

## RESEARCH ARTICLE

# Trend of Cancer Incidence in Nepal from 2003 to 2012

Krishna Kanta Poudel<sup>1\*</sup>, Zhibi Huang<sup>2</sup>, Prakash Raj Neupane<sup>3</sup>

### Abstract

Trends in cancer incidence is a key tool to identify the pattern of cancer of any country. This retrospective study was performed to present the trends of change in cancer incidence in Nepal. The total number of cancer cases in males was 26,064 while the total number of females cancer cases was 29,867 throughout the 10 years from 2003 to 2012. The cancer incidence per 100,000 in males was 12.8 in 2003 and 25.8 people in 2012. Similarly, in females, the crude incidence rate was 15.1 in 2003 and 26.7 per 100,000 in 2012. Cancer incidence was low at early age but it was increased with age in both sexes in Nepal. Lung cancer was the most common cancer in males throughout, while it was the third most common cancer in females. Cervix uteri was the most common site of cancer in females throughout the 10 years, with a clear trend for increase in breast cancer within this time.

**Keywords:** Cancer incidence data - organ sites - gender - trends - Nepal

*Asian Pac J Cancer Prev*, 17 (4), 2171-2175

### Introduction

The first hospital based cancer registry was established in Nepal in 2003. There were 1488 male cancer cases and 1763 female cancer case out of 3251 cancer cases in 2003 in Nepal (Cancer Registry Report, 2003). The purpose of this study was to evaluate the 10 years (2003 to 2012) incidence rates and trends of cancer by years, age and sites in males and females of Nepal in order to assist in the field of cancer epidemiology and cancer statistics. Former studies by Pun et al. (2015) and Pradhananga et al. (2009) had also used the national cancer registry data but only showed the cancer cases by age. Due to non-existence of population based cancer registry (Pun et al., 2015; Pradhananga et al., 2009), we had taken the population (denominator) from the census and cases from the hospital.

### Materials and Methods

Data were collected by National Cancer Registry programme from B P Koirala Memorial Cancer hospital, Bhaktapur cancer hospital, Bir hospital, TU teaching hospital, Kanti children hospital, BP Koirala institute of health science and Maniatal teaching hospital. The cancer cases registered under the national cancer registry programme from 2003 to 2012 were taken for our study. We had added the cancer cases together within categories as per international classification of disease for oncology (ICD-10) published by international agency for research on cancer/ world health organization (IARC/WHO). This was done to make the number comparable with the cancer registry report of 2012. We had also added cancer cases

and world population together within the age categories defined by 0-14, 15-34, 35-64 and 65+ to make the number comparable with all the reports. All double/multiple entry cases were excluded in the study (National Cancer Registry Report, 2012).

The total cancer cases were 56013 from 2003 to 2012 and we excluded 82 cases because of missing age data. We analyzed 26064 male cases and 29867 female cases which had known age. The collected data were entered in Excel Sheet with respect to years, sex and sites. The population growth rate from 2001 to 2011 published on population monograph of Nepal volume 1 and the Census population of 2001 and 2011 were used to predict the population of Nepal of 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 and 2012 (Population Monograph of Nepal, 2014). World population was taken from Cancer Registration: Principles and methods (Jensen et al., 1991).

The crude incidence rate of cancer (per 100,000) for both sexes was calculated. We had also calculated the age standardized rate (ASR) for both sexes. Crude incidence rate of cancer in males and females by age groups was also performed. Statistical analysis was performed using SPSS (version 23.0) and Microsoft Excel 2010.

### Results

Summary of total cancer cases over 10 years (from 2003 to 2012) were presented in Table 1. Crude cancer incidence rate was increased by year for both sexes (Table 2). Female crude cancer incidence rate was higher than male crude cancer incidence from 2003 to 2012. Female had also the higher ASR than the ASR of male from

<sup>1</sup>Bhaktapur Cancer Hospital, Bhaktapur, <sup>3</sup>B P Koirala Memorial Cancer Hospital, Bharatpur, Chitwan, Nepal, <sup>2</sup>Department of Epidemiology and Biostatistics, School of Public Health, Guangxi Medical University, China \*For correspondence: k.poudel.08@aberdeen.ac.uk, gxzhibihuang@163.com

