

Incidence of Urogenital Neoplasms in India

Abstract

Objective: To study and compare the national and regional incidences and risk of developing of neoplasms of individual urogenital sites using 2012 – 2014 reports from the National Cancer Registry Programme (NCRP) data. **Materials and Methods:** A number of incident cases, age-adjusted rates (AARs), and cumulative risk (0 – 64 years) pertaining to urogenital neoplasms, along with the ICD-10 codes, were extracted. Data on indicators, namely number of incident cases, AARs and one in a number of persons develop cancer were summarized for both the sexes in each of the cancer registries and presented region-wise in the form of ranges. **Results:** The proportion of all urogenital neoplasms in comparison to all cancers was 12.51% in women and 5.93% in men. Risk of development of urogenital cancers for women was maximum (1 in 50) in the North-eastern region, followed by Rural West, South, and North. For men, the risk of developing neoplasms of urogenital sites was highest (1 in 250). For the neoplasms of the renal pelvis and ureter, both the incidence and risk were quite low for all genders across all the regions. Cervical neoplasms had the highest incidence (4.91 – 23.07) among female genital neoplasms, while prostate had the highest incidence (0.82 – 12.39) among male genital neoplasms. **Conclusion:** Making people aware of urogenital neoplasms and their risk factors are important for the public health awareness point of view. Centers that deal with either management of urogenital cases or/and screening of genital neoplasms could serve as the designated centers for creating such awareness.

Keywords: Age-adjusted rates, cancer registry, cumulative risk, incidence, neoplasms, urogenital

Introduction

According to the GLOBOCAN 2012, almost 21.4% of incident cancer cases across the world involved major urogenital sites (urinary bladder, kidney, cervix, uterus, ovary, prostate, and testis). In India, 20.7% of incident cancer cases involved these sites, with 17.7% cancer-related deaths attributable to them.^[1] Despite well understood and extensively described epidemiological and etiological profiles of urogenital neoplasms, Indian efforts for prevention, screening, and treatment have either been scant or misguided.^[2,3] Cervical cancer is a case in point. Cervical cancer was the second most common cancer in India, with almost 10% of all cancer-related deaths attributable to it.^[1] Despite being amenable to early detection, no national level or large-scale screening program exists.^[3] In fact, a large-scale situational analysis of public health-care centers in the National Capital Region revealed a horrific lack of basic screening, diagnostic, and treatment facilities.^[4]

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General Indian populace remains largely ignorant of the existence of most urologic and genital tract cancers let alone their risk factors.^[5,6] While smoking has been widely established as a significant risk factor for the development of neoplasms of kidney, bladder, cervix, and prostate, the tobacco awareness programs continue to focus only on lung and head-and-neck cancers. Coupled with horrifyingly inadequate urologic services, this makes for a grim situation.^[7]

This willful neglect continues in the area of published medical literature. While cervical cancer remains a hot topic for researchers in India, cancers of other urogenital sites remain cold spots. This study attempts to detail, summarize, and compare the national and regional incidences and risk of development of neoplasms of individual urogenital sites using 2012–2014 reports from the National Cancer Registry Programme (NCRP), with the hopes of emphasizing a neglected chunk of cancer burden, that is amenable to screening and efficient primary prevention.

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Methods

This study utilized data from published reports of 27 Indian PBCRs, compiled under NCRP by the Indian Council of Medical Research. A number of incident cases, age-adjusted rates (AARs), and cumulative risk (0–64 years) pertaining to urogenital neoplasms, along with the ICD-10 codes, were extracted. Following sites were considered as follows: vulva (C51), vagina (C52), cervix uteri (C53), corpus uteri (C54), uterus unspecified (C55), and ovary (C56); other female genital (C57), placenta (C58), penis (C60), prostate (C61), testis (C62); and other male genital (C63), kidney (C64), renal pelvis (C65), ureter (C66), urinary bladder (C67), and unspecified urinary organs (C68). C64–68 were clubbed under

Based on the location, 27 registries were divided into seven regions (years referenced mentioned in the brackets) as follows:

