RESEARCH COMMUNICATION

Population-based Survival from Cancers Having a Poor Prognosis in Mumbai (Bombay), India

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Abstract

Background: Oesophagus, stomach, pancreas and lung cancers contribute more than 35% of the total cancer incidence in Mumbai and survival rates for these cancers are very poor in most populations in the world. The authors here report and discuss the population-based survival from these cancers in Mumbai, India.

Methods: Follow-up information on 5717 cancers patients having a low prognosis, registered in the Mumbai Population-Based Cancer Registry for the period 1987-1991, was obtained by a variety of methods, including matching with death certificates from the Mumbai vital statistics registration system, postal/telephone enquiries, home visits and scrutiny of medical records. The survival for each case was determined as the duration between the date of diagnosis and date of death, loss to follow-up or the closing date of the study at the end of 1996. Cumulative observed and relative survival rates were calculated by the Hakulinen Method. For comparison of results with other populations, age-standardized relative survival (ASRS) was calculated by directly standardizing age specific relative survival to the specific age distributions of the estimated global incidence of major cancers in 1985. The log rank test was used with univariate analysis to identify the potentially important prognostic variables. The variables showing statistical significance in univariate analysis were introduced stepwise into a Cox Regression model to identify the independent predictors of survival.

Results: The 5-year relative survival rates were 11.8% for oesophagus, 10.1% for the stomach, 4.1% for the pancreas, and 7.0% for lung. Females had higher survival rates than males, except with lung cancer. Lower survival was observed for those younger than 35 years for all 4 sites. For each site, survival declined with advancing age. Single patients who remained unmarried had better survival, except with pancreatic cancer. For all sites Muslims had a better survival and Christians had a lower survival as compared to Hindus. Education did not show any pattern for any site. Survival decreased rapidly with advancing clinical extent of disease for all sites. Survival for localized cancer ranged from12.5% to 31.3%, for regional spread 1.3% to 3.4% and with distant metastasis not a single site recorded more than 1%. On multivariate analysis, extent of disease emerged as an independent predictor of survival with all the sites. Also, age for oesophagus, stomach and lung, religion for oesophagus and stomach, and education for stomach and lung, emerged as independent predictors of survival.

Conclusion: All the sites included in the study demonstrated very low survival rates with significant variation. Comparison with other populations revealed lower survival rates than for Shanghai-China. In remaining populations, survival proportions did not show much variation for pancreas and lung cancers. For stomach cancer, European countries showed better survival rates. Early detection with treatment is clearly important to reduce the mortality from these cancers.

Key Words: Survival - prognosis - oesophagus - stomach - pancreas - lung - stage - extent of disease

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Introduction

Oesophagus, stomach, pancreas, lung and leukaemias are generally cancer sites having a poor prognosis. Clinical stage at date of diagnosis has been well established as an important prognostic factor for solid tumors. As it is difficult to determine the clinical stage for leukaemias, only solid cancers like –oesophagus, stomach, pancreas and lung are considered for this study. A total of 6484 subjects (4501 males and 1979 females) with these cancers were registered during 1987–91, contributing 35.3% in males and 12.7% in females of total cancers. Oesophagus, stomach and

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pancreatic cancers contribute 57.6 %of total digestive system cancers while lung cancer contributes 57.7% of respiratory system cancers. A slow but steady decline trend in incidence for oesophagus and stomach in both the sexes and increasing trend in incidence for lung and pancreatic cancers in both the sexes are noted in Mumbai population (Kavarana et al, 2001). All these cancers have, common characteristics in terms of natural history and pattern of spread. They have a high tendency to spread to adjacent sites and, as well as there distant metastasis potential is very high. Most treatment failure is due to high risk of secondary cancers, the vast majority of these patients with this complication die of their disease. Survival data for these cancers are available mostly for developed countries. Recently survival data for these cancers from developing countries are published for Chennai-India, Qidong and Shanghai-China, and Chiang Mai-Thailand populations (Sankaranarayanan, et al 1998). In this paper an attempt has been made to estimate the population based survival proportions for these cancers for Mumbai-India population and compare the results of this study with those in other populations. For most of the sites survival rates are found to be always better for the populations of developed countries when compare with the rates of populations of developing countries. The survival rates for these cancers are reported poor even in developed countries (Miller et al1993, Berrino et al 1999).

