RESEARCH ARTICLE

Thirty Years Cancer Incidence Data for Lahore, Pakistan: Trends and Patterns 1984-2014

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Abstract

   This research was conducted to generate trends and patterns of most common male and female cancers from 1984-2014 for the city population of Lahore Pakistan. Cancer incidence data gathered for different organs were processed through cleaning, integration, transformation, reduction and mining for ultimate representation. Risk of cancer appeared to be continuously increasing among both males and females. Overall, lymphomas and breast cancer are the most common neoplasm in males and females, respectively, in Lahore with almost the highest rates in the Asian Pacific region. The incidence of head and neck, brain, and lung cancers, as well as leukemia have rapidly increased among males, whereas, ovarian, cervix, head and neck and lymphomas have become more common among females. The present communication should be helpful for adequate strategic planning, identification of risk factors and taking appropriate prevention and control measures at the national level.

Keywords: Cancer incidence - cancer diagnosis - breast cancer - cancer survival - Pakistan

Introduction

   Cancer is a major cause of elevating global death tolls and experiencing continuously increasing cancer incidence trends (Torre et al., 2016 ; Moore, 2013; Simard et al., 2012) even in developing world (Jemal et al., 2010). Cancer registry play an important role in providing fundamental information regarding cancer trends and causes (Siegel et al., 2017; Sengoku et al., 2014; Brecht et al., 2014; Park et al., 2013; Schlesinger et al., 2013), Attempts have been made to alleviate the risk of cancer disease in the Asian pacific region (JSY and Ismail-Pratt, 2016; Sarwar and Saqib, 2017; Van Laar et al., 2013; Shin et al., 2012; Liu et al., 2012). According to International Agency for Research on Cancer (IARC) (Globocan, 2012), there were 14,100,000 new incidence cases in 2012 in the world and there were 8, 000, 000 new incidence cases in the less developing regions (Liu et al., 2014; Chen et al., 2013; Ferlay et al., 2012). In Asian pacific region, low cancer survival rates is still prevalent due to lack of awareness about cancer, poor health facilities and socioeconomic conditions (Cao et al., 2017; Are et al., 2013; Siegel et al., 2012; Begum et al., 2012; Hanif et al., 2009). Cancer risk is increasing in developing countries of

South Asia, including Pakistan and responsible for about 25% of all deaths (Moore et al., 2010; Salim et al., 2010). In Pakistan, nearly 80% cancer burden is shared under the auspices of the Pakistan Atomic Energy Commission Cancer Registry (PAECCR) and continuously utilizing the data for devising cancer control and prevention strategies. According to current population statistics, total population of Pakistan and Punjab provincial capital city Lahore is 200,180,000 and 20,137,000 respectively.Approximately 320,000 new cases are diagnosed every year (Ferlay et al., 2012) out of which nearly 256,000 patients are treated at (PAEC) institutes. Current communication aims to disseminate thirty years incidence data and the presented common incidence trends will be helpful in understanding the challenges to be addressed.

   Cancer registration provides information about cancer incidence and survival (Ferlay et al., 2015).The population based registration facilitate confirmation of effective screening, and intervention for cancer control, cancer registries at hospitals and even pathology levels can also make useful contribution at national level. Globocan provides major resources for cancer incidence and descriptive epidemiology of cancer. Annual cancer registration basis research updates help for concentrated

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efforts for devising cancer control strategies for future planning (Chen et al., 2016; Moore et al., 2013).

World wise available national cancer registries provide strong input information regarding the cancer incidence and mortality. In developing countries, it has been observed that numerous difficulties cause problems for accurate decision making e.g., absence of mortality data and incorrect estimates (Hanif et al., 2009). Indirect methodology using recent data can be more productive and prospective strategy is more feasible to achieve best results and improve cancer registries data (Dhar et al., 2008; Mathew et al., 2011).The true cancer registration data representation can be achieved through national database management system (Weiet al., 2012). IARC have established the rules related to standardization, comparability and data completion and recommended these rules for facilitation and comparison of registry data with international data by fulfilling some comparability criteria and quality control (Moore et al., 2010; Hanna et al., 2010; Salim et al., 2010; Mazhar et al., 2009; Agha et al., 2006; Parkin et al., 2002).

