

MINI-REVIEW

Social Inequalities in Cancer with Special Reference to South Asian Countries

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Abstract

There are major differences in cancer burden across socioeconomic classes, as is evident from the data for cancer incidence and mortality from Greater Mumbai, India. Changes over time are also evident and recently there has been a clear shift to increasing breast cancer particularly in well-educated women, who conversely are at much lower risk of cervical cancer. With infection-related and tobacco-related cancers, programs of prevention and early detection will yield desirable results only if it is associated with a program directed towards elimination of poverty, illiteracy and restoring social inequality. Similarly education must play a role in combatting diet-related neoplasia but here the target population may differ, requiring a specific awareness of psychological profiles.

Key Words: Social inequality - trend - education - occupation - income - residence - incidence - mortality

Asian Pac J Cancer Prev, 7, 36-40

Introduction

Data on cancer mortality by social class were first published for England and Wales in 1911 (Lynge, 1998), and it was evident even at that time that deaths due to cancer were distributed unequally in the population. In the population-based cancer registries in Mumbai (Bombay) and Chennai (Madras) data on clinical extent of the disease and survival of common cancers in women have been analysed in relation to socio economic parameters like education level, marriage status and place of residence (urban or rural). While there is a lack of reliable data on economic status, the education level of the individual can be used as a pointer. Socio-economic status within societies has always been an issue on the political agenda but inferior survival as a result of social inequality has not received its due attention.

It is the purpose of this paper to present key data on socio economic differences in cancer incidence and mortality in South Asian countries. An adequate infrastructure for registration of cancer in India is now available as a result of the national cancer registry program, although coverage is less comprehensive in other countries.

Historical perspective

Socio-economic differences in the frequency of cancer may be attributable to differences in the circumstances of life of different sections of society. Societies are not

homogenous, and variations between people of different social classes in many aspects of lifestyle, culture and behavior have clear repercussions with regard to health. In most studies of socio-economic differences and cancer occurrence, measures have been used that are constructed on the basis of occupation, education, income and wealth or area of residence (Liberatos et al 1988). Classifications involving such measures have been criticized as providing imprecise definitions and having an uncertain relation to sociological concepts. However, they persist in epidemiological research because data on morbidity and mortality and on health behavior reveal clear social divisions.

Figure 1 shows mortality rates for males and women in Greater Mumbai according to the social class in the years 1991 and 2001. Class 1 comprises professionals like doctors, lawyers, and businessmen whereas class 2 is for white collar workers, class 3 is for unskilled workers and class 4 covers people for whom no information was available. There was a clear gradient in overall cancer mortality in both 1991 and 2001, with the lowest mortality rates seen in class 1 and the highest rates in classes 3 & 4 (Jussawala et al, 1994; Kurkure et al, 2005).

Percentage distributions of cancer cases for cancer of breast, cervix and mouth by educational level amongst Greater Mumbai females for the period 1991 and 2001 are presented in Figure 2. The educational levels have been categorized in four groups: i.e. illiterates (no schooling at all); primary (upto 6 yrs of schooling); secondary (7-10 yrs);

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Figure 1. Cancer Mortality by Class/Professional Status, in Greater Mumbai

and college (11-15 yrs). For breast and mouth cancer incidence during 1991 there were no significant differences by educational level but in 2001 a clear trend was noted for percentages to increase with the education level. For cervix and mouth cancers there is a definite trend in percentage distribution in 1991 and 2001, as education level increases the level of occurrence decreases

The data send three key messages: 1. There are certain cancers which are common in lower socio-economic classes; 2. The treatment outcome is related to the social class as patients belonging to the higher class have better survival, probably due to better access to the healthcare and ability to complete the treatment; 3. Inequality between social class can increase or decrease over the time depending upon changes taking place in the society.

Cancer Incidence Patterns in South Asia

Information relating to cancer incidence trends, forms the scientific basis for the planning and organization of prevention, diagnosis and treatment of cancer in communities. The trends may also give rise to a hypotheses concerning the etiology and biology of cancer which can be tested. A trend however, always represents changes that have occurred within different groups of people, living under divergent conditions.

