Section: Miscellaneous

Original Research Article

PREVALENCE AND PREDICTORS OF CANCER AMONG OLDER ADULTS IN INDIA, BY PLACE OF RESIDENCE: FINDINGS FROM LONGITUDINAL AGEING STUDY IN INDIA (LASI) WAVE -1

Vani Srinivas[1], Pravin K Jha[2], Saurabh Singh[3], Sanjay K J[4]

[1]Scientist E, Indian Council of Medical Research (ICMR) – National Centre for Disease Informatics and Research (NCDIR), India.
[2]PhD (Population Studies) Public Health Expert, Consultant Supporting Health Systems Strengthening Projects, Asian Development Bank (ADB), Central International Health Division; Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India, Nirman Bhawan, New Delhi, India.
[3]Junior Research Fellow, M.Sc.(Biostatistics), Centre of Biostatistics, Institute of Medical Sciences Banaras Hindu University Varanasi, India.
[4]B Sc nursing Project Research Scientist -I (Non-Medical), Department of Epidemiology, Population Health and Biostatistics, St. John's Research Institute, Bengaluru, India.

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Corresponding Author:
Dr. Vani Srinivas,
Scientist E, MD PSM, ICMR-NCDIR, Nirmal Bhawan, ICMR Complex, Poojanahalli Road, Adjacent to Trumpet Flyover of BIAL, Kannamangala Post Bengaluru - 562 110. India.
Email: drvanisri@yahoo.co.in.

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ABSTRACT

Background: It is evident that burden of cancer is rising in India. The objective of this study is to estimate the overall population level prevalence of self-reported cancer, its determinants and utilization of health care services among the older adults by the place of residence.

Material and Methods: This paper presents the secondary data analysis, using Longitudinal Ageing Study in India (LASI) wave 1 of 2017-18. Data of adults aged ≥ 45 years (60,643 participants) were included in this study for analysis.

Results: The overall prevalence of self-reported cancer among older adult was 0.6%. Prevalence was higher among adults above ≥ 60 years (53.7%) of age, compared to adults aged 45-59 years (46.27%). Females had a higher prevalence of cancer (62.72%). Logistic regression analysis found that, overall, Odds Ratio(OR) was higher among for older adults who smoked more than 25 tobacco products per day, residing in urban area [OR=11.47 (1.18 - 111.17), p=<0.05] and among adults who reported family history of cancer in first degree relatives i.e. father [OR=3.70 (2.41- 5.69), p=<0.001] and mother [OR=1.48 (0.81 - 2.72), p=0.21], compared to those who did not have such history. Both in rural and urban areas older adults preferred private health facilities for cancer care services.

Conclusion: The prevalence of self-reported cancer was low, varied across states and by place of residence. Smoking tobacco in high doses, and family history of cancer in first degree relatives was significantly associated with cancer, such individuals should be prioritized for cancer screening.

Keywords: Cancer, Older adults, Non-Communicable Disease, India, Risk Factors.

INTRODUCTION

As per the global burden of disease 2019, cancer is the world's second leading cause of death.[1] In year 2020 nearly 10 million deaths in world were due to cancer.[2] Cancer and other non-communicable diseases are emerging major public health issues in India.[3] As per the National Cancer Registry Program Report (NCRP) 2020, in India the number of cancer cases are expected to rise from 1.39 million in 2020 to 1.57 million by 2025.[4] In 2016, cancer was responsible for 8.3% of deaths and 5.0% of Disability Adjusted Life Years (DALYs), and its contribution has more than doubled since 1990.[5]

Growth of population and ageing are the two primary contributors to the rising number of cancer cases and the shifting burden of cancer and other chronic diseases in economically developing countries.[6] As

per the Study on global Ageing and Adult health (SAGE)-2 2015 study in India, chronic diseases contributed to a large portion of the burden of non-communicable diseases more prevalent among older adults.[7] Years of Life Lost (YLL) due to cancer in India, were highest in individual in the age group of 65-69 year (14.0%) and 75-79 year (13.6%), and men had higher YLLs at age 75-79 years than that among women.[8]

India's state-level disease burden report:2017 indicates that behavioural risk factors account for a significant proportion of DALYs.[9] Identification and reduction of non-communicable diseases (NCD) risk factors is key for reducing cancer prevalence and other NCDs. The risk factors of today are the diseases of tomorrow.[10] Studies have shown that adopting healthy lifestyles is associated with substantial risk reduction in cancer morbidity and mortality, and thus should be given priority for cancer prevention.[11]

To overcome high burden of behavioural risk factors and burden of cancer, and other NCDs Government of India has taken several initiatives, in health,[12] and non- health sectors,[13,14] to reduce the NCD risk factors. These includes NCD risk factors assessment at community level using Community-Based Assessment Checklist (CBAC) form by Accredited Social Health Activist (ASHA) workers and population based screening of three common cancers (oral , breast and cervical), and appropriate referral for NCD risk factors reduction.[15] The national program for non-communicable disease focuses on health promotion through behaviour change communication, early diagnosis, screening and strengthening clinical care at higher level public health facilities for those diagnosed with cancer.[16] Impact of such interventions are yet to be assessed among those diagnosed with cancer. Moreover, there is knowledge gap to understand prevalence of risk factors among patients diagnosed with cancer. There are limited national level population-based studies to understand NCD risk factors among those diagnosed with cancer. Nearly 70% of country's population lives in rural areas, but majority of cancer care services are in urban areas,[17] thus, it is essential to study the utilization of health care services by place of residence. The primary objective of this study is to estimate the overall prevalence of self-reported cancer and to determine NCD risk factors among older adults diagnosed with cancer, by the place of residence. Secondary objective is to understand the health care utilization by cancer patients in India.

