



Research Article

Estimation of Survival Rates of Female Breast Cancer Patients in Meerut City, India

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Abstract

There is no data available on cancer incidence pattern in Meerut City. This is the first report on breast cancer incidence in females among Meerut urban population during the period of 2008-09, which gives the first hand information on breast cancer incidence in females. The data for this report has been collected by us. The sources for cancer registration are the tertiary care government hospital and two private cancer referral centers in the region. A total of 285 breast cancer cases were registered during the period from 1st January, 2008 to 31st December, 2009. Complete data was analyzed by using SPSS Statistical Software version 17. Complete to Follow Up (CFU) patients survival rate were estimated by Actuarial Method (ACM) and Lost to Follow Up (LFU) patients survival rate were estimated by Lost Adjusted Survival Rate (LAR) Method. The patients were followed up for more than three years. The overall survival rate in age group 40-49 (51%, OR=0.69, CI=0.35-0.1.32) was higher than that seen in other age groups were comparatively lower than other registries situated in India. Survival rate against Hindu patients (23%, OR=1.78, CI=0.93-3.27) was higher than Muslim patients and it was statistically significant. Patients with tumor size <2cm had a better survival rate (65%, OR=2.22, CI=1.22-3.98) and it was statistically significant (p=.008).

Keywords: Cancer registration; Survival pattern; India; Meerut City

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Introduction

There is no population based Cancer Registry in Meerut City. It is mandatory to collect cancer incidence, treatment and survival data, which can be used to monitor the impact of cancer among the urban population in Meerut City. However, hitherto no data is available for the Meerut Urban population. In this paper an attempt has been made to describe the cancer survival pattern among the Meerut City urban population during 2008- 2009. Breast cancer is the leading cancer among females and the incidence rate is high in western region of Uttar Pradesh, India. Survival estimates may be biased if the proportion of cases due to loss to follow-up is substantial and if the loss to follow-up is connected with the probability of death of patients, which are lost. This bias is more due to loss of substantial data in survival analysis and needs correction or adjustment to find the probability of deaths. There are many studies published on breast cancer survival all over the world [1-3], but few studies have been conducted in India. A hospital based study was conducted on 471 breast cancer cases in Tata Memorial Hospital in 2001 [4]. This research showed that in younger patients (≤ 50 years), 5-year survival rate was 67%, which was statistically significant ($p=.024$). There was no impact on survival with regard to residential status, T3 stage was poor prognostic factor with a 5- year survival rate 60% ($p=.002$).

Material and Methods

The population of Meerut City includes Hindi, Urdu, English and Punjabi speaking masses. The data was collected by interviewing methods, data abstraction from case records, coding etc. by visiting to various hospitals and nursing homes and by interviewing the patients, who are either undergoing cancer treatment or being investigated for cancer at radiology

department. Also examined the case records maintained by various departments of the hospitals viz, pathology, hematology and radiology etc. and recorded details of all patients with malignant tumors into a special form. Date of incidence of a case is defined as date of hospital admission or date of first diagnosis (for outpatient) whichever is earlier. All the information collected is crosschecked for completeness of the data. Sometimes a patient may register his/her name in more than one hospital for treatment so care has been taken to exclude duplicates and ensure that each patient is included only once in the records. Also personally visited the vital statistics departments and collected information about deaths where the death certificate states the cause of death as cancer or tumor. These death records are then matched with morbidity records. Cases not matching with the records are registered as Death Certificates Only cases (DCO'S) in that corresponding year. The main criterion for registration is that the patient should be residing in Meerut City area for at least one year at the time of first diagnosis of cancer. This also includes clinically diagnosed cases.

A total of 285 confirmed cases were enrolled. Out of 285 cases a total of 155 cases had a complete follow up for over three years but the remaining 130 cases were lost to follow up. The adjustment probability of death was estimated for these 130 cancer cases by applying logistic regression to the complete follow up cases, based on nine parameters like age, hospital, menopausal stage, occupation, TNM-Stage, religion, laterality, education and treatment modality.

The success of cancer treatment is explained by the analysis of survival rate. Any population based survival study reflects the availability, growth of the accessibility to cancer health services in any area. Survival based on hospital sequence reproduces the impact of the clinical services specific to the hospitals. The both occurrence, high level completeness of ascertainment of mortality data,

which is important, and when such completeness cannot be secure, survival rate should be suspiciously interpreted [5, 6].