An attempt has been made to study the trends in age-adjusted incidence rates for the period 1982 to 2001, for

prominent sites in Greater Mumbai patients. A model that fits this data is the logarithm $Y=AB^x$ which represents a linear regression model, where Y is the estimated incidence rate per 100,000 of the population and x is the calendar year minus the initial year (1982) for the current data. 'A' therefore represents the estimated rate of the initial year and $(A-1)*100$ gives the average annual percentage change in the incidence rate, during the period. Figures show the results of the model fit, diagrammatically. In Table 1, the estimates of average annual percentage change in incidence rates, of various cancers by sex are given for the major sites, during the period 1982 to 2001 (Kurkure et al 2005). The overall age-adjusted cancer incidence rates, decreased 0.72% per year in males and increased 0.37% per year in females.

Increasing trends (statistically significant) in incidence, were seen in males for cancers involving the liver, gallbladder, prostate, urinary bladder, kidney, brain, lymphomas and leukemias and in females for cancers involving the gallbladder, breast, uterus, ovary, urinary bladder, kidney, brain, lymphomas and leukemias. A decreasing trend statistically significant in incidence, was found for the oropharynx, hypopharynx, oesophagus, stomach, larynx, lung testis and penis in males and oropharynx, hypopharynx, oesophagus, stomach and cervix in females. The incidence was found to be more stable for cancers involving the tongue, mouth, colon, rectum, and thyroid in males and tongue, mouth, oropharynx, colon,

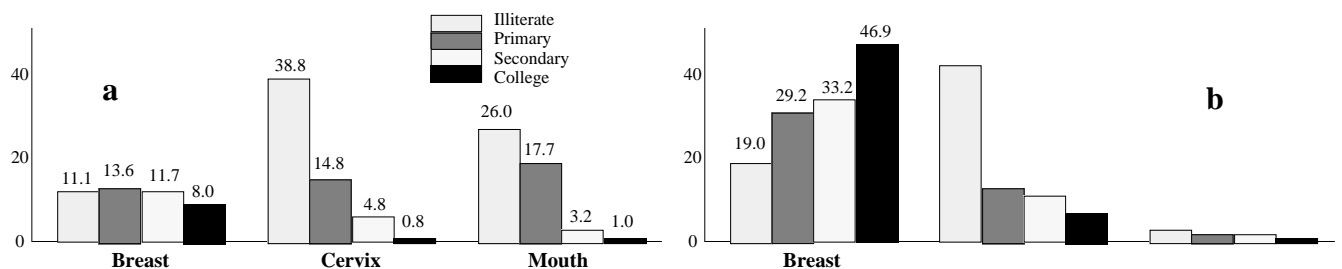


Figure 2. Percentage Distribution of Cancer Cases for Selected Sites by Educational Level, Females a) 1991 b) 2001

Table 1. Estimates of Average Annual %age Change in Adjusted Incidence Rate by Site and Sex from Regression Analysis of Greater Mumbai Data for 1982-2001

ICD	Site	%age Change	
		Male	Female
C01-C02	Tongue	- 2.42***	- 0.78ns
C04-C06	Mouth	+0.36ns	- 0.02ns
C09-C10	Oropharynx	- 2.91***	- 1.84ns
C12-C13	Hypopharynx	- 3.96***	- 3.44**
C15	Oesophagus	- 2.83***	- 2.67***
C16	Stomach	- 2.20***	- 2.82***
C18	Colon	+0.86 ns	+0.68 ns
C19-C21	Rectum	- 0.57ns	- 0.13ns
C22	Liver	+1.76***	+1.26ns
C23-C24	Gallbladder	+4.22***	+3.89***
C25	Pancreas	+1.01ns	+1.65*
C32	Larynx	- 1.11*	- 2.78**
C33-C34	Lung	- 1.63***	+1.21ns
C50	Breast	-	- 1.04**
C54-55	Uterus	-	+2.65***
C56	Ovary	-	+1.73***
C61	Prostate	+1.27*	-
C62	Testis	- 1.33*	-
C60	Penis	- 4.69***	-
C66-C68	U Bladder	+1.61*	+1.99*
C64-C65	Kidney	+3.40***	+4.02***
C70-C72	Brain	+3.79***	+4.45***
C73	Thyroid	+0.13ns	+0.88ns
C81-C85	Lymphomas	+3.68***	+4.02***
C91-C95	Leukemias	+1.57*	+1.38***
C00-C95	All Sites	- 0.72ns	+0.37ns

ns, not significant; *, **, ***, p<0.05, <0.01, <0.001

rectum, liver, pancreas, lung and thyroid in females.

For males, the greatest change in incidence over the eighteen year period was for penis which decreased by 4.65% per year followed by gall bladder (an increase of 4.23% per year) and lymphomas (an increase of 3.96% per year). In females, the greatest change in incidence during the same time period was observed for the brain (an increase of 4.60% per year) then gallbladder (up 4.42% per year) followed by lymphomas (up 4.24% per year).