MATERIAL AND METHODS

We used data of Longitudinal Ageing Study in India (LASI-wave 1) for analysis. The first wave of a Longitudinal Ageing Study in India (LASI) was conducted in 2017–2018 across all the 30 states, 640 districts and 6 union territories (UTs). The study covered urban wards and rural villages.

The LASI was designed to provide reliable estimates of all health outcomes and social and economic wellbeing indicators for older adults aged 45 and above, including spouses less than age 45 years representative to India's population.

The data was received from International Institute of Population Sciences (IIPS), Mumbai in Statistical Package for Social Sciences (SPSS) format. Two different SPSS files were received, one for individual level data and another with biomarker data. These two sets were used and both sets were merged into a single file, using key variable. Single SPSS file was used for analysis and data was analyzed using IBM SPSS version 26.0, for Windows USA, Chicago.

Data was reviewed for its completeness for all the relevant variables prior to analysis. The missing data of all continuous variables were replaced by the mean value. Most of the missing variable were less than one percent, except age at the time of diagnosis of cancer, approximately 93% of data was missing for this variable.

The original study covered 72,250 older adults aged above 45 years and their spouses irrespective of their age. For this study, data of some respondents who were less than 45 years (6236) and data of respondents above 45years (5391) were excluded from analysis due to non-availability of biomarker data. The total of 60,643 respondents ≥45 years, with biomarker data were included in this analysis. (See figure 1).

Cancer related study variables

The study had few questions very specific to cancer e.g., 'Has any health professional ever told you that you had been diagnosed with cancer?' If the respondent answered yes, then a series of questions were asked about 'who was diagnosed', 'when it was diagnosed' and 'which organ is affected by cancer'. The treatment information for cancer included types of treatment such as chemotherapy, surgery, radiation, medication, and treatment in the past 2 years before the survey. Most of the variables specific to cancer, were included in analysis.

The other study variables included in analysis were individuals' socio- demographic characteristics, NCD risk factors, health care utilization by the older adults diagnosed with cancer.

Statistical Analysis

Simple descriptive statistics was applied to calculate proportions and mean for continuous variables. Chi square test / fisher exact test was applied for understanding the difference in socio demographic and health seeking behaviors of the respondents diagnosed with cancer by place of residence. Logistic regression analysis was done to understand the association of NCD risk factors, with cancer as outcome variable. The unadjusted Odds Ratio (OR) and 95% confidence interval (CI) were calculated for various NCD risk factors by the place of residence. A "p" value of < 0.05 was considered statistically significant.

Ethical approval

The LASI data is available on request, from IIPS Mumbai. This paper is the secondary data analysis of the de- identified data of respondents; thus, the Institutional Ethical Committee (IEC) approval was not obtained.

RESULTS

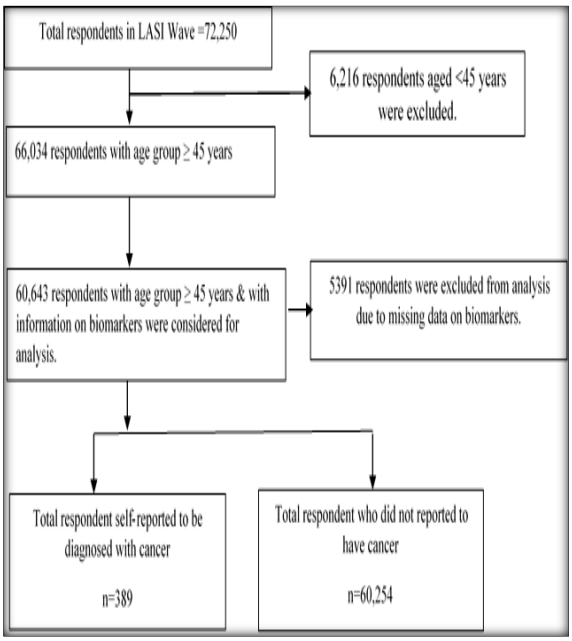

Figure 1: Inclusion of study participants in data analysis

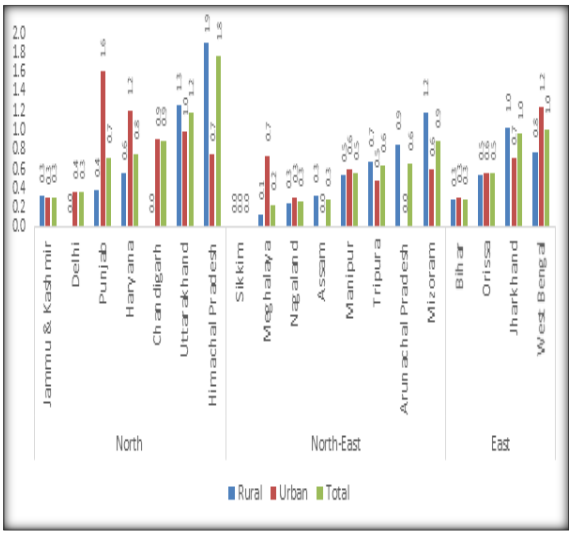

Figure 2 a : Prevalence of self reported cancer among older adults in North, North East and East region of India , by place of residence , LASI 2017-18