Material and Methods

The Mumbai (Bombay) Cancer Registry, the first population-based registry in India, was established in 1963. It registers all incidence cases occurring in the resident population of Mumbai (currently 11 million). The registration system is active i.e. the registry staff visit more than 150 data sources (hospitals, clinic, nursing homes and laboratories). In Mumbai and surrounding areas where cases are likely to be diagnosed and/or treated to identify to collect required data on all cancer cases (Kavrana et al 2001). Data from death certificates mentioning "cancer" are "tumor" is obtained from Mumbai Municipal Corporation. Internal quality control measures are regularly applied to ensure the completeness and reliability of collected data. It has been shown that the quality of Mumbai Cancer Registry data is reliable and complete (Yeole and Jussawalla 1988). It has been also shown that there has been a substantial improvement in reliability and completeness of Mumbai Cancer Registry data from 1964 to 1997 (Yeole 2001).

A total of 6480 subjects of which cancers of oesophagus, stomach, pancreas and lung were registered in Greater Mumbai during 1987-91. Of these cases (58.9%) were diagnosed microscopically, (27.7%) were diagnosed by clinical investigations and (13.7%) were registered on the basis of information available on death certificates only (DCO). DCO cases are excluded from the final analysis as date of incidence and date of death are assumed to be the same day and thus 0 survived. Finally n=5717 cases were considered for further analysis. Data on sex, religion, education, marital status, age at diagnosis, incidence death, histology, and clinical extent of disease were available from the records of the registry. For 2391(41.8%) cases treatment details were not known. 1038 (18.2%) had radiotherapy only, 734(12.8%) had surgery only, 479(8.4%) had chemotherapy only and 437(7.7%) had combined modality treatment.

The cases in the study were matched against death certificates mentioning "cancer" or "tumor" as the cause of death for the period 1987-96 from the Mumbai Municipal Corporation. For unmatched cases, enquiries about the status of their current health, letters were sent, accompanied by envelopes with postage paid for replies, the few patients with telephones were called with enquires. For those cases in which no information was obtained after theses efforts, home visits were made by social workers employed by the registry. For patients who could not be traced by house visits, case records from reporting hospitals, if available, were scrutinized to determine the date of patient's last visit to a clinic.

The survival of each case was determined by the time difference (in days) between the date of incidence (index date) and date of death, date of last follow-up, are or closing date of follow-up (December 31st, 1996). The date of diagnosis was the first date consultation with a doctor when the diagnosis of cancer was made, the date of first admission at a hospital for cancer, or the date of diagnosis of invasive

Table 1. Observed And Relative Survival By Site For Cancers Having a Poor Prognosis, Greater Mumbai, 1992-94

Site	Number	Observed Survival (%)			Relative Survival (%)		
		1 Year	3 Year	5 Year	1 Year	3 Year	5 Year
Oesophagus	2018	32.7	13.6	9.7	34.0	15.3	11.8
Stomach	1265	24.8	11.0	8.3	25.8	12.4	10.1
Pancreas	439	13.7	4.9	3.4	14.2	5.5	4.1
Lung	1995	19.9	8.0	5.7	20.7	9.0	7.0

Table 2. 5-Year Relative Survival For Cancers Having a Poor Prognosis By Site, Age, Greater Mumbai, 1992-94

Site	5 Year relative survival (%) by Age group						5 Year ASR (%)	
	<35	35-44	45-54	55-64	65-74	75+	All Ages	0-74
Oesophagus	29.4	24.7	14.1	6.1	6.9	8.3	10.3	11.0
Stomach	16.6	16.8	10.7	6.9	7.5	3.5	6.6	9.7
Pancreas	17.2	9.2	5.8	0	0	0	1.9	3.0
Lung	14.9	11.8	10.8	4.2	3.1	0	4.0	6.1

cancer on a pathology report. Cumulative observed and relative survival probabilities were calculated using the method described by Hakulinen method (Hakulinen 1982, Hakulinen et al) To calculate observed survival, death from any cause was considered failure, and the subjects who were last to follow-up prior to the closing date as well as those known to be alive on closing date were censored on those dates relative survival, which indicates the excess risk of dieing from the disease was calculated as a ratio of the observed survival to expected survival in a group of people in the general population similar to the diseased group with respect to age, sex, and calendar period of observation. The expected survival was calculated based on a life table constructed from mortality from all causes of death in Mumbai(Annual Report 1990)

