RESEARCH COMMUNICATION

Trends in Incidence of Head and Neck Cancers in India

Balkrishna B Yeole

Abstract

Information relating to cancer incidence trends forms the scientific basis for the planning and organization of prevention, diagnosis and treatment of cancer in a community. An attempt was here made to study the trends in the age adjusted incidence rates for the sites of head and neck cancers in Mumbai, Bangalore, Chennai, Delhi, Bhopal, and Barshi registry's populations. For carrying out trend analysis the gum, the floor of mouth, the mucosa of cheek, the hard and soft palate and the uvula were grouped together and assigned as cancers of mouth. The trend analysis was carried out for all sites together, tongue, mouth, hypopharynx and larynx in males and all sites together and mouth in females. Sites such as lip, hypopharynx and nasopharynx were not considered. In males, for all sites together linear regression showed no increase or decrease in age adjusted rates overall for Bangalore and Delhi registries, a significant decrease for Mumbai and Delhi registries, but a rising trend for Chennai and Bhopal registries over a period of time. In females, for all sites together no change was observed in age adjusted incidence rates for Mumbai, Chennai, Bhopal, Bangalore and Barshi registries while a decreasing trend was noted for Delhi registries over a period of time. For the specific sites, variation among registries was also apparent. The results point to local differences in sub-site specific risk factors which might be elucidated by analytical epidemiological assessment.

Key Words: Head and neck cancer - incidence - time trend - mouth - tongue - hypopharynx - Indian cancer registries

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Introduction

Information relating to cancer incidence trends forms the scientific basis for the planning and organization of prevention, diagnosis and treatment of cancer in a community. Time trends may also give rise to hypotheses concerning the etiology and biology of cancer, which can be applicable for the testing of various hypothesis made in clinical and experimental oncology. A trend however always represents changes that have occurred within different groups of people, living under divergent conditions.

An attempt was here made to study the trends in the age adjusted incidence rates for the sites of head and neck cancers in Mumbai, Bangalore, Chennai, Delhi, Bhopal, and Barshi registry's populations. All these registries are under the network of National Cancer Registry Programme of Indian Council of Medical Research, New Delhi. Clean data are available for Mumbai, Bangalore, and Chennai registries for the period 1982-2003 and for Delhi, Bhopal, and Barshi Registries for the period 1988-2003. For calculating Age Specific Rates, populations were estimated by distribution method for each sex using 1981, 1991, 2001 Census figures (National Cancer Registry Programme, 2006). For calculating age adjusted incidence rates, World Standard Population has been used (Cancer Incidence in Five Continents, 1982). Usually the sites lip, tongue, gum, floor of mouth, palate, mucossa, oropharynx, nasopharynx, hypopharynx, and larynx, are considered as head and neck cancers. For carrying trend analysis the gum, the floor of mouth, the mucosa of cheek, the hard and soft palate and the uvula were here grouped together and assigned as cancers of mouth. The trend analysis is carried out for all sites, together, tongue, mouth, hypopharynx, and larynx in males and all sites together, and mouth in females. Sites such as lip, hypopharynx and nasopharynx were not considered for trend analysis as age adjusted incidence rates based on small numbers were not statistically significant to carry out trend analysis.

Materials and Methods

Various analytic approaches and measures of trends including geographical display and the overall mean annual percentage rate of change in age adjusted incidence rates or age specific rates as well as modeling by age, period and cohort have been used to study the trends in cancer incidence.