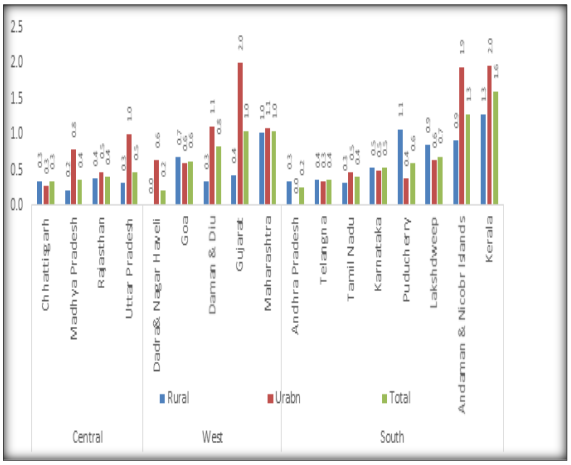

Figure 2 b: Prevalence of self reported cancer among older adults from central , west and south region of India , by place of residence

Figure 2 a and b, shows state-wise prevalence of cancer among older adults by place of residence, in different regions of India. The overall prevalence of self-reported cancer in India was 0.6%. Prevalence of cancer was highest in Himachal Pradesh (1.8%) followed by Kerala (1.6%), compared to other states, with rural urban differences across most of the states. The table 1 depicts other background characteristics of respondents based of place of residence.

The mean age of older adults self-reported to have cancer in rural and urban area was 60 and 59 years respectively. More than half (56%) of the respondents ever diagnosed with cancer were from rural areas. Overall, the prevalence of cancer was more among women (62.7%) compared to men (37.3%), with some minor differences in rural and urban area, for women (61.2 % vs 64.7%) and men (38.8.% vs 35.3%). The overall age of initiation of alcohol was 25 years, with some urban and rural (22 years vs 26 year). There was no difference in the age of initiation of tobacco consumption (23 years) between rural / urban respondents.

Significant differences were seen among respondents from rural and urban areas in terms of education status (p =<0.001), education level (p= 0.008), caste category (p= 0.006), and retirement from organised sector (p= 0.005).

Table 2 depicts information on health care utilization among those diagnosed with cancer by place of residence. Nearly 70% of older adults visited doctor's outpatient departments for consultation. Overall, for both the Out Patient (OP) (62.7%) and In -Patient (IP) services (57.3 %) consultations, the responded preferred more of private health facilities. Majority, of respondents (98.2%) from rural and urban areas reported cancer was diagnosed by Bachler of Medicine and Bachler of Surgery (MBBS) doctors. The most common mode of treatment received was surgery (46%), with some minor rural urban differences (43.4% vs 49.4%). Overall, nearly one fifth (21.1%) reported not receiving any treatment for cancer, this was more in rural (26.5%) area compared with urban (14.1%) counterparts.

Statistically significant differences were found in respondents from rural and urban areas in terms of chemotherapy or medication received (p=0.003) and those reported not receiving treatment (p=0.003).

Table 3 depicts bivariate logistic regression results of association of NCD risk factors among respondents self-reported to have cancer by the place of residence. Respondents residing in urban areas who smoked more than 25 tobacco products per day were 11 times more likely to get cancer. This was found statistically significant [OR=11.47 (1.18 - 111.17), p=0.04.

Overall, odds for developing cancer were higher among those who had Body Mass Index (BMI) in overweight category [OR=1.45 (1.13 - 1.85), p<0.001], females with waist circumference of >80 cm [OR=1.60 (1.19 - 2.16), p<0.001] and men with waist hip ratio >90 cm [OR=1.90 (1.11 - 3.25), p<0.05].

Overall odds for developing cancer were higher among respondents who reported family history of cancer among first degree relatives, father [OR=3.81 (2.49- 5.84), p<0.001] and mother [OR=1.72 (0.94 – 3.14), p=0.07], compared to those who did not have such history.

Table 4: depicts results of binary logistic regression for association of older adults on cancer treatment with pattern of healthcare utilized by them.

Both in urban & rural areas, most of the older adults had more than one in-patient visit to the hospital. Overall, the odds of visiting the hospital for in-patient services was 7 times more than those who never visited hospital for in-patient services [AOR= 7.0 (4.76-10.31), p=0].

The odds of overall duration of hospital stay for >7days was 3 times compared to those who stayed <7days in hospital [OR= 3.07 (1.97-4.78), p<0.001]. The odds of duration of stay for rural respondents was 2 times [OR= 4.07 (2.26-7.35), p<0.001] more than that of urban respondents [OR= 2.08 (1.05-4.12), p<0.05].

Among respondents in urban area, the odds [OR=4.06 (0.86-19.14), p=0.08] of visiting the other type of health facility was 4 times higher compared to those visiting public health facility.

Table 5; The leading anatomical site as International Agency for Research on Cancer, classification for cancer in India, as reported by the respondents from rural area is endometrium / uterus (18.8%), followed by stomach (12.8%) and breast (12.4%).

In urban areas the leading anatomical site was breast, followed by stomach (14.2%) and bone (14%), endometrium / uterus (13.6%) and digestive organs (15%). Rest all the other organs the prevalence was less than 10% both in rural and urban areas.

