Original Article (I)

Cancer Patterns in the Rayalaseema Region of Andhra Pradesh

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ABSTRACT

Background: We Collected information on cancer patterns from the Rayalaseema region of Andhra Pradesh.

Methods: Patients with microscopically confirmed diagnosis of malignancy were included with an objective of studying cancer types, epidemiological, and survival patterns. Staging was assessed as per TNM guidelines.

Results: One thousand eighty-nine patients were included (588 Males and 501 females). Median age for all patients was 51 years (range 1 – 91 years). One eighty-three (19.7%) patients presented with early stage disease and Seven hundred forty-seven (80.3%) patients presented with advanced stage. Seventy-one patients (7.1%) didn't have data on stage. Eighty-eight patients had hematological malignancies that are not staged routinely.

The most common 10 cancers were lung (9.9%), stomach (9.7%), cervix (9.4%), breast (9.3%), head and neck (8.1%), primary unknown origin (4.4%), ovary (4.3%), HCC (4.2%), NHL (4.2%), Esophagus (3.5%) and CML (3.4%).

Median survival for the whole cohort was 30.5 months (95% CI: 25-36). The 3-year survival rate was 41%. Males had median survival of 23.8 months, while females did not reach median survival (P<0 .0001). Patients with early stage cancer did not reach the median survival, while patients with advanced stage had median survival of 26 months (P<0 .0001).

Conclusions: This study shows relatively high frequencies of carcinoma lung, stomach liver and colon when compared to other regions in India. The 3 year survival rate for all cancers was 41%. Male gender and advanced stage have adverse effect on survival.

INTRODUCTION:

There is no data on cancer incidence and distribution from the Rayalaseema region in the state of Andhra Pradesh. Rayalaseema region comprises of five districts, Chittoor, Kadapa, Ananthapur, Kurnool and Nellore. The total population of these five districts is 1,40,77,980; the total area is 80375 sqkm. The literacy rate of this region is 45.55, which is below the National average of 52.21. Approximately 76.7% of the population resides in the rural area[1]. It has distinct ethnicity. This is a prospective, observational study conducted with an objective of studying the cancer types, epidemiology and survival patterns.

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METHODS: The study was carried in the department of Oncology. Patients with either cytologically or

histologically confirmed diagnosis of malignancy were included. Staging was assessed and classified as per TNM guidelines. Further, patients were classified in to two groups, having early stage and advanced stage cancer for survival analysis.

Early- stage group consisted of patients with stage I and II. Advanced- stage group consisted of patients with stage III and IV. Head and Neck cancers included those originating from oral cavity, tongue, lips, hypopharynx, nasopharynx, larynx, salivary gland tumors and pyriform fossa tumors.

Two independent persons have checked the data for accuracy, one person has gone through each of the case record in medical records department and another checked the same at the Local area Network (LAN) in the Institute.

Principal investigator supervised both these activities and crosschecked with departmental cancer register.

Statistics and Data handling: Primary data was entered in to excel spread sheet and numerically coded. Checked for repeat entries.

Survival was calculated from the date of diagnosis to the date of death. Patients who could not be followed until death were assigned censured values based on the last date they were known to be alive.

Kaplan- Meier method was used to calculate the survival. Log rank test was used to test the equality of the groups over the survival distribution estimates. Cox regression analysis with forward conditional method was used to identify the prognostic factors. SPSS and Epi Info 2002 statistical packages were used for the analyses.

RESULTS :

Demography and Patient characteristics:

One thousand eighty nine patients were included in this study. Five hundred eighty eight (54.0%) were males and 501 (46.0%) were females. Median age for all patients was 51 years (range 1 – 91 years): median age for males was 53.5 yrs (range 2-91 years), while median age for females was 50 years (range 1-85 years). One thousand two patients (92%) were Hindus, 81(7.4%)were Muslims and 6(0.6%) patients were Christians. **District**: Six hundred eighty nine patients (63.3%) have come from Chittoor, while 215 patients (19.7%) were from Kadapa, 102 patients (9.4%) were from Nellore, 22 (2.1%) were from Ananthapur and 61 patients (5.67%)came from other areas.