For studying trends we use a model that fits the data for the logarithm of Y=ABx which represents a Linear Regression Model where 'Y' is the estimated incidence rate per 100,000 population and 'x' is the calendar year - initial year for the current data. Capital 'A' therefore represents the estimated rate of the initial year and (B-

Bombay Cancer Registry, Indian Cancer Society, 74, Jerbai Wadia road, Parel, Mumbai, 400012, India Fax: 91-22-4122351 E-mail: bcrics@vsnl.com

Table 1. Average Age Adjusted Incidence Rates for Head and Neck Cancers for Various Registries by Sex

Site	Sex	Average Age Adjusted Incidence Rates					
		Mumbai	Bangalore	Chennai	Delhi	Bhopal	Barshi
All sites	Male	110.6	92.8	101.0	116.2	100.3	46.1
	Female	110.1	112.2	116.9	125.8	92.4	54.2
Tongue	Male	5.6	3.3	5.0	5.9	9.2	2.0
Mouth	Male	5.7	3.0	6.3	3.9	7.7	2.9
	Female	3.9	7.8	6.5	2.1	5.4	1.2
Hypopharynx	Male	6.1	5.3	5.0	2.6	6.8	4.6
Larynx	Male	7.0	3.8	4.5	8.5	4.4	1.9

Table2. Annual Percentage Change for Head and Neck Cancers for Various Registries by Sex

Site	Sex	Annual Percentage Change					
		Mumbai	Bangalore	Chennai	Delhi	Bhopal	Barshi
All sites	Male	-0.85**	0.04ns	1.10**	-0.11 ns	0.62**	1.075**
	Female	-0.29 ns	-0.14 ns	-0.20 ns	-1.03**	0.10 ns	-0.36 ns
Tongue	Male	-2.27**	0.27 ns	1.26*	0.49 ns	-0.20 ns	-2.96 ns
Mouth	Male	0.75*	-1.82**	-0.71 ns	1.20 ns	2.73 ns	0.56 ns
	Female	-0.64 ns	-3.26**	2.81**	3.39*	1.46 ns	7.45**
Hypopharynx	Male	-4.39**	-1.11*	-0.05 ns	-0.81 ns	-1.06 ns	5.25*
Larynx	Male	-2.91**	0.13 ns	1.12*	1.36*	1.24 ns	-0.78 ns

ns – Not Significant , * - Significant at 0.05 level , ** - Significant at 0.01 level.

1)*100 gives the Average Annual Percentage Change in the incidence rates during the period. The observed and estimated (based on model fitting) age adjusted incidence rates for each site for all registries are shown diagramatically. The estimates of the average annual percentage rates in incidence rates of various cancers by sex are given in tabular form. In all the six registries, for coding the data, for topography ICD-10 (World Health Organisation, 1992) and coding morphology ICD-03 (World Health Organisation, 2000) is being used.

Results

The latest average age adjusted incidence rates per 100,000 population for various sites considered for trend analysis for each registry are presented in Table 1. The average age adjusted incidence rates for all sites together, in males and females varied from 46.1 and 54.2 in Barshi registry to 116.2 and for 125.8 Delhi registry. In males for the sites tongue and mouth, highest incidence rate was noted by Bhopal registry and lowest in Barshi. For mouth

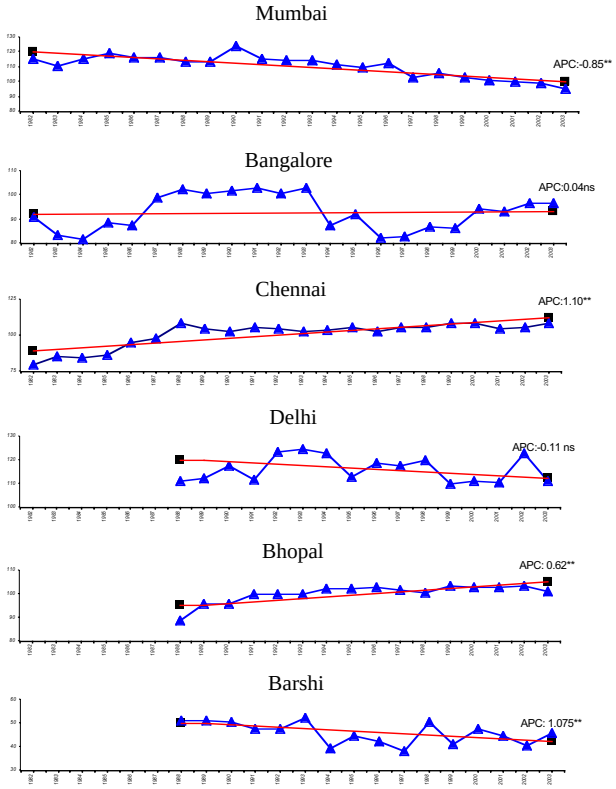

Figure 1. Trends in Age Adjusted Incidence Rates in Various Registries: All Sites - Males

