ORIGINAL ARTICLE

Knowledge, awareness and attitude towards cancer: An intervention-based study among the students of the University of Delhi, India

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Received: 12 June 2023 **Revised:** 22 August 2023 **Accepted:** 31 August 2023 **Available online:** September 2023
DOI: 10.55131/jphd/2023/210319

ABSTRACT

There are limited studies evaluating the knowledge of the student communities in India about cancer. The present study assesses the knowledge, awareness and attitude of the students of the University of Delhi, India towards cancer. Two sets of structured questionnaires (set 1& 2) were used for the survey. Set 1 was used for the survey of 1000 students, comprising 500 male and 500 female students. The data was collected using a self-designed Relational Database Management System (RDBMS) on a Likert scale (1-5) and was subsequently converted to scores. The significance of the scores was evaluated by one-way Analysis of Variance (ANOVA). A Set 2 questionnaire was used for the follow-up survey. The results of the survey based on the Set 1 questionnaire indicated that the students had some knowledge about "cancer risk factors, types of cancer, and sources of cancer awareness". However, students lacked knowledge about "cancer symptoms and age susceptibility to cancer". Consequent to this survey, awareness programs were conducted among these students spread over 5 months. The awareness gained was assessed by the follow-up surveys using the Set 2 questionnaire (split into pre- and post-follow-up studies). The awareness campaigns significantly increased the knowledge and changed the attitude of the students towards cancer. This study thus highlights the need and effectiveness of awareness campaigns with special reference to student communities in countries such as India.

Key words:
cancer; intervention; students; knowledge; symptoms; screening; awareness

Citation:
Geetanjali Kala, Mohd. Saleem Mir, Neel Pandey, Subham Srivastava, Sugandha Sharmha, Jogeswar Satchidananda Purohit. Knowledge, awareness and attitude towards cancer: An intervention-based study among the students of the University of Delhi, India. J Public Hlth Dev. 2023;21(3):246-259 (https://doi.org/10.55131/jphd/2023/210318)

INTRODUCTION

Cancer is one of the leading causes of death across the world [1]. In future, cancer is likely to be one of the major health burdens in low and middle-income countries, such as India, owing to their limited resources for prevention, diagnosis and treatment of the disease [2,3].

Globally, the most commonly diagnosed new cases of cancer in 2020, in decreasing order, were female breast, lung, colorectal, prostate, skin and stomach cancer. The main causes of cancer deaths for the same period in decreasing order were lung, colorectal, liver, stomach and breast cancer [4]. Lung, prostate, colorectal, stomach, oral and liver cancer are the most common types in males, while breast, colorectal, lung, cervical, uterus, ovary, corpus uterus and thyroid cancer are the most common in females [5,6].

Leading behavioural and dietary risk factors such as high body mass index, low fruit and vegetable intake, lack of physical activity, and tobacco and alcohol use are proposed as reasons for 1/3rd of the total global cancer incidences; while the other risk factors are unhealthy lifestyle, obesity, exposure to ionizing radiations and certain types of viral infections [7,8]. In India, tobacco use (both smoking and other forms) is the major risk factor for cancer in males; while poor reproductive and personal hygiene and early marriage are the major risk factors for cancer in females [9].

Cancer mortality can be reduced significantly if detected early. Some of the most common cancer types, such as breast, cervical, oral and colorectal cancer have high cure rates when detected early and treated accordingly [10]. Even testicular seminoma, leukemia and lymphoma in children have high cure rates if appropriate treatment is provided, even at the malignant stage [11]. Screening is the best way to identify cancer in its earlier stages. Hence, increased awareness about possible symptoms of cancer and early screening is crucial, which is challenging for countries like India [12]. This results in most people visiting a physician only when symptomatic, usually at stage 2 or beyond. Hence, cancer mortality in India is higher, compared to Western countries.

Knowledge about the health risks and benefits of cancer prevention is important to help and encourage people to take preventive measures. It has been found that the lack of awareness is one of the reasons for patients not undergoing cancer screening [13,14]. Further, interventions based on social cognitive theories have been demonstrated to positively modulate awareness generation, changing the behaviour of an individual and thereby improving the overall quality of life for cancer patients. Such theory-based interventions have been shown to boost the overall public health impact of an awareness and prevention program [15].

Hence, there is a need for any community to have the knowledge and an informed attitude towards cancer symptoms, risk factors, early diagnosis, treatment and preventive methods. To the best of our knowledge, in India, there have been almost no studies assessing the awareness among the student community in India about cancer. Further, many of these studies are mostly restricted to breast and cervical cancers [16-18]. Therefore, in the present study, we intend to explore the levels of knowledge, awareness, and attitude towards cancer among the male and female students of the North Campus of the University of Delhi, India. In addition, this study also explores the necessity and effectiveness of cancer awareness programmes conducted amongst these students.