Two hundred sixty patients (28.6%) were ever smokers and 650 patients (71.4%) were non-smokers. One hundred seventy nine (16.4%) patients did not have information on smoking. All smokers were males. 161 patients (61.8%) smoked beedi and 92 (33.6%) smoked cigarettes. Seven (4.6%) smoked both beedi and cigarettes. Mean bundle beedi years smoked was 37.6, while mean pack years of cigarette smoking was 50.4.

One hundred thirty-nine (15.7%) have consumed alcoholic beverages and 748 (68.7%) were not alcoholics. There is no data on 202 (18.5%) patients. The mean duration of alcohol use is 24.2 years. All alcoholics were males. Forty-one patients (3.8%) were reported to be paan-tobacco chewers, out of these 20 were males and 21 were females.

Cancer patterns: The frequencies of cancers occurrence in the study cohort are listed in Table-1. Solid tumors were diagnosed in 923 patients (83.5%, 95%CI: 82.5%- 86.8), while hematological malignancies were diagnosed in 166 patients (15.2%, 95%CI 13.2-17.5).

The most common 10 cancers for the whole cohort are lung (9.9%), stomach (9.7%), cervix (9.4%), breast (9.3%), head and neck (8.1%), primary unknown origin (4.4%), ovary (4.3%), HCC (4.2%), NHL (4.2%), esophagus (3.5%) and CML (3.4%). Cancers stratified according to gender are presented in the table-2 and table-3.

Synchronous double primaries were seen in four patients.

Table1: Cancer Types and Their Frequencies

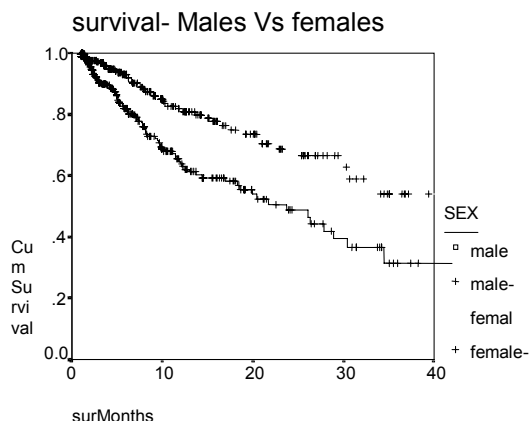| Cancer type	Frequency	Percent %	95%CI
Lung	108	9.9	8.2–11.9
Stomach	105	9.7	8.0–11.6
Cervix	102	9.4	7.7–11.3
Breast	101	9.3	7.7–11.2
Head & Neck	88	8.1	6.6–9.9
primaryUnknown	48	4.4	3.3–5.9
Hepatocellular Ca	46	4.2	3.1–5.6
N H L	46	4.2	3.1–5.6
Ovary	47	4.3	3.2–5.7
Esophagus	38	3.5	2.5–4.8
C M L	37	3.4	2.4–4.7
Colon	34	3.1	2.2–4.4
A M L	33	3	2.1–4.3
Rectum	26	2.4	1.6–3.5
Brain	23	2.1	1.4–3.2
Pancreas	20	1.8	1.2–2.9
Urinary bladder	18	1.7	1.0–2.7
Multiple Myeloma	18	1.7	1.0–2.7
Soft tissue sarcoma	18	1.7	1.0–2.7
Bone	17	1.6	0.9–2.5
Hodgkins lymphoma	18	1.7	1.0–2.7
A L L	14	1.3	0.7–2.2
Prostate	12	1.1	0.6–2.0
Renal cell carcinoma	13	1.2	0.7–2.1
Choriocarcinoma	8	0.7	0.3–1.5
Testis	7	0.6	0.3–1.4
Anal canal	6	0.6	0.2–1.3
CLL	4	0.4	0.1–1.0
Double primary	4	0.4	0.1–1.0
Penis	4	0.4	0.1–1.0
Cholangio carcinoma	3	0.3	0.1–0.9
Melanoma	3	0.3	0.1–0.9
Neuroblastoma	3	0.3	0.1–0.9
Rhabdomyosarcoma	4	0.4	01.–1.0
Thymoma	3	0.3	0.1–.09
Carcinoid	2	0.2	0.0–0.7
Endometrium	2	0.2	0.0–0.7
Mesothelioma	2	0.2	0.0–0.7
Gall bladder	1	0.1	0.0–0.6
GI stromal tumor	1	0.1	0.0–0.6
Small bowel	1	0.1	0.0–0.6
Wilms's tumor	1	0.1	0.0–0.6

