RESEARCH ARTICLE

Descriptive Report on Pattern of Variation in Cancer Cases within Selected Ethnic Groups in Kamrup Urban District of Assam, 2009-2011

Jagannath Dev Sharma, Manoj Kalita*, Jamil Ahmed Barbhuiya, Ranjan Lahon, Arpita Sharma, Debanjana Barman, Amal Chandra Kataki, Barsha Deka Roy

Abstract

Background: The global burden of cancer is continuously increasing. According to recent report of the National Cancer Registry Programme (NCRP) on time trends it is estimated that future burden of cancer cases for India in 2020 will be 1,320,928. It is well known that knowledge of the incidence of cancer is a fundamental requirement of rational planning and monitoring of cancer control programs. It would help health planners to formulate public health policy if relevant ethnic groups were considered. North East-India alone contains over 160 Scheduled Tribes and 400 other sub-tribal communities and groups, whose cancer incidence rates are high compared to mainland India. As since no previous study was done focusing on ethnicity, the present investigation was performed. Materials and Methods: In this paper PBCR-Guwahati data on all cancer registrations from January 2009 to December 2011 for residents of the Kamrup Urban District, comprising an area of 261.8 sq. km with a total population of 900,518, including individual records with information on sex, age, ethnicity and cancer site are provided. Descriptive statistics including age adjusted rates (AARs) were taken as provided by NCRP. For comparison of proportional incidence ratios (PIR) the Student's t test was used, with $p<0.05$ considered as statistically significant. Results and Conclusions: Differences in leading sites of Kamrup Urban District since from the beginning of the PBCR-Guwahati were revealed among different ethnic groups by this study. The results should help policy makers to formulate different strategies to control the level of burden as well as for treatment planning. This study also suggests that age is an important factor of cancer among different ethnic populations as well as for overall population of Kamrup District of Assam.

Keywords: Cancer - age adjusted incidence rates - ethnic groups - Assam - India

Asian Pac J Cancer Prev, **15 (15)**, 6381-6386

Introduction

Global burden of Cancer incidence is continuously increasing. As per the GLOBOCAN 2008 estimates, about 12.7 million cancer cases and 7.6 million cancer deaths are estimated to have occurred in 2008 (Jemal et al., 2011). According to recent report of National Cancer Registry Programme (NCRP, 2013) on time trends it is estimated that future burden of cancer cases for India in 2020 will be 13,20,928 (male 6,22,203, female 6,98,725). Knowledge of the incidence of cancer is a fundamental requirement of rational planning and monitoring of cancer control programs (Yang and Parkin et al., 2005). Globally cancer incidence pattern is varied widely and studies in migrant populations may help explain the relative contribution of genetic and environmental factors to these differences and aid our understanding of cancer aetiology (Parkin et al., 2004). Demographic, ecological, environmental, cultural, ethnicity and genetic variables all contribute to the heterogeneity of cancer incidence (Yong-Chuan Wang et al., 2012).

India is a hub of diverse ethnic residential population and disparities in pattern of cancer incidence rate is observed among different regions and among ethnic groups. North East- India alone comprise of over 160 Scheduled Tribes and over 400 other sub-tribal communities and groups (Taid et al., 2014), where cancer incidence rate is severely high compared to mainland India and also variation within ethnic residential population was observed, So it is necessary to observe the pattern among ethnic groups by different ways. However so far only a limited studies were done in India to observe the incidence pattern on ethnic populations.

Studies by (Cho et al., 1996; Nirmala et al., 2012) have suggested that ethnicity plays a significant role towards the differences in cancer rates among individual groups.

Population Based Cancer Registry, Indian Council of Medical Research, Dr. B. Borooah Cancer Institute, Guwahati, Assam, India
**For correspondence: dr_j_sarma@rediffmail.com*

A study was carried out in UK to access the variation in incidence rate and rate ratio among British Indian and British Whites in Leicester (Ali et al., 2010). Similarly variation in incidence rate of cancer among ethnic groups was studied in Sikkim, India (Verma et al., 2012). However no previous study was conducted ethnicity wises for this region of India.

The Northeastern region is distinguished by a preponderance of the Tibeto Burman languages, and the population here is thought to comprise migrating peoples from East and Southeast Asia region (Kataki et al., 2011). Which may be a factor of versatile ethnic population in NE-India and diversity among cancer incident cases was observed. Therefore it is necessary to compare cancer incident rates among ethnic groups. Present day in Kamrup Urban District roughly covers the area ruled by the 'native' ethnic groups, the Ahoms, Kalitas, Koiborta, Kayastha, Bodos, Kochs, Rabhas, Mishings, Mataks and Chutiya and different branches of Kacharis such as Dimasa, Sonowal and Thengal etc.