Table 1: Socio-demographic and behavioural characteristics of older adults diagnosed with cancer, by the place of residence

	Place of residence			P-Value (χ^2 test)
	Rural (n=219)	Urban (n=170)	Overall (n=389)	
	n (%)	n (%)	n (%)	
Age group				
45 to 59	106 (48.4)	74 (43.5)	180 (46.3)	0.339
60 and above	113 (51.6)	96 (56.5)	209 (53.7)	
Sex of Respondent				
Male	85 (38.8)	60 (35.3)	145 (37.3)	0.477
Female	134 (61.2)	110 (64.7)	244 (62.7)	
Marital status				
currently married	168 (76.7)	122 (71.8)	290 (74.6)	0.481
Widowed	48(21.9)	44 (25.9)	92 (23.7)	
Others	3 (1.4)	4 (2.4)	7 (1.8)	
Education status				
Ever attended school	116 (53.0)	130 (76.5)	246 (63.2)	<0.001
Never	103 (47.0)	40 (23.5)	143 (36.8)	
Education level				
Less than primary	34 (29.3)	25 (19.2)	59 (24.0)	0.008
Primary to secondary	69 (59.5)	69 (53.1)	138 (56.1)	
Higher secondary	7 (6.0)	15 (11.5)	22 (8.9)	
Diploma, graduate and others	6 (5.2)	21 (16.2)	27 (11.0)	
Religion				
Hindu	160 (73.1)	116 (68.2)	276 (71.0)	0.073
Muslim	23 (10.5)	29 (17.1)	52 (13.4)	
Christian	27 (12.3)	13 (7.6)	40 (10.3)	
Others	9 (4.1)	12 (7.1)	21 (5.4)	
Caste Category				
Scheduled tribe	29 (13.2)	14 (8.2)	43 (11.1)	0.006
Scheduled caste	35 (16.0)	22 (12.9)	57 (14.7)	
Other backward class (OBC)	83 (37.9)	50 (29.4)	133 (34.2)	
None of them	61 (27.9)	76 (44.7)	137 (35.2)	
No response	11 (5.0)	8 (4.7)	19 (4.9)	
Working status				
Currently working	72 (32.9)	35 (20.6)	107 (27.5)	0.21
Not working	87 (39.7)	59 (34.7)	146 (37.5)	
No response	60 (27.4)	76 (44.7)	136 (35.0)	

Retirement from organised sector				
Retired from work	13 (5.9)	19 (11.18)	32 (8.2)	0.005
Not retired from work	146 (66.7)	75 (44.12)	221 (56.8)	
No response	60 (27.4)	76 (44.71)	136 (35.0)	
Age of initiation (in years)				
Tobacco consumption (mean ± SD)	23±10	23±10	23±10	
Alcohol consumption (mean ± SD)	26±9	22±4	25±8	

Table 2: Status of health care utilization, by older adults for cancer care, by place of residence

Variables	Rural (n=219)	Urban (n=170)	Overall (n=389)	P-Value (χ^2 test)
	n (%)	n (%)	n (%)	
Out-patient visits[1] (last 12 months)				
None	34 (15.5)	28 (16.5)	62 (15.9)	0.817
Once or more than once	153 (69.9)	118 (69.4)	271 (69.7)	
No response	32 (14.6)	24 (14.1)	56 (14.4)	
Type of OP service availed[#]				
Public facility	60 (39.3)	41 (34.7)	101 (37.3)	0.060
Private facility and Others[2]	93 (60.8)	77 (65.3)	170 (62.7)	
Inpatient services[3]				
None	141 (64.4)	116 (68.2)	257 (66.1)	0.426
Once or more than once	48 (21.9)	34 (20.0)	82 (21.1)	
No response^	30 (13.7)	20 (11.8)	50 (12.9)	
Type of health facility used for IP service[$]				
Public facility	23 (47.9)	12 (35.3)	35 (42.7)	0.255
Private and other facilities[4]	25 (52.1)	22 (64.7)	47 (57.3)	
Diagnosed by health care provider				
A doctor (MBBS)	215 (98.2)	167 (98.2)	382 (98.2)	0.431
Ayurvedic/Unani/ homeopathy/ Siddha/ others[5]	4 (1.8)	3 (1.8)	7 (1.8)	
No. of cancer site				
Single / one type	152 (69.4)	128 (75.3)	280 (72.0)	0.168
More than one type of cancer	67 (30.6)	41 (24.1)	108 (27.8)	
No response^	0 (0)	1 (0.6)	1 (0.3)	
Type of Treatment				
Chemotherapy or medication	60 (27.4)	71 (41.8)	131 (33.7)	0.003
Radiation	37 (16.9)	41 (24.1)	78 (20.1)	0.236
Surgery	95 (43.4)	84 (49.4)	179 (46.0)	0.078
Medications and treatments for symptoms (pain, nausea & rashes)	54 (24.7)	39 (22.9)	93 (23.9)	0.645
Reported not receiving any treatment	58 (26.5)	24 (14.1)	82 (21.1)	0.003

# among those who visited OPD, n (rural) =153, n (urban) =118, n (total) =271
$ among those who reported IP visits, n (rural) =48, n (urban) =34 , n (total) =82
$ among those who reported IP visits, n (rural) =48, n (urban) =34 , n (total) =82

[1]Outpatient- consultation with a healthcare provider including folk healers in the past 12 month
[2]Other OP visits includes- Health camp, Mobile healthcare unit, Pharmacy/drugstore, and home visit.
[3]Inpatient care- hospitalization or admitted as patient to a hospital/long-term care facility for at least one night during the past 12 months
[4]Other IP visits include - NGO/Charity/Trust/Church-run hospital, Private (partial) and /Government (partial)/NGO (partial).
[5]Outpatient- consultation with a healthcare provider including folk healers in the past 12 months
^No response category is not considered for calculating for Chi square P value