Stage: Thirty-seven patients (3.7%) had stage I cancer,146 (14.6%) stage II, 385 (38.5%) stage III and 362 patients (36.2%) had stage IV cancer. Seventy-one patients had no data on stage (7.1%). Eighty-eight patients had hematological malignancies that are not staged routinely. One eighty-nine (20.5%) out of 923 patients with solid tumors have presented with visceral metastases.

One eighty-three (19.7%, 95%CI 17.2 to 22.4) patients had early stage disease (stage I and II), while 747 patients (80.3%, 95%CI 77.6 to 82.8%) had advanced stage disease (stage III and IV).
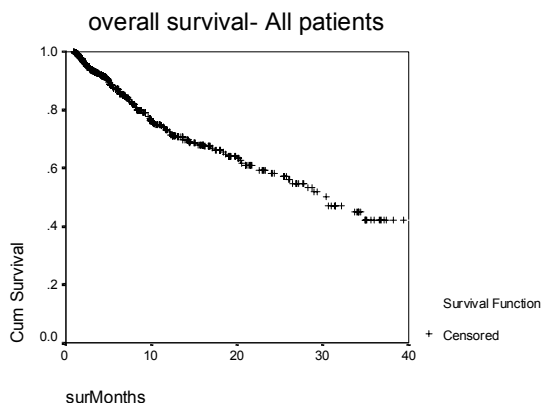
Survival: Median survival for the whole cohort was 30.5 months (95% CI 25.0 to 36.0). Males had median survival of 23.8 months (95%CI 17.0, 30.6), while median survival for women was not reached (Figure2). The log rank test, significance P<0.0000. The median survival of most common 10 cancers is provided in Table4. Non-smokers had median survival of 30.5 months (95%CI 24.3 to 36.6), while ever smokers had median survival of 20 months (95CI 9.6, 30.3). The log rank test significance P< 0.0026.

Patients with early stage cancer (stage 1 and 2) did not reach the median survival. Patients with advanced stage (stage 3 and 4) had median survival of 26 months (95% CL 19.7, 32.4). Log rank significance P<0.0001 (Figure3). Cox regression analysis with forward conditional method was employed to study the relationship between the smoking status, sex and the stage on overall survival. The model excluded the smoking status as a prognostic factor.
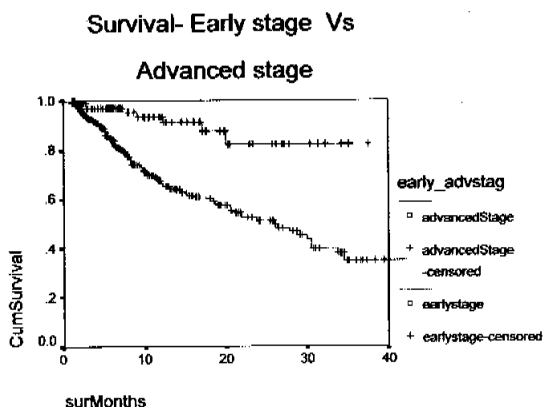
The relative risk for gender was 0.424 and for stage 0.315. It means that when compared to females, males are 0.424 times more prone for death. Similarly patients with advanced stage are 0.315 times more prone for death than the patients with early stage. The regression model was found to be significant with chi-square value 39.616 (P<0.0001).