To compare the results of the study with those for other populations, age standardized relative survival|(ASR) was calculated for the entire group of the the patients and for the age group 0-74 only, by directly standardizing (ASR's) to the specific age distributions of the estimated global incidence of a major cancers in 1985(Sankarnarayan et al 1998 , publication no 145). The log rank test was used in a univariate analysis to identify the potentially important prognostic variables. The variables that showed statistical significance in univariate analysis were introduced stepwise into a Cox regression model to identify the independent predictors of the survival (Cox et al 1972).

Results

Complete follow-up details for five year's after the incidence date was available for 92.8% of included cases (n=5717), and the rest were lost to follow up during the first five years after the index date. Observed and relative survival rates at 1,3,5 years from diagnosis for cancers of oesophagus, stomach, pancreas and lung are given in table 1. The lowest relative survival was observed for patients with pancreatic cancers (4.1%) and the highest survival was observed for oesophageal cancer (11.8%). The 5-year relative survival for stomach cancer was (10.1%) and for the cancer of the lung was (7.0%). Females had higher survival rates than males for cancer of oesophagus, stomach, and pancreas. Survival of males exceeded that of females with cancer of the lung. (Table 3)

Table 3. 5-Year Survival Rates For Each Site By Selected Variables, Greater Mumbai 1992-94

Variable	Oesophagus			Stomach			Pancreas			Lung		
	No	Sur%	Pvalue	No	Sur%	Pvalue	No	Sur%	Pvalue	No	Sur%	Pvalue
Sex			0.7965			0.9905			.03820			0.7316
Male	1217	9.2		880	7.9		262	3.2		1676	5.8	
Female	801	10.5		385	9.1		177	3.7		319	5.0	
Age			<.0001			<.0001			<.0001			<.0001
<35	57	28.9		71	19.3		20	16.7		70	16.6	
35-44	192	23.9		128	16.3		52	8.8		184	11.4	
45-54	511	13.2		309	9.9		99	5.4		460	10.0	
55-64	651	5.3		391	5.9		132	0.1		671	3.2	
65-74	401	5.1		249	5.3		103	1.3		462	2.1	
75+	206	3.2		117	1.4		33	0.0		148	0.0	
Marital Status			.1459			.8383			.0025			.0342
Single	59	12.7		45	11.4		8	0.0		59	9.6	
Married	1384	9.9		827	7.9		282	3.4		1441	2.3	
Widowed	307	7.5		103	7.7		34	2.9		135	5.8	
Oth./Unk	268	10.4		290	9.1		115	3.7		360	6.8	
Religion			.0015			.0173			.6255			.0797
Hindu	1565	9.6		963	7.9		308	3.0		1358	5.2	
Muslim	274	13.4		162	11.3		72	6.4		407	8.6	
Christian	95	4.0		96	3.3		30	0.0		164	4.1	
Others	84	6.9		44	17.3		29	6.9		66	2.4	
Education			.1557			.0351			<.0001			<.0001
None	401	10.8		163	12.1		38	9.2		275	8.5	
<=5 yrs	297	11.8		126	7.4		25	0.0		236	8.9	
6-12 yrs	373	8.7		170	8.2		38	9.6		328	4.6	
>12 yrs	51	8.2		35	7.8		17	0.0		70	6.9	
Unknown	896	9.0		771	7.6		321	2.6		1092	4.6	
Extent of Disease			<.0001			<.0001			<.0001			<.0001
Localized	814	17.8	213	31.3		58	12.5		374	20.8		
Regional	528	3.4		453	3.1		77	1.3		467	2.3	
Dist Met.	365	0.9		424	0.8		215	0.9		839	0.2	
Unknown	311	5.0		175	18.9		89	5.0		315	2.7	
Treatment			<.0001			<.0001			.1442			<0.0001
Surgery	189	9.0		363	11.7		78	4.6		104	11.7	
Radiotherapy	624	10.0		16	0.0		15	0.0		383	4.8	
Chemotherapy	122	4.1		96	5.1		29	0.0		232	4.7	
Combined	158	12.0		92	8.7		21	0.0		167	4.5	
Others	193	9.9		131	7.0		40	0.0		273	4.5	
Unknown	732	9.7		567	6.9		256	4.5		836	6.4	