- i. North: Delhi (2012), Patiala (2012–2014)
- ii. South: Bengaluru (2012), Chennai (2012–2013), Kollam (2012–2014), and Thiruvananthapuram (2012–2014)
- iii. Central: Bhopal (2012–2013)
- iv. Northeast: Cachar (2012–2014), Kamrup (2012–2014), Dibrugarh (2012–2014), Manipur (2012–2014), Mizoram (2012–2014), Sikkim (2012–2014), Meghalaya (2012–2014), Tripura (2012), Nagaland (2012–2014), Naharlagun (2012–2014), and Pasighat (2012–2014)
- v. West: Barshi Expanded (2012), Mumbai (2012), Ahmedabad (2012–2013), Aurangabad (2012–2014), Nagpur (2012–2013), Pune (2012–2013), and Wardha (2012–2014)
- vi. Rural West: Barshi Rural (2012–2014)
- vii. East: Kolkata (2012).

Average yearly incident cases were computed by dividing the number of incident cases recorded for each site in each registry by the total number of years, data were recorded for.

Cumulative risk(s) computed by NCRP were based on the following formulae:

$$\text{Cumulative risk} = 100 \times (1 - \exp [-\text{cumulative rate}/100])$$

Where,

$$\text{cumulative rate} = (5 \times \Sigma [\text{ASpR}] \times 100)/100,000 \text{ and}$$

ASpR is age-specific incidence rate(s)

The multiplication factors five in above formula of cumulative rate indicate the 5-year age intervals in ASpRs.

We computed another indicator, one in a number of persons likely to develop urogenital cancer in the lifetime of 0–64 years, for each urogenital site in each registry as.

One in a number of persons likely to develop urogenital neoplasm = 100/cumulative risk.

Data on indicators, namely number of incident cases, AARs and one in a number of persons develop cancer were summarized for both the sexes in each of the cancer registries and presented region-wise in the form of ranges.

Results

The proportion of all urogenital neoplasms in comparison to all cancers was 12.51% in women and 5.93% in men. The Western region saw the highest number of cases of urogenital neoplasms, both in females (3353) and males (1786) [Table 1]. The highest rate of incidence of urogenital cancers in women was found in the Northeastern region (23/100,000), followed by the Southern and Northern regions (16/100,000). For men, the highest rate of incidence (12/100,000) was noted in the Northern and the Northeastern regions [Table 2]. Risk of development of urogenital cancers for women was maximum (1 in 50) in the Northeastern region. For men, the risk of developing neoplasms of urogenital sites was highest (1 in 250) in the Northern and Northeastern Regions [Table 2]. Overall, the risk of developing urogenital neoplasms (as one in a number of persons likely to develop cancer) ranged from 1 in 50 to 1 in 1000 for women and 1 in 250-1 in 1000 for men [Table 2].

Urologic neoplasms

Of all urologic neoplasms, bladder neoplasms were associated both with the highest incidence and risk, irrespective of the sexes. It was followed by neoplasms of the kidney. For both the sites, the incidence and the risk were consistently higher for the males as compared to females across all the regions. The incidence of bladder neoplasms in males was the highest in the North (8/100,000), the associated risk too was the highest in the North (one in 250). The Northeastern and Northern regions reported the highest incidence of bladder neoplasms (2/100,000) for the females, with the risk being the same across all the regions (one in 1000, where applicable) [Table 3].

For males, both the incidence and the risk of developing kidney neoplasms was the highest in the Northern, Southern, and Western Regions (Rate: 3/100,000, Risk: one in 500). The highest incidence of kidney neoplasms was seen in the Western region for females (2/100,000). The risk of developing kidney neoplasms in females was same across the regions (one in 1000, where applicable). The Western region had a marginally greater burden of incidence and risk as compared to other regions for both the sexes.

For the neoplasms of the renal pelvis and ureter, both the incidence and risk were quite low for all genders across all the regions. Overall, both the incidences and risk of development of urologic cancers in both the sexes was highest in the North (Rate: 7/100,000; Risk: one in 250) [Table 2].