Table 3 a: Association of NCD risk factors with cancer (outcome), among older adults, in India, by place of residence

	Rural		Urban		Overall	
Variables	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Modifiable Risk factors						
Ever used tobacco (both smoke & smokeless)						
Never	Ref.		Ref.		Ref.	
At least once	1.03 (0.79, 1.35)	0.83	0.87 (0.61, 1.23)	0.42	0.91 (0.74, 1.12)	0.38
Currently , smoke any tobacco products						
Non-user	Ref.		Ref.		Ref.	
Current user	0.34 (0.20, 0.58)	<0.001	0.54 (0.22, 1.30)	0.17	0.39 (0.25, 0.61)	<0.001
Number of (cigarettes/ bidis/ cigars/ hookah/ cheroot) smoked on average per day						
<5	Ref.		Ref.		Ref.	
5-9	0.75 (0.22, 2.56)	0.64	3.09 (0.32,29.78)	0.33	1.08 (0.39, 2.98)	0.89
10 - 14	1.49 (0.55, 4.01)	0.43	2.74 (0.28, 26.39)	0.38	1.64 (0.67, 4.02)	0.28
15-24	1.34 (0.47, 3.84)	0.58	1.38 (0.09, 22.14)	0.82	1.35 (0.51, 3.61)	0.55
25+	1.40 (0.36, 5.45)	0.62	11.47 (1.18, 111.17)	0.04	2.54 (0.88, 7.34)	0.09
Currently consume any smokeless products						
Non-user	Ref.		Ref.		Ref.	
Current user	0.25 (0.14, 0.47)	<0.001	0.20 (0.09, 0.44)	<0.001	0.22 (0.14, 0.36)	<0.001
Ever consumed alcohol						
Never	Ref.		Ref.		Ref.	
At least once	0.95 (0.68, 1.33)	0.05	0.54 (0.31, 0.94)	0.03	0.76 (0.58, 1.02)	0.07
Frequency of alcohol consumption						
Never	Ref.		Ref.		Ref.	
Daily/almost daily	0.12 (0.02, 0.91)	0.04	0.00 (00)	0.99	0.09 (0.01, 0.64)	0.02
Weekly	0.12 (0.02, 0.85)	0.03	0.82 (0.18, 3.71)	0.8	0.27 (0.08, 0.88)	0.03
Monthly	0.33 (0.12, 0.96)	0.04	0.00 (00)	0.99	0.25 (0.09, 0.69)	0.01
Less than monthly	0.73 (0.34, 1.56)	0.42	0.00 (00)	0.99	0.54 (0.26, 1.13)	<0.001
Heavy episodic drinking of alcohol (standard drinks/day[6]						
<6	Ref.		Ref.		Ref.	
≥6	0.51 (0.18, 1.41)	0.2	0.68 (0.04, 10.96)	0.79	0.56 (0.21, 1.46)	0.24
Physical activity level Moderate-intensity (minutes/week)						
< 150	Ref.		Ref.		Ref.	
≥ 150	2.01 (1.20, 3.36)	<0.001	0.57 (0.16, 1.96)	0.37	1.6 (1.00, 2.50)	0.048
Vigorous-intensity physical activity (minutes/week)						
< 75	Ref.		Ref.		Ref.	
≥75	0.68 (0.40, 1.14)	0.147	0.36 (0.13, 0.98)	0.05	0.59 (0.38, 0.91)	<0.001
Non-modifiable risk factors						
Gender						
Male	Ref.		Ref.		Ref.	
Female	1.40 (1.07, 1.84)	0.02	1.53 (1.12, 2.10)	0.01	1.46 (1.19, 1.79)	<0.001
Age (in years)						
45-59	Ref.		Ref.		Ref.	

One standard drink contains a net pure alcohol content of 10 gm in a single drinking occasion in the past 30 days.

≥60	1.15 (0.88, 1.50)	0.31	1.52 (1.12, 2.06)	0.01	1.27 (1.04, 1.56)	0.02
Family history of cancer (all types)						
Father						
No history of cancer	Ref.		Ref.		Ref.	
History of cancer	4.45 (3.52, 7.85)	<0.001	2.98 (1.56, 5.70)	<0.001	3.81 (2.49, 5.84)	<0.001
Mother						
No history of cancer	Ref.		Ref.		Ref.	
History of cancer	2.31 (1.08, 4.93)	0.03	1.09 (0.40, 2.95)	0.86	1.72 (0.94, 3.14)	0.07

Table 3 b: Biological Risk Factors among older adults, by place of residence

	RURAL		URBAN		TOTAL	
Variables	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
BMI (kg/m^2) ***(Asian classification)***						
Normal (18 to 22.9)	Ref.		Ref.		Ref.	
Overweight (23 to 24.9)	1.45 (1.03, 2.04)	0.03	1.32 (0.91, 1.89)	0.13	1.45 (1.13, 1.85)	<0.001
Obese (≥ 25)	1.04 (0.52, 2.06)	0.90	1.55 (0.99, 2.43)	0.05	1.51 (1.05, 2.16)	0.02
Waist circumference ***(males) (in centimetre)***						
< 90	Ref.		Ref.		Ref.	
≥ 90	1.26 (0.80, 2.0)	0.31	1.03 (0.61, 1.74)	0.93	1.24 (0.89, 1.74)	0.20
Waist circumference ***(females) (in centimetre)***						
<80	Ref.		Ref.		Ref.	
≥ 80	1.57 (1.09, 2.27)	0.01	1.27 (0.74, 2.16)	0.38	1.60 (1.19, 2.16)	<0.001
Waist Hip Ratio (men) (in centimetre)						
< 0.90	Ref.		Ref.		Ref.	
≥ 0.90	1.72 (0.93, 3.19)	0.08	2.14 (0.66, 6.86)	0.20	1.90 (1.11, 3.25)	0.02
Waist hip ratio (women) (in cm)						
< 0.85	Ref.		Ref.		Ref.	
≥ 0.85	1.40 (0.85, 2.30)	0.18	0.96 (0.52, 1.76)	0.90	1.29 (0.88, 1.89)	0.19