Table 4. Independent Predictors of Survival From Oesophageal Cancer In Greater Mumbai, 1992-94

Factor	Univariate (HR 95 %CI)	Multivariate	
		Treatment included In model (HR 95% CI)	Treatment not included In model (HR 95% CI)
Age group			
<=34[a]	1.00	1.00	1.00
35-44	1.15(0.80-1.63)	1.19(0.83-1.71)	1.15(0.80-1.65)
45-54	1.57(1.13-2.18)*	1.48(1.06-2.07)*	1.41(1.01-1.96)*
55-64	1.85(1.34-2.56)*	1.85(1.33-2.57)*	1.73(1.25-2.41)*
65-74	2.10(1.51-2.93)*	2.04(1.45-2.86)*	2.89(1.35-2.64)*
75+	2.62(1.85-3.72)*	2.57(1.80-3.67)*	2.36(1.66-336)*
Religion			
Hindu [a]	1.00	1.00	1.00
Muslim	0.84(0.72-0.97)*	0.81(0.70-0.93)*	0.81(0.70-0.94)
Christians	1.23(1.00-1.52)*	1.10(0.88-1.38)	1.06(0.85-1.34)
Others	1.31(1.03-1.63)*	1.26(0.99-1.61)	1.22(0.96-1.55)
Extent of Disease			
Localized[a]	1.00	1.00	1.00
Regional spread	1.79(1.59-2.01)*	1.85(1.64-2.09)*	1.83(1.62-2.07)*
Distant Metastatis	3.93(3.43-4.50)*	3.56(3.09-4.10)*	3.76(3.28-4.32)*
Unknown	1.49(1.26-1.76)*	1.36(1.14-1.61)*	1.41(1.19-1.67)*
Treatment			
Surgery[a]	1.00	1.00	
Radiotherapy	0.86(0.72-1.02)	0.95(0.80-1.13)	
Chemotherapy	1.19(0.93-1.51)	1.19(0.93-1.52)	
Combined	0.80(0.64-1.00)*	0.91(0.72-1.14)	
Others	1.24(1.00-1.54)*	1.21(0.97-1.51)	
Unknown	1.12(0.93-1.32)	1.24(1.04-1.48)*	

HR =Hazard Ratio CI =Confidence Interval a =Reference Category * =<0.05

Table 5. Independent Predictors of Survival From Stomach Cancer In Greater Mumbai, 1992-94

Factor	Univariate (HR 95 %CI)	Multivariate	
		Treatment included In model (HR 95% CI)	Treatment not included In model (HR 95% CI)
Age group			
<=34[a]	1.00	1.00	1.00
35-44	0.95(0.67-1.32)	1.06(0.72-1.48)	1.03(0.73-1.45)
45-54	1.19(0.88-1.59)	1.18(0.87-1.60)	1.13(0.83-1.53)
55-64	1.41(1.05-1.88)*	1.52(1.17-2.06)*	1.47(1.09-1.99)*
65-74	1.70(1.26-2.30)*	1.81(1.32-2.48)*	1.70(1.24-2.32)*
75+	1.89(1.35-2.64)*	2.26(1.59-3.27)*	2.31(1.63-3.27)*
Religion			
Hindu [a]	1.00	1.00	1.00
Muslim	0.82(0.68-0.99)*	0.81(0.70-0.93)*	0.87(0.81-1.51)
Christians	1.22(0.98-1.52)	1.10(0.88-1.38)	1.13(0.90-1.41)
Others	0.79(0.57-1.11)	1.26(0.99-1.61)	0.59(0.42-0.83)*
Education			
None[a]	1.00	1.00	1.00
<=5 yrs	1.21(0.95-1.55)	0.86(0.71-1.04)	1.21(0.94-1.56)
6-12 yrs	1.13(0.90-1.43)	1.13(0.91-1.42)	1.13(0.90-1.44)
>12 yrs	0.94(0.63-1.41)*	0.59(0.42-0.83)	1.04(0.69-1.58)
Unknown	1.25(1.07-1.55)*	1.21(1.00-1.40)*	1.25(1.02-1.52)*
Extent of Disease			
Localized[a]	1.00	1.00	1.00
Regional spread	2.33(1.99-2.82)*	2.62(2.15-2.30)*	2.44(2.00-2.98)*
Distant Metastatis	5.67(4.62-6.94)*	6.24(5.06-7.70)*	6.19(5.04-7.62)*
Unknown	1.99(1.51-2.61)*	1.98(1.50-2.60)*	2.05(1.56-2.70)*
Treatment			
Surgery[a]	1.00	1.00	
Radiotherapy	1.31(0.77-2.24)	1.10(0.64-1.89)	
Chemotherapy	1.43(1.13-1.81)*	1.07(0.84-1.37)	
Combined	0.97(0.76-1.24)	0.89(0.69-1.14)	
Others	1.44(1.15-1.79)*	1.54(1.23-1.93)*	
Unknown	1.52(1.32-1.76)*	1.42(1.22-1.65)*	