2003 to 2012. Cancer incidence rates for males increased from 12.75 per 100,000 in 2003 to 25.27 per 100,000 in 2012. Similarly, cancer incidence rates for females also increased from 15.09 per 100,000 in 2003 to 28.06 per 100,000 in 2012 (Figure 1). After 2011, incidence rates for males showed decreasing trends. Our finding performed up-and-down trends of cancer incidence in females from 2007 to 2012. The age standardized cancer rates among male increased from 17.33 per 100,000 in 2003 to 30.16 per 100,000 in 2012. The age standardized cancer rates among female increased from 20.47 per 100,000 in 2003 to 33.97 per 100,000 in 2012. Early age had low cancer incidence rate in both sex (Figure 1) however, in middle

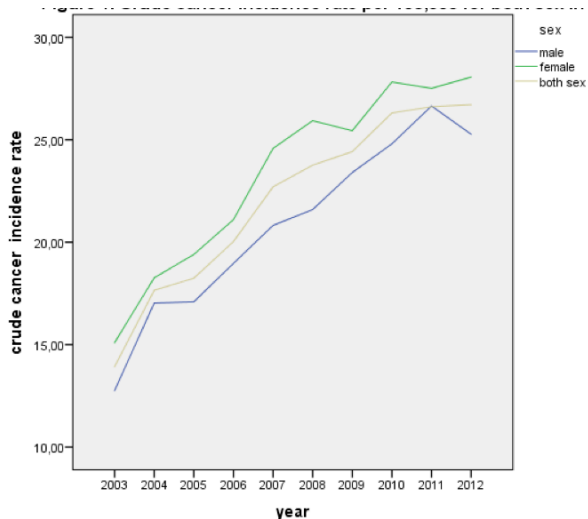


Figure 1. Crude Cancer Incidence Rates per 100,000 for Both Sexes in Nepal

Table 1. Summary of Total Cancer Cases from 2003 to 2012 in Nepal

Years	Male	Female	Total
2003	1488	1763	3251
2004	2009	2156	4165
2005	2051	2331	4382
2006	2308	2570	4878
2007	2758	3276	6034
2008	2702	3247	5949
2009	2970	3229	6199
2010	3192	3581	6773
2011	3295	3793	7088
2012	3291	3921	7212
Total	26064	29867	55931

age, female cancer incidence was higher than male cancer incidence and again in old age, male cancer incidence was higher than female cancer incidence. Lung was the major common cancer over the ten years in males and stomach was the second common cancer though it was the third common cancer in 2003 (Figure 4). The top three major cancers in females were not changed throughout the 10 years (Figure 5).

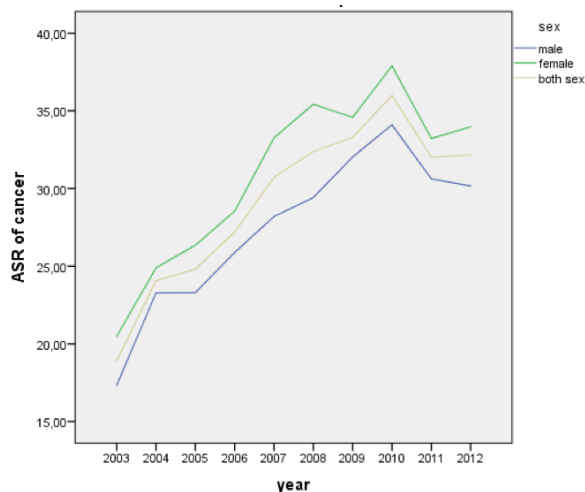


Figure 2. Age-Standardized Cancer Incidence Rates per 100,000 for Both Sexes in Nepal

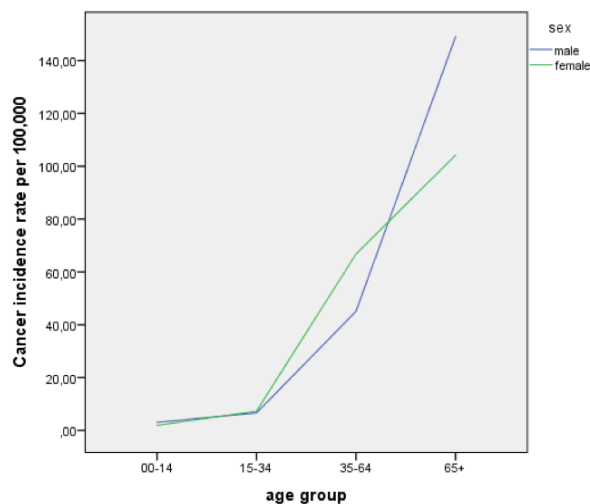
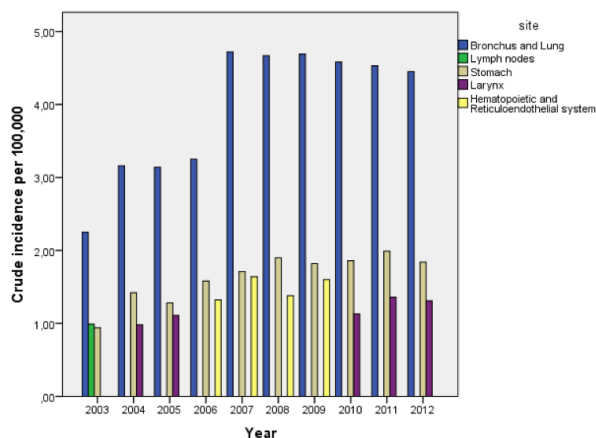