In order to effectively implement the cancer prevention and control strategy in Pakistan, National Cancer Control Programme (NCCP) has been designed which is in implementation phase. Basic cancer control efforts are emphasized through cancer occurrence data, risk factors knowledge, key causes of cancers and measures required to avoid cancer risk provide sterling foundation for disease management and bases for cancer control strategies. In Pakistan, previous and current efforts regarding prevention and cancer control is focused on registration and cancer registries set up. Different cancer campaigning societies like pink ribbon and other associations are involved in distribution of the information material. National data representation from Pakistan in (IARC) is lacking and incidence data from major cities of Pakistan i.e., Lahore, Karachi, Quetta and Peshawar cancer registries indicate that cancer is on the rise(Sarwaret al., 2017; Badar et al., 2015; Masood et al., 2015; Bhurgri et al., 2002).

According to WHO, cancer burden is dramatically rising in developing and underdeveloped countries especially in our region. Hospitals and their well trained physicians, oncologists, medical physicists and well equipped facilities play a key role in treating such patients. The cancer patient faces burden in deteriorating health, quality of life and working disability (Jung et al. , 2016; Montazeri et al., 2008; Short et al., 2008). According to current federal bureau of statistics and population census of Pakistan in 2017, the estimated population of provincial capital city of Lahore is more than20 million. In Pakistan, 80% malignancies (with urban rural variation) diagnostics and therapeutics facilities are provided by PAEC treatment centers.

Punjab Cancer registry (PCR) working is in progress on collection of cancer statistic links in the Punjab province of Pakistan. In PCR registries at Lahore, 15 centers are collaborating in the district which is managed by nine member governing council and 38 professionals members are serving for the Registry including both government and private sector. PCR registry is collecting cancer information treated in Lahore chapter of the Registry, which is now expanding its work and role for collection of incidence data for the diagnosed cancer cases among residents of nearby areas adjacent to provincial capital Lahore, which include Gujranwala, Sheikhupura, Kasur, NankanaSahb, Hafizabad, and Faisalabad. The cancer registries are very actively being managed and maintained in public and private sector in Punjab province. INMOL Lahore cancer registry is working under the auspices of (PAEC), one of the state of the art institute among its eighteen nuclear medical centers in Pakistan that has been declared center of excellence in south east Asian Region by International Atomic Energy Agency (IAEA). It is continuously engaged for providing resplendent diagnostic and therapeutic facilities to all cancer patients. The institute based cancer registry has been working since its establishment in 1984, which is being handled by its unit called cancer registry for clinical data collection and management. The cancer patients are initially triaged as per institute's policy and accepted for treatment after registration. Patient's disease related information is abstracted from patient's records. The diseases and related treatment data information is available at different places and its results are collated to generate summaries of cases on yearly basis. INMOL has become a leading referral and state of the art cancer care center for disease management in Pakistan.

INMOL is an important Cancer Registry of (PAECCR) where the cancer registration and clinical data management staff ensures accuracy related to entry of data and current results are illustrated through annual registration data sheets which serve as accurate registry record and is available for oncology professionals.

Materials and Methods

Cancer patient's registration and cancer incidence data of the institute was initially available in yearly based soft data sheets. The cancer incidence data of last thirty years was processed through the application of computational technique for generation of trends and patterns to perform data analysis for illustration of key cancer incidence features. It was difficult to perform data mining, data analysis and its assessment in scientific manner through initial yearly data sheets from (1984–2014). The said data was so compiled and conformed in the manner that it served as input for data mining. The computational technique that includes data cleaning, data integration, data transformation, data reduction, data mining, its evaluation and knowledge presentation was applied in order to transform the conformed data in symmetric and harmonic way for information utilization, data analysis and assessment concerning occurrence for demonstration of cancer incidence results. Finally, the trends and pattern generation of INMOL's most common cancers from 1984-2014 has been presented, which greatly helped in consolidating and mining huge amount of last thirty years data. These resultant patterns are readily available for data analysis and illustration of required trends just within seconds. Currently, registration is being performed through Pakistan Atomic Energy Commission (PAECCR) national institutional registry software which has been

linked with all cancer institutional registries. The accurate registration information on cancer incidence is now available for utilization of accurate information as input for trends and patterns generation for all major cities of Pakistan.