Table 1: Annual Incident Cancer Cases in Females and in Males

Region of Registry location (n=No. of Registries)	Annual Incident Cancer Cases in Males									Total
	Penis	Prostate	Testis	Other male genital	Kidney etc.	Renal Pelvis	Ureter	Urinary Bladder	Unspecified Urinary Organs	
	C60	C61	C62	C63	C64	C65	C66	C67	C68	
North (n=2)	86	744	95	11	210	1	3	485	6	1641
South (n=4)	75	692	52	3	199	1	6	306	2	1336
Central (n=1)	6	42	11	0	9	1	0	23	0	92
Northeast (n=11)	87	157	47	7	82	0	1	142	2	525
West (n=7)	159	836	122	6	269	1	4	386	3	1786
Rural West (n=1)	4	7	0	0	1	0	0	4	0	16
East (n=1)	25	229	20	0	57	0	0	108	2	441
All regions (n=27)	442	2707	347	27	827	4	14	1454	15	5837
Total Annual Cancer Cases (Urogenital Sites) in all regions							5837			
Total Annual Cancer Cases (All sites) in all regions							45,645			

Geographical distribution of cancer registries: North – Delhi, Patiala District; South – Bengaluru, Chennai, Kollam, Thiruvananthapuram; Central – Bhopal; Northeast – Cachar District, Kamrup Urban District, Dibrugarh, Manipur State, Mizoram State, Sikkim State, Meghalaya, Tripura State, Nagaland, Naharlagun District, Pasighat; West – Barshi Expanded, Mumbai, Ahmedabad Urban, Aurangabad, Nagpur, Pune, Wardha District; Rural West – Barshi Rural; East – Kolkata

Table 2: Incidence of Urologic, Genital and Urogenital Neoplasms in different geographical regions of India categorized according to location of population-based cancer registries

Region of registry location (n=No. of registries)	AAR (One in number of people likely to develop cancer)								
	Urologic Neoplasms (C64-C68)			Genital Neoplasms (C50-C58; C60-C63)			Urogenital Neoplasms (C50-C58; C60-C63; C64-C68)		
	Female	Male	Both Sexes	Female	Male	Both Sexes	Female	Male	Both Sexes
North (n=2)	0.01-1.53 (1000)	0.02-7.41 (250-1000)	0.01-7.41 (250-1000)	0.08-41 (33-500)	0.04-12.39 (333-1000)	0.04-41 (33-1000)	0.01-41 (33-1000)	0.02-12.39 (250-1000)	0.01-41 (33-1000)
South (n=4)	0.09-1.11 (1000)	0.03-4.9 (500-1000)	0.03-4.9 (500-1000)	0.02-37.92 (34-1000)	0.05-9.4 (500-1000)	0.02-37.92 (34-1000)	0.02-37.93 (34-1000)	0.03-9.4 (500-1000)	0.02-37.93 (34-1000)
Central (n=1)	0.04-0.72 (-)	0.11-2.95 (1000)	0.04-2.95 (1000)	0.06-33.05 (40-500)	0.64-5.59 (500-1000)	0.06-33.05 (40-1000)	0.04-33.05 (40-500)	0.11-5.59 (500-1000)	0.04-33.05 (40-1000)
Northeast (n=11)	0.02-1.91 (1000)	0.03-3.78 (500-1000)	0.02-3.78 (500-1000)	0.03-27.11 (50-1000)	0.12-12.16 (250-1000)	0.03-27.11 (50-1000)	0.02-27.11 (50-1000)	0.03-12.16 (250-1000)	0.02-27.11 (50-1000)
West (n=7)	0.02 (1000)	0.01-4.06 (500-1000)	0.01-4.06 (500-1000)	0.04-33.63 (43-1000)	0.06-9.78 (500-1000)	0.04-33.63 (43-1000)	0.02-33.63 (43-1000)	0.01-9.78 (500-1000)	0.01-33.63 (43-1000)
Rural West (n=1)	0.2-0.81 (1000)	0.39-1.57 (1000)	0.2-1.57 (1000)	0.13-16.09 (83-1000)	0.12-2.11 (1000)	0.12-16.09 (83-1000)	0.13-16.09 (83-1000)	0.12-2.11 (1000)	0.12-16.09 (83-1000)
East (n=1)	0.05-1.08 (1000)	0.13-3.96 (1000)	0.05-3.96 (1000)	0.03-25.52 (53-1000)	0.68-8.21 (1000)	0.03-25.52 (53-1000)	0.03-25.52 (4-3333)	0.13-8.21 (1000)	0.03-25.52 (53-1000)
All regions (n=27)	0.01-1.91 (1000)	0.11-7.41 (250-1000)	0.01-7.41 (250-1000)	0.02-41 (33-1000)	0.04-12.39 (250-1000)	0.02-41 (33-1000)	0.01-41 (4-3333)	0.01-12.39 (250-1000)	0.01-41 (33-1000)