The Population Based Cancer Registry (PBCR) Guwahati covers the entire area of kamrup Urban District of North East-India and is formed in 2003 at Dr. B. Borooah Cancer Institute, Guwahati-Assam, under National Cancer Registry Programme (NCRP), Indian Council of Medical Research (ICMR) and operating throughout with the objective to generate reliable Cancer incident data.

In this paper an attempt was initiated to report the incidence and patterns of cancer including the ethnic variation observed in Kamrup Urban District during the last 3 years (2009-2011) of registry operation. However no previous study was done considering ethnicity for this part of the world.

Materials and Methods

The PBCR-Guwahati covers the Kamrup urban district comprising an area of 261.8 sq. km. The population as per the 2001 Census is 490 772 men and 409 746 women (total population 900 518) (Sharma et al., 2013). In this paper PBCR-Guwahati provides data on all cancer registrations from January 2009 to December 2011 for residents of the Kamrup Urban District, including individual records with information on sex, age, ethnicity and cancer site. The major ethnic groups were selected for the study while rest minors were clustered as others category. The site of the cancer was coded according to the International Classifications of Diseases, revision 10.

Statistical analysis

A descriptive study was conducted to figure out leading sites for major ethnic groups as well as overall population. Age Adjusted Rate (AAR) was taken as calculated by NCRP for their report 2009-2011 (NCRP, 2013) and provided to PBCR-GHY. Proportional Incidence Ratio (PIR) for leading sites of cancer for different ethnic groups (using all cases of Kamrup Urban district as Reference, cancer site wise), which is complete for sex and race. Proportional incidence ratios (PIR) were calculated by using the observed:expected ratio, where the observed number was the number of site-specific cancer cases in the worker cohort, and the expected number was calculated by multiplying the age- and period-specific number of all cancer cases in this worker cohort by the proportion of site-specific cancer relative to all cancers in the general population (Chapter 11. Statistical methods for registries, P. Boyle and D. M. Parkin-IARC, France). Student's t test was used to test difference between mean ages, $p<0.05$ considered as statistically significant at 95% Confidence interval (CI).

Results

A total of 4416 cancer cases was reported during the period of study 2009-2011, out of the total cases 2508 (56.79%) were males and 1908 (43.21%) were females, the male to female ratio was 1.31: 1.00. Almost equal male: female ratio was observed among koiborta community with 1.09:1.00. The average annual AAR per 100 000 population for all sites was 185.2 in males and 156.3 in females. Oesophagus was the most common cancer site in males which comprised 14.47% of all cancer cases and 10.42 % in Females, followed by Hypo pharynx (8.25%) in Male. In Female Breast cancer was the most common one comprised a total of 16.98%, followed by Oesophagus (10.43%). According to NCRP Report 2013 among the residents of Kamrup Urban region, Oesophagus (AAR Male=27.0, Female=18.3) was the top leading common cancer site for both males and females followed by Lung

Table 1. Age Adjusted Rate (AAR) of Kamrup Urban District (2009-2011), As per NCRP Report 2013

Males				Females			
Sites	No	AAR	Relative Proportion %	Sites	No	AAR	Relative Proportion %
Oesophagus	363	27	14.5	Breast	324	22.8	17.0
Hypopharynx	207	14.7	8.3	Oesophagus	199	18.3	10.4
Lung	183	15	7.3	Cervix Uteri	176	13.9	9.2
Stomach	170	13.3	6.8	Gallbladder	162	14	8.5
Tongue	136	9.4	5.4	Ovary	154	10.7	8.1
Prostate	116	11.1	4.6	Stomach	85	7.5	4.5
Mouth	107	7.7	4.3	Lung	83	7.6	4.4
Larynx	104	8.2	4.1	Mouth	81	7.6	4.2
Gallbladder	99	7.4	3.9	Corpus Uteri	49	4	2.6
Tonsil	94	6.6	3.7	Rectum	41	3.7	2.1
All Sites	2508	185.2		All Sites	1908	156.3	

(AAR=15.0, 7.6) Stomach (AAR=13.3, 7.5) and Mouth (AAR 7.7, 7.6). Breast Cancer (AAR 22.8) was observed as the top leading site of female over the study period 2009-2011 (Table 1).

