



Cancer Incidence in Nepal: A Three-Year Trend Analysis 2013-2015

Gambhir Shrestha

Prakash Neupane

Nirmal Lamichhane

Bijaya Chandra Acharya

Bhola Siwakoti

Krishna Prasad Subedi

Kishore Kumar Pradhananga

Rashmi Mulmi

B.P. Koirala Memorial Cancer Hospital

Bhaktapur Cancer Hospital

B.P. Koirala Memorial Cancer Hospital

B.P. Koirala Memorial Cancer Hospital

B.P. Koirala Memorial Cancer Hospital

B.P. Koirala Memorial Cancer Hospital

B.P. Koirala Memorial Cancer Hospital

B.P. Koirala Memorial Cancer Hospital

Background: Cancer is an major public health problem in the world. This study aims to present a three-year trend of cancer incidence in Nepal.

Methods: This study used the three-year data of National Cancer Registry Program (NCRP) from January 2013 to December 2015. NCRP currently includes 12 major hospitals where diagnostic treatment facilities are available and represent the majority of the cases in Nepal. Descriptive analysis was used to present the demographic profile of the participants and the incidence of different topography of cancer. Age-specific and age-adjusted cancer incidence per 100,000 population were presented.

Results: A total of 27,483 new cancer cases were included in the study. The age-adjusted incidence rates were 39.1, 39.8 and 41.8 per 100,000 population in the year 2013, 2014 and 2015 respectively. The most common cancer in Nepal was lung followed by cervical, breast, stomach and colorectal cancer. Among males, lung cancer was the most common followed by lip and oral cavity, stomach, colorectal cancer and leukemia and among females, cervical cancer followed by breast, lung, ovary and stomach.

Conclusion: Cancer incidence is rising in Nepal and thus comprehensive policies targeting prevention, early detection, and treatment programs should be carried out.

Introduction

Cancer is a major public health problem and it has become one of the leading cause of deaths worldwide. Globally, nearly 18.1 million new cancer cases and 9.6 million cancer deaths occurred in 2018 with 70% deaths occurring in developing countries of the world [1]. By 2040, it is estimated that the new cases of cancer will rise to 29.5 million [1]. Increase in life expectancy, changes in lifestyle related factors like food habits, sedentary lifestyle, sexual behaviour, environmental pollution due to industrialization are mainly related to increasing the burden of cancer incidence and deaths in developing countries [2]. Likewise, low level of awareness of people on cancer and low screening rate has additionally raised the burden of cancer which is especially diagnosed at a late stage. This challenges the existing healthcare system with added economic burden in health economy of especially those of low- and middle-income countries [3]. GLOBOCAN 2018 estimates that the age-standardized cancer incidence and mortality rates in Nepal to be 103.7 and 77.8 per 100,000 population in Nepal [4]. Previous studies have shown that the cancer burden in Nepal may still rise in future and poses a serious threat [5].

The National Cancer Registry Program (NCRP) of Nepal routinely collects data on cancer patients' information including demographics, primary tumour sites and tumour morphology from 12 major hospitals of Nepal.

B.P. Koirala Memorial Cancer Hospital (BPKMCH) is responsible for collecting, evaluating and

publishing national cancer statistics [6-7]. This study aimed to present the trend of 3-year registry data of new cancers registered in the NCRP between January 2013 and December 2015.

Materials and Methods

The Department of Cancer Prevention, Control and Research, BPKMCH is responsible to collect and analyze the data from 12 cancer centres for National cancer registry Program. The hospitals included are BPKMCH (Chitwan), Bhaktapur Cancer Hospital (Bhaktapur), Bir Hospital (Kathmandu), TU Teaching Hospital (Kathmandu), Kanti Children’s Hospital (Kathmandu), B. P. Koirala Institute of Health Sciences (Sunsari), Manipal Teaching Hospital (Pokhara), Paropakar Maternity and Women’s Hospital (Kathmandu), Patan Academy of Health Sciences (Lalitpur), Civil Service Hospital (Kathmandu), Shree Birendra Army Hospital (Kathmandu) and Nepalgunj Medical College Teaching Hospital (Nepalgunj [7]. These 12 hospitals have the diagnostic as well as treatment facilities and represent the majority of the cases in Nepal. This study used data collected by NCRP to present the trend of cancer incidence in Nepal in a three-year period from January 2013 to December 2015 [8-10]. The data were collected using a standardized semi-structured form consisting of socio-demographic characteristics, detail of diagnosis, clinical stage and treatment. In order to avoid double and multiple entries of the cases, the database was verified by name, age, sex, address, topography and morphology of cancer cases. The data were entered, cleaned, removed duplicates and analysed using in excel 2016. Descriptive analysis was used to present the demographic profile of the participants and the incidence of different topography of cancer according to the gender and their related variables. Age-specific and age-adjusted cancer incidence were also presented. For age-specific crude incidence rate, we used population data for 2013-2015 medium variant predicted by the Central Bureau of Statistics [11] and to adjust the age we used Segi World Standard Population. Cancer cases were categorized as per the international classification of disease for oncology (ICD-10). Permission was taken prior to the study from B.P. Koirala Memorial Cancer Hospital, Nepal.