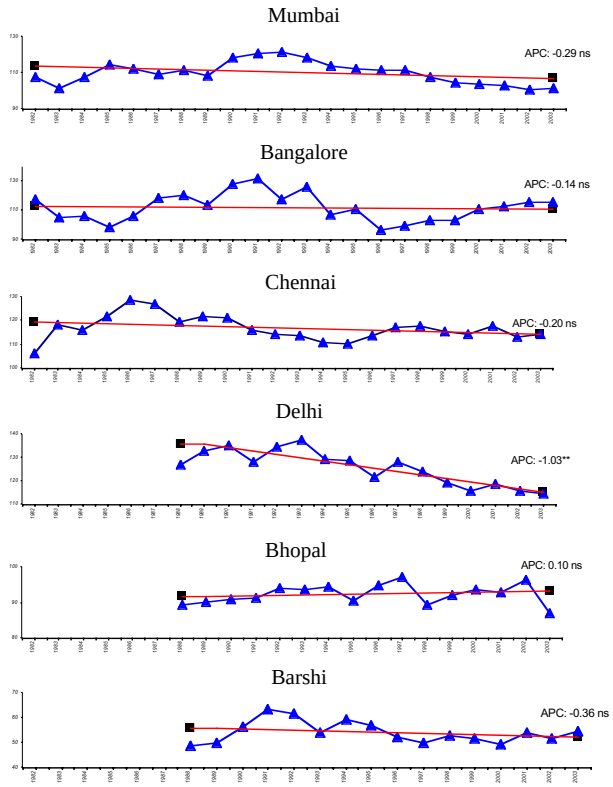

Figure 2. Trends in Age Adjusted Incidence Rates in Various Registries: All Sites - Females

in females the highest incidence was noted in Bangalore and the lowest in Barshi (1.2). For the site hypopharynx, in males there is no significant difference in the age adjusted incidence rate between the registries except for Delhi registry. For laryngeal cancer in males the highest incidence is noted by Delhi registry (8.5) followed by Mumbai (7.0), Chennai (4.5), Bhopal (4.5), Bangalore (3.8), and Barshi registry (1.9).

In Bangalore Registry, in males, the sites, hypopharynx, mouth, larynx, and tongue occupied places in the list of 10 leading sites in 1982-83 while only hypopharynx retained its place in the list of 10 leading sites in 2002-03. In Chennai registry, in males, sites such as mouth, hypopharynx, larynx, and tongue, have occupied the place in the list of 10 leading sites in 1982-83, as well as in 2002-03. But increase in the incidence was noted for the site of tongue only. In Mumbai registry, in males, mouth, hypopharynx, larynx, and tongue have occupied the place in the list of 10 leading sites in 1982-83 while hypopharynx did not appear in the same list of 2002-03 and, significant increase was noticed in the incidence of mouth cancer, while there is decline in the incidence of tongue, larynx and hypopharynx over a period of time. In Delhi registry, in males, only larynx and tongue, appeared in the list of 10 leading sites, in 1988-89 while in 2002-03 cancer of the mouth added in this list and occupied 9th rank. In Bhopal registry in males, cancer of the tongue, mouth, larynx, and hypopharynx have appeared in the list of 10 leading sites in 1988-89, as well as in 2002-03. In Barshi registry, in males, cancer of the tongue, mouth, larynx and hypopharynx appeared in the list of 10 leading sites for the period of 1988-89 but cancer of the tongue disappeared from the same list of 2002-03.