There are few studies on survival of breast cancer in India due to incomplete follow-up. These concerns and shows the life table method approached by actuarial [7] and Kaplan Meier [8] methods for breast cancer patients. Both methods utilized observed survival time independently of whether it is end of the death of a patient. The overall survival rate was calculated by Actuarial Method and in case of incomplete follow up the survival rates were determined by using Loss Adjusted Rate (LAR) Method, a method devised by Ganesh B [1]. The differences between the actuarial survival and loss-adjusted survival rates indicate the magnitude of the effect of differential loss to follow-up. The study adds to the present knowledge regarding outcome, in terms of survival rate. It is a follow up cohort study that attempts to summaries the overall survival experiences of a series of cases. Loss-Adjusted Survival Rate Method (LAR-Regression) does not give 100% accurate predicted result. But LAR is the best possible method that can be applied for Adjusted Survival Rates for patients lost to follow-up. It is reasonable to accept to survival status in patients' loss to follow-up and those with complete follow-up to be similar within a prognostic group, than when patients are considered together [9].

Results

Table 1 shows the odds ratio with 95% confidence interval of logistic regression of events whether these are complete follow up or lost to follow up. This provides the expected number of deaths in lost to follow-up cases. There were (54%) cases with complete follow-up and (46%) cases, which were loss to follow-up. Figure 1 showed that cumulative survival for breast cancer cases by Kaplan Meier method of two groups.

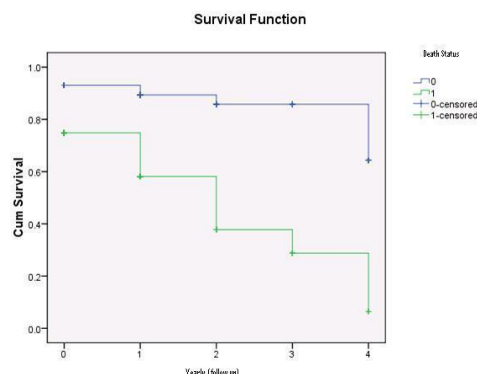


Figure 1 the cumulative survival for breast cancer cases by Kaplan Meier method of two groups

In the age groups, 40-49 years, 50-59 years and more than 60 years, the risk of dying was 69%, 91% and 78% respectively. A decreasing trend is found corresponding to the age group <40 years.

In hospital 45% cases were found at first private referred cancer center and 55% cases were found at tertiary care government hospital and second private center. The proportion of the odd ratio is not different between the factor of hospital and laterality and odd ratio were found approximately 10 % less in first and 2% more in second private center corresponding to government hospitals.

In terms of menopausal, 45% cases belonged to pre-menopausal stage and 55% cases belong to post-menopausal stage. This factor had equal percentage of loss to follow-up and complete follow-up. The risk of dying in post-menopausal stage was equal to the risk in pre-menopausal stage.

In occupation, a difference was found between the working women in jobs and house wives. The risk of dying in house wives was 75% more as compared to that in service women.

In staging parameters, there was an equal distribution of stages (size of cancer) of < 2 cm and 2 to < 5 cm sub categories. The odd ratio of dying in > 5 cm tumor was two times more than in the stage of < 2 cm. The hazard ratio of the stage 2 to < 5 cm was 13% increased as compared to the stage < 2 cm. It was statistically significant.