Information on ethnicity was available for 3984 number of cases accounting a total of 2214 (55.57%) number of cases of males and 1770 (44.43%) number of female cases with Mean Age±SEM 57.04±0.328, 52.28±0.360 respectively. The Mean Age difference was observed as statistically significant p<0.05.

A total of 670 Cancer cases were reported from Kalita ethnic background residential population, comprised of 400 (59.70%) male cases and 270 (40.29%) female cases over the period and Mean Age±SEM were 57.22±0.807, 52.82±0.919 respectively for male and female, mean age difference was found statistically significant with p=0.0004. Most common cancers among male were Oesophagus 16.75% cases (i.e. 67 out of 400 cases) followed by Hypopharynx 9.25% (37/400), Stomach 8.25% (33/400), Lung 6.75% (27/400) and Tongue 4.75% (19/400). In female the common leading sites were carcinoma of Breast 19.26% cases (i.e. 52 out of 270 cases) followed by Oesophagus 12.22% (33/270), Cervix uteri 8.14% (22/270), Ovary 7.78% (21/270) and Gallbladder 7.04% (19/270). Proportional incidence ratios (PIR) of male was found to be higher in carcinoma of Brain and Nervous system with PIR 1.596 (95%CI: 1.072, 2.120) as well as Rectum with PIR 1.543 (95%CI: 1.053, 2.033) followed by Stomach 1.217 (CI 0.876, 1.559), Oesophagus 1.157 (95%CI: 0.918, 1.397). In females Hypopharynx was with high 1.413 (95%CI: 0.720, 2.106) followed by rectum 1.379 (95%CI: 0.686, 2.072), Oesophagus 1.172 (95%CI: 0.831, 1.513) and carcinoma of breast 1.134 (95%CI: 0.862, 1.406) (Table 2).

Out of total 359 cancer cases from Koiborta ethnic population 188 (52.4%) male cases and 171 (47.6%) were females. The Mean Age±SEM was observed as 58.55±1.073 for males and 55.91±1.253 for females (Table2), found the mean difference was statistically significant with p=0.0059. Oesophagus was the top leading site accounting 14.44% cases (i.e. 26 out of 180 cases) of total male cases followed by carcinoma of Hypopharynx 11.70% (22/188), Lung and Tongue both 6.38% (12/188). While in Female carcinoma of Gallbladder was found to be the top contributing sites of cancer accounting a total of 16.37% (i.e. 28 out of 171) cases

Table 2. Number of Site Specefic Cancer Cases According to Ethnicity Population, Proportional Incidence Ration and 95% Confidence Interval for Male & Female in Kamrup Urban District, 2009-2011