Results

The total number of new cases from 12 hospitals were 8882 in 2013, 9221 in 2014 and 9851 in 2015. Out of which, 471 cases were non-Nepalese and were excluded from the analysis. The total number of new cases included in this study were 8729 in 2013, 9036 in 2014 and 9718 in 2015. Male consists of 45% and female were 55% of the cases (Table 1). Majority of the cases were married. About 33% of the cases were from Province 3 followed by Province 1 (19%) and Province 5 (15%).

Characteristics	Year n (%)		
	2013	2014	2015
Gender			
Male	4,011 (46.0)	4,014 (44.4)	4,483 (46.1)
Female	4,718 (54.0)	5,022 (55.6)	5,235 (53.9)
Marital status			
Unmarried	245 (2.8)	184 (2.0)	145 (1.5)
Married	5,613 (64.3)	5,892 (65.2)	6064 (62.4)
Widow/ Divorced/ Separated	174 (2.0)	183 (2.0)	221 (2.3)
Not available	2,377 (27.2)	2,454 (27.2)	2763 (28.4)
Not applicable (<15 years)	320 (3.7)	323 (3.6)	525 (5.4)
Province			
Province 1	1694 (19.4)	1794 (19.9)	1825 (18.8)
Province 2	1139 (13.0)	1203 (13.3)	1210 (12.5)
Province 3	2790 (32.0)	2919 (32.3)	3265 (33.6)

Province 4	1066 (12.2)	997 (11.0)	1173 (12.1)
Province 5	1304 (14.9)	1362 (15.1)	1481 (15.2)
Province 6	193 (2.2)	249 (2.8)	253 (2.6)
Province 7	310 (3.6)	308 (3.4)	340 (3.5)
Unknown	233 (2.7)	204 (2.3)	171 (1.8)
Total	8729 (100.0)	9036 (100.0)	9718 (100.0)

Table 1: Characteristics of New Cancer Cases in Nepal 2013-2014.

Top Cancer in Nepal

The most common cancer in Nepal was lung followed by cervical cancer, breast, stomach and colorectal cancer (Table 2).

S.N	Topography	N (%)
1	C33-34 Lung	3737 (13.60)
2	C53 Cervix uteri	2552 (9.29)
3	C50 Breast	2456 (8.94)
4	C16 Stomach	1574 (5.73)
5	C18-21 Colorectal	1457 (5.30)
6	C00-06 Lip, oral cavity	1426 (5.19)
7	C91-95 Leukemia	1259 (4.58)
8	C32 Larynx	1085 (3.95)
9	C56 Ovary	1065 (3.88)
10	C23 Gall bladder	911 (3.31)

Table 2: Top 10 Cancers in Nepal 2013-2015.

The top leading cancer site among males was lung followed by lip and oral cavity, stomach, colorectal cancer and leukaemia. Likewise, among females, it was cervical uteri followed by breast, lung, ovary and stomach (Table 3).

S.N	Top Male Cancers	n (%)	Top Female Cancers	n (%)
1	C33-34 Lung	2121 (16.96)	C53 Cervix uteri	2552 (17.04)
2	C00-06 Lip, oral cavity	1047 (8.37)	C50 Breast	2392 (15.97)
3	C16 Stomach	909 (7.27)	C33-34 Lung	1616 (10.79)
4	C18-21 Colorectal	812 (6.49)	C56 Ovary	1065 (7.11)
5	C91-95 Leukemia	773 (6.18)	C16 Stomach	665 (4.44)
6	C32 Larynx	751 (6.00)	C18-21 Colorectal	645 (4.31)
7	C67 Bladder	547 (4.37)	C23 Gall bladder	616 (4.11)
8	C70-72 Brain and CNS	419 (3.35)	C91-95 Leukemia	486 (3.25)
9	C22 Liver	374 (2.99)	C73 Thyroid	414 (2.76)
10	C85 Non-Hodgkin Lymphoma	353 (2.82)	C00-06 Lip, oral cavity	379 (2.53)

Table 3: Top 10 Cancers among the Male and Female Population in Nepal 2013-2015.