Table 4: Association of cancer care (those who reported being on treatment) and utilization of healthcare services, by place of residence.

	Rural		Urban		Overall	
Variables	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Out-patient visits[7],						
Never	Ref.		Ref.		Ref.	
Once or more than once	1.08 (0.74-1.57)	0.66	1.02 (0.67-1.54)	0.93	1.05 (0.80-1.39)	0.69
Type of OP facility						
Public	Ref.		Ref.		Ref.	
Private	0.73 (0.52-1.02)	0.07	0.94 (0.64-1.38)	0.74	0.82 (0.64-1.06)	0.13
Others[8]	0.42 (0.23-0.78)	0.01	0.31 (0.10-1.01)	0.05	0.39 (0.23-0.66)	<0.001
Inpatient services [9]						
Never	Ref.		Ref.		Ref.	
Once	2.37 (1.61-3.48)	<0.001	1.85 (1.15-2.99)	0.01	2.13 (1.58-2.88)	<0.001
More than once	7.01 (4.14-11.87)	<0.001	6.87 (3.89-12.16)	<0.001	7.0 (4.76-10.31)	<0.001
Type of health facility for In-patient care (IP)						
Public facility	Ref.		Ref.		Ref.	
Private facility	0.88 (0.50-1.56)	0.66	1.23 (0.60-2.53)	0.58	1.01 (0.65-1.57)	0.97
Other[10]	0.00 (0.00-0.00)	1	4.06 (0.86-19.14)	0.08	1.32 (0.31-5.60)	0.7
Reason of hospitalization						
Cancer	Ref.		Ref.		Ref.	
Other than cancer	0.002 (0.001-0.004)	<0.001	0.002 (0.001-0.004)	<0.001	0.002 (0.001-0.004)	<0.001
Duration of hospital stay (in days)						
<7	Ref.		Ref.		Ref.	

>7	4.07 (2.26-7.35)	<0.001	2.08 (1.05-4.12)	0.03	3.07 (1.97-4.78)	<0.001

Table 5: Prevalence of self-reported first organ diagnosed with cancer as per anatomical sites according to IARC classification

First organ diagnosed with cancer	Place of residence		Total n (%)
	Rural n (%)	Urban n (%)	
Endometrium / Uterus	41 (18.8)	23 (13.6)	64 (16.5)
Breast	27 (12.4)	34 (20.1)	61 (15.8)
Stomach	28 (12.8)	24 (14.2)	52 (13.4)
Larynx	17 (7.8)	12 (7.1)	29 (7.5)
Others	14 (6.4)	10 (5.9)	24 (6.2)
Brain	11 (5.0)	11 (6.5)	22 (5.7)
Oral cavity	11 (5.0)	9 (5.3)	20 (5.2)
Urinary Bladder	10 (4.6)	9 (5.3)	19 (4.9)
Skin	10 (4.6)	3 (1.8)	13 (3.4)
Pharynx	7 (3.2)	4 (2.4)	11 (2.8)
Bone tumor	7 (3.2)	1 (0.6)	8 (2.1)
Cervix	3 (1.4)	5 (3.0)	8 (2.1)
Kidney	4 (1.8)	3 (1.8)	7 (1.8)
Prostate	3 (1.4)	4 (2.4)	7 (1.8)
Spinal cord	3 (1.4)	4 (2.4)	7 (1.8)
Liver	4 (1.8)	2 (1.2)	6 (1.6)
Thyroid	4 (1.8)	2 (1.2)	6 (1.6)
Blood / Lymphoid tissue	2 (0.9)	4 (2.4)	6 (1.6)
Ovary	4 (1.8)	0 (0.0)	4 (1.0)
Bone Marrow	3 (1.4)	1 (0.6)	4 (1.0)
Colon or rectum	2 (0.9)	1 (0.6)	3 (0.8)
Pancreas	2 (0.9)	1 (0.6)	3 (0.8)
Lung	1 (0.5)	1 (0.6)	2 (0.5)
Esophagus	0 (0.0)	1 (0.6)	1 (0.3)
Total	**218 (56.3)**	**169 (43.7)**	**387 (100.0)**

DISCUSSION

This study provides state-wise prevalence of self-reported cancer, at population level by area of residence, in India using a nationally representative sample. The prevalence of self-reported cancer was low. However, there is wide variation in prevalence between states, by the place of residence within states. The NCD risk factors do not differ much by the place of residence, however, the utilization of health services does have the differences by the place of residence. The older adults preferred more private health facilities for cancer care.

This is the first point data among NCD risk factors using LASI survey. The subsequent LASI survey can contribute to understanding the impact of health & non-health interventions to reduce NCD risk factors among cancer survivors. The reduction of risk factors has the greatest impact on NCD mortality and morbidity, and these measurements can be proven to be valid for monitoring the impact of interventions.

