ($p < 0.05$). A better assessment would have been by comparison with total number of families in the province with less than Rs. 1000/- income but unfortunately figures were not available. 91.8% were below Rs. 2000/- level. Income level was low in other categories of cancer as well and these were also statistically significant. (Table VI)

Table VI - Income less than Rs. 1000/-

Category	Number	Percentage
Oral Cavity	49 out of 55	89
Breast	30/41	73.2
Lymphomas	18/27	66.6
Cervix	18/26	69.2
Larynx	18/23	78.3
Stomach	14/19	73.7
Pharynx	13/16	81
Colon & Rectum	8/8	100

It is reasonable to assume that the low income group's nutritional status is

poor and deficient dietary factors contribute to the increased incidence in this group. In fact it is estimated that 50% of neoplasms may be related to diet ^{6 7}

Betel Chewing

95 (77.2%) chewed betel: 26 out of 44 males and 69 out of 79 females. This is statistically significant ($p < 0.05$). 38 had one to two chews, 37 three to four and 18, more than four chews per day. Most of them kept the chew in cheek for about 15 mins and 20 swallowed the juice. Except for seven who didn't use tobacco all used tobacco, lime and areca-nut. That betel chewing is a risk factor in cancer of Oral Cavity is well recognised but Stephen and Uragoda ⁸, favoured betel chewing as the main cause of cancer of oesophagus in this country. There cannot be any doubt that 77.2% in this series having chewed betel, when the estimated percentage of population chewing betel is about 29%⁹, betel chewing is a contributory factor in this series.

Smoking

61 (out of 123) smoked. 17 cigarettes and 49 cigars (5 cigarettes and cigars) This is statistically not significant. The number of cigars/ cigarettes smoked was low (49 one to five, 5 six to ten and 5 more than 10 per day) but for long periods (45 for greater than 10 years). Though not statistically significant, it is interesting to note that 28 out of 36 males and 21 of the 25 females used cigars.

Snuff Tooth Powder/Paste

Only 5 used snuff. 112 (out of 123) used tooth powder and 11 tooth paste. 72 of the 112 used Gopal Tooth powder, but considering the large population using this, it cannot be a significant factor.

Dental sepsis was observed in only 43 patients and Oral sepsis in 6.

Dietary Factors

Only 94 cases were studied, the balance 29 being excluded, as the data was incomplete. 88 were Non-Vegetarians. Assessment of the factors was done on the basis of frequency of the item taken. For example, leafy vegetables: Nil or once per week was considered low, 2 to 3 times fair, 4 to 5 times moderate and above 5 times good.

Analysis showed that the consumption of protein was low or fair except for fish (moderate), vegetables especially leafy vegetables low, carrots practically nil and fruits low with papaw being very low. There was no excess fat consumption. 55 used pickles once or twice a week, and 65 (52.9%) salted fish. The intake of palmyrah root, flour, canned, packeted foods, bottled drinks, coffee and alcohol was low. Use of spices was low in 52 and moderate in 61. Only 28 preferred hot food or drink 45 preferring it warm. Clay utensils were used by many and the grinding stone by 80 (56, once or twice a week 15, 3 or 4 times and 8 more than 4 times).

Deficiency of Iron and Selenium, Vitamins A, C & E, and B₁₂ and excess of fat (particularly saturated fat)

Alcohol, Coffee, Salted fish, Mould affected food, hot food and arecanut are dietary factors known to increase the incidence of cancer. From the foregoing analysis, it is clear that in this series the intake of dietary constituents has been low. The level of income lends support too.

In our Province we have seen that dietary deficiency, betel chewing with perhaps cigar smoking also playing a role. It is difficult to say whether salted fish and pickles had a part to play. But it is generally accepted that dietary deficiency is more outside the peninsula in our province and perhaps in the South too and yet the incidence is more in the peninsula in the demarcated areas and in the Islands. There is no doubt therefore that nitrate and nitrite concentrations and Salinity are potent causes, with other factors playing a supplementary role.

ORAL CAVITY

Included in this category are cancers of cheek, tongue floor of mouth jaws, palate, fauces and lips. 55 patients were available for study. The age distribution is shown in Table VI

Age and Sex

Table VI Age Distribution - Oral Cavity

Age in Years	Number
31 to 40	1
41 to 50	10
51 to 60	20
61 to 70	17
> 70	7

Except for one, all were above 40 years of age.