Results

Cancer risk is continuously increasing in South Asian region and demands for effective control strategy (Afsharfard et al., 2013; Takiar et al., 2010). Many types of cancers are recognized initially either through screening or by their symptoms. Chance of death which is due to the type of cancer can be reduced by performing individual patients monitoring, detection and treatment of early disease in the phase of their initial development and through disease management in accordance with the best available diagnostic evidences. The most common ten diseases among males from the city population of Lahore is shown in Figure 1. The trends for male patients described for the 30 years cancer incidence illustrates gradual decrease in the type of cancers and after lymphomas, head & neck, brain, lungs and leukemia cancers are 2nd, 3rd, 4th and 5th most common cancer incidence among males having an elevated trends.

The ten most common diseases among females have been illustrated in Figure 2. Breast cancer is the top most cancer disease among females as compared to the other female cancers. It is evident from Figure 2, that the trends and patterns given for ovarian, cervix, Head and Neck and Lymphoma cancer incidence among females are 2nd, 3rd, 4th and 5th high proportion cancers among the population of Lahore, Pakistan.

The percentages of disease wise patterns of ten most common cancers among males and females has been presented in Figures 3-4 for the thirty year time span from 1984-2014. It can be seen from Figure 4 that the breast cancer is the main reason of death associated with cancer among 55% female population of Lahore Pakistan, which is highest rate Pakistan high rate of breast cancer in South East Asian region where possibility of growing breast cancer in women is 35% - 40% after age of forty. UICC and WHO report statistics depict that nearly 47% newly diagnosed breast cancers are at advance level in

Figure 2. Most Common Top Ten Female Cancers in Lahore Pakistan from (1984-2014)
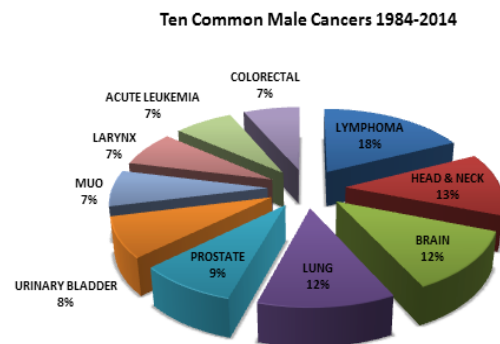
Figure 3. Percentages of Ten Most Common Male Cancer Trends from (1984-2014)

Pakistan. The Medical checkup on annual basis need to be performed after the age of forty by trained health workers that should be started for every woman at the age of 20 periodically after every three years and related disease signs should also be further investigated.

Ten most common male cancer percentage trends for the city population of Lahore has been described in Figure 3. It is evident from figure 3 that Lymphoma, Head and Neck and Brain share 18%, 13% and 12% male cancer cases respectively, whereas, Lungs (12%), Prostate (9%) and urinary bladder (8%) are next three higher percentages among males. MUO, Larynx, Acute
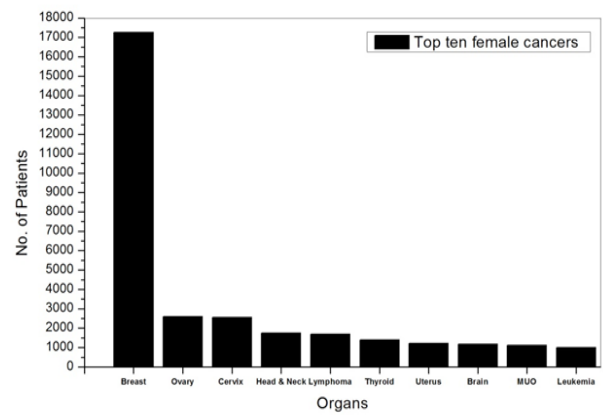

Figure 1. Most Common Top Ten Male Cancers in Lahore Pakistan from (1984-2014)