HR =Hazard Ratio CI =Confidence Interval a =Reference Category * =<0.05

Lower survival was observed for those younger than 35 years than for other age groups for all four cancers (Table 2). For each cancer survival declined with advancing age, though this was less remarkable after the age 55. The lowest ASRs for those ages 0-74 years were observed for cancer of pancreas (3.0%) and highest for the oesophagus (11.0%).

Single patients who remained unmarried had better survival rates than others except for pancreatic cancer. Muslims had a better survival and Christians had poor survival as compare to that of for Hindus for all the sites. Where as education did not show any pattern of survival in any of the sites (table 3).

Information on clinical extent of disease was available in 80 to 90% cases for these sites. The percentage localized stage comprised about 40% for oesophagus and around about 15% for other sites. The percentage for regional spread was maximum of 35.8 for stomach and only 1.3 for pancreas. Percentage for distant metastases were recorded highest for pancreatic cancer (49%) followed by lung (42.1%), stomach (33.5%) and oesophagus (18.1%) in descending order. Survival decreased rapidly with advancing clinical extent of disease for all the sites. Survival for localized cancer ranged from 12.5 % to 31.3%. But it ranged only from 1.3% to 3.4% for regionally spread disease at different sites and not more than 1% for any site with distance metastasis.

In univariate analysis survival differences reached statistical significance for age and extent of disease for all the sites. Survival difference did not reached statistical significance in religion for oesophageal and stomach cancers, in marital status for pancreas and lung, in education for oesophageal cancer and in treatment pancreatic cancer. Combined therapy for oesophageal cancer, surgery for stomach, pancreas and lung cancer showed better survival than other mortalities (Table 3). The differences in survival by treatments was a reflection of the clinical extent of disease based on which different modalities might have been chosen for treatment. Survival by selected socio-economic indicators, such as sex, age, marital status, education and religion; and clinical variables such as extent of disease and treatment for each site are studied separately.

Independent predictors of survival from oesophageal, stomach, pancreatic and lung cancer are presented in Tables 4, 5, 6, 7, respectively.

On multivariate analysis age, religion, and extent of disease were emerged as independent predictors of survival for oesophageal cancer. People aged 75 and above had a 2.62 times higher risk of death as compared to the age less than 35 years. Muslims had 20% lower risk of death as compared to those with Hindus. Those patients with distant metastases had an approximately four times higher risk of death than localized disease (Table 4).

For stomach cancer age, religion, education, and stage of disease were emerged as independent predictors of survival. People aged 75 and over had 90% higher risk of death than aged less than 35 years. Muslims have 18% less and Christians have 20% higher risk of dying than Hindus. Patients with distance metastasis had 5.7 times risk of death as compared to the patients having a localized stage (Table 5).