Unlike in the case of oesophageal cancer, a preponderance of males was seen,—39 males and 16 females. This is statistically significant ($p < 0.05$)

Ethnicity

54 were Tamils and one Muslim reflecting a higher incidence in Tamils (population ratio T : M : 39.6 : 1)

Residential Area

There was a fairly even distribution in the different areas of the Province with little more in Kilinochchi (6), Jaffna (4), Aitchvely (4) and Chunnakam Chavakacheri, and Mallakam 3 each.

Occupation

17 were Farmers, 6 Coolies, 8 Housewives, 8 Unemployed, 2 Masons and balance in various other occupations, Income

49 out of 55 (89.1%) belonged to the under Rs. 1000/- income group. This is statistically significant ($p \geq 0.05$)

Betel Chewing

41 out of 55 (74.5%) chewed betel. This is statistically significant ($p < 0.05$). Of the 41, 36 used tobacco, 38 lime and 38 arecanut. 3 had 1 to 2 chews per day, 21, 3 to 4 and 17, more than 4. 28 had it in cheek for about 15 mins, 9 for 15 to 30 mins and 4 for more than 30 mins.

In an analysis of 31 patients admitted to Cancer Home Varthalaivilan, Tellipallai, 27 chewed betel and except for 2, all had more than 3 to 4 chews

and except for 4, for more than 20 years. 21 used tobacco with lime and arecanut and others lime and arecanut only.

That betel chewing is a potent cause of cancer of the oral cavity is known only too well. In this series, it certainly is an important causative factor. It used to be said that tobacco is the culprit with lime to a lesser extent but it is now found that betelnut may also cause it.¹⁰

Smoking

Smoking was noted in 32 of the 55, with 25 smoking cigars: 25 smoking one to five of them for more than 25 years.

Tooth Powder, / paste, Snuff Etc

43 used tooth powder, 20 of whom using Gopal tooth powder. This is statistically not significant. Dental sepsis and Oral sepsis were not significantly related.

Dietary Constituents

The dietary deficiency, followed the same pattern as in oesophageal cancer except that more leafy vegetables, carrots and pumpkin were consumed. 16 only used pickles, 29 hot foods and 41 used grinding stone. The use of spices was moderate.

Betel chewing, Smoking, Oral snuff, alcoholic beverages¹⁰ and deficiency of dietary factors have been incriminated as risk factors.

In this series, Betel Chewing has been the potent factor with dietary

deficiency and smoking acting as contributory factors.

BREAST

41 patients were available for study
Table VII shows the age distribution.

Age Distribution

Table VII - Age Distribution- Breast

Age in Yrs	Number
21 to 30	2
31 to 40	6
41 to 50	12
51 to 60	14
61 to 70	5
Not Known	2
	<u>41</u>

80.5% were over 40 years of age and two were quite young-- 28 and 30 yrs. All were females (the author encountered one case of cancer in male before the start of this study) breast.

Civil Status

Only one was single and of those married, 8 were widowed and 3 divorced.

Ethnicity & Income

All were Tamils, 28 were housewives and 6 coolies. 30 (73.2%) were in the below Rs. 1000/ income group.

Age at first pregnancy

Table VIII shows the age at first pregnancy.

Table VIII- Age at first pregnancy -Breast

Age in Yrs	Number
15 to 20	8
21 to 30	21
7 30	7

Earlier the age of 1st pregnancy the lesser the incidence of cancer.¹¹

Number of pregnancies, Children and No. breastfed.

Table IX shows the number of pregnancies, number of children and number breastfed.

Table IX- No of pregnancies, children, No breast fed -Breast

Number of patients

Number of Pregnancies	Children	Breastfed
1 to 2	11	12
3 to 5	16	13
7 5	9	7

2 were infertile and 3 probably aborted. The greater the number of children breastfed the lesser the incidence of breast cancer. In this series 19 out of 36 have breast fed 3 or more children.

Menopause. 34 reached menopause before 50 and 7 afterwards.

Betel Chewing, Smoking & Fat consumption

Only 21 chewed betel and 7 smoked. There was no excess fat consumption.

The factors incriminated in Breast cancer are Excess fat, oil & meat

consumption, Age at first pregnancy, Number of children breastfed, age at menarche, menopause, intake of oral contraceptives before first pregnancy thyroid disease (and hormone replacement therapy) ¹². None of these factors were found to be significant in this series and the only significant feature was the low income probably causing dietary deficiency.