Cancer Incidence

The incidence of cancer was seen increasing with the increase in age and the incidence was seen more in the age group 70-74 years in 2013. Similarly, the incidence was also seen increasing with

age in 2014 and 2015 but it was found more in the age group 60-64 years. A similar pattern was seen in the incidence among the male population. However, the incidence increase with age in females with age group 45-49, 50-54 and 60-64 being the most common age group in the year 2013, 2014 and 2015 respectively. After this age group, the incidence in females was seen decreasing with age (Table 4).

Age group (years)	Male			Female			Total		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
0-4	60	48	114	27	36	55	87	84	169
5-9	64	61	116	32	42	66	96	103	182
10-14	71	89	110	66	47	64	137	136	174
15-19	69	88	89	77	67	87	146	155	176
20-24	100	85	111	97	111	117	197	196	228
25-29	90	88	124	139	166	139	229	254	263
30-34	144	140	149	195	234	212	339	374	361
35-39	162	146	188	325	309	331	487	455	519
40-44	209	228	241	444	486	505	653	714	746
45-49	225	249	263	575	584	588	800	833	851
50-54	328	379	433	563	627	641	891	1006	1074
55-59	438	450	419	503	603	605	941	1053	1024
60-64	495	554	595	556	596	649	1051	1150	1244
65-69	448	458	500	407	457	503	855	915	1003
70-74	649	504	498	448	355	369	1097	859	867
75-79	248	269	295	148	166	190	396	435	485
80+	211	178	238	116	136	114	327	314	352
Total	4,011	4,014	4,483	4,718	5,022	5,235	8729	9036	9718

Table 4: Distribution of Cancer Cases by Age Group and Gender.

The age-specific incidence rate (ASIR) was observed more in the age group 80 and above in overall (218 per 100,000 in 2015) and male population (303 per 100,000 in 2015) and 60-64 years in case of the female population (170 per 100,000 in 2015) in all the three-year period. The ASIR increased with increase in age. However, we also found that the ASIR decreased in the age group 75-79 years then increased in 80 and above population in both males and females. The ASIR in females also decreased in the age group 65-69 years. The total ASIR in females is more than that of males in 2013-2015. The ASIRs in age groups less than 30 years and more than 60 years were more than in males than females. The female ASIR increased in consecutive years but slightly decreased in males in the year 2014 (Table 5).

Age group (years)	Male			Female			Total		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
0-4	4.204	3.295	7.651	1.998	2.664	3.935	3.131	2.968	5.852
5-9	4.367	4.279	8.326	2.283	2.996	4.961	3.348	3.694	6.682
10-14	4.253	5.432	6.866	4.112	2.928	4.166	4.184	4.236	5.545
15-19	4.261	5.324	5.319	4.772	4.152	5.307	4.516	4.719	5.313
20-24	8.172	6.466	7.919	6.869	7.86	7.769	7.474	7.062	7.841
25-29	9.741	9.294	12.626	11.484	13.714	10.94	10.73	11.622	11.675
30-34	17.563	16.825	17.625	18.685	22.422	19.143	18.191	19.605	18.486
35-39	22.034	19.525	24.73	36.428	34.635	35.15	29.925	27.343	30.496
40-44	31.206	33.727	35.289	58.325	63.842	62.545	45.632	48.898	50.055
45-49	37.334	40.594	42.197	89.255	90.652	86.228	64.16	65.27	65.201
50-54	63.413	71.623	80.017	107.007	119.171	112.997	85.396	93.515	96.896
55-59	100.091	101.095	92.41	116.565	139.739	133.264	108.27	118.724	112.85

60-64	136.148	149.865	158.199	149.81	160.588	170.359	143.049	154.293	164.318
65-69	152.479	154.604	166.957	131.477	147.629	157.241	141.704	149.766	161.939
70-74	271.093	213.568	214.017	177.221	140.432	147	222.881	176.038	179.239
75-79	181.788	180.207	186.985	105.314	118.123	111.69	142.984	141.709	147.92
80+	295.854	242.606	303.703	156.918	183.973	137.387	225.14	209.377	218.169
Total	30.35	29.948	32.98	33.6	35.765	36.241	32.024	32.685	34.66

Table 5: Crude Age Specific Incidence Rate per 100,000 Population in 2013-2015.