Amongst females cancers of breast, cervix and ovary contribute about 50% of total incidence. A statistically significant increasing trend was observed for breast and ovarian cancers, with a decreasing trend, also statistically significant, observed for cancers of the cervix.

Preventable Cancers

The majority of cancers are preventable. The goal of primary prevention is to avoid the development of cancer by reducing or eliminating exposure to cancer causing factors. These include environmental carcinogens as well as life style factors. In Asia, particularly in Indian sub-continent, the proportion of tobacco-related cancers is very

high i.e. more than 50% in males and more than 20% in females.

Tobacco-induced death and disease are preventable. Halving current smoking rates would avoid 20-30 million deaths before 2025 and 150 million by 2050, in the world. Smoking cessation is very effective in reducing the risk of lung cancer in later life. The greatest saving of life would result if rates of smoking update by children and adolescent were decreased. Comprehensive tobacco control, including implementation of regulatory majors and encouraging personal commitments requires co-coordinated involvement of government and community and organization, health care professionals and planners. The hazard posed by environmental tobacco smoke is significant. This justifies the demand for tobacco-free environment, particularly at work and in public places.

The burden of cancer due to infections (hepatitis B & C), *Helicobacter pylori*, and human papilloma virus (HPV) have been identified in the range of 15-40% depending upon the socio economic status of the country. These cancers can be prevented by eradication and use of vaccines. The prevention of cancer is attributable to occupational environmental exposures is primarily achieved by regulatory action. Relevant measures include the replacements of carcinogens with alternative chemical or processes, improved ventilation, re-engineered manufacturing processes. A significant reeducation in occupational cancer attributable to implementation of preventive measures has been demonstrated in many instances.

Fighting Inequalities

Empowerment is defined as a multidimensional social process that helps people to gain control over their own lives and thereby overcome the vicious cycle portrayed in Figure 3. Poverty and lack of education (Table 2) together leads to the lack of empowerment which leads to delay in diagnosis, inability to access health care facilities to complete treatments and have adequate follow up.

Role of socio-economic status and reproductive factors

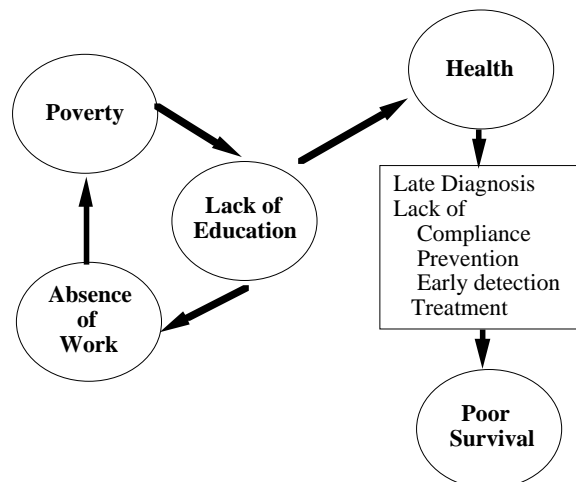


Figure 3. The Vicious Cycle Leading to Poor Survival

Table 2. Literacy Rates: 2001-02 (%), South Asia

Country	Male	Female
Bangladesh	53.9	31.8
India	68.0	44.0
Nepal	65.1	42.5
Pakistan	54.8	32.0
Sri Lanka	94.8	90.0

Source: Government reports of respective countries

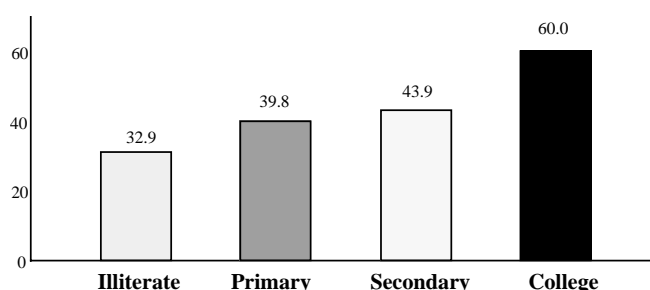
in breast cancer in India is studied by Reddy 2005. In this study three parameters education level, economic or income level, and area of living were considered under socio-economic status. According to existing status in the country the education levels have been categorized into four groups i.e. illiterates (no schooling at all), primary (up to 6 yrs of schooling), secondary (7-10 yrs of schooling), and college (11-15 yrs of schooling). Income level has been categorized into three levels. Lower income (below Rs1,500/- p.m.), Middle income (Rs.1501-4500/- p.m.) and higher income (Rs.4500/- p.m.). Area of living has been classified into two groups namely urban and rural as per census definitions.