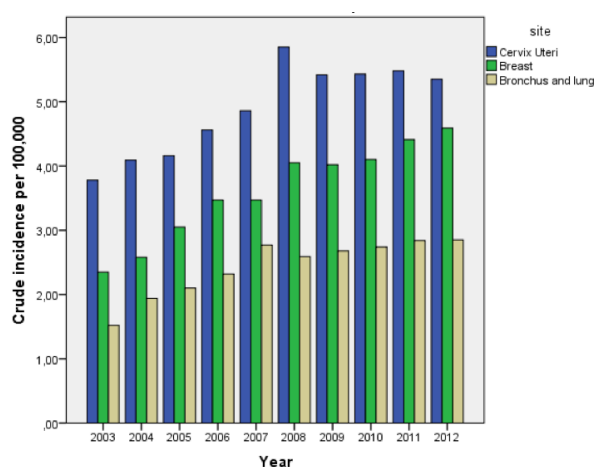
Figure 3. Crude Incidence Data by Age Groups in males and females of Nepal from 2003 to 2012

Table 2. Trend of cancer Incidence per 100,000 People in Nepal from 2003 to 2012

Year	Total male crude incidence	Total female crude incidence	Both sex total crude incidence	Total male ASR	Total female ASR	Both sexes total ASR
2003	12.75	15.09	13.92	17.33	20.47	18.89
2004	17.03	18.26	17.65	23.28	24.89	24.07
2005	17.09	19.4	18.24	23.3	26.35	24.81
2006	18.96	21.1	20.03	25.88	28.54	27.2
2007	20.82	24.58	22.7	28.2	33.26	30.72
2008	21.59	25.93	23.76	29.42	35.42	32.38
2009	23.4	25.44	24.42	32.03	34.58	33.29
2010	24.8	27.82	26.31	34.1	37.89	35.99
2011	26.65	27.51	26.61	30.62	33.22	32.01
2012	25.27	28.06	26.71	30.16	33.97	32.16



**Figure 4. Crude Incidences of Major Cancers in Males from 2003 to 2012 in Nepal**



**Figure 5. Crude Incidences of the Three Major Cancers in Females from 2003 to 2012 in Nepal**

## Discussion

Our study reported the comprehensive incidence of cancer in males and females over 10 years in Nepal. Overall, the cancer incidence in male and female had increasing trend however, in male; there was decreasing trend after 2011. This study also revealed that up-and-down trend occurred in females from 2007 to 2012. This retrospective study indicated that the incidence in female cancer was higher than the incidence in male cancer.

The cancer treatment history of Nepal was very short (Subedi et al., 2012). The incidence of cancer was increased in Nepal every year (Pradhananga et al., 2009; Subedi et al., 2012). It could be because of increasing activities of screening programme in different parts of the country (NNCTR report) and the support from the International Agency for Research on Cancer (IARC) for early detection and prevention of cervix and breast cancer (Sankaranarayanan R et al., 2011). In last few years, cancer treatment facilities were only delivered by seven major hospitals of Nepal (Pradhananga et al., 2009; Bhatt et al., 2009), but now the number of private cancer hospitals has also increased which facilitated to diagnosis the cancer. It could be the another reason of increasing the number of

new cancer cases every year in Nepal.