The observed and expected age adjusted rates over a period of time for various types and sex are presented by line graphs in Figures 1 to 7, for all sites in males and females, for tongue in males, for mouth in males and females, for hypopharynx and larynx in males respectively. The values of Average Annual Percentage Changes in Age Adjusted Rates with statistical significant for various sites by sex in six registries are given in Table 2.

In males, for all sites together linear regression method showed no increase and decrease in age adjusted rate, for Bangalore and Delhi registries, a significant decrease for Mumbai and Delhi registries while rising trend for Chennai and Bhopal registries over a period of time. In females, for all sites together no change was observed in age adjusted incidence rates for Mumbai, Chennai, Bhopal, Bangalore and Barshi registries while decreasing trend was noticed for Delhi registries over a period of time.

For the site "tongue" in males, there was no trend in the age adjusted rates for the registries of Bangalore, Barshi, Bhopal and Delhi while Chennai registry shows an increasing trend while Mumbai registry shows a decline trend in age adjusted incidence rate.

For the site "mouth" in males, there was no trend observed for Mumbai, Bhopal, Chennai and Delhi registries, Barshi registry showed rise while Bangalore registry showed a declined trend in age-adjusted incidence rates. In females, there was a no trend for Bhopal and Mumbai registries, an increasing trend for Barshi and decreasing trends for Bangalore, Chennai, and Delhi registries in the age adjusted incidence rates.

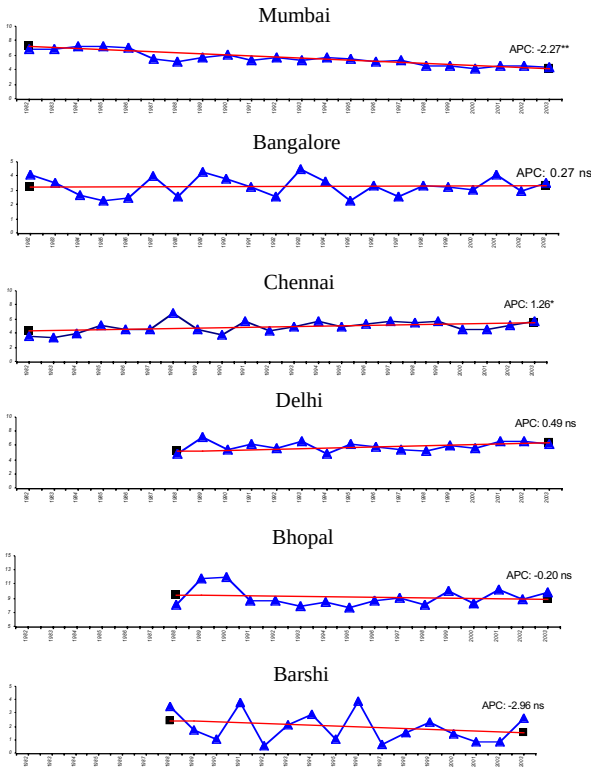

Figure 3. Trends in Age Adjusted Incidence Rates in Various Registries: Tongue - Males