LYMPHOMAS

This category includes the Hodgkins and Non — Hodgkins lymphomas. 27 cases were available for study. As is well known no age group is exempt. (Table X).

Table X - Age Distribution - Lymphomas.

Age in Years	Number
1 to 5	3
6 to 10	3
11 to 20	4
21 to 30	2
31 to 40	2
41 to 50	3
51 to 60	6
61 to 70	2
71 to 80	2

16 were males and 11 females (Ratio of 3:2), 12 Single and 15 married. All were Tamils. In 3 there was a history of malignancy in the family but these were of oral cavity, epiglottis and colon. 16 used toothpowder (6Gopal) and 11 toothpaste.

Chromosomal disorders, immunological deficiency, Rheumatoid arthritis-exposure to certain chemicals (Chloro-

phenols, Solvents in refineries, Chemicals in petroleum refineries, Benzene in Rubber tyre production) and Burkitts Lymphoma Virus have been implicated. ¹¹ None of these factors obtained in this series and it is not possible to ascribe any factor. Infection by Epstein Barr Virus at some stage cannot be ruled out.

CERVIX

26 patients were available for study. 5 were between 31 and 40 years of age, and 21 over 40. 18 out of 26 (69.2%) had an income of less than Rs. 1000/-. All were married, with 10 widowed and one divorced. 25 were Tamils and one Muslim. 80.8% had an early marriage (15 to 20 years) 65.4% were 15 to 20 years of age at first pregnancy and 88.8% had 3 or more pregnancies and children.

Early marriage and coitus, multiple and often broken marriages, low income venereal infection and antibodies to Herpes Simplex type 2 virus have been incriminated. ¹³ In this series early marriage and many pregnancies and low income could have contributed to the occurrence.

LARYNX

23 patients were available for study. 19 (82.6%) were over 50 years of age and 4 between 41 and 50. All were males. 22 were Tamils and one Muslim. 78.1% were in the below Rs. 1000/- group. Only 5 chewed betel but 19 (82.6%) smoked fairly heavily for more than 10 years. 9 used cigars.

The incidence of cancer of larynx is 10 times more in the males. ¹⁴ In this series all were males though there had been

females before the commencement of this study. Low economic status, smoking, alcohol, chemicals, leather, nickel wood and asbestos industries are some factors responsible¹¹. In this series low economic status and smoking have certainly been responsible.

STOMACH

19 cases were available for study 16 (84.2%) were above 40 years of age. 12 were males and 7 females (ratio of 3:2) 14 (73.7%) were in below Rs. 1000/- income group. The intake of vegetables and fruits was low. 8 used moderate and 4 high amounts of spices and 9 (50%) used pickles. (5. once or twice a week and 4 more than twice). 8 used salted fish but not too frequently. 11 used palmyrah root and flour in moderate amounts seasonally and 8 peanuts once or twice a month. 14 used grinding stone. Only 7 smoked. Deficiency of fresh vegetables, fruits, smoking, atmospheric pollution, dusty jobs, spicy and pickled foods, dental and oral sepsis, high consumption of dried salted fish¹¹ and pesticide residues in food items have been incriminated. In this series, dietary deficiency, pickles and salted fish could have been contributory factors. Pesticide residues are unlikely to be a cause as intake of diet was poor.

PHARYNX

16 cases were available for study. 12 (75%) were above 40 years of age. 12 were males and 4 females (ratio of 3:1). 15 were Tamils and one Muslim 13 (81%) were in below Rs. 1000/- income group. Only 4 chewed betel but 11 smoked 8 of them cigars and 8

took alcohol but very little for short periods. Only 5 preferred hot food, 5 had pickles and 8 salted fish fairly frequently. Dietary constituents were of low intake.

The same factors as in Oesophageal cancer and wood dust have been incriminated with perhaps Epstein Barr Virus infection. In this series dietary deficiency is a possible cause with smoking, alcohol and salted fish possibly playing a supplementary role.

COLON and RECTUM

Only 8 cases were available for study in conformity with the low incidence seen in the Eastern population who have a high fibre diet.

An interesting feature is the occurrence, in a fairly young age group. Two were 19 & 29 years of age and three, 37, 38 and 40. 3 were males and 5 females. All were in the below Rs. 1000/- income group. 7 were non-vegetarians.

Deficiency of fibre in diet, excess fat & animal protein consumption, excess beer, hot foods¹¹ fried meat and fish⁵ have been incriminated. A faecal mutagen in non-vegetarians is being investigated.⁵ It is possible that in this series very low consumption of vegetables and fruits with consequent deficiency of fibre, was a risk factor.