The odd ratios for factors related to socio economic status comprising level, economic status and area of living are given in Table 4. The univariate analysis of the socio-economic factors as regards standard of living revealed that the risk of breast cancer increased significantly with the increase in education level by over four-fold, particularly for woman with educational levels of secondary and college level compared with illiterate woman. Similarly with higher income had about three-fold risk of developing breast cancers compared to woman with lower income. Woman residing in urban areas were found to be at over two-fold higher risk of breast cancer compared to woman residing in rural areas

Five-year survival rate for breast cancer was 41.8% for Mumbai population during 1992-94 (Yeole et al 2004). Age, education, marital status and extent of disease emerged as independent predictors of survival in breast cancers. Educated patients have been gone to the college 40% less risk of death as compare to those with illiterate woman

Table 3. Odd ratios and 95% Confidence Intervals for Breast Cancer by Socioeconomic Status

Factor	Case	Control	OR	95% CI
Education Level				
Illiterate	153	215	1.00*	-
Primary	57	71	1.24	0.82-1.87
Secondary	119	58	4.09	2.56-6.53
College	31	16	4.15	1.99
Economic Level				
Lower	143	177	1.00*	-
Middle	106	129	1.07	0.76-1.51
Higher	111	54	3.06	1.95-4.82
Area of Living				
Rural	208	250	1.00*	-
Urban	152	110	2.05	1.41-2.99

**Figure 4. Survival Proportions of Breast Cancer by Education Level, Greater Mumbai, 1992-94**

(Figure 4). Dr. Aziz Zeba from the Allama Iqbal Medical College in Lahore, Pakistan published the correlation between the socio economic status and outcome of Breast Cancer in ESMO newsletter (Aziz, 2005).

As far as diagnosis is concerned there is no difference in staging low socio-economic group patients. While 75% of breast cancer patients have been diagnosed in high socio-economic group in early stage. As far as treatment outcome is concerned 89% of breast cancer patients have received adequate treatment in high socio-economic group as against only 44% in low socio-economic group. Patients belonging to the high socio-economic groups have more than three times better 10 year survival as compared to the patients belonging to low socio-economic group (Table 5). The link between oral cancer with low-income level, poor oral hygiene and habits like use of alcohol, tobacco and pan were demonstrated by Dhar et al (2000).

Breaking the Barriers of the Vicious Cycle

The health education and awareness programs can reduce the mortality. These programs require minimal resources that can educate large population in short period. Such well-prepared programs can increase awareness of the signs and symptoms of the cancer and information and benefits of available health care. Such programs will empower people to take decisions and approach existing health care systems for treatment and will increase their compliance for the

Table 5. Relationship between Socioeconomic Status and Outcome for Breast Cancer Patients, Pakistan

	Diagnosis Stage		Treatment	10 yr
	Early	Late	Adequate	Survival
Low Social	50%	50%	44%	22%
High Social	75%	25%	89%	73%

Table 6. Stage and Treatment of Disease by Registration Period, Barshi Registry, India

Stage (FIGO)	1988-89 (%)	1990-02 (%)
I	12 (15.4)	35 (20.7)
II	13 (16.7)	31 (18.3)
III	39 (50.0)	74 (43.8)
IV	3 (3.8)	2 (1.2)
Unknown	11 (14.1)	27 (16.0)

completion of the treatment and adequate follow up.

The strategy adopted by Tata Memorial Centre rural cancer project at Barshi in India is to educate the population and motivate people to undergo medical investigations. The women with suspicious lesions were navigated and tracked to rural cancer centres by referral card. A significant change in down staging of cervical cancer was achieved. Some 51% of patients were diagnosed at stages 1 & 2 in the period 1990-92 as compared to the 38% of patients in the period 1988-89. The shift in down staging and completion of treatment resulted in significantly higher 5 year survival (33.1%) in the period 1990-92 versus the 24.4% in 1988-89. The health education also improved the compliance with the treatment as 60% patients completed the treatment as compared to the 42% (refer to Table 6).

Programs of prevention and early detection will yield desirable results only if it is associated with programs directed towards elimination of poverty, illiteracy and restoring social inequality.

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