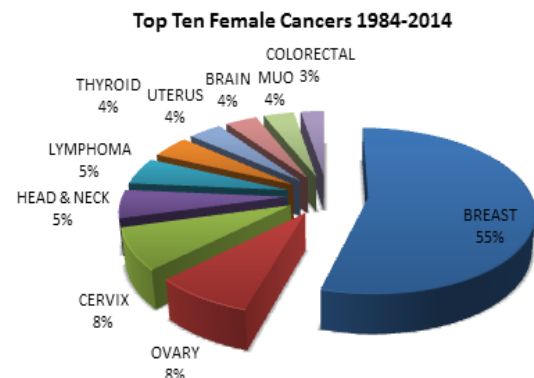Figure 4. Percentages of Ten Most Common Female Cancer Trends from (1984-2014)

Table 1. Organ Wise Cancer Incidence Data among Males in Lahore Pakistan from (1984-2014)

Sr.	Organ Name	1984	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	0	1	2	3	4	5	6	7	8	9	10	11	12	13	2014	Total
1	Lymphoma	5	30	31	38	55	74	97	85	110	103	107	107	90	148	92	106	118	104	112	119	104	134	136	170	211	218	214	179	161	104	206	3568
2	Head & Neck	6	19	34	38	36	55	53	96	102	90	46	86	49	90	64	92	68	77	86	104	85	104	144	97	146	114	90	132	117	145	131	2543
3	Brain	0	1	11	7	17	13	16	31	45	46	49	66	66	60	63	68	71	79	89	118	142	127	104	144	146	106	158	179	150	154	124	2404
4	Lung	3	17	44	54	71	94	99	75	67	62	50	78	54	56	62	68	76	67	61	87	87	85	104	117	106	90	77	100	98	106	127	2351
5	Misc	1	16	8	12	19	24	72	43	31	17	44	49	50	46	41	90	22	7	21	125	78	132	137	184	129	86	85	8	19	88	220	2272
6	Prostate	2	10	9	16	14	19	23	29	38	46	32	41	47	49	56	42	48	47	51	49	61	49	69	87	102	86	89	86	81	99	103	1714
7	Urinary Bladder	4	7	13	17	20	33	27	44	40	48	32	40	36	44	37	40	40	48	53	62	55	60	69	81	89	74	78	91	80	85	107	1624
8	Muo	0	0	0	0	2	4	6	24	20	28	39	40	41	40	69	37	52	64	43	64	51	87	60	74	67	60	74	110	138	99	62	1466
9	Larynx	2	9	17	16	28	29	41	52	40	24	20	49	46	35	35	47	64	43	52	80	77	67	59	63	48	60	50	79	69	89	52	1448
10	Acute Leukemia	0	0	0	0	0	26	18	37	33	35	39	45	39	49	57	71	68	35	31	72	80	77	67	48	57	46	50	67	62	61	95	1425
11	Colorectal	5	6	7	11	26	12	32	37	33	33	35	23	27	16	32	16	34	31	30	59	64	44	59	94	81	76	73	92	73	85	95	1376
12	Bone Sarcomas	4	4	10	16	25	24	13	15	20	23	25	24	15	24	15	32	38	47	46	46	58	48	50	74	74	79	76	93	52	49	22	1187
13	Soft Tissue Sarcomas	2	10	12	11	14	25	17	36	15	19	25	46	34	40	38	35	25	40	40	40	37	43	43	38	41	46	62	48	21	21	22	990
14	Skin	4	16	22	20	23	15	19	25	19	25	32	43	36	27	38	35	31	35	27	33	27	27	37	38	20	20	16	42	44	47	36	899
15	Pharynx	2	9	8	18	20	16	10	25	19	22	33	40	20	26	7	35	26	21	39	30	30	30	31	25	35	24	33	35	34	32	32	755
16	Testis	1	5	6	8	14	9	13	19	18	21	15	27	15	17	19	23	32	16	23	26	18	27	25	23	19	20	33	26	43	27	21	593
17	Chronic Leukemia	0	0	0	0	12	2	11	14	21	11	15	12	23	30	32	36	26	45	36	40	24	9	9	20	17	28	19	28	42	15	20	574
18	Kidney	0	2	4	9	12	8	12	19	27	11	15	21	22	11	22	30	34	24	26	17	26	25	22	9	20	20	17	19	24	15	12	567
19	Thyroid	1	3	6	8	11	12	18	20	13	14	17	10	13	10	22	13	22	14	17	10	17	22	30	33	28	18	28	30	33	30	36	537
20	Esophagus	3	1	2	4	10	6	12	13	14	24	0	15	22	15	11	9	9	10	14	15	26	17	17	33	24	23	34	32	26	26	23	507
21	Liver	0	0	3	1	6	12	13	15	22	24	29	34	23	28	14	21	15	9	7	14	27	16	17	23	24	14	16	9	7	14	6	480
22	Salivary Gland	0	5	4	7	5	6	7	12	16	24	24	34	18	18	14	21	14	16	12	16	19	11	17	23	20	5	14	10	26	21	24	415
23	Stomach	1	1	1	5	4	10	8	13	9	16	12	11	11	11	8	8	16	7	6	10	16	19	14	27	12	14	26	24	21	14	20	349
24	Breast	0	2	7	6	6	6	3	5	6	9	7	9	7	11	11	15	11	15	2	16	15	2	16	12	18	12	27	16	16	27	27	328
25	Gall Bladder	1	0	0	3	8	8	9	10	10	13	11	17	8	10	6	11	6	11	13	6	10	12	8	8	5	3	4	1	0	27	0	225
26	Pancreas	0	0	1	4	1	4	6	9	4	6	9	4	6	7	3	10	6	7	10	9	6	6	12	8	7	5	2	2	4	0	0	164
27	Anal Canal	0	0	2	0	2	2	2	3	0	1	1	2	6	5	2	10	1	1	3	4	5	8	6	7	8	5	9	8	4	4	12	109
28	Blood	0	1	17	14	19	19	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	9	90
29	Penis	0	0	1	0	1	1	1	0	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	1	0	0	0	0	0	11