survival- Males Vs females

(Figure2

overall survival- All patients

(Figure1)

Survival- Early stage Vs Advanced stage

(Figure3)

shown that smoking and alcohol consumption is extremely rare among women in southern India, while paan-tobacco chewing is commonly seen in women[2-4]. Table 2and 3 are showing 10 common cancer stratified according to the gender; from hospital based cancer registries (HBCR) from three different regions, Chennai (Southern India), Mumbai (Central India) and Chandigarh (Northern India)[5]. The data from the present study is provided for comparison.

The frequency of lung cancer in both males and females is higher at Tirupati. A higher frequency of lung cancer among women, despite being non-smokers, may be due to cooking habits. Tirupati is a municipality and the most of the patients come from the rural regions. Firewood continues common cooking medium. Passive smoking may also be a factor. Similarly the frequency of stomach cancer was high at Tirupati, in both sexes. The prevalence of H.pylori infection in this region is unknown. Additional factors, particularly diet, as it is distinctly spicy, need to be studied. The carcinoma of colon and the Primary Unknown Origin (PUO) were more common at Tirupati, affecting males and females equally. This again is suggestive of common aetiological factor. Since these cancers are seen affecting both sexes, although more prominently the males: common aetiological factor(s) seem to be operating, may be dietary or environmental or combination of both.

DISCUSSION:

In this study we found that lung and stomach cancers were the two most common malignancies. Other common cancer sites in descending order of frequency were carcinoma uterine cervix, breast, head and neck region cancers, primary unknown origin, hepato cellular carcinoma, NHL, ovary and esophagus. Solid tumors comprises of more than two-thirds of cancer burden. Two-thirds of the patients present with advanced stage. Median survival for the whole cohort was 30.5 months (figure1). Male sex and advanced stage have adverse effect on the survival.

Cancer promoting habits smoking and alcohol use was confined to male patient population. The paan-tobacco chewing was equally distributed in both males and females. We have

TABLE 2 : Ten Major Common Forms of Cancer in Males-HBCR data

	TIRUPATI (Present Study)	CHENNAI	MUMBAI	CHANDIGARH
1	lung (15.1)	Oral Cavity (11.4)	Oral Cavity (9.9)	Lung (11)
2	stomach (12.6)	Esophagus (8.4)	Tongue (8.8)	Tongue (6.6)
3	Head & Neck (9.5)	Tongue (7.8)	Hypopharynx (8.1)	Esophagus(5.7)
4	HCC (7.0)	Stomach (7.3)	Esophagus (7.6)	Stomach (4.8)
5	NHL (7.0)	Hypopharynx (7.2)	Lung (6.9)	Larynx (4.4)
6	puo (4.8)	Lung (6.5)	Larynx (6.3)	NHL (4.2)
7	esophagus (4.3)	Larynx (4.4)	NHL (4.4)	Brain (3.7)
8	AML (4.1)	NHL (3.9)	Oropharynx (3.8)	Oropharynx (3.3)
9	CML (3.7)	Oropharynx (3.5)	Leuk Myeloi (3.6)	Rectum (3.5)
10	colon (3.6)	Penis etc. (3.2)	Leuk Lympho (3.4)	Leuk Lympho (3.1)