Males	Kalita			Koiborta				Ahom				Boro			
Sites	No	PIR	95% CI	Sites	No	PIR	95% CI	Sites	No	PIR	95% CI	Sites	No	PIR	95% CI
Oesophagus	67	1.16	0.92 to 1.40	Oesophagus	26	0.96	0.57 to 1.34	Oesophasus	14	0.7	0.18 to 1.22	Oesophagus	16	1.01	0.52 to 1.50
Hypopharynx	37	1.12	0.80 to 1.44	Hypopharynx	22	1.42	1.00 to 1.84	Prostate	12	1.88	1.31 to 2.45	Hypopharynx	13	1.45	1.91 to 1.99
Stomach	33	1.22	0.88 to 1.56	Lung	12	0.88	0.31 to 1.44	Lung	10	0.99	0.37 to 1.61	Larynx	9	1.99	1.34 to 2.65
Lung	27	0.93	0.55 to 1.30	Tongue	12	1.78	0.61 to 1.74	Stomach	9	0.96	0.31 to 1.62	Rectum	7	2.48	1.74 to 3.22
Tongue	19	0.88	0.43 to 1.33	Stomach	10	0.79	0.17 to 1.41	Hypopharynx	8	0.7	0.01 to 1.40	Stomach	5	0.68	0.20 to 1.55
Larynx	17	1.03	0.55 to 1.50	Tonsil	10	1.42	0.80 to 2.04	Tongue	7	0.94	0.20 to 1.68	Tonsil	5	1.22	0.35 to 2.10
Rectum	16	1.54	1.05 to 2.03	Prostate	9	1.04	0.38 to 1.69	Tonsil	7	1.35	0.61 to 2.09	Lung	4	0.5	0.48 to 1.48
Prostate	16	0.87	0.38 to 1.36	Bladder	7	2.08	1.33 to 2.82	Rectum	7	1.96	1.22 to 2.70	Tongue	4	0.68	0.30 to 1.66
Mouth	15	0.88	0.37 to 1.39	Gallbladder	6	0.81	0.08 to 1.61	Colon	6	2.18	1.38 to 2.98	Brain & Nervous	4	1.67	0.69 to 2.65
Brain & Nervous	14	1.6	1.01 to 2.12	Skin	6	1.27	0.47 to 2.07	Pancreas	5	2.33	1.45 to 3.21	Bladder	4	2.05	1.07 to 3.03
Females	**Kalita**			**Koiborta**				**Ahom**				**Boro**			
Sites	No	PIR	95% CI	Sites	No	PIR	95% CI	Sites	No	PIR	95% CI	Sites	No	PIR	95% CI
Breast	52	1.13	0.86 to 1.41	Gallbladder	28	1.93	1.56 to 2.29	Breast	32	1.81	1.47 to 2.15	Breast	17	1.11	0.64 to 1.59
Oesophagus	33	1.17	0.83 to 1.51	Oesophagus	23	1.29	0.88 to 1.70	Oesophagus	8	0.74	0.45 to 1.43	Oesophagus	10	1.07	0.45 to 1.69
Cervix Uteri	22	0.88	0.47 to 1.30	Breast	19	0.65	0.21 to 1.10	Gallbladder	6	0.98	0.12 to 1.49	Gallbladder	10	1.31	0.69 to 1.93
Ovary	21	0.96	0.54 to 1.40	Cervix Uteri	16	1.01	0.52 to 1.50	Ovary	6	0.72	0.09 to 1.52	Cervix Uteri	9	1.08	0.43 to 1.74
Gallbladder	19	0.83	0.38 to 1.28	Ovary	15	1.09	0.58 to 1.59	Stomach	5	1.08	0.20 to 1.96	Ovary	6	0.83	0.03 to 1.63
Mouth	12	1.05	0.48 to 1.61	Mouth	7	0.96	0.22 to 1.71	Cervix Uteri	5	0.52	0.36 to 1.40	Tongue	4	2.23	1.25 to 3.21
Stomach	11	0.92	0.32 to 1.51	Stomach	7	0.92	0.18 to 1.66	Mouth	4	0.91	0.74 to 1.89	Mouth	4	1.05	0.67 to 2.03
Lung	10	0.85	0.23 to 1.47	Lung	6	0.81	0.06 to 1.61	Corpus Uteri	4	1.5	0.52 to 2.48	Stomach	4	1	0.02 to 1.98
Hypopharynx	8	1.41	0.72 to 2.11	Tongue	5	1.47	0.59 to 2.35	Tonsil	3	2.02	1.07 to 3.33	Lung	3	0.77	0.37 to 1.90
Rectum	8	1.38	0.69 to 2.07	Hypopharynx	4	1.12	0.14 to 2.10	Lung	3	0.66	0.47 to 1.80	Skin	3	2.27	1.14 to 3.4

alone for this community followed by Oesophagus 13.45% (23/171), Breast cancer 11.11% (19/171)and Cervix Uteri 9.36% (16/171). Among Males of Koiborta ethnic group carcinoma of Bladder was a significantly elevated high with PIR 2.075 (95%CI: 1.334, 2.816) followed by Tonsil 1.419 (95%CI: 0.799, 2.039), Hypopharynx PIR 1.418 (95%CI: 1.000, 1.836) and modestly elevated for Tongue PIR 1.177 (95%CI: 0.611, 1.743)and Prostate Cancer PIR 1.035 (95%CI: 0.381, 1.688). In females Mouth is found to be with PIR 1.468 (95%CI: 0.592, 2.345) followed by moderate increase trend in Hypopharynx 1.116 (95%CI: 0.136, 2.096)