Geographical distribution of cancer registries: North – Delhi, Patiala District; South – Bengaluru, Chennai, Kollam, Thiruvananthapuram; Central – Bhopal; Northeast – Cachar District, Kamrup Urban District, Dibrugarh, Manipur State, Mizoram State, Sikkim State, Meghalaya, Tripura State, Nagaland, Naharlagun District, Pasighat; West – Barshi Expanded, Mumbai, Ahmedabad Urban, Aurangabad, Nagpur, Pune, Wardha District; Rural West – Barshi Rural; East – Kolkata

Genital neoplasms (female)

Northeast saw the highest incident burden of cervical neoplasms (23/100,000) followed by South, North, and Rural west (16/100,000). Risk of developing cervical neoplasms followed along; one in 50 in the Northeast and one in 83 in the South, North, and Rural West [Table 4]. The incidence and the risk of developing neoplasms of uterine body were highest in the Southern and Northern regions (6/100,000;

one in 250), followed closely by Rural West and East (4/100,000; one in 333). For incident ovarian neoplasms, the Northern region came at the top (10/100,000), followed closely by Northeast (9/100,000). Both regions displayed the highest risk (one in 143) compared to other regions. While the incidence of vaginal neoplasm was low in all the regions, the incidences in the West, Rural West, and South were slightly higher (2/100,000). The incidences of

Table 3: Incidence of Urologic Neoplasms in different geographical regions of India categorized according to location of population-based cancer registries

AAR (One in number of people likely to develop cancer)										
Region of registry location (n=No. of Registries)	Female					Male				
	Kidney etc. C64	Renal Pelvis C65	Ureter C66	Urinary Bladder C67	Unspecified Urinary Organs C68	Kidney etc. C64	Renal Pelvis C65	Ureter C66	Urinary Bladder C67	Unspecified Urinary Organs C68
North (n=2)	0.98-1.3 (1000)	0.01 (-)	- (-)	1.05-1.53 (1000)	0.03-0.03 (-)	1.64-2.85 (500-1000)	0.02 (-)	0.05 (-)	3.6-7.41 (250-500)	0.06 (-)
South (n=4)	0.69-1.11 (1000)	0.01 (-)	0.03-0.07 (-)	0.52-1.09 (1000)	0.02-0.04 (-)	1.9-2.76 (500-1000)	0.03 (-)	0.13 (-)	2.39-4.9 (500-1000)	0.07 (-)
Central (n=1)	0.61 (-)	0.04 (-)	- (-)	0.72 (-)	- (-)	1.03 (1000)	0.11 (-)	- (-)	2.95 (1000)	- (-)
Northeast (n=11)	0.19-1.04 (-)	0.02-0.04 (-)	0.07-0.3 (-)	0.11-1.91 (1000)	0.03-0.05 (-)	0.13-2.3 (1000)	0.03 (-)	0.15 (-)	0.29-3.78 (500)	0.25 (-)
West (n=7)	0.35-1.52 (1000)	0.03-0.04 (-)	0.02 (-)	0.38-1 (1000)	0.02-0.02 (-)	0.54-2.71 (500)	0.01 (-)	0.05 (-)	0.83-4.06 (1000)	0.04 (-)
Rural West (n=1)	0.2 (-)	- (-)	- (-)	0.81 (1000)	- (-)	0.39 (-)	- (-)	- (-)	1.57 (1000)	- (-)
East (n=1)	1.08 (1000)	- (-)	0.05 (-)	0.77 (-)	0.12 (-)	2.02 (-)	- (-)	- (-)	3.96 (1000)	0.13 (-)
All regions (n=27)	0.19-1.52 (1000)	0.01-0.04 (-)	0.3-0.7 (-)	0.11-1.91 (1000)	0.02-0.12 (-)	0.13-2.85 (500-1000)	0.11 (-)	0.15 (-)	0.29-7.41 (250-1000)	0.25 (-)

Geographical distribution of cancer registries: North – Delhi, Patiala District; South – Bengaluru, Chennai, Kollam, Thiruvananthapuram; Central – Bhopal; Northeast – Cachar District, Kamrup Urban District, Dibrugarh, Manipur State, Mizoram State, Sikkim State, Meghalaya, Tripura State, Nagaland, Naharlagun District, Pasighat; West – Barshi Expanded, Mumbai, Ahmedabad Urban, Aurangabad, Nagpur, Pune, Wardha District; Rural West – Barshi Rural; East – Kolkata