Table 2. Organ Wise Cancer Incidence Data among Females in Lahore Pakistanfrom (1984-2014)

| Sr	Organ Name	1984	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	0	1	2	3	4	5	6	7	8	9	10	11	12	13	2014	Total
1	Breast	24	64	145	167	190	229	310	321	361	440	461	474	462	418	451	406	502	469	446	549	622	640	742	799	908	894	1051	1114	1074	1227	1307	17267
2	Ovary	0	15	16	27	40	50	59	43	79	69	79	77	68	82	76	61	1	98	94	98	128	116	102	139	123	129	148	132	130	157	166	2602
3	Cervix	1	0	20	44	44	0	32	72	72	69	105	123	117	0	0	74	1	63	65	93	70	81	102	81	100	103	125	121	122	163	158	2555
4	Misc	0	10	0	16	15	42	9	13	9	32	30	9	32	123	115	97	30	62	29	16	140	70	148	140	140	103	125	95	145	163	354	1850
5	Head & Neck	0	8	28	15	21	39	35	37	41	40	49	87	64	49	48	41	77	57	78	54	57	62	79	100	140	42	54	119	95	99	70	1754
6	Lymphoma	4	15	9	25	24	30	39	41	37	51	45	42	36	38	54	39	43	28	52	52	64	73	66	79	127	54	51	99	98	93	108	1691
7	Thyroid	0	9	13	18	26	26	25	37	46	36	31	45	38	35	32	32	28	38	33	39	55	50	65	68	82	64	57	79	84	83	94	1394
8	Uterus	1	21	17	8	18	26	25	37	46	36	33	0	0	42	35	32	37	32	33	40	44	54	65	65	57	80	80	80	48	0	123	1221
9	Brain	0	4	3	5	11	11	8	8	23	16	25	34	22	24	27	33	31	34	27	55	49	51	65	73	73	48	67	16	71	85	71	1171
10	Muo	0	0	0	1	2	4	11	11	21	22	24	36	37	29	33	40	43	27	34	27	16	34	46	51	52	67	16	145	92	53	45	1124
11	Colorectal	1	3	5	8	14	19	19	19	22	24	20	32	19	29	13	17	24	34	34	38	38	36	39	53	52	51	57	48	43	50	61	871
12	Gall Bladder	0	0	5	3	5	14	34	44	44	39	40	41	0	0	35	48	48	33	29	37	36	20	33	31	18	9	57	8	2	7	0	779
13	Bone Sarcomas	2	3	8	11	9	16	6	44	6	18	16	0	10	14	13	33	38	37	34	34	38	20	39	28	68	56	53	68	24	14	12	742
14	Skin	2	16	14	15	11	16	29	37	33	28	28	0	29	23	36	23	23	35	35	37	31	30	39	41	28	19	13	22	22	40	36	741