Our study showed lower prevalence of cancer (0.6%) of the older adults, these results were discordant with findings of monitoring survey of cancer risk factors and health system response in northeast region (NER) of India, which reported slightly higher prevalence (1%).[18] These differences may be due higher cancer risk factors and prevalence of cancer in NER, compared to other regions in India.[19] The Report on Cancer Burden in NE states of India reported that higher prevalence of tobacco related cancer (42.5 %).[20] The high prevalence of cancer in various anatomical sites was nearly very similar to high prevalence reported by national cancer registry report 2020. Cancer of breast and cervix uteri were the most common cancers among females and cancer of lung, mouth, stomach and esophagus were the most common cancer sites among males.[4]

The self-reported cancer was more among older adults residing in rural areas and who were less educated, belonging to disadvantaged group indicating less awareness of prevention of NCD risk factors and importance of being screened for cancer. These results are concordant with other studies done in India.[21]

In our study, the prevalence of cancer was higher among the rural older adults than their urban counterparts, in the age group of ≥ 60 years and in females. These results were concordant with other studies in India,[22] indicating increasing cancer prevalence and incidence among elderlies in India. Other studies have also reported the highest proportion of all sites cancers among individuals in 45 to 64 years age group, except for prostate cancer, which was higher in those over 65 years.[23]

Our study found that consumption of both smoke and smokeless tobacco products (any forms) was the major modifiable risk factor in respondents who self-reported to have cancer. These findings are concurrent with other studies.[24]

In our study, the mean age of initiation of alcohol consumption among respondents of urban areas (26 years) was 4 years earlier than rural counterparts. Mean initiation of consumption of tobacco (21.2 years) and alcohol (22.2 years) was lower in other population based NCD survey (18–69 years), compared to our study.[25] This may be due to

difference in age group of study respondents considered in both the surveys.[26]

In our study we found, respondents with family history of cancer among first degree relative, had higher odds ratio, this findings are concurrent with other hospital based studies done in India,[27] indicating first-degree family history of cancer to be the major risk factor for Head and Neck Squamous Cell Carcinoma in tribal population in India and similar studies done in developed countries reporting cancer syndromes that appeared more among close relatives and may indicate the presence of genetic factors influencing multiple cancer sites.[28]

In our study, more respondents from rural area reported, not being treated for cancer, indicates less awareness or non-availability of treatment facilities in the rural areas. The current study results show that, respondents with cancer used more private health facilities (both OP and IP services) than public health facilities. These findings are similar to other studies done in India.[29]

Strengths and limitations

The findings of the study are based on a large sample size and nationally representative data, which provides population-based estimates on cancer prevalence. Study also includes data of individuals not being treated for cancer; this data might not have been captured in hospital or population-based cancer registry. This study has certain limitations due to study design, i.e., cross-sectional study design, the risk factors identified do not necessarily indicative as causative factor for occurrence of cancer. The self-reported information on disease condition may be under reported by older adults, if the they were unaware of any symptoms of cancer or if cancer was in early stage, and the older adults would not have taken any consultations with health care provides for diagnosis of cancer. In states with low level of population-based screening for 3 common cancers, may further report low prevalence of cancer.

CONCLUSION

The prevalence of self-reported cancer is low, varies across states and by place of residence. Smoking tobacco in high doses and family history of cancer in first degree relatives was significantly associated with cancer. This study recommends prioritizing individuals with family history of cancer for population based screening.

This study recommends inclusion of family history of cancer in CBAC forms and priorities these individuals for cancer screening at population level. In the absence of regular, NCD surveillance in India this study also recommends inclusion of NCD risk factors assessment among cancer patients to be reported in national cancer registry. The key to controlling the NCDs epidemics is primary prevention. i.e., risk factor reduction. Monitoring the trends of risk factors in routinely collected data of cancer can inform the policy makers regarding effectiveness of various health and non-health interventions to control NCDs. Comprehensive population-wide programs directed towards reducing risk factors at community level can significantly reduce the burden of cancer in India.

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REFERENCES

1. Global Burden of Disease 2019 Cancer Collaboration. Cancer Incidence, Mortality, Years of Life Lost, Years Lived with Disability, and Disability-Adjusted Life Years for 29 Cancer Groups from 2010 to 2019: A Systematic Analysis for the Global Burden of Disease Study 2019. JAMA Oncol. Published online December 30, 2021. Available from: 10.1001/jamaoncol.2021.6987
2. Cancer Fact Sheet. World health Organization. (n.d.). https://www.who.int/news room/facsheets/detail/cancer#:~:text=Cancer%20is%20a%20leading%20cause,and%20rectum%20and%20prostate%20cancers. Accessed on 06/03/2024
3. Varghese C (n.d.). 50 Years of Cancer Control in India. 48 Cancer Prevention and Control in India. Available on:https://main.mohfw.gov.in/sites/default/files/Cancer%20Prevention%20And%20Control%20In%20India.pdf Accessed on 06/03/2024
4. Indian Council of Medical Research. National centre for disease informatics and research, ICMR NCDIR Report of National Cancer Registry Programme (2012-2016) https://ncdirindia.org/All_Reports/Report_2020/resources/Chapter15Summary.pdf
5. Dhillon P, Mathur P, Nandakumar A, Fitzmaurice C, Kumar G, Mehrotra R et al. The burden of cancers and their variations across the states of India: the Global Burden of Disease Study 1990–2016. The Lancet Oncology. 2018; 19:1289-1306.
6. Thun MJ, DeLancey JO, Center MM, Jemal A, Ward EM. The global burden of cancer: priorities for prevention. Carcinogenesis. 2010 Jan;31(1):100-10. Available from: 10.1093/carcin/bgp263. Epub 2009 Nov 24. PMID: 19934210; PMCID: PMC2802672.
7. INDIA Study on global AGEing and adult health (SAGE), Wave 2 WHO SAGE WAVE 2. (n.d.).
8. Kulothungan, V., Sathishkumar, K., Leburu, S., Ramamoorthy, T., Stephen, S., Basavarajappa, D., et al.). Burden of cancers in India - estimates of cancer crude incidence, YLLs, YLDs and DALYs for 2021 and 2025 based on National Cancer Registry Program. BMC Cancer, (2022) 22(1), 1–12. Available from: https://doi.org/10.1186/S12885-022-09578-1/FIGURES/4
9. Indian Council of Medical Research, Public Health Foundation of India, and Institute for Health Metrics and Evaluation. India: Health of the Nation's States — The India State-Level Disease Burden Initiative. New Delhi, India: ICMR, PHFI, and IHME; 2017.