For the study period a total of 242 number of cancer cases were reported from Tai Ahom community, 57.0% (n=138) were males and 43.0% (n=104) were females. Mean Age±SEM was 58.55±1.481, 55.91±1.253 respectively for Males and Females with a significant value of p=0.0193. In Tai Ahom population the common cancers among male were Oesophagus comprised with a total of 10.14% (i.e. 14 out of 138 cases) followed by Prostate 8.70% (12/138), Lung 7.25% (10/138) and Stomach 6.52% (9/138). In female Breast cancer alone accounts one third of the total cases i.e. 30.77% (32 out of 104 cases) of total female cases followed by Oesophagus 7.69% (8/104), Gallbladder 5.76% (6/104) and carcinoma of Ovary 5.76% (6/104). In males carcinoma of Colon was with a rise incidence of about PIR 2.18 (95%CI: 1.381, 2.981), rectum 1.957 (95%CI: 1.216, 2.698). Carcinoma of Tonsil was observed to be a significant high with PIR 2.202 (95%CI: 1.070, 3.333) followed by Corpus Uteri 1.498 (95%CI: 0.517, 2.478) in females.

Bodo is one of the community which accounting a higher proportion of cases to overall cases, a total of 199 cancer cases were reported, of which 108 (54.8%) males and 90 (45.2%) were female cases. The Mean Age±SEM were 49.48±1.485, 49.97±1.452 were for males and females and mean difference was not observed as significant, p=0.8159. Among the inhabitants of Boro ethnic population also found Oesophagus was the top contributor with 14.68% (i.e. 16 out of 109) of cases in males followed by Hypopharynx 11.92% (13/109), Larynx 8.25% (9/109) and Rectum 6.42% (7/109) of cases. Carcinoma of Breast is found to be the leading contributor with 18.88% of cases (i.e. 17 out of 90), followed by Oesophagus and Gallbladder 11.11% (10/90), Cervix Uteri 10.00% (9/90) and Ovary 6.67% (6/90). In males significant higher proportional incidence was observed in rectum with PIR= 2.478 (95%CI: 1.737, 3.219) followed by carcinoma of bladder 2.045 (95%CI: 1.065, 3.025) and Larynx 1.991 (95%CI: 1.338, 2.695). In females tongue is among high incidence of the community with PIR=2.231 (95%CI: 1.252, 3.212) followed by Gallbladder 1.309 (95%CI: 0.6889, 1.928).

Discussion

The study was conducted with a perception to formulate public health policy by considering relevant ethnic groups with incident pattern among cancer cases. Which will be useful for healthcare planners to formulate and decide how to manage and utilize the available resources as well as this study also provide knowledge, risk of different cancer incident pattern among communities. The overall Age Adjusted Incidence Rate (AAR) for the study period in males was observed as 185.6 and 156.2 in females. The most common cancer was Oesophagus as well as Lung in male, while Breast and Oesophagus was in female. A significant factor observed in the study that only 6.26% (n=157/2508) cases of all cases were from the age group 0-34, while remaining 93.74% (n=2351/2508) cases were from 35 and above age group. While in female it is observed as 9.33% cases from the previous age group while 90.67% cases from later age group. This also proves that age is an important risk factor for occurrences of cancer.

Among Ahom females observed that only 5% are form 0-34 age group while remaining 95% from other group, which is less than the overall Kamrup urban, while Boro, Kalita community it observed 11% and 10% from Koiborta community from previous age group and rest from later age group. So a difference in age was present in the communities to the total population of Kamrup Urban District. Among Kalita male found that PIR was high for carcinoma of rectum and Brain and Nervous where others were moderately less or above. While in female also found Rectum a little high. In Koiborta ethnic group, PIR in Hypopharynx female was found significantly high with 1.93, while Bladder also found significantly high among males. In Ahom found that Tonsil was with high proportional incidence ration among females while Colon, rectum and carcinoma of Pancreas was with high incidence.

In males Oesophagus was high in all ethnic groups ranging from 10 to 17 percent cases to the total cases of the respective ethnic group, observed 16.75% cases of total cases among Kalitas. Most of the cancer studies in North East India and Assam suggested that ethnic food like kolakhar, a locally made unique alkaline food additive, papad, very hot spicy food, chillies, chewing of betel nut with or without tobacco, high intake of alcohol, smoke and smokeless tobaccos are important risk factors (Rai et al., 2014; Sharma et al., 2014) among ethnic groups.

Hypopharynx was the another common site among the ethnic groups of Kamrup Urban District of Assam, studies in Kamrup Urban District has reflected that high consumption of tobacco and dietry habits of among the residents of these region was to be a factor for high incidence of hypopharyengal carcinoma (Sharma et al., 2013). In males of Bodo and Koiborta ethnic group Hypopharynx was 11.92% and 11.70% to total cases. As feminine cancers are common among females of kamrup urban district but observed that among koiborta community the top leading site is Gallbladder, followed by Oesophagus.