Table 1 Odds ratio with 95% confidence interval of logistic regression analysis

Factor	Complete to follow up No.155 (54%)		Lost to follow up No.130 (46%)		Odd Ratio (95%CI)	P value
	Patients	Death	Patients	Expected		
Age						
< 40	35	11	24	7	1	
40- 49	46	15	46	14	0.69 (0.35- 1.32)	0.263
50- 59	41	16	31	12	0.91 (0.45- 1.82)	0.784
60 +	33	18	29	15	0.78 (0.38- 1.60)	0.500
All Ages	155	60	130	48	-	-
Hospital						
Govt. Hospital	51	20	41	15	1	
First Private Referral Center	67	28	60	24	0.9 (0.52- 1.54)	0.695
Second Private Referral Center	37	12	29	9	1.02 (0.54- 1.93)	0.938
Menopausal Stage						
Pre	69	22	58	16	1	
Post	86	38	72	32	1.00 (0.62- 1.60)	0.987
Occupation						
House-Wife	141	54	123	44	1	
Service	14	6	7	4	1.75 (0.68- 4.46)	0.245
TNM-Stage						
< 2 cm	28	5	37	8	1	
2 to <5 cm	30	7	35	9	1.13 (0.56- 2.26)	0.724
More than 5cm	97	48	58	31	2.2 (1.22- 3.98)	0.008
Religion						
Hindu	121	43	112	40	1	
Muslim	34	17	18	8	1.78 (0.93- 3.27)	0.08
Laterality						
Left	91	36	77	27	1	
Right	64	24	53	21	1.02 (0.63- 1.6)	0.929
Education						
Literate	70	23	67	24	1	
Illiterate	85	37	63	24	1.29 (0.80- 2.06)	0.283
Treatment						
Surgery	115	46	103	40	1	
Radiation	8	5	5	4	1.43 (0.45- 4.51)	0.539
Chemotherapy	32	9	22	4	1.30 (0.71- 2.38)	0.391

Table2 Comparison of survival rate between the Actuarial Method and Loss Adjusted Survival Rate Method (LAR)

Factor	Year	Total Cases	ACM	LAR	Factor	Year	Total Cases	ACM	LAR
	Age					TNM-Stage			
<40	1	59	0.91	0.75	<2 cm	1	65	0.96	0.82
	2	28	0.79	0.53		2	26	0.91	0.65
	3+	14	0.43	0.30		3+	12	0.65	0.46
40-49	1	92	0.92	0.73	2 to <5 cm	1	65	0.92	0.79
	2	48	0.87	0.58		2	30	0.88	0.62
	3+	27	0.51	0.30		3+	16	0.68	0.39
50-59	1	72	0.92	0.81	More than 5 cm	1	155	0.84	0.58
	2	29	0.69	0.20		2	70	0.66	0.23
	3+	13	0.26	0.08		3+	37	0.26	0.08
60+	1	62	0.77	0.49	Religion				
	2	21	0.60	0.20	Hindu	1	233	0.90	0.70
	3+	11	0.34	0.09		2	106	0.77	0.39
AllAges	1	285	0.89	0.69		3+	55	0.48	0.23
	2	126	0.76	0.40	Muslim	1	52	0.80	0.63
	3+	65	0.40	0.20		2	20	0.70	0.42
Hospital				3+		10	0.12	0.00	
Govt.Hospital	1	92	0.86	0.66	Laterality				
	2	42	0.86	0.66	Right	1	117	0.83	0.61
	3+	22	0.32	0.15		2	43	0.73	0.37
First Private Referral Center	1	127	0.89	0.65		3+	24	0.48	0.25
	2	55	0.70	0.19	Left	1	168	0.92	0.75
	3+	31	0.44	0.13		2	83	0.77	0.44
Second Private Referral Center	1	66	0.92	0.77		3+	41	0.36	
	2	29	0.72	0.47	Education				
	3+	12	0.43	0.24	Illiterate	1	148	0.85	0.67
Menopausal Stage				2		61	0.74	0.31	
Pre	1	127	0.93	0.77		3+	36	0.35	0.15
	2	62	0.84	0.54	Literate	1	137	0.92	0.71
	3+	35	0.47	0.31		2	65	0.78	0.46
Post	1	158	0.85	0.63		3+	29	0.48	0.27
	2	64	0.69	0.30	Treatment				
	3+	30	0.34	0.12	Surgery	1	218	0.87	0.66
Occupation				2		96	0.75	0.40	
House Wife	1	264	0.88	0.68		3+	43	0.38	0.18
	2	116	0.75	0.40	Radiation	1	13	0.81	0.50
	3+	59	0.43	0.22		2	6	0.81	0.50
Service	1	21	0.94	0.82		3+	5	0.20	0.00
	2	10	0.83	0.41	Chemo therapy	1	54	0.95	0.87
	3+	6	0.17	0.00		2	24	0.78	0.32
						3+	17	0.55	0.24

In religion categories, a big difference was found between Hindus and Muslims. The risk of dying among Muslim patients was 78% increased as compared to the Hindu patients. This was also statistically significant.