It was also reported that age was a major determinant of cancer incidence. The incidence of cancer increased dramatically with age (WHO fact sheet, 2015). Our study found that early age of male and female had low incidence rate of cancer. Finding from the study by Mishra et al. (2015), also performed that the incidence of cancer was found to be less in children below 15 years of age at 1.9%. Our study presented that the cancer incidence in females was higher in middle aged group than the middle aged males group however old aged groups of males had higher cancer incidence than the old aged females groups. The research conducted in Multi-Institution Hospital, Nepal presented that cancer cases increased by age. The number of cancer cases was highest for the age of 60-64 for male, while for female the number was highest for the age of 45-49 (Pradhananga et al., 2009). Likewise, another study demonstrated that the most prevalent age group in female was 50-54 years (12.8%), while in male it was 60-64 years (13.6%) (Pun et al., 2015).

Our study illustrated that bronchus and lung was the most common cancer in males over 10 years from 2003 to 2012. The crude incidence rate of bronchus and lung was increased from (2.25) in 2003 to (4.45) in male in 2012. Different studies had reported that lung cancer was the major in males (Pun et al., 2015; Pradhananga et al., 2009; Binu et al., 2007) in Nepal. It was because of lower education, unmarried individuals and Rai/Limbu/Magar ethnicity (Hashibe et al., 2010), household air pollution and tobacco consumption (Raspanti et al., 2016, Raspanti et al., 2015), and not enough medical health education (Khatiwada et al., 2012). For young people in western Nepal; smoking was a serious issue (Binu et al., 2010) which was the risk factor of lung cancer (Torre et al., 2015). However, a hospital based retrospective study in Manipal Teaching Hospital indicated that head and neck cancer were the most common types of cancer and lung was the second most common cancer in males (Bhat et al., 2009). In 2012, approximately 1.8 million new lung cancer cases were found, accounting for almost 13% of all cancers diagnosed. The highest lung cancer incidence rates among men were found in Europe, Eastern Asia, and Northern America, and the lowest rates were in Sub-Saharan Africa (Torre et al., 2015).

Our study illustrated that lung was the third common cancer in females both in years 2003 to 2012. The crude incidence rate of bronchus and lung was (1.52) in 2003 while it was (2.85) in 2012 in females. Findings from the study by Pun et al. (2015) and Pradhananga et al (2009) had also reported that lung cancer was the third most common cancer for females in Nepal. In case of women, the highest -lung cancer occurred in Northern and Western Europe, Northern America, Eastern Asia, and Australia/ New Zealand (Torre et al., 2015).

Our study found that the first three common cancers were not changed in females throughout the 10 years. This study illustrated that cervix uteri cancer was the most common type in females to all years from 2003 to 2012. The crude incidence rate of cervix uteri was (3.78) in 2003 while it was (5.35) in 2012. Studies had also revealed that cervix uteri was the most common cancer for females

in Nepal (Pun et al., 2015; Pradhananga et al., 2009., Bhatt et al., 2009), because women did not have enough information regarding the human papillomavirus (HPV), cervical cancer and HPV vaccine (Johnson et al., 2014), concept of pap smear test (Ranabhat et al., 2014). Owing to lack of enough knowledge and the poor purchasing capacity for HPV vaccination (Singh et al., 2010), the cases of cervix cancer will be increased year by year and high priority should be given to manage the risk factors of cervical cancer (Sathian et al., 2013) however, one study conducted in Manipal Teaching Hospital in Nepal reported that lung cancer was the major cancer for females followed by cervix, breast, stomach and ovary (Binu et al., 2007). Nepal had less burden of human papillomavirus infection comparing with the many places of China and India. Using the HPV16/18 vaccines, almost 80% of cervical cancer in Nepal could be prevented (Sherpa et al., 2010). The incidence of cervix cases was found to be highest in Sub-Saharan African, Latin America, the Caribbean, and Melanesia whereas the lowest incidence occurred in Western Asia, Australia/New Zealand, and Northern American (Torre et al., 2015).

In 2003, lymph nodes was the second most common cancer in males, however, it was not under the top three major common cancers after 2003. The crude incidence rate of lymph nodes was (0.99) in males in 2003. Our study illustrated that breast was the second most common cancer in females over the 10 years. The crude incidence rate of breast cancer was (2.35) in 2003 while it was (4.59) in 2012. Studies had also showed that breast was the second most common cancer for females in Nepal (Pun et al., 2015; Pradhananga et al., 2009). More than quarter of the breast cancer occurred in young females of Nepal. More aggressive biological features of tumors were found in younger women. Breast cancer prevention program was essential among this people (Thapa et al., 2013). One study conducted in western Nepal had showed that research was essential to know the role of smoking in breast cancer in association with oxidative stress and antioxidant in Nepalese people (Nagamma et al., 2014). Educated women were more conscious about the knowledge of breast examination in comparison with the illiterate women (Sathian et al., 2014). A cross sectional descriptive study performed at Kist Medical College in Kathmandu demonstrated that breast cancer was increased due to the lack of information on breast cancer, risk factors, and breast screening (Shrestha, 2012). For the prevention and control of breast cancer in Nepal, breast self-analysis could be used as one of the key tool (Tara et al., 2008). The breast cancer incidence rates were higher in North America, Australia/New Zealand, and Northern and Western Europe as compared to most of Africa and Asian and intermediate in Central and Eastern Europe (Torre et al., 2015).