TABLE 3 : Ten major forms of cancer in females- HBCR data

	TIRUPATI (Present Study)	Chennai	Mumbai	Chandigarh
1	Cervix (20.4)	Cervix (42.2)	Cervix (27.6)	Cervix (39.8)
2	Breast (20.0)	Breast (15.8)	Breast (23.0)	Breast (15.3)
3	Ovary (7.8)	Oral Cavity (7.4)	Esophagus (5.1)	Esophagus (5.0)
4	Head & Neck (6.4)	Esophagus (3.6)	Oral Cavity (4.7)	Ovary (4.1)
5	Stomach (4.4)	Ovary (3.1)	Ovary (4.3)	Brain (2.2)
6	PUO (4.0)	Vagina (2.5)	Tongue (2.3)	Gall Bladder (2.1)
7	Lung (3.2)	Stomach (2.3)	Sec.Resp.Et(2.3)	Hypo pharynx (2.1)
8	CML (3.0)	Hypo pharynx (2.1)	Hypo pharynx (2.1)	Body Uterus (2.0)
9	Esophagus (2.6)	Thyroid Gland (1.6)	Leuk Myeloi(2.1)	NHL (1.7)
10	Colon (2.6)	Tongue (1.6)	NHL (2.0)	Lung

Hepatocellular carcinoma has a frequency of 7% and ranked 4th among males at Tirupati. The well-known liver carcinogens-alcohol and hepatitis virus B and C infections are unlikely to be different from other regions. The role of Aflatoxin needs to be investigated in these patients, as groundnut consumption is very high and is used in most of food preparations in this

Table 4:Median survival of 10 major forms of cancer, by stage

Serial no	Cancer type	Median Survival (months)	95%CI
1)	All cancer		
	early	Not reached	
	advanced	26	19.7-32.4
	all	30.5	25-36
2)	Lung		
	early	20	
	advanced	12.2	4.9-19.4
	all	17.4	5.9-29.0
3)	Stomach		
	all	14.4	10.5-18.2
4)	Cervix		
	early	Not reached	
	advanced	28.6	20.2-37.0
	all	33	27.3-38.7
5)	Breast		
	early	Not reached	
	advanced	21.8	19.7-23.5
	all	33.7	9.6-57.9
6)	Head&Neck		
	early	17	13.7-23.5
	advanced	11.5	10.8-25.6
	all	17	5.1-28.9
7)	PUO		
	all	20.2	13.2-27.1
8)	Ovary		
	all	30.5	19.4-33.1
9)	HCC	5.3	4.8-5.7
	all		
10)	NHL		
	early	19.7	12.2-27.3
	advanced	11.4	10.2-19.7
	all	23.3	17.9-28.7
11)	Esophagus		
	all	12.9	8.4-17.0

region. Hematological malignancies such as NHL, CML and AML seem to have higher frequency at Tirupati.

The 3year survival rate for all cancers, which is a good surrogate marker for 5year survival rate, was 41%. The 5year survival for all cancers in the developed countries is 58% [6]. The poor survival rate in the present study is likely to be due to advanced stage of the disease at presentation. Broadly, there is effective treatment for early stage cancer; it is not true for locally advanced, inoperable or metastatic disease, barring very few exceptions such as carcinoma testis, choriocarcinoma and Hodgkin's disease. Five year survival rates for early- stage stomach, lung, breast, cervix, head and neck, and colon ranges from 50% to 90%, while 5year survival rates for any of these cancers is rare[7]. Similar differences are shown between early-stage and advanced-stage hematological cancers as well. In this study, patients with early stage cancer did not reach median survival, while patients with advanced stage had median survival of 26 months (log rank P<0.0001). In this study, women showed better median survival than males, this could be explained by the differential cancer patterns among them. Carcinomas of uterine cervix and breast, the top two cancers in females, have better treatment options than the carcinoma of lung, stomach and liver, the top three cancers in males.

The cancer patterns at Tirupati show some important differences with other registries. The important differences were the cancers of lung, stomach, liver and colon. These suggest an aetiological role for a dietary or environmental factor or combination of both. Further epidemiological monitoring and investigation is necessary to identify potential agents in each of these cancer types.

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