15	Acute Leukemia	0	0	0	0	10	12	19	21	21	13	19	11	15	19	23	30	36	35	27	39	34	41	39	27	27	16	10	30	28	32	26	662
16	Lung	0	3	18	12	42	19	21	21	13	13	9	7	9	9	10	10	14	22	20	11	16	27	19	39	34	21	13	25	27	18	35	579
17	Pharynx	1	2	3	6	11	12	6	21	11	19	9	6	18	9	10	14	80	22	17	10	22	27	27	36	19	16	20	40	32	20	22	578
18	Soft Tissue Sarcomas	1	4	12	5	14	10	18	29	13	22	34	28	17	26	20	0	16	20	25	29	25	10	19	23	34	38	24	19	8	17	17	567
19	Esophagus	0	3	5	9	12	12	16	12	9	12	13	0	11	12	4	17	9	9	4	14	13	12	23	25	28	20	28	32	21	21	20	420
20	Urinary Bladder	0	3	5	6	1	5	8	8	8	6	6	5	3	4	12	12	12	20	11	10	16	11	17	19	24	13	24	26	14	29	350	350
21	Chronic Leukemia	0	0	0	0	0	0	4	1	9	6	5	4	12	13	9	9	7	25	21	23	22	21	31	12	21	8	7	6	25	21	15	347
22	Kidney	0	2	3	3	6	8	9	9	11	15	11	15	4	16	14	11	12	16	12	16	12	17	8	10	6	15	14	8	2	4	305	305
23	Salivary Gland	0	3	4	4	5	4	6	11	4	8	8	9	15	11	7	11	33	8	9	13	11	8	8	11	11	7	8	16	13	15	11	297
24	Liver	1	7	5	2	1	11	7	12	7	11	6	11	11	13	11	11	9	7	8	9	9	14	11	5	6	13	6	3	6	4	2	245
25	Stomach	0	0	2	2	8	0	9	5	4	9	7	4	5	9	6	9	7	5	2	6	3	5	9	10	10	14	10	12	6	9	21	205
26	Larynx	0	7	3	3	4	8	7	9	6	6	7	8	8	4	4	6	4	6	8	9	7	8	10	11	4	3	8	9	6	9	9	199
27	Vulva	1	4	0	2	6	5	9	2	6	5	4	10	2	4	8	7	8	9	8	1	9	7	11	8	7	6	7	9	14	12	0	168
28	Vagina	0	0	1	1	0	5	0	2	4	3	5	6	4	6	1	8	4	3	2	5	3	2	7	4	1	8	9	10	7	4	8	102
29	Pancreas	0	0	0	3	3	1	2	5	4	5	2	5	5	6	3	2	4	2	5	2	5	3	8	6	4	3	6	0	1	1	0	97
30	Anal Canal	0	0	0	0	0	2	1	2	2	2	2	1	0	3	0	3	3	1	2	0	5	7	8	6	6	3	5	2	2	7	4	69
31	Blood	1	10	2	13	10	9	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9	55
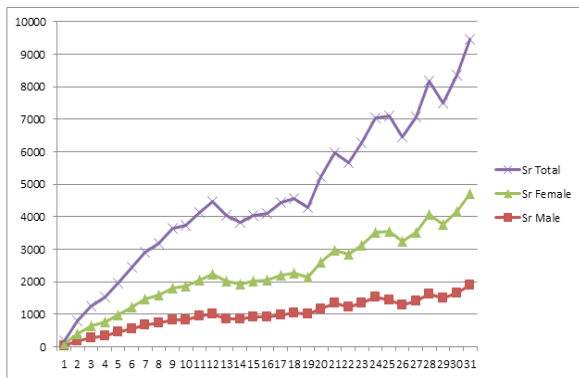
Figure 5. Number of Cancer Patients vs Years (1984-2014)

Leukemia and colorectal cancer has 7% male cancer cases.