Table 4: Incidence of Female Genital Neoplasms in different geographical regions of India categorized according to location of population-based cancer registries

AAR (One in number of people likely to develop cancer)								
Region of registry location (n=No. of Registries)	Vulva	Vagina	Cervix Uteri	Corpus Uteri	Uterus Unspecified	Ovary etc.	Other Female Genital	Placenta
	C51	C52	C53	C54	C55	C56	C57	C58
North (n=2)	0.43-0.6 (-)	0.46-0.52 (-)	11.46-15.53 (83-100)	3.16-5.52 (250-333)	0.46-3.03 (500)	5.52-10.02 (143-250)	0.09-0.09 (-)	0.05-0.08 (-)
South (n=4)	0.05-0.57 (-)	0.18-0.79 (1000)	6.69-15.88 (83-200)	2.92-6.04 (250-500)	0.22-1.19 (1000)	5.42-8.2 (167-250)	0.02-0.1 (-)	0.04-0.08 (-)
Central (n=1)	0.26 (-)	0.59 (-)	13.83 (100)	2.77 (500)	0.06 (-)	8.4 (200)	- (-)	0.41 (-)
Northeast (n=11)	0.2-0.86 (1000)	0.08-1 (1000)	4.91-23.07 (50-250)	0.15-3.93 (333-1000)	0.38-2.09 (500-1000)	1.72-8.68 (143-500)	0.03-0.2 (-)	0.06-0.42 (-)
West (n=7)	0.08-0.43 (-)	0.12-1.29 (1000)	6.91-14.65 (91-200)	0.9-4.17 (333-1000)	0.06-0.88 (1000)	2.32-8.14 (167-500)	0.04-0.15 (-)	0.04-0.09 (-)
Rural West (n=1)	0.2 (-)	0.97 (1000)	16.09 (83)	0.88 (1000)	0.13 (-)	2.93 (500)	- (-)	- (-)
East (n=1)	0.49 (-)	0.54 (-)	10.43 (125)	3.94 (333)	1.16 (1000)	7.96 (167)	0.03 (-)	- (-)
All regions (n=27)	0.05-0.86 (1000)	0.08-1.29 (1000)	4.91-23.07 (50-250)	0.15-6.04 (250-1000)	0.06-3.03 (500-1000)	1.72-10.02 (143-500)	0.02-0.2 (-)	0.04-0.42 (-)

Geographical distribution of cancer registries: North – Delhi, Patiala District; South – Bengaluru, Chennai, Kollam, Thiruvananthapuram; Central – Bhopal; Northeast – Cachar District, Kamrup Urban District, Dibrugarh, Manipur State, Mizoram State, Sikkim State, Meghalaya, Tripura State, Nagaland, Naharlagun District, Pasighat; West – Barshi Expanded, Mumbai, Ahmedabad Urban, Aurangabad, Nagpur, Pune, Wardha District; Rural West – Barshi Rural; East – Kolkata

vulvar, placental, and other female neoplasms were quite low. Cervical neoplasms had the highest incidence among female genital neoplasms, followed by neoplasms of uterine

body. The Northeastern region showed the highest incident burden and risk of female genital neoplasms, followed by the Rural West, South, and North [Table 2].

Table 5: Incidence of Male Genital Neoplasms in different geographical regions of India categorized according to location of population-based cancer registries

Region of registry location (n=No. of registries)	AAR (One in number of people likely to develop cancer)			
	Penis C60	Prostate C61	Testis C62	Other Male Genital C63
North (n=2)	1.03-1.12 (1000)	6.3-12.39 (333-500)	0.64-0.85 (1000)	0.04-0.14 (-)
South (n=4)	0.45-1.16 (1000)	6.14-9.4 (500-1000)	0.33-0.75 (1000)	0.05 (-)
Central (n=1)	0.64 (-)	5.59 (500)	0.95 (1000)	- (-)
Northeast (n=11)	0.69-1.66 (1000)	0.82-12.16 (250)	0.12-1.29 (1000)	0.2 (-)
West (n=7)	0.62-1.46 (1000)	1.48-9.78 (500)	0.34-0.81 (-)	0.06 (-)
Rural West (n=1)	1.68 (1000)	2.11 (1000)	0.12 (-)	- (-)
East (n=1)	0.88 (1000)	8.21 (1000)	0.68 (-)	- (-)
All regions (n=27)	0.45-1.68 (1000)	0.82-12.39 (250-1000)	0.12-1.29 (1000)	0.04-0.2 (-)