Similarly, with age adjustment, the incidence rate in the total population was found to be increasing in consecutive years (39.1, 39.8 and 41.8 per 100,000 in the year 2013, 2014 and 2015 respectively). However, the age-adjusted incidence rate (AAIR) among male slightly decreased in 2014 (37.0, 36.5 and 39.9 per 100,000 in 2013, 2014 and 2015). In contrast, AAIR among female increased in 2014 then slightly decreased in 2015 (41.0, 43.9 and 43.4 per 100,000 in 2013, 2014 and 2015) (Figure 1).

Figure 1: Age Adjusted Cancer Incidence Rate per 100,000 Populations in Nepal.

Discussion

The present analysis was based on a total of 27,483 new cancer cases diagnosed in Nepal from 12 hospitals from 2013 to 2015. Cases reported in 2015 (n=9718) was 11% higher than that in 2013 (n=8729). NCRP Nepal data shows an increased incidence of cancer in Nepal from 2013 (ASIR=39.1 per 100,000) to 2015 (ASIR=41.8 per 100,000). It has been estimated by WHO that the incidence for the year 2018 to be 18.1 million cases globally which in 2040 will increase to 29.9 million [1]. Increase in life expectancy, changes in lifestyle related factors like diet, physical activity, sexual habit, environmental pollution due to industrialization might boost up in increasing the cancer incidence in Nepal. The incidence of cancer was observed to be increasing with age. Advancing age is one of the important risk factors for the overall cancer. The duration of exposure to multiple risk factors like chronic infection, unhealthy lifestyle involving tobacco and alcohol use, stress, lack of regular physical activity and poor dietary pattern, obesity, increases with advancing age [12].

The study highlights that female occupies more cancer burden than the male. The reason might be among the top 10 cancers in Nepal, the female site-specific cancer i.e cervical, breast and ovary occupy the major portion. In addition, this study showed females were affected at an earlier age than the males with age group 45-64 years being the commonest. Lung cancer was the most common cancer in men in Nepal, followed by lip/oral cavity, stomach and colorectal cancers. Cervical and breast cancers were the most common cancer in female followed by lung, ovary and stomach cancers. This trend of cancer was found to be similar to the trend in 2002 to 2012 NCRP report [6]. Thus, lung cancer, cervical cancer, breast cancer, stomach cancer, colorectal cancer and oral cancers are major cancer burden of the country. Province 3 occupies higher burden of cancer and Province 6 and 7 the least [13]. The reason might be the availability of health facilities and diagnostic centres and also the socio-economic status. Kathmandu, the capital city of Nepal is located in Province 3 and comprised of many tertiary health institutions as well as the diagnostic centres [14]. In contrast, Province 6 and 7 have less number of diagnostic facilities for cancer and the people are socio-economically weak. Thus, many will not be diagnosed and missed in the cancer registry.

Lung cancer is the leading cause of cancer in Nepal and throughout the world. The incidence of oral cancer is increasing in both men and women ranking the second highest cancer among men and 10th in women. Both these cancers are attributed to increased exposure to any form of tobacco i.e chewing and smoking [15]. According to STEPS Survey Nepal, tobacco smoking proportion in

Nepalese population is 18.5% (men 27.0% and women 10.3%) and for smokeless tobacco use it is 17.8% (men 31.3% and women 4.8%) [16]. The government of Nepal has undertaken a number of tobacco control initiatives which includes most of the important provisions of the Framework Convention, i.e. prohibition of smoking in public places, on public transport and in workplaces; ban on all forms of tobacco advertisement, promotion and sponsorship; pictorial health warnings in cigarette, bidi and other tobacco packets; prohibition of sale of tobacco to and by minors and pregnant women; establishment of a tobacco control and regulatory committee; establishment of a health tax fund, etc. [17-18]. Although tobacco control legislation and policies exist in Nepal, they have to be implemented effectively. Over the year, cervix and breast cancers have increased in Nepal. Creating awareness on cervical cancer, vaccination against HPV and regular screening for cervical cancer help in early detection and prevention of cervical cancer [19]. Similarly, regular self-examination, periodic clinical breast examination and mammogram are excellent ways of detection of early stage of breast cancer [20]. Despite being early detectable and curable cancers in Nepal, most of the women are diagnosed at late stage [21]. Thus, raising awareness among women on these cancers along with nationwide screening campaigns would aid in early detection and treatment thereby reducing the morbidity and mortality caused by these female-related cancers [22-23].