Stomach cancer was the third most common cancer in 2003 in males, however, it was the second most common cancer over the nine years from 2004 to 2012. The crude incidence rate of stomach was (0.94) in 2003 while it was (1.84) in 2012. Out of 7212 cases from the data of B P Koirala Memorial Cancer Hospital (7.3%) were stomach cancer (Pun et al., 2015). Similarly, another study

reported that (7.5%) stomach cancers for males while the corresponding percentage of females was (4.1%) out of 4397 cases (Pradhananga et al., 2009). Perforation peritonitis was considered as a rare complication of a gastric cancer associated with high postoperative morbidity and mortality. Curative resection was the best treatment for the long term survival of patients (Kandel et al., 2013). Because of low gastric mucosal atrophy, the incidence of gastric cancer was low in Nepal however the people who lived in mountain area could be taken as a high risk population for gastric mucosal status (Miftahussurur et al., 2015). Men were almost two times higher as compared to women in stomach cancer and vary widely worldwide. Overall, incidences rates were highest in Eastern Asia particularly in Korea, Mongolia, Japan, and China, Central and Eastern Europe, and South America whereas, the lowest incidence rates were found in most parts of Africa and Northern America (Torre et al., 2015). Hematopoietic and reticuloendothelial system was the third most common cancer in males from 2006 to 2009, but it was not under the top three major cancers from 2010 to 2012. Larynx was the third most common cancer in males from 2010 to 2012. Out of 7212 cases in 2012 (5.2%) were the larynx cases (Pun et al., 2015). Similarly, another study reported that 3.7% larynx cancer in males while the corresponding percentage in females was 1.3% out of 4397 cases (Pradhananga et al., 2009).

In conclusion, to manage the burden of major cancers such as lung cancer and larynx cancer in males in Nepal, health education and anti-smoking activities were essential. Our result also proved that the first three common cancers in females throughout the ten years were not changed. Studies had reported that cervix cancer and breast cancer could be prevented by the awareness of human papillomavirus (HPV), cervical cancer, HPV vaccine and screening programme. Thus, to prevent the various type of cancer, it is to be much emphasized that the knowledge and facts about the risk factors should be widely informed to the general mass of Nepal.

## References

- Bhatt CR, Sharan K, Ninan J, et al (2009). Cancer Treatment by Radiotherapy in Western Nepal: A hospital based study. *Asian Pac J Cancer Prev*, **10**, 205-8.
- Binu VS, Chandrashekhar TS, Subba SH, et al (2007). Cancer pattern in western Nepal: A hospital based retrospective study. *Asian Pac J Cancer Prev*, **8**, 183-6.
- Binu VS, Subba SH, Menezes RG, et al (2010). Smoking among Nepali Youth – Prevalence and Predictors. *Asian Pac J Cancer Prev*, **11**, 221-26.
- Hashibe M, Siwakoti B, Wei M, et al (2010). Socioeconomic status and lung cancer risk in Nepal. *Asian Pac J Cancer Prev*, **11**, 1083-8.
- Jensen OM, Parkin DM, Maclennan, Muir CS, et al (1991). Cancer Registration: Principles and Methods, IARC scientific publication No.95.
- Johnson DC, Bhatta MP, Gurung S, et al (2014). Knowledge and awareness of human papillomavirus (HPV), cervical cancer and HPV vaccine among women in two distinct Nepali communities. *Asian Pac J Cancer Prev*, **15**, 8287-93.
- Kandel BP, Singh Y (2013). Gastric cancer perforation: experience from a tertiary care hospital. *J Nepal Med Assoc*,