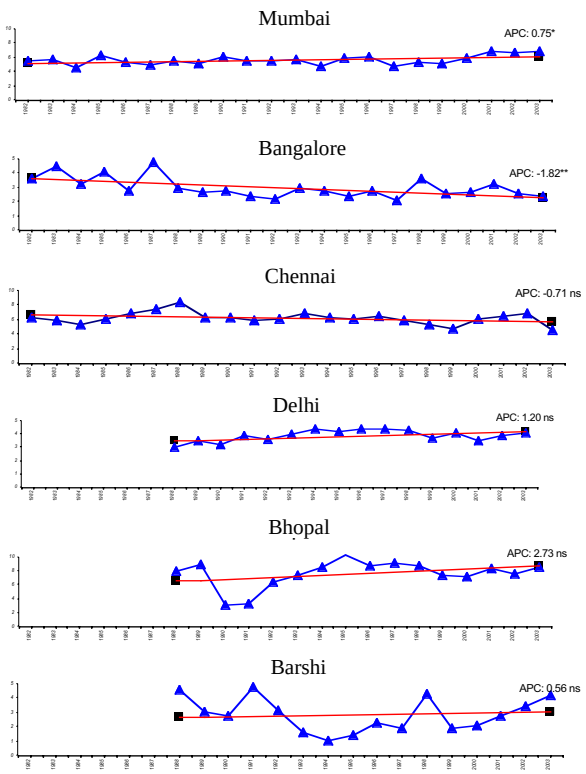

Figure 4. Trends in Age Adjusted Incidence Rates in Various Registries: Mouth - Males

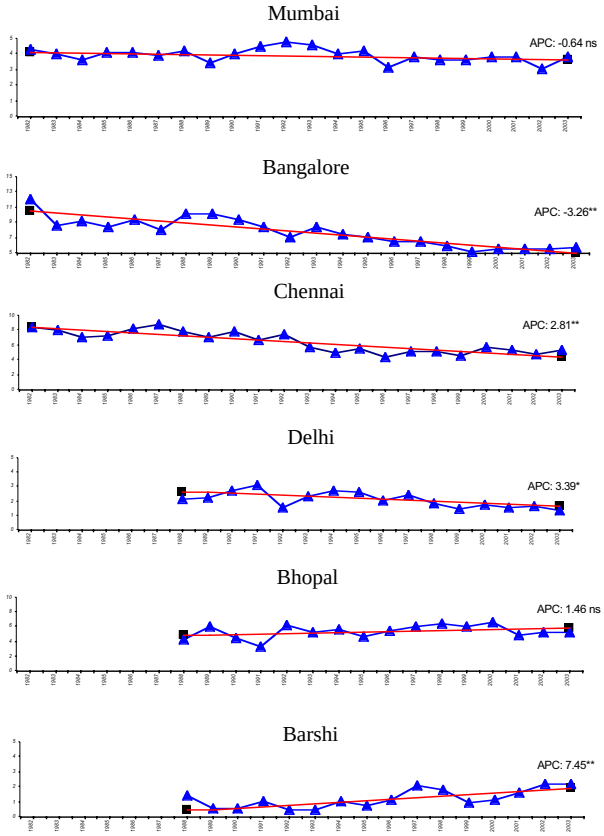

Figure 5. Trends in Age Adjusted Incidence Rates in Various Registries: Mouth - Females

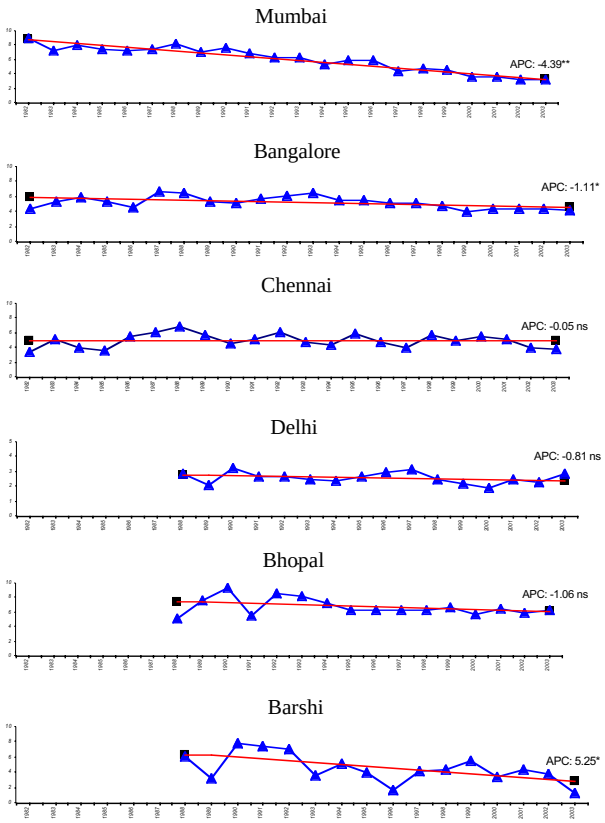

Figure 6. Trends in Age Adjusted Incidence Rates in Various Registries: Hypopharynx - Males

For the site "hypopharynx" in males, no trend was observed in a age adjusted incidence rates for Delhi, Barshi, Bangalore, and Chennai registries, decreasing trend for Mumbai and rising trend for Bhopal registry.