Geographical distribution of cancer registries: North – Delhi, Patiala District; South – Bengaluru, Chennai, Kollam, Thiruvananthapuram; Central – Bhopal; Northeast – Cachar District, Kamrup Urban District, Dibrugarh, Manipur State, Mizoram State, Sikkim State, Meghalaya, Tripura State, Nagaland, Naharlagun District, Pasighat; West – Barshi Expanded, Mumbai, Ahmedabad Urban, Aurangabad, Nagpur, Pune, Wardha District; Rural West – Barshi Rural; East – Kolkata

Genital neoplasms (male)

Among male genital cancers, the highest rate of incidence (12/100,000) and risk (one in 250) was for prostate cancer. The Northeastern and Northern regions showed the highest incidence. The highest risk was noted in the Northeastern region, followed by Northern region (one in 333). The incidence of penile neoplasms was the highest in the Rural West (2/100,000). The risk of development was similar across all the regions (one in 1000; where applicable) [Table 5]. Other male genital sites showed appreciably lower incidence. Overall, men in the Northern and Northeastern regions had the highest incidence and risk of development of neoplasms of the male genital tract [Table 2].

Discussion

Gender differences were observed for the incidence and risk profiles of specific and generalized sites. Both the incidence and the risk of developing urologic neoplasms were almost four times higher in males as compared to females across all the regions. The higher risk of urologic neoplasm in males is due to higher occupational exposure and smoking among males.^[8-10] The incidence of neoplasms of the female genital tract was more than three times the incidence of neoplasms of the male genital tract. For both the genders, the genital tract neoplasms contributed a greater proportion to the overall urogenital neoplasm incidence and risk. This was, especially true for the female gender, which suffered from lower incidence and risk of urologic neoplasms, and very high incidence and risk of genital tract neoplasms. The complex interplay between endocrinal and reproductive factors in the maintenance of fertile female genitalia has been implicated.

Cervical neoplasms were the most common site of female genital neoplasms. Incidence and risk of development of cervical cancer have increased compared to GLOBOCAN

2012 report and from an earlier study utilizing 2007–2008 data.^[1,11] The northeastern region has seen a substantial increase in risk (from 1 in 82 to 1 in 50) since then. HPV infection is the most important factor significantly associated with the development of cervical cancer. Lack of a national screening program and high costs of HPV vaccination,^[3,12,13] stand as a major roadblock in improving outcomes associated with cervical cancer. The incidence of uterine neoplasms has increased almost two-fold compared to values reported by a study utilizing data spanning 1980–2003 from a limited set of registries.^[14] Compared to the same study, incidence of ovarian neoplasms too showed an increase albeit of lesser magnitude.

Prostate was the most common site of male genital neoplasms. Despite conventionally low incidences in Asian and African countries, earlier studies had indicated a slowly but steadily rising burden.^[15,16] The values reported by present study conform to this trend. The urinary bladder was the most common site for the development of urologic neoplasms, followed by kidney. Smoking is an established risk factor for both the sites.^[17,18] In addition, occupational exposure is an independent risk factor for the development of bladder neoplasms.^[8]

The site-specific neoplasms contributing to the bulk of urogenital neoplasm burden, all have risk factors that can be directly addressed. By reducing smoking, HPV prevalence, and occupational exposure, the burden of urogenital neoplasms can be substantially reduced. What lacking is the incorporation of risk profile assessment and dissemination of advice at appropriate centers.

Conclusions

Making people aware of urogenital neoplasms and their risk factors are important for the public health awareness point of view. Centers that deal with either management of urogenital cases or/and screening of genital neoplasms

could serve as the designated centers for creating such awareness. Efforts can be concentrated in regions with higher incidence/risk, namely the Northern and Southern regions. In addition, there is a dire need to increase the number of Population-Based Cancer Registries (PBCRs) across the regions to allow for a more wholesome visualization of distribution.

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Conflicts of interest

There are no conflicts of interest.

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