Left and right breast cancer was found approximately equal dying of the risk in laterality factor and the risk of dying among illiterate patients was 29% increased as compared to the literate patients. Both were found statistically insignificant. According to treatment, about 76% of the patients were treated by surgery and remaining 24% patients are treated by radiation and chemotherapy. Death rate in the patients who underwent radiation was 43% more and 30% more for patients with chemotherapy as compared to the person who underwent surgery only.

Table 2 shows that Actuarial Life Table Method (ACM) for finding the cumulative survival rates of the above prognostic factors and also the loss adjusted survival rates by using the logistic regression method which is based on complete or lost to follow up cases.

The overall survival rate is calculated 40% by ACM and 20% by LAR Method for more than 3 years. An inverse relationship between survival and age at diagnosis was evident. By using ACM method, survival rate in age group 40-49 was found (51%) higher as compared to other age groups, and by LAR method, survival rate in the age group < 40 years and 40-49 years was found (30%) higher as compared to other age groups.

By actuarial method, survival rates in both private centers (44% and 43%) respectively were found higher as compared to Govt. Hospital 32%, by LAR method, the survival rate was found higher in the first private center 24% as compared to the Govt. hospital/ second private cancer center.

Occupation was the another factor, which showed differences in survival rate, the housewife has a better survival rates 22% as compared to the service class 0.0 % by using the LAR method, which indicate better prognosis for those who were housewives. The same result is also seen by using

actuarial method where a housewife has a better survival rate than service class women.

The laterality showed the differences in survival rates for right and left breast cancer. By actuarial method, the survival rate of right breast cancer 48% was higher than that of left side breast cancer which was 36%. Similarly, same result was also observed by LAR method.

Education as prognostic factor showed survival rate among literate patient was higher 27% as compare to illiterate patient 15%. Similarly, same result was also observed by actuarial method. This indicates that literary is a good prognostic factor.

The menopausal factor showed that pre-menopausal stage has survival rate of 31% as compare to the post-menopausal stage with survival rate of 12% on using loss-adjusted survival rate method. This gives statistically insignificant result. The ACM also shows that pre-menopausal stage patient has better survival rate as compared to post-menopausal stage patient.

The survival rate for different stages of disease indicates that the prognosis was poor for > 5 cm size of tumor in comparison to those diagnosed having a size < 2 cm. The stage of < 2 cm has maximum survival rate. By using actuarial method, survival rate was 68% for 2-5 cm size of tumor, 65% for <2 cm tumor and 26% for more than 5 cm tumor in this method, which was statistically significant between the size of < 2 cm and more than 5 cm.

Religion was also important factor in the present study. Survival rates by LAR method for Hindu patients 23% were found to be better than for Muslim patients 0%. The ACM gives the same survival rate in reference to the religion in breast cancer patients. The differences in survival rate were statistically significant.

The treatments groups were analyzed in detail of the above table showed that, more than 3 years of survival rate for surgery, radiation and chemotherapy are 18%, 0% and 24% respectively by using LAR method. This indicates that the outcome due to the chemotherapy in the treatment

of breast cancer was better than in radiation therapy and surgery only. The above results were also observed by using actuarial method in different types of treatment of breast cancer patients. The differences in survival rates between surgery and chemotherapy treatments were not statistically significant.

Discussion

This is the first report on breast cancer incidence in Meerut city. The breast cancer incidence is generally high in Northern India in comparison to other parts of India [10]. The estimation of survival rate is of major importance since it indicates the effectiveness of new treatments, in comparison with standard treatment. The length of survival, which was used for computing survival rates, requires that the patients be followed up over a period of time. According to western countries, they have a centralized registration system across the country, which makes it possible to obtain follow-up information. But in developing countries including India, it is difficult to obtain complete follow-up information for all patients for various reasons. Cancer patients who are no longer being followed-up in hospitals must be treated by active methods, involving phone number, postal inquiries and home visits. The frequency of cancer patients transferred from their usual place of residence to that of their relatives and the hospital/private nursing homes may not be informed of change in address makes tracing of patients at home difficult, since the new contact and address must be obtained from other sources like neighbors or friends.