Stomach, colorectal, oesophagus, gall bladder and liver are also rising cancers in Nepal. The dietary factors like consumption of alcohol, food at very high temperature, fatty junk food, spicy food, low fiber diet, processed meat and red meat and salt preserved foods are the key risk factors for these cancers in Nepal [12].

The overall incidence of cancer in Nepal is in steady rise among both males and females, becoming a major public health problem. This challenges the overall health system of the country in present as well as in near future. Strengthening health system of the country from periphery to tertiary level in cancer prevention, early detection, diagnosis, treatment and palliation is way forward to cope with this rising incidence of cancer. Incorporating cancer control activities in package of essential non-communicable disease (PEN) program would be a significant step towards its prevention. Also, nationwide intervention on control of tobacco consumption would be a cost-effective cancer prevention activity. Furthermore, the top cancers in Nepal i.e. cervical cancer, breast cancer and oral cancer are early detectable and curable, nationwide extensive screening programs, awareness activities, launching HPV vaccination in National immunization program to reduce the load of these cancers.

The major limitation of our study is that NCRP data collection does not cover patients who are diagnosed and treated elsewhere than the 12 included hospitals. However, these hospitals are the major cancer treatment centres with good coverage of the country. Our findings may serve as a baseline for future comparisons and assessment of the overall effectiveness of cancer health care in Nepal and may provide a clue to capture the greatest need.

In conclusion, the incidence of cancer is in increasing trend in Nepal with lung, cervix, breast, stomach and colorectal cancers being the leading cancer sites. This study reflects that cancer is a key public health issue of the current era and the government should focus on all the aspects of cancer control i.e., preventive, curative and rehabilitative services.

Acknowledgements

The authors would like to express their gratitude to the National Cancer Registry Program for providing data to conduct this study.

Funding Statement



None

Statement Conflict of Interest

None

References

References

1. GLOBOCAN. New global cancer data: GLOBOCAN 2018 [Online]. Lyon, France: International Agency for Research on Cancer, World Health Organization, 2018. Available: <https://www.uicc.org/new-global-cancer-data-globocan-2018> [Accessed 12 March 2019].
2. Aly HF. Dietary habits and relation to cancer disease in different population. *Arch Cancer Res.* 2012; 1(1)
3. Bloom DE, Cafiero E, Jané-Llopis E, Abrahams-Gessel S, Bloom LR, Fathima S, et. al. The global economic burden of noncommunicable diseases. Program on the Global Demography of Aging; 2012 [Online]. Geneva: World Economic Forum and Harvard School of Public Health. Available: http://www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf [Accessed Feb 2 2019].
4. GLOBOCAN. The global cancer observatory: Nepal factsheet [Online]. Lyon, France: International Agency for Research on Cancer, World Health Organization, 2018. Available: <http://gco.iarc.fr/today/data/factsheets/populations/524-nepal-fact-sheets.pdf> [Accessed Feb 18 2019].
5. Poudel Krishna, Huang Zhibi, Neupane Prakash Raj, Steel Roberta. Prediction of the Cancer Incidence in Nepal. *Asian Pacific Journal of Cancer Prevention.* 2017; 18(1)[DOI](#)
6. National Cancer Registry Program. Hospital based cancer registry 10 years consolidated report (2003-2012). *Bharatpur, Chitwan, Nepal: Department of Cancer Prevention, Control and Research, B.P. Koirala Memorial Cancer Hospital, 2015.*
7. Shrestha G, Pradhananga KK, Mulmi R, Subedi KP, Siwakoti B. Cancer registration in Nepal: current status and way forward. *JNMA J Nepal Med Assoc.* 2019; 58(216)
8. National Cancer Registry Program. Report of hospital based cancer registry 2013. *Bharatpur, Chitwan, Nepal: Department of Cancer Prevention, Control and Research, B.P. Koirala Memorial Cancer Hospital, 2016.*
9. National Cancer Registry Program. Report of hospital based cancer registry 2014. *Bharatpur, Chitwan, Nepal: Department of Cancer Prevention, Control and Research, B.P. Koirala Memorial Cancer Hospital, 2017.*
10. National Cancer Registry Program. Report of hospital based cancer registry 2015. *Bharatpur, Chitwan, Nepal: Department of Cancer Prevention, Control and Research, B.P. Koirala Memorial Cancer Hospital, 2018.*
11. Central Bureau of Statistics. National population and housing census 2011 (population projection 2011 - 2031) [Online]. Kathmandu, Nepal: Central Bureau of Statistics, 2014. Available: <https://cbs.gov.np/wp-content/uploads/2018/12/PopulationProjection2011-2031.pdf> [Accessed Nov 1 2018].
12. Kushi Lawrence H., Doyle Colleen, McCullough Marji, Rock Cheryl L., Demark-Wahnefried Wendy, Bandera Elisa V., et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention. *CA: A Cancer Journal for Clinicians.* 2012; 62(1)[DOI](#)
13. MoHP, New ERA, ICF. Nepal demographic and health survey 2016 [Online]. Kathmandu, Nepal: Ministry of Health, Government of Nepal, 2017. Available: <https://www.dhsprogram.com/pubs/pdf/fr336/fr336.pdf> [Accessed Jan 18 2018].
14. Adhikari Saroj. Cancer burden in Nepal: a call for action. *MOJ Proteomics & Bioinformatics.*