Stomach cancer is another leading site among males accounting a total of 8.25% (33/400) cases among kalitas, 5.31% (10/188) among Koiborta and Bodo 4.58% (5/109) community, 6.52% (9/138) among Ahoms. Whereas in females 5.77% (6/104) among Ahom population and 4.07% among kalitas 4.09% (11/270), Koiborta 4.09% (7/171) and Boro 4.44% (4/90) populations. A high incidence of carcinoma of stomach may be due to

carcinogenic potential of smoked meat, smoked fish and also the habit of consumption of rice beer along with the smoked meat and fish (Krishnatreya et al., 2014). Studies based on ethnicity gives the insight pattern about the prevalent cancer type within the ethnic group. As H. pylori infection thought to be one major factor of stomach cancer so testing and treatment of H. Pylori in should be complemented with dietary modification modifications (Graham, 2000). Studies have also shown that p53 codon 72 polymorphism and dietary and tobacco habit interactions influence stomach cancer (Malakar et al., 2014).

Carcinoma of Lung is another common and leading site of cancer both among males and females of the studied ethnic groups. It is observed that in females 3.70% and 3.50% of cases for Kalita and kobotra, while 2.88% among Ahom and 3.33% cases among Bodo ethnic females. In males kalita and Ahom ethnic gropus a same amont of 6.75% and 7.25% cases respectively to the total of their respective cases. Whereas carcinoma of lung cases contribution is 6.38% for koiborta ethnic groups while 3.67% among Boro ethnic groups. Studies found that habits of smoking (Mandal et al., 2013) with genetic alteration like as studied by (Saikia et al., 2014) found that Gln/Gln alleles of both XRCC1 and XPD genes appear to amplify the effects of household exposure, smoking and betel quid chewing on lung cancer. A study on Dietary Habits shown that exposure of cooking oil emission and wood smoke, intake of smoked meat, smoked fish and soda and tobacco consumption are some of the factors for increase risk of lung cancer (Phukan et al., 2014).

The study also reveals some of the important points like males are more prone to carcinoma of Tongue compared to females among the studied ethnic groups, whereas carcinoma of Mouth is common among females. The overall Age Adjusted incidence rate (AAR) considering overall population of kamrup Urban district for the period 2009-2011 was reported as AAR=9.4 among males, standing as second most Tongue cancer prone area globally, while fourth in females with AAR 3.2 (NCRP, 2013). Carcinoma of Mouth in female is one of the sites in which Kamrup Urban District ranks top nationally with AAR 7.6. Extensive Chewing habit of betel quid, betel nut with or without tobacco, smoking is very common in India especially in North Eastern India where it is regularly used even by women, which is also found to be a factor for carcinoma of mouth and tongue(Taranikanti Mand Das B, 2013, Mishra and Meherotra, 2014,)

Carcinoma of Brain and Nervous is observed as one of the leading site among Kalitas, carcinoma of Skin in Koiborta and carcinoma of Bladder and carcinoma of Colon are in Bodo communities (Table 1), which is earlier not thought to be as leading cancer sites for Kamrup Urban District but this study had revealed the stratified leading sites among different communities/ethnic groups. Carcinoma of skin was also found leading site among females of Bodo ethnic groups, So this study suggest that in Bodo and Koiborta community carcinoma of skin may be common while among Kalitas, Brain and Nervous system so need to be focused through different studies.

However not enough studied have been taken place in Assam to find out the potential risk factors for the carcinoma of Prostate, Rectum, Brain and Nervous and Skin.

In conclusion, different non-trending or non-leading sites of Kamrup Urban District since from the beginning of the PBCR-Guwahati were revealed as leading sites among different ethnic groups by this study. This would help policy makers to formulate different strategies for cancer control as well as to health planning accordingly. This study also suggests that ageing is an important factor of cancer among the ethnic population as well as for overall population of Kamrup District of Assam.

Acknowledgements

We are grateful to Dr. A. Nandakumar, Deputy Director General, ICMR and Officer in charge of the National cancer Registry Programme of India for providing necessary guidance and valuable advices and technical support. The author also thankful to Mr. Kamal C. Deka for helping in the preparation of paper especially for computer related problems.