PYRIFORM FOSSA

Only 8 cases were available for study. All were above 40 years of age. 6 were males and two females. All were Tamils, 6 (75%) were in below Rs. 1000/-

income group. 7 used Gopal Tooth powder, 6 smoked heavily for long periods 3 were mechanics, in contact with petroleum and grease.

It is interesting that a patient, 45 year old, a mechanic had several members of the family affected by malignancy. A brother, also a mechanic, had cancer of pyriform fossa, mother of uterus, a cousin sister of breast, and cousin brother of tongue. This is not necessarily due to heredity causes and could be due to environmental factors.

Smoking may have had a causative relationship in the 6 patients who smoked.

PANCREAS

Only 8 patients were available for study. 6 were above 40 years of age and two 38 and 39 years old.

3 were males, 5 females, all were Tamils, and 4 were in below Rs.1000/- income group. Only two took alcohol in moderate amounts. Consumption of coffee was very low.

Smoking, high consumption of alcohol, excess coffee, fat and proteins are incriminated as risk factors¹¹. In this series there is nothing of significance except the low income.

PROSTATE

Only 8 patients were available for study. All were above 60 years of age all were Tamils, 6 were in less than Rs. 1000/- income group and 4 smoked. Consumption of alcohol had not been documented.

It may be mentioned that excess consumption of fat and increased sexual drive have been incriminated in cancers of prostate.

MAXILLARY ANTRUM

Only 7 patients were available for study. 5 were above 50 years one a male was only 14 (with Burkitt's Lymphoma) and another female, only 19 years (with adenoid cystic carcinoma). 4 were males and 3 females, All were Tamils, 6 were in below Rs. 1000/- income group and 4 smoked, 3 of them cigars.

Burkitt's Lymphoma is due to a virus carried by mosquitoes and smoking may have a causal relationship in the others

CONCLUSIONS

In conclusion, overall, in many of the cancers, deficient dietary factors, betel chewing and smoking have figured as causal or contributory factors. The low income group had been hit badly.

Dietary deficiency betel chewing, nitrate and nitrite concentration, salinity and perhaps smoking were factors in oesophageal cancer. The role of pickles and salted fish needs to be elucidated.

Betel Chewing predominantly with dietary deficiency and smoking probably figured in Cancer of Oral Cavity.

Only dietary deficiency could be related for breast cancer.

Early marriage and many pregnancies were possibly the factors in cancer of cervix,

Smoking with dietary factors contributing was responsible for cancer of larynx. Dietary deficiency with perhaps use of pickles and salted fish contributed to development of cancer of stomach.

Dietary deficiency with low fibre content led to cancer of Colon and Rectum. Non-vegetarianism may have played a part.

Smoking very possibly was responsible for cancer of the pyriform fossa

SOLUTION

Any study is worthless without practical suggestions and more important the implementation. Some recommendations are cited belows: (a) Health Education with regard to nutrition should be intensified with special reference to fresh vegetables particularly leafy vegetables, carrots, pumpkins, legumes and fruits, particularly papaw and mango.

(b) Public should be encouraged to grow leafy vegetables and papaw at least, in home garden, if land space is available.

(c) The state should establish farms with leafy vegetables, carrots, papaw, and legumes

(d) The state should try to raise the economic status of the poor- admittedly not an easy task

(e) Public should be discouraged from chewing betel.

(f) State should find alternate employment for those growing betel and destroy all betel farms. The growing of betel and sale of betel must be penalised by legislation. The leaf of the Portia tree (Poovarasu) could be used for rites and ceremonies.

(g) Smoking particularly cigars should be discouraged. The stoppage of tobacco

cultivation and cigars rolling, both money spinners, is perhaps not practical.

(h) The use of artificial manure should be minimised and use of compost encouraged: Water for drinking should not be obtained from wells in farms and near farms.

Studies of Nitrate and nitrite concentrations should be done again in various areas of the Province as values available now are equivocal. As the values of the Lagoons water are alarmingly high, no scheme to supply drinking water from the lagoons should be envisaged

(i) Primary Health Care Workers should have a low income group list (in their respective areas) in the high incidence areas at least and screen monthly all over 35 years of age with regard to early warning symptoms and signs and examination of the oral cavity. Self examination of breast should be demonstrated, perhaps by female PHCW's. Special training should be imparted to P.H.C.W's with regard to these aspects

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