Time trend analysis in age adjusted incidence rates for "laryngeal" cancer in males showed no trend for Bangalore and Bhopal and Barshi registries, a decreasing trend for Mumbai registry and an increasing trend for Chennai and Delhi registries.

Discussion

When data is assessed for studying trends from a particular registry, data should be reliable and complete. From diagnosis point of view, the cases registered over a period of time should have a high percentage of microscopic confirmation and low percentage of cases diagnosed by death certificate alone. At all times all sources should be tried for collecting the required data. Strict definition should be adopted for inclusion or exclusion of cancer cases throughout the entire period of study. Much attention should be given to this issue when trends are compared with trend analysis of other registries.

The difficulty in defining cancer is illustrated by the so-called carcinoma *in-situ* lesions. In some geographical areas these lesions are registered as malignant tumors. The classification problem of papilomas of the bladder can be used as another example of difficulties in defining cancer. In some registries during some time period's papilomas are included and some times they are excluded in the incidence of urinary bladder cancer. Furthermore, in some registries and during the same time periods they are called carcinomas instead of papillomas.

A significant difficulty in the interpretation of cancer trends is created when tumors can be classified on two or more bases. During some time periods, they may be classified topographically, during others, according to the morphologically or some other criteria. Tumors of lymphatic tissue provide a good example (Barekat et al., 1979; Saxen, 1979). In some series malignant lymphomas are grouped under tumors of lymphatic tissue; in other series with reference to the primary site.

Observer variation is another great problem in the histological classification of tumors and may be of such magnitude that it seems relevant to raise serious doubts about the validity of many epidemiological studies concerning trends. A considerable level of observer disagreement has been shown in studies dealing with lung cancers (Feinstein et al), cervical cancer, malignant lymphomas (Symmers, 1968; Hakama et al., 1973), and thyroid cancer (Saxen, 1978).

Mass examinations (screenings) have a definite effect on trend curves and also on the frequency of biologically different tumors included in the trends. The reason for this is simply that slow growing tumors are always more frequently diagnosed through mass examinations than they are under normal conditions.

There should be practice of census at regular intervals of times for registry areas. Population figures by age and sex should be made available from the census department. Population estimates for required years should be made on scientific way i.e. taking into consideration the population components such as fertility, mortality, and migration.

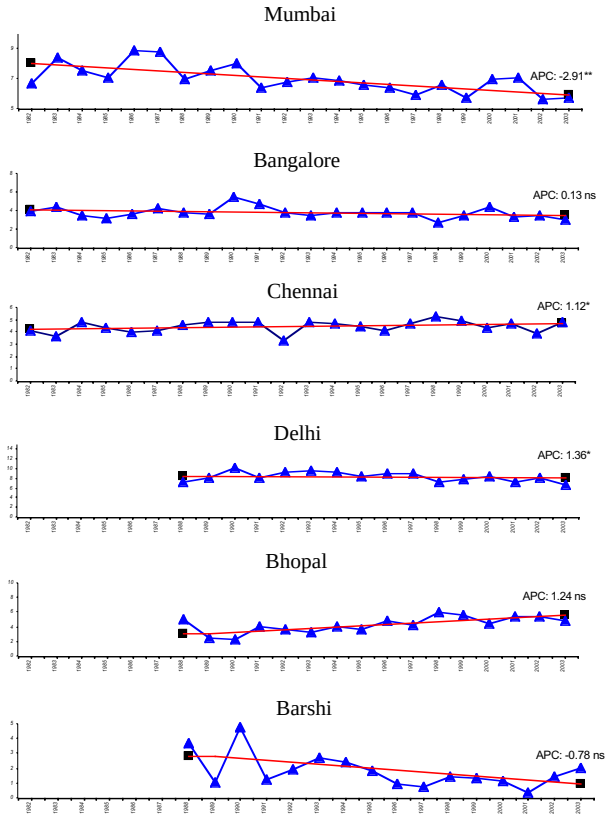

Figure 7. Trends in Age Adjusted Incidence Rates in Various Registries: Larynx - Males