- 52, 489-93.
- Khatiwada P, Kayastha SR, Panta P, et al (2012). Understanding of tobacco and lung cancer among medical students in Kathmandu University School of Medical Sciences (KUSMS). *Kathmandu Univ Med J*, **10**, 60-5.
- Miftahussurur M, Sharma RP, Shrestha PK, et al (2015). Helicobacter pylori infection and gastric mucosal atrophy in two ethnic groups in Nepal. *Asian Pac J Cancer Prev*, **16**, 7911-6.
- Mishra SR, Neupane D, Bhandari PM, Khanal V, Kallestrup P (2015). Burgeoning burden of non-communicable diseases in Nepal : a scoping review. *Global Health*, **11**, 32.
- Nagamma T, Baxi J, Singh PP (2014). Status of oxidative stress and antioxidant levels in smokers with breast cancer from western Nepal. *Asian Pac J Cancer Prev*, **15**, 9467-70.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2003.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2004.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2005.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2006.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2007.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2008.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2009.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2010.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2011.
- National Cancer Registry Programme Report of Hospital Based National Cancer Registry 2012.
- Population Monograph of Nepal.(volume I, Population Dynamics),2014.Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics.
- Pradhananga KK, Baral M, Shrestha BM (2009). Multi-institution hospital-based cancer incidence data for Nepal: an initial report. *Asian Pac J Cancer Prev*, **10**, 259-62.
- Pun CB, Pradhananga KK, Siwakoti B et al (2015). Malignant neoplasm burden in Nepal- Data from the seven major cancer service hospitals for 2012. *Asian Pac J Cancer Prev*, **16**, 8659-63.
- Ranabhat S, Tiwari M, Dhungana G, Shrestha R (2014). Association of knowledge, attitude and demographic variables with cervical Pap smear practice in Nepal. *Asian Pac J Cancer Prev*, **15**, 8905-10.
- Raspanti GA, Hashibe M, Siwakoti B, et al (2015). Ethnic variation in consumption of traditional tobacco products and lung cancer risk in Nepal. *Asian Pac J Cancer Prev*, **16**, 5721-26.
- Raspanti GA, Hashibe M, Siwakoti B, et al (2016). Household air pollution and lung cancer risk among never smokers in Nepal. *Environmental Res*, **147**, 141-45.
- Report of NNCTR <https://www.globalgiving.org/pfil/6686/projdoc.pdf> Retrieved on 24-03-2016.
- Sankaranarayanan R, Sauvaget C, Ramada K, et al(2011). Clinical trials of cancer screening in the developing world and their impact on cancer healthcare. *Ann Oncol*, **22**, 21-8.
- Sathian B, Fazil A, Sreedharan J, et al (2013). Statistical modelling and forecasting of cervix cancer cases in radiation oncology treatment: a hospital based study from western Nepal. *Asian Pac J Cancer Prev*, **14**, 2097-100.
- Sathian B, Nagaraja SB, Banerjee I, et al (2014). Awareness of breast cancer warning signs and screening methods among female residents of Pokhara valley, Nepal. *Asian Pac J Cancer Prev*, **15**, 4723-6.
- Sherpa ATL, Clifford GM, Vaccarella S, et al (2010). Human papillomavirus infection in women with and without cervical cancer in Nepal. *Cancer Causes Control*, **21**, 323-30.
- Shrestha K (2012). Breast cancer knowledge and screening practice among women visited to KIST medical college. *Nepal Med Coll J*, **14**, 308-11.
- Singh Y, Shah A, Singh M, et al (2010). Human Papilloma virus vaccination in Nepal: an initial experience. *Asian Pac J Cancer Prev*, **11**, 615-17.
- Subedi KS, Sharma P (2012). Cancer treatment in Nepal: A historical background, development of treatment facilities, epidemiology and challenges for prevention and control of cancer. *Asian J Cancer*, **11**, 205-12.
- Tara S, Agrawal CS, Agrawal A (2008). Validating breast self-examination as screening modalities for breast cancer in eastern region of Nepal: a population based study. *Kathmandu Uni Med J*, **6**, 89-93.
- Thapa B, Singh Y, Sayami P, et al (2013). Breast cancer in young women from a low risk population in Nepal. *Asian Pac J Cancer Prev*, **14**, 5095-9.
- Torre LA, Bray F, Siegel RL et al (2015). Cancer Statistics *Cancer J Clin*, **65**, 87-108.
- WHO Cancer Fact sheet No.297.World Health Organization (February 2015). <http://www.who.int/mediacentre/factsheets/fs297/en/> Retrieved on 13-01-2016.