10. WHO STEPS Surveillance manual. The WHO STEPwise approach to noncommunicable disease risk factor. Last Updated: 2 October 2020
11. Zhang, YB., Pan, XF., Chen, J. et al. Combined lifestyle factors, incident cancer, and cancer mortality: a systematic review and meta-analysis of prospective cohort studies. Br J Cancer 122, 1085–1093 (2020). https://doi.org/10.1038/s41416-020-0741-x
12. Ministry of Health and Family Welfare. Government of India. National health Mission. Reducing Risk Factors for Non-Communicable Diseases (NCDs) in Primary Care Training Manual for Medical Officers 2016.
13. Do You Eat Right? Food Safety and Standards Authority of India. Government of India [internet]. https://fssai.gov.in/upload/knowledge_hub/852185f89a7fc009c5Book_Do_You_Eat_Right_16_10_2020.pdf
14. Ministry of youth affairs and sports. Government of India. Fit India Movement. https://fitindia.gov.in/
15. Ministry of Health and Family Welfare. Government of India. National health Mission. Operational Guidelines for Common Non–Communicable Disease, 2016
16. Ministry of Health and Family Welfare. Government of India. National health Mission. Ayushman Bharat-Comprehensive Primary Health Care through Health and Wellness Centers, Operational Guidelines
17. Cancer Care in Rural India. https://oncolifehospitals.com/cancer-care-in-rural-india/, February 3, 2023
18. ICMR-NCDIR. (2022). Report on monitoring survey of cancer risk factors and health system response in north east region (NER) of India. https://www.ncdirindia.org
19. Mathur P, Sathishkumar K, Chaturvedi M, Das P, Sudarshan K L; Stephen S, et al,; on behalf of ICMR-NCDIR-NCRP Investigator Group Cancer Pattern and Burden in India Under NCRP. American Society of Clinical Oncology
20. Indian Council of Medical Research-National Centre for Disease Informatics and Research. A Report on Cancer Burden in North Eastern States of India. Available from: https://www.ncdirindia.org/All_Reports/Reports_Ne/NE2012_2014/Files/NE_2012_14.pdf
21. Khanna, D., Sharma, P., Budukh, A. et al. Rural-urban disparity in cancer burden and care: findings from an Indian cancer registry. BMC Cancer 24, 308 (2024). https://doi.org/10.1186/s12885-024-12041-y
22. Sankarapillai, S. Krishnan, T. Ramamoorthy, K.L. Sudarshan, P. Das, M. Chaturvedi, et al . Epidemiology of cancers among older adults in India: findings from the National Cancer Registry Programme. J Public Health. Volume 223, October 2023, Pages 230-239 https://www.sciencedirect.com/science/article/abs/pii/S0033350623002846?via%3Dihub
23. Clinicopathological Profile of Cancers in India: A Report of the Hospital Based Cancer Registries, 2021. (n.d.). Retrieved September 23, 2022, from https://www.ncdirindia.org
24. J.B. Prasad and M. Dhar. Assessment and projection of burden of cancer due to tobacco in India till 2025. Clinical Epidemiology and Global Health 8 (2020) 1067–10
25. Mathur P, Kulothungan V, Leburu S, Krishnan A, Chaturvedi HK, Salve HR, et al. (2021) National noncommunicable disease monitoring survey (NNMS) in India: Estimating risk factor prevalence in adult population. PLoS ONE 16(3): e0246712. https://doi.org/10.1371/journal. pone.0246712
26. ICMR-NCDIR, National Noncommunicable Disease Monitoring Survey (NNMS) 2017–18, Bengaluru, India.
27. Pachuau L, Zami Z, Nunga T, R. Zodingliana , Zoramthari R, R. Lalnuntluanga , Sangi Z , etal. First-degree family history of cancer can be a potential risk factor among head and neck cancer patients in an isolated Mizo tribal population, northeast India Clinical Epidemiology and Global Health 13 (2022) 100954
28. Turati F, Edefonti V, Bosetti C, et al. Family history of cancer and the risk of cancer: a network of case-control studies. Ann Oncol. 2013;24(10):2651-2656. doi:10.1093/annonc/mdt280
29. Oommen C. Kurian, "Transforming India's Approach to Cancer Care," ORF Special Report No. 222, January 2024, Observer Research Foundation.