While interpreting trends, changes in coverage areas under the period of study, problems with the starting registration system and difficulties in the registry conduction should also be taken into consideration. In short, interpretation of trends can be effected correctly only by those who are aware of their reliability.

For studying the trends, in six population based registries age-period-cohort models have been not used because the data required for carrying out analysis is not available for longer period except for the Mumbai registry.

Before attempting an interpretation of trends it is of the importance to evaluate the reliability of the incidence data. Various indices of reliability have been proposed for e.g., proportion with microscopic verification of diagnosis (MV), proportion registered by death certificate alone (DCO), and percentage of deaths in relation to incidence (M/I) (2). The percentage of MV between these registries is ranged 77 to 87% in males and 75 to 89% in females; the percentage of DCOs ranged from 1 to 8% while mortality incidence ratio ranged in between 25 to 75% (1). The data from these six registries has been accepted for publications in the VI, VII,VIII volumes of Cancer Incidence in Five Continents published by International Agency for Research on Cancer, Lyon, France (Cancer Incidence in Five Continents, 1992; Cancer Incidence in Five Continents, 1997; Cancer Incidence in Five Continents, 2002). It appears that cancer registration within registries is of acceptable standard and interpretation of the observed trends can be attempted.

From the Table 1, it is observed that trends in tongue, hypopharynx, and larynx are declining in almost all the registries while cancer of mouth is either stable or on the rise in most of the registries.

Several studies in India have shown that chewing and/or smoking tobacco are the main risk factors for cancer of the upper aerodigestive tract. The changing patterns in this cancer could be viewed in light of prevalent tobacco habits in the various cohorts and the risk ratios associated with specific tobacco habits. Risk ratios in smokers and chewers for several cancer sites have been estimated in two studies (Jussawalla and Deshpand, 1971; Sanghavi, 1981). However, cancer of the base of tongue which is reported to have characteristics similar to that of oropharyngeal cancer (Paymaster, 1957) is generally grouped with cancer of the oropharynx. In contrast, international classification which groups entire tongue under oral cavity. As a result, estimate of risk ratio is available for cancer of the oropharynx inclusive of the base of tongue and will be considered as appropriate for cancer of both oropharynx and tongue, Cancer of the tongue comprises mostly 75% of cancers at the base.

It has been shown in the above mention study risk ratio of bidi smokers was higher for cancers of oropharynx (RR=10.4) and Larynx (RR=7.7) than chewers (RR=3.3) and (RR=7.8) for oropharynx and larynx. Where as risk in chewers is higher for cancer of oral cavity (RR=6.0) and oropharynx (RR=4.5) than in bidi smokers (RR=2.1) for oral cancers and (RR=2.4) for hypopharynx. Those combining the habit of smoking and chewing have a much higher risk, almost multiplicative compared to those indulging in only the single habit. The risk of combine habits is particularly high for cancers of oropharynx (RR=31.7), hypopharynx (RR=16.9) and larynx (RR=20.1).

We could consider some of the western study estimates of the risk of cancer at above sites, specially cigarette smokers. For caner of the oral cavity estimates are 1.5 (Rothman and Keller, 1972) and (Wynder, 1975) One study with groups together oropharynx and hypopharynx did not show any significant risk for cigarette smokers (Elwood et al., 1984). For cancer of the larynx risk ratio was 3 for those smoking less than 16 cigarettes and 6 for those smoking 16 to 30 cigarettes per day (Wynder et al., 1976). It is worthwhile noting that bidi smokers have a much higher risk of oropharyngeal and laryngeal cancer than that of cigarette smokers.