- 2018; 7(5)[DOI](#)
15. Danaei Goodarz, Vander Hoorn Stephen, Lopez Alan D, Murray Christopher JL, Ezzati Majid. Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors. *The Lancet*. 2005; 366(9499)[DOI](#)
 16. Aryal K, Neupane S, Mehata S, Vaidhya A, Singh S, Paulin P, et al. Non communicable diseases risk factors: STEPS survey Nepal 2013 [Online]. Kathmandu, Nepal: Nepal Health Research Council, 2014. Available: http://nhrc.gov.np/wp-content/uploads/2017/02/noncommunicable-disease-report_2012_2013.pdf [Accessed Dec 12 2018].
 17. Nepal Law Commission. Tobacco products (control and regulatory) act, 2068 (2011) [Online]. Kathmandu, Nepal: Nepal Law Commission, Government of Nepal, 2011. Available: <http://www.lawcommission.gov.np/en/archives/19086> [Accessed Feb 2 2019].
 18. MoHP. Brief profile on tobacco control in Nepal [Online]. Kathmandu, Nepal: Ministry of Health and Population, Government of Nepal, 2012. Available: https://www.who.int/fctc/reporting/party_reports/nepal_2012_annex2_tobacco_profile.pdf [Accessed March 10 2019].
 19. Saslow Debbie, Solomon Diane, Lawson Herschel W., Killackey Maureen, Kulasingam Shalini L., Cain Joanna, et al. American Cancer Society, American Society for Colposcopy and Cervical Pathology, and American Society for Clinical Pathology screening guidelines for the prevention and early detection of cervical cancer. *CA: A Cancer Journal for Clinicians*. 2012; 62(3)[DOI](#)
 20. Smith R. A., Saslow D., Andrews Sawyer K., Burke W., Costanza M. E., Evans W. P., et al. American Cancer Society Guidelines for Breast Cancer Screening: Update 2003. *CA: A Cancer Journal for Clinicians*. 2003; 53(3)[DOI](#)
 21. Gyenwali Deepak, Pariyar Jitendra, Onta Sharad Raj. Factors Associated with Late Diagnosis of Cervical Cancer in Nepal. *Asian Pacific Journal of Cancer Prevention*. 2013; 14(7)[DOI](#)
 22. Gyenwali Deepak, Khanal Gita, Paudel Rajan, Amatya Archana, Pariyar Jitendra, Onta Sharad Raj. Estimates of delays in diagnosis of cervical cancer in Nepal. *BMC Women's Health*. 2014; 14(1)[DOI](#)
 23. Giri Mohan, Giri Mamata, Thapa Rabin Jung, Upreti Bibhuti, Pariyar Bijay. Breast Cancer in Nepal: Current status and future directions (Review). *Biomedical Reports*. 2018; 8(4):325-329. [DOI](#)