For pancreatic cancer only extent of disease had emerged as an independent predictor of survival (Table 6). On multivariate analysis for lung cancer age and extent of

Table 6. Independent Predictors of Survival From Pancreas Cancer In Greater Mumbai, 1992-94

Factor	Univariate (HR 95 %CI)	Multivariate	
		Treatment included In model (HR 95% CI)	Treatment not included In model (HR 95% CI)
Age group			
<=34[a]	1.00	1.00	1.00
35-44	0.93(0.52-1.66)	0.58(0.31-1.07)	0.58(0.32-1.08)
45-54	0.87(0.50-1.50)	0.58(0.33-1.04)	0.57(0.32-1.02)
55-64	1.17(0.68-2.01)	0.80(0.45-1.42)	0.81(0.46-1.43)
65-74	1.42(0.81-2.45)	0.94(0.53-1.68)	1.00(0.56-1.78)
75+	1.91(1.01-3.58)*	1.32(0.66-2.63)	1.36(0.68-2.69)
Marital Status			
Single[a]	1.00	1.00	1.00
Married	1.01(0.45-2.28)	0.88(0.35-2.20)	0.84(0.34-2.11)
Widowed	1.16(0.48-2.78)	0.89(0.33-2.40)	0.86(0.32-2.31)
Others	1.70(0.58-7.36)	1.18(0.46-3.02)	1.16(0.46-2.96)
Education			
None[a]	1.00	1.00	1.00
<=5 yrs	1.12(0.66-1.89)	0.94(0.54-1.63)	0.89(0.52-1.53)
6-12 yrs	0.84(0.51-1.37)	0.79(0.47-1.32)	0.78(0.47-1.30)
>12 yrs	1.10(0.59-2.05)	1.01(0.51-1.99)	1.00(0.51-1.96)
Unknown	1.69(1.15-2.42)*	1.40(0.94-2.09)	1.39(0.93-2.07)
Extent of Disease			
Localized[a]	1.00	1.00	1.00
Regional spread	1.51(1.05-2.17)*	1.92(1.31-2.80)*	1.93(1.32-2.82)*
Distant Metastatis	2.51(1.82-3.46)*	2.90(2.07-4.05)*	2.83(2.03-3.95)*
Unknown	1.46(1.00-2.16)*	1.25(0.83-1.88)	1.29(0.86-1.93)

HR =Hazard Ratio CI =Confidence Interval a =Reference Category * =<0.05

Table 7. Independent Predictors of Survival From Lung Cancer In Greater Mumbai, 1992-94

Factor	Univariate HR(95%CI)	Multivariate Treatment included In model (HR95% CI)	Treatment not included In model (HR95% CI)
Age group			
<=34[a]	1.00	1.00	1.00
35-44	1.10(0.80-1.52)	0.98(0.71-1.37)	0.94(0.68-1.32)
45-54	1.11(0.82-1.49)	1.04(0.77-1.41)	1.04(0.77-1.41)
55-64	1.30(0.98-1.75)	1.26(0.94-1.70)	1.26(0.93-1.69)
65-74	1.49(1.11-2.01)*	1.35(1.00-1.83)*	1.39(1.03-1.89)*
75+	2.01(1.45-2.79)*	1.43(1.02-2.00)*	1.55(1.11-2.17)*
Marital Status			
Single[a]	1.00	1.00	1.00
Married	0.97(0.72-1.30)	0.95(0.70-1.34)	0.86(0.63-1.16)
Widowed	1.10(0.78-1.55)	0.97(0.81-1.16)	0.82(0.58-1.16)
Others	1.30(0.59-3.77)	0.89(0.68-1.17)	0.97(0.70-1.33)
Education			
None[a]	1.00	1.00	1.00
<=5 yrs	0.93(0.77-1.13)	0.85(0.69-1.02)	0.86(0.71-1.04)
6-12 yrs	0.99(0.84-1.18)	0.97(0..81-1.15)	0.95(0.80-1.13)
>12 yrs	0.90(0.68-1.20)	0.92(0.69-1.22)	0.84(0.63-1.12)
Unknown	1.32(1.14-1.52)*	1.18(1.02-1.38)*	1.20(1.03-1.39)*
Extent of Disease			
Localized[a]	1.00	1.00	1.00
Regional spread	2.33(2.00-2.72)*	2.51(2.14-2.94)*	2.42(2.07-2.82)*
Distant Metastatis	4.81(4.14-5.58)*	5.01(4.30-5.84)*	4.87(4.19-5.67)*
Unknown	2.20(1.80-2.69)*	2.16(1.77-2.64)*	2.26(1.85-2.76)*
Treatment			
Surgery[a]	1.00	1.00	
Radiotherapy	1.28(1.01-1.62)*	1.07(0.84-1.36)	
Chemotherapy	1.50(1.17-1.93)*	1.16(0.89-1.50)	
Combined	1.15(0.88-1.50)	0.89(0.68-1.17)	
Others	1.84(1.44-2.36)*	1.54(1.20-1.98)*	
Unknown	1.81(1.44-2.27)*	1.51(1.20-1.90)*	