In summary, the clear trend of cancer of the tongue, oropharynx and larynx where bidi smoking is the dominant risk factor could be explained on the basis of available data. However, for other sites (excepting the oral cavity) where, chewing or cigarette smoking is an equally or more important risk factor than bidi smoking. Further data on detailed habit pattern in birth cohorts in the general population are required to elucidate the observed lack of consistency in the trends.

References

Barekat AA, Saidi F, Dutz E (1979). Cancer Survey in South Iran with special reference to gastrointestinal neoplasma. Int. J *Cancer*, **71**, 353-63.

Cancer Incidence in Five Continents (1982). Vol.IV, IARC Scientific Publication No.42, Edited by : J Waterhouse, C Muir, K Shanmugaratnam, J Powell, *IARC*, Lyon, France.

Cancer Incidence in Five Continents (1992). Vol.VI, IARC Scientific Publication No.120, Edited by : DM Parkin, CS Muir, SL Whelan, YT Gao, J Ferlay and J Powell. *IARC*, Lyon, France.

Cancer Incidence in Five Continents (1997). Vol.VII, IARC Scientific Publication No.143, Edited by : DM Parkin, SL Whelan, J Ferlay, A Raymond and J Young. *IARC*, Lyon, France.

Cancer Incidence in Five Continents (2002). Vol.VIII, IARC Scientific Publication No.155, Edited by : DM Parkin, SL Whelan, J Ferlay, L Teppo and DB Thomas. *IARC*, Lyon, France.

Elwood JM, Pearson JCG, Skippen DH et al (1984). Alcohol, smoking, social and occupational factors in etiology of cancer of the oral cavity, pharynx and larynx, *Int. J. Cancer*, **34**, 603.

Hakama M, Franssila K, Saxen E (1973). Reliability of histopathogenic diagnosis of malignant lymphoma. *Ann Res*, **5**, 104-8.

Jussawalla DJ, Deshpande VA (1971). Evaluation of cancer risk in tobacco chewers and smokers : An Epidemiologic assessment. *Cancer*, **28**, 244.

National Cancer Registry Programme (2006). Consolidated Programme of Cancer Registries, 2001-2004, Indian Council of Medical Research, New Delhi.

Paymaster JC (1957). The importance of a uniform clinical classification and staging of carcinomas of the upper digestive tract. *Indian J.Surg*, **19**,1.

Rothman KJ, Keller A (1972). The effect of joint exposure to alcohol and tobacco on risk of cancer of the mouth and pharynx. *J Chron Dis*, **25**, 711.

Sanghavi LD (1981). Cancer Epidemiology: The Indian scene. *J Cancer Res Clinical Oncology*, **99**, 1.

Saxen E (1979). Histopathology in cance repidemiology (The Maude Abbott lecture). *Pathol Annu*, **14**, 203-27.

Saxen E, Franssila K, Bijarnason D, et al (1978). Observer variation in histologic classification of thyroid cancer. *Acta Pathol Microbiol Scand(A)*, **86**, 483-6.

Symmers WS (1968). Survey of the eventual diagnosis in 600 cases reffered for a second histological opinion after an initial biopsy diagnosis of Hodgkin's disease. *J Clin Pathol*, **21**, 650-3.

World Health Organisation (1992). Manual of the International Classification of Diseases . Injuries, causes of death (ICD-10) Vol.1, Geneva:WHO.

World Health Organisation (2000). International Classification of Diseases for Oncology, Third Edition, Geneva: WHO.

Wynder EL, Covey LS, Mabuchi K (1976). Mushinski, Environmental factos in cancers of the larynx, A second look, *Cancer*, **38**, 1591.

Wynder EL, Bross IJ, Feldman Rm (1975). A study of the etiologic factors in cancers of the mouth, *Cancer*, **10**, 1300.