This study, observed that younger patients (belonging to the age group <40 years and 40-49 years) have 30% survival rates. While the older patients (belonging to the age group 50-59 and ≥ 60 years) have 8% and 9% survival rates respectively by using LAR method. The survival rate in younger patients is better as compared to older patients if diagnosed at an early age. This is also in agreement with the report showing that prognosis becomes

poor with increase in age at diagnosis [11]. In one study the 5-year age-standardized relative survival rate for female breast cancer by age group showed no distinct pattern or trend [12]. Another study showed that the 5-year age-standardized relative survival rate for female breast cancer by age group portrayed either an inverse relationship or was fluctuating [13].

In present study, the survival rate has been found better in the first private referral center. This center has shown an advantage over Govt. and the second private center.

The survival rate of breast cancer patients was related to the menopausal stage. The pre menopausal patients have a better survival rate rather than the post menopausal breast cancer patients. This study reveals that a woman's risk of developing breast cancer is related to her exposure to hormones that are produced by her ovaries.

According to occupation parameter, this study show that house wife have better ≥ 3 year survival rate as compared to service class women. Several studies have suggested that women who are working in night shift -may have an increased risk of developing breast cancer [14]. The survival rate in term of occupation also depends on the working areas, where the workers are exposed to chemicals as carcinogens.

Stage of cancer size at diagnosis is an important factor of survival analysis. This study shows that there is an inverse relationship of stage of cancer with survival. Similar findings have been reported by many workers [11, 15-17]. Five year survival rates were found 85%, 63%, 32% and 21% with T1, T2, T3 and T4 lesions respectively. Those with No disease had a 68% five year survival rate and 90%, 65%, 33% and 6% survival rate were found with the stage I, II, III and IV respectively. The present study shows that the stages of more than 5cm cancer size have 8% survival rate of more than three years, which is very poor survival rate compared to <2 cm size of cancer. The interpretation of international difference in cancer patient's survival has been simplified by explanatory survival according to each disease

stage at diagnosis which in the present study has been studied in terms of stages of cancer size at diagnosis.

With reference to religions, Hindu community patients have a better survival rate of more than three years over the Muslim community patients. Life style plays an important role in the survival rate of breast cancer patients. The factors important include life style of patient, level of exercise, early marriage, and other reproductive factors because many research shows that the Muslim community was found lowest literacy rates compare to Hindu community in Utter Pradesh, India [18-21].

Laterality was also a factor in survival rate of breast cancer patients; the left side breast cancer patient has better survival than the right side breast cancer patient. There is no evidence that detection bias plays a major role, and although the left breast is slightly larger, on average, than the right, there is little evidence that breast size is associated with breast cancer risk. A literature research showed that current explanations for laterality include handedness, size difference, nursing preference, and brain structure [22]. However, men are affected even more by left laterality than women and thus many of these explanations are unconvincing.

In education, this study shows that literate patients have advantage in survival rate over illiterate patients. Literate patients had more awareness about breast cancer compared to illiterate patients, and knew about the diet, regular check-up under the supervision of specific doctors and screening test.

Rates of survival after breast-conserving surgery have been at least as good as those for patients undergoing total mastectomy. With current treatment, primary operable breast cancer in young women appears to have a similar prognosis to that for breast cancer in older women. According to treatment parameter, the present study reveals that only chemotherapy shows a better survival rate than surgery and radiation therapy of breast cancer patients.

The outcomes of different treatments do not have big difference except in case of the radiation

therapy, because it has 0% survival in more than three year of study. The aim of cancer treatment is to relieve symptoms, cure the patient and prolong or save life. All these aims may not be met in every case. When cancer is detected early, treatment is effective and patients are usually cured.

In conclusion, these data on breast cancer incidence in Meerut city, despite some limitations, provide a comprehensive picture on cancer occurrence among Meerut city population, which in turn can be utilized for further etiological studies as well as cancer control programmes. It is also suggested that early detection and treatment of breast cancer should also be given top priority.

All parameters are positively indicative to outcome in the terms of survival. There are adequate opportunities to study the disease process therapy improving the treatment for better survival of breast cancer patients. It is important to improve the actual follow up and also improves the registration of data in Government hospital/private referred cancer centers. This requires that, routine follow up is actively implemented. The analytical data can be improved and will be useful for the calculation of survival rates by using the data in adjusting methods for loss cases i.e. for surveillance, evaluation and comparison. That means, it does not directly improve human health, but has the potential to improve the input of hospital/cancer centers itself. Another limitation of this study is the recall bias. There are problems of reliability of information concerning the distant past which the subject may forget to recall.

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