HR =Hazard Ratio CI =Confidence Interval a =Reference Category * =<0.05

disease had emerged as independent predictors of survival. Patients having 75 and above have double risk of dying than patients having age less than 35 years. Patients treated by radiotherapy alone have 28% better survival and by chemotherapy have 50% more as compared to the patients treated by surgery (Table 7).

Discussion

The problem in determining the vital status of registered patients of specified intervals after diagnosis are manifold in developing countries due to inadequate death registration system, lack of national and regional population registries, routine linkage mechanisms and inadequately developed clinical follow-up systems in hospitals. Even though death registration is reportedly more than 95% complete in Mumbai (Annual report 1990, Gupta and Ramarao 1973). Documentation of cause of death is in adequate and far from satisfactory. Since adequate follow-up information on death is a major prerequisite to obtain precise estimates of survival, additional active follow-up procedures were employed. In present study out of 5717 cases 3501 (61.3%) were matched with death certificates from Municipal Corporation, from remaining cases follow-up status was determined for patients 1153(20.2%) by either from telephone or postal enquiries and for patients 648(11.3%) by making visits, and remaining 412 (7.2%) patients were lost to follow-up.

The overall five year relative survival from oesophageal cancer (11.8%) was found to be higher as compare with stomach cancer (10.1%), lung cancer (7.0%), and pancreatic cancer (4.1%). This may be due to higher proportion of localized cancers and fewer cases of distance metastasis in the oesophageal cancer as compare to stomach, lung, and pancreatic cancers. Sex differentials in survival for each sites disappeared after adjustment for disease-specific factors such as age and stage.

Poor survival with advancing age was observed in each site and remained significant after adjusting for clinical extent of disease and treatment except for cancer of pancreas. Survival reports from most populations in USA (Miller B A et al) Europe (Berrino 1991), Australia (Supramaniam et al 1999) and some populations in developing countries (Sankarnarayan et al 1998), do not suggest any marked differences across age groups except poor survival in the elderly. The low survival is attributed to poor general health in old age and difficulties in prescribing radical cancer therapies and possibly an association with more advanced stages.

The survival differences that persisted for marital status and religion and more likely to be related to socio-economic factors associated with personal habits and comorbiidity. Marital status has been shown to be independent predictors

Table 8. 5-Year Age Standardized Relative Survival In the 0-74 Year Agegroup In Selected Populations

Population/Country	Period	Oesophagus	Stomach	Pancreas	Lung
Mumbai, India	1987-91	11.0	9.1	3.0	6.1
Chennai, India	1984-89	6.9	7.5	4.4	7.9
Qidong, China	1982-91	4.6	17.2	6.0	3.9
Shanghai,China	1988-91	14.8	28.2	7.2	13.8
Chiang Mai, Thailand	1983-92	3.3	8.7	2.5	3.2
England	1985-89	9.0	12.0	3.0	7.0
Finland	1985-89	8.0	21.0	3.0	11.0
Swedan	1985-89	14.0	17.0	3.0	10.0
Europe	1985-89	9.0	22.0	4.0	10.0

Source for data other than Mumbai; Reference No. 2, 4.

of survival for breast cancer in Mumbai (Sankarnarayan et al 1998). The impact of socio-economic differences in survival has been documented elsewhere (Kogevinas et al 1990, Mackillop et al 1997). The poor survival of patients with cancers having poor prognosis is mostly due to comorbidity associated with long-standing tobacco and alcohol habits.

The anatomatic structure of and relations among these cancers sites are very complex and the lesions arising in a particular site tend to overlap and spread locally to adjutants sites, particularly at advanced stage, thus there are often difficulties in determining the site of origin. These difficulties are even more pronounced in cases of oesophagus, stomach and lung. Notwith standing these difficulties and possible site misclassification, the sites of origin of cancers having poor prognosis is a major determinant of survival outcome of because of the differences in clinical spread of disease and choice of treatment options. In our study a better prognosis was observed for patients with oesophageal cancers compared with stomach, lung and pancreatic cancers.