References

Ali R, Barnes I, SW Kan, V Beral (2010). Cancer incidence in British Indians and British Whites in Leicester, 2001-2006. *Br J Cancer*, **103**, 143-8

Chapter 11. Statistical methods for registries, P. Boyle and D. M. Parkin-IARC, France.

Cho NH, Moy CS, Davis F, et al (1996). Ethnic variation in the incidence of stomach cancer in Illinois, 1986-1988. *Am J Epidemiol*, **144**, 661-4

Graham DY (2000). Helicobacter pylori infection is the primary cause of gastric cancer. *J Gastroenterol*, **12**, 90-7

Jemal A, Bray F, Melissa M, et al (2011). Global cancer statistics (2011). *CA Cancer J Clin*, **61**, 69-90.

Kataki AC, Simons MJ, Das AK, et al (2011). Nasopharyngeal carcinoma in the northeastern states of India. *Chin J Cancer*, **30**, 106-13.

Krishnatreya M, Gogoi G, Sharma JD, et al (2014). Patterns of cancer in select ethnic groups from assam: a retrospective study. *Int Res J Social Sci*, **3**, 17-20

Malakar M, Devi RK, Phukan RK, et al (2014). p53 codon 72 polymorphism interactions with dietary and tobacco related habits and risk of stomach cancer in Mizoram, India. *Asian Pac J Cancer Prev*, **15**, 717-23

Mandal SK, Singh TT, Sharma TD, et al (2013). Clinico-pathology of lung cancer in a regional cancer center in northeastern India. *Asian Pac J Cancer Prev*, **14**, 7277-81

Mishra A, Meherotra R (2014). Head and neck cancer: global burden and regional trends in India. *Asian Pac J Cancer Prev*, **15**, 537-50

Nirmala BP, Hartman M, Yip CH, et al (2012). Ethnic differences in survival after breast cancer in South East Asia. *Plos One*, **7**, 1-6.

Parkin DM (2004). International variation. *Oncogene*, **23**, 6329-40.

Phukan RK, Saikia BJ, Borah PK, et al (2014). Role of household exposure, dietary habits and glutathione s-transferases M1, T1 polymorphisms in susceptibility to lung cancer among women in Mizoram India. *Asian Pac J Cancer Prev*, **15**, 3253-60

Rai AK, Freddy AJ, Banerjee A, et al (2012). Distinct

Involvement of 9p21-24 and 13q14.1-14.3 chromosomal regions in raw betel-nut induced esophageal cancers in the state of meghalaya, India. *Asian Pac J Cancer Prev*, **13**, 2629-33

Saikia BJ, Phukan RK, Sharma SK, et al (2014). Interaction of XRCC1 and XPD gene polymorphisms with lifestyle and environmental factors regarding susceptibility to lung cancer in a high incidence population in North East India. *Asian Pac J Cancer Prev*, **15**, 1993-9

Sharma JD, Kalita M, Nirmolia T, et al (2014). Cancer: scenario and relationship of different geographical areas of the globe with special referrence to North East India. *Asia Pac J Cancer Prev*, **15**, 3721-9

Sharma JD, Kataki AC, Vijay CR (2013). Population-based incidence and patterns of cancer in Kamrup Urban Cancer Registry, India. *National Med J India*, **26**, 133-41.

Taid TC, Rajkhowa RC, Kalita JC (2014). A study on the medicinal plants used by the local traditional healers of dhemaji district, assam, India for curing reproductive health related disorders. *Adv Applied Science Res*, **5**, 296-301

Taranikanti M and Das B (2013). Risk factor profile of oral cancer patients in North East India. *IJBR*, **4**, 615-22.

National cancer registry programme (2013). Three year report of Population Based Cancer Registries: 2009-2011, National centre for disease informatics and research (NCDIR).

National cancer registry programme (2013). Time Trends in Cancer incidence Rates 1982-2010 with projection of Burden of Cancer. National centre for disease informatics and research (NCDIR).

Verma Y, Pradhan PK, Gurung N, et al (2012). Population-based cancer incidence in Sikkim, India: report on ethnic variation. *Br J Cancer*, **106**, 962-5.

Yang LD, Parkin M, Ferlay J, et al (2005). Estimates of cancer incidence in China for 2000 and projections for 2005. *Cancer Epidemiol Biomarkers Prev*, **14**, 243-250

Yong-chuan Wang, Li-juan Wei, Jun-tian Liu, et al (2012). Comparison of cancer incidence between China and the USA. *Cancer Bio Med*, **9**, 128-32