Further percentage evaluation of data acquired for female cancers from last thirty years has been illustrated in Figure 4, where major highlighted disease percentage is breast cancer i.e. 55%. It is pertinent to note that the percentage distribution for various female cancers shows that breast cancer among women of 31–40 age group is rising rapidly (DeSantis et al., 2016; Siegel et al., 2016; Leclere et al., 2013; Mousavi et al., 2013; Gabriel et al., 2010) According to (PAECCR) statistics, breast cancer is overall top ranking and continually increasing disease in the city population of Lahore Pakistan. Breast cancer incidence in other countries also shows similar patterns and consistency with South East Asian region trends (Chen et al., 2015; Barayan et al., 2014; Kharazmi et al., 2014; Wu et al., 2013; Zhang et al., 2012) Other most common cancer percentages include, 8% for Ovary and Cervix cancer, 5% for Head & Neck and Lymphoma and 4% for Thyroid, Uterus, Brain and MUO.

In Figure 5 the number of cancer patients among males, females and there accumulative values have been presented from 1984 to 2014 for the city population of Lahore Pakistan. It can be seen that the total number of female patients has year wise considerably higher incidence as compared to number of male cases during the span of thirty years. The difference between the number of male and female cases increased every year which is at its maximum for the year 2014. From the year 2004 to onward, the total number of female cases is appormaxilty doubled as compared to the male cases which depicts the significant difference in life style between females and males populations in Pakistan. This situation can be improved through creating awareness and adopting healthy life style.

Discussion

It has now been established that cancer is caused by wide range of accumulative effects of multiple risk factors (Perdue et al., 2014; Barayan et al., 2014; Kharazmi et al., 2014; Cheung et al., 2013; Cheunget al., 2013) and there is lack of awareness among most of the urban and rural male and female population in developing regions (Tripathi et al., 2014; Gao et al., 2013) which is consistent with data from other part of the world (Mousavi et al.,

2013; Leclere et al., 2013; Gabriel et al., 2010). The overall incidence trends are consistent with South East Asian region patterns (Afsharfard et al., 2013; Takiar et al., 2010). The cancer incidence remains the highest in South East Asian region which is an accumulative effect of different influencing factors (Moore et al., 2013; Belasco et al., 2014; Tripathi et al., 2014). Recent cancer incidence data from Lahore, Pakistan describes that the cancer in young male and female at the age group 41–50 is rapidly rising and breast cancer has been seen in females at age group 41–60. For safety purpose, all females over 40 years of age, mammography must be performed after every three year. The average age for mostly male diagnosed cases are from 51–60 years, whereas, it is 41–50 years for females. The data is useful for interpretation of different kinds of tumors for cancer prevention and devising its control strategies. Similar results of the cancer incidence have been noted and reported by other researchers (Perdue et al., 2014; Cheung et al., 2013). During 2015, newly designed software has been introduced to give information about age-specific incidence which will help to depict these trends more accurately for occurrence of cancers in specific age groups. (PAECCR) has addressed the problem at national level and developed necessary required infrastructure which provide effective and valuable setup for assessing early screening needs along with adequate planning and evaluating screening services for management of cancer in Pakistan.

For instance, it has become known that the incidence of acute and chronic leukemia is reported in patients who have been exposed to any kind of radiation, benzene, pesticides and herbicides. The assessment and analysis of the vast data can be used for identification of the adequate amount of resources annually required to ensure more intervention measures for prevention of cancer and control that cannot be overestimated. The disease identification, its progression and reporting is difficult as lot of reasons are contained in disease aggression and pointing out nature of complexity which demands for systematic thinking and approach to identify key indicators inferred from the data (Tripathi et al., 2014; Belasco et al., 2014; Gao et al., 2013; Takiar et al., 2011). The typical results of cancer incidence reflect the various aspects that have its own multiplication with several other factors to compose enough effect for developing cancers as described elsewhere (Chen et al. 2015). The chances of getting cancers are relatively lower in younger age group of population and manifestation of developing cancer has greater possibility with growing age. The cancer incidence among all groups can be explained through risk behaviors (e.g., alcohol consumption, smoking, unhealthy life style, excessive sun exposure, unhealthy diet, and prolongation of infectious diseases) in addition to exposure from environmental carcinogenesis risk factors and lack of knowledge about disease and available cancer diagnosis, screening and treatment services.