Our results clearly indicate the importance of clinical extent of disease in the prognosis of cancer. Since data collected from many data sources and there are qualitative differences in investigative capabilities and documentation across different sources, population based cancer registries are at a disadvantage in obtaining detailed and accurate clinico pathological staging information for the majority of cases. Documentation of clinical staging for many cancer sites remains less than satisfactory in many regions of the world in spite of international efforts to promote uniform cancer staging systems (Hermanek et al 1997). We were able to obtain some information from the records in the clinical spread of disease for 85% of oesophageal, stomach and lung, and 80% for pancreatic cancer. Localized "cancers" in our study refer to tumor limited to particular that cancer without known spread to the lymph nodes are adjacent tissues; regional disease indicates the presence of invasion of surrounding tissues and /or involvement of the lymph nodes; and distant metastasis implies spread of distant organs. Although this categorization is rather simple and is not based on the explicit descriptions of clinical invasion of cancer at diagnosis, the survival according to these categories (table IV-VII) predicted the prognosis the reasonably well.

Oesophagus, stomach, pancreas and lung cancer are primarily treated by surgery or radiotherapy or a combination both. The selection of appropriate treatment for a specific cancer depends on a number of variables including tumor sites, clinical stage, nutritional status, concomitant health, patient preference and the established effects of different treatments. For small primary cancers without regional spread, wide surgical excision alone or curative radiotherapy by branchy therapy and/or external beam alone is considered. Although functional and cosmetics results are better following radiotherapy, local control rates are generally better with primary surgery. However, local recurrence after radiotherapy may be successfully treated with surgery. For more extensive tumors with loco regional spread, combinations of both modalities with or without chemotherapy are generally used. Chemotherapy is mostly investigational, and it's use has not been shown to improve long term survival in clinical trails. However tobacco and alcohol, both risk factors for all these four cancers may compromise radical treatment due to their association with other illness.

There are no focused and sustained early detection efforts for cancer in Mumbai, are for the matter in the state of Maharashtra or the whole of India, even though there are periodic efforts in health awareness programs and opportunistic detection facilities. However diagnostic and therapeutic services for cancer are reasonably well developed in Mumbai as indicated by the wide spread facilities for surgery and radiotherapy. Surgical facilities are available in many hospitals in both public and private sectors. Radiotherapy and cancer chemotherapy services are provided by more than 15 hospitals.

Five-year age standardized relative survival in the 0-74 year age group for oesophagus, stomach, pancreas and lung cancer in selected populations are presented in table VIII. Survival for all these four cancers is reported better for Shanghai population when compared to other populations. Survival in Mumbai for pancreatic cancer is similar to the most of the countries except Chinese population. For lung cancer the survival in Mumbai is similar to populations of England and Chennai, India, higher than the population of Qidong –China and Chiang Mai, Thailand and it was almost half of that observed in Shanghai population. Almost all

the populations have reported better survival for stomach cancer as compared to Indian and Thailand populations. The survival for stomach cancer is reasonably better for European populations as compared to that of Asian populations. For oesophageal cancer only Swedish and Shanghai populations have reported better survival than the Mumbai population.

Cancers of oesophagus, stomach, pancreas and lung are characterized by poor survival with increasing age at diagnosis. For all these cancers the largest survival difference is between youngest age class and the next class. Since stage at diagnosis and surgical radically are the main prognostic factors for all these cancers. It would seem that elderly patients more often presents at advanced stage of disease or with contradiction to exclusive surgery than younger patients. (Faivre et al 1998, Gatta et al 1998).

Too possible explanations for the general patterns are that the natural history of disease has more influence than therapy in determining outcome among older patients, or that older patients are treated less frequently and less intensively than younger patients. Advanced age at diagnosis is often associated with late tumor stage and comorbidity, which can contradict the application of potentially curative therapy. (Bergman et al 1992, Havlik 1992), leading to less favorable and more homogeneous outcomes in the own. By contrast, younger patients are generally in better health and their disease may be at an earlier stage, so that more aggressive and effective therapies can be applied.

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