Cancer incidence may be attributed by number of reasons due to gender differences, unhealthy routine family and social lifestyle, exposure of males and females due to different environmental risk factors has their own significance for its genesis and prognosis with variable

susceptibility for developing various types of cancers associated with their gender related discrepancies in genetics and physiology. The population of urban and rural living areas responds in a different manner to the cancer related symptoms, treatment services and prevention and leading to uneven distribution of incidence cases registration. Most of the cancer diagnosis and treatment facilities in Pakistan are only available in large hospitals and rural population in far off places are often outside the local cancer registry jurisdiction which poses accessibility barriers for rural population, to get services especially for aged ones. Another problem is to obtain complete relevant cancer case history record from required data for checking in case of local rural cancer registries. It has also been observed that a formal residence for substantial part of rural population is not registered and most of the rural school age population especially children are not properly diagnosed and they die due to cancer not having any record. Incidence of Lung disease in females and Thyroid cancer in males are not included ten most common diseases of male respectively. In addition, Thyroid is 6th common disease among females in Lahore cancer registry. Among males, bone & soft tissue sarcomas, skin, pharynx, esophagus and liver are not included in top ten cancers. At the same time, gall bladder, bone sarcomas, skin, acute leukemia, pharynx and urinary bladder are not among top ten female diseases. Table 1-2, illustrates organ wise thirty year cancer incidence data among males and females in the population of provincial capital city Lahore Pakistan.

It is obvious from INMOL data that the manifest features imply need to strengthen cancer prevention and control mechanism for early screening program. The in depth basic clinical research will further help in investigation of root cause analysis for identification of the geographical distribution of risk factors. Raising cancer awareness campaign throughout the country is very important and valuable cancer prevention and control tool for effective handling of disease. Assessment of need for early screening and evaluation of screening services for most common female and male cancers is of utmost importance.

Cancer control activities also include primarily education for creating awareness, model community program to increase awareness and potential for success also depend on resource allocation, socioeconomic cultural similarities for patients which are reported in advanced stages. Public health care education is extremely useful for school children in playing important role for primary prevention in use of tobacco and alcohol that can have dramatic effects on minimizing cancer trends and measures taken for prevention of cancer risk with diet control (e.g., breast, colon, gastric cancers), avoidance of preservatives, processed foods, dyes, pesticides, occupational hazards protection to control, mobility and healthy life style can help to control up to 50% of the malignancies. According to WHO, Pakistan falls in less resource countries and the risk having cancer can be 40% minimized through simple measures by no smoking, no alcohol consumption, avoiding excessive sun exposure, timely treatment of infectious diseases, courteous diet and healthy life style.

The detection of disease by comprehensive assessment of risk, appropriate biomarkers and skillful well trained professionals may prove to be very cost effective. The interpretation and utilization of trends and pattern generated through (PAECCR) cancer registry data will pave the way for taking into account all the factors which are related to genesis, prognosis and expression of the disease and is pertinently important to made substantial progress. Another important aspect which needs to be emphasized is ethnic, social, economic and geographic parameters for correct prediction of trends over time to determine requirements for planning.

In conclusions, (PAECCR) Lahore registry data comprising thirty years of cancer incidence from (1984-2014) has been successfully processed by computational technique for evaluation of useful patterns and valuable presentation of knowledge. Resultant data analysis has been presented in the form trends which is of significant importance for international scientific community and the patterns of different disease organs has been expressed to portrait clear picture of cancer incidence in Lahore Pakistan. These results demonstrate the rapidly increasing male and female cancer diseases and depict new challenges which need to be tackled on urgent basis in Pakistan. The research work compiled valuable information and discussed methodology to address common risk factors. The future projection of most common prevalent cancers can also be illustrated through generated patterns and trends. The results emphasize the need for initiation of immediate cancer screening at early stages. These results also highlight the importance of launching an organized public awareness campaign for cancer alleviation at national level. Such results are helpful for identification of adequate resources required for diagnostic and therapeutic facilities and in terms of well-trained oncologists, physicists, medical and surgical staff. These multidimensional outcome aspects of the present research work give it a significance nature and also pave the way for different futuristic studies for cancer prevention and control.

Acknowledgements

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