MATERIAL AND METHODS

Study area and time frame

This study was conducted in the colleges and hostels of the North Campus, University of Delhi, India (a publicly funded university by the Union Government of India) during one full academic year.

Study design and sampling methods

A community-based cross-sectional study was used to collect data through two sets of structured and standardized questionnaires 'Set 1' and 'Set 2'. All the protocols for the study including the questionnaire were approved by the institutional ethical committee. Further, approval from the institutional authorities and informed consent was obtained from the participants before the collection of data. The Set 1 questionnaire was tested by a pilot study on the students of the university by the convenient sampling method using a printed questionnaire. 363 students (219 female and 144 male students) of the North Campus participated in the pilot study. The final study was conducted using the Set 1 questionnaire on 1000 students comprising 500 males and 500 female students. The male and the female groups were further subdivided into the age group 18-25 years and the age group above 25 years (>25). The cluster and purposive sampling methods were used for sample collection, for the final study. All colleges and hostels of the North Campus of the University were grouped into 4 clusters and samples were collected from each cluster.

Assessment of psychometric properties of the questionnaire

The questionnaire Set 1 and Set 2 were assessed for face validity and content validity by standard methods. Briefly, for assessment of face validity, the preliminary questionnaire Set 1 and Set 2 were evaluated by 20 students (11 male and 9 female students) and 10 faculty members of the university. The student group comprised undergraduate, post graduate and Ph.D. students. These groups assessed the difficulty, generality and ambiguity of the questions by rating them using a 5-point Likert scale from completely important to not important questions, scoring 5 to 1. The obtained Likert scale data was converted to scores, and only questions with average scores above 3.5 were kept for this study. Similarly, the content validity of the questionnaires (Set 1 and Set 2) was examined by 11 experts comprising cancer specialists and researchers, healthcare workers and English language teachers. These experts were asked to comment on the quality, validity, authenticity, relevance, grammar, choice of vocabulary and placement of the questionnaire on a 3-point Likert Scale (not important to completely important question, as above). The obtained Likert scale data was converted to scores, and only questions with average scores more than 2.0 were kept for the studies.

Creation of a Database Management System (DBMS)

For an organized collection of data, a Relational Database Management System (RDBMS) was created using MySQL. The database was made by using the colleges, departments and hostels as clusters, as mentioned above. The RDBMS was designed to strictly accommodate 1000 entries; 500 male and 500 female participants. These male and female participants were further divided into age groups 18-25 years and >25 years, as described earlier. Care was taken to have proportional entries from all 4 clusters as described earlier.

Collection of data

The Set 1 questionnaire, which was administered on the RDBMS platform, contained 7 questions. Each question contained multiple factors as response

options. For easier analysis, the responses were scored on the Likert scale, where the participants were asked to rate these factors from least likely to most likely on a 1-5 points rating system. Here, '1' represented least likely and '5' represented most likely. The follow-up study was conducted in 2 phases: pre-follow-up and a post-follow-up study. The Set 2 questionnaire in printed form, comprising 9 questions was used for the survey.

Analysis of the data

The Likert scale data was extracted from the RDBMS into an Excel sheet. The scores obtained for each factor of a question, for a particular group, were summed and divided by the total number of participants (∑scores/total participants). The value obtained was a number x ($0<x<5$). The significance of the values was tested by using one-way ANOVA at a significance level of $p<0.05$, among the group and between the groups, for a given question. The responses of the pre- and the post-follow-up studies were converted into percentages and the significance of the obtained values was tested by the Chi-square test at a significance level of $p<0.05$.

Awareness interventions and follow-up survey

Awareness programmes were conducted among the different clusters of the university for duration of 5 months. A peer learning and informed learning method was adopted for awareness programmes. The student volunteers who engaged in this particular study were trained by organizing seminars and interviews with cancer specialists, researchers and practitioners. These trained student volunteers then prepared posters, pamphlets, etc. Multiple poster events, pamphlet distributions, student talks, discussions and online video screening in smaller groups, etc. were conducted in the different clusters of the university. The knowledge and awareness gained by these students following the awareness campaign were tested by the follow-up survey. The follow-up survey was distributed in two phases: the pre- and the post-follow-up survey and the awareness campaigns were staged in between them. Questionnaire Set 2 in a printed form, containing 9 'yes/no/don't know' questions, was used for the pre- and the post-follow-up surveys. The responses were converted into percentages. The positive impact of the awareness intervention was quantified by visualizing the enhancement in the "yes" response for a factor in the post-follow-up survey compared to the corresponding pre-follow-up survey.

RESULTS

The present study can broadly be divided into the RDBMS-based survey, awareness interventions and the follow-up survey. The timeline and the detailed workflow of the present study are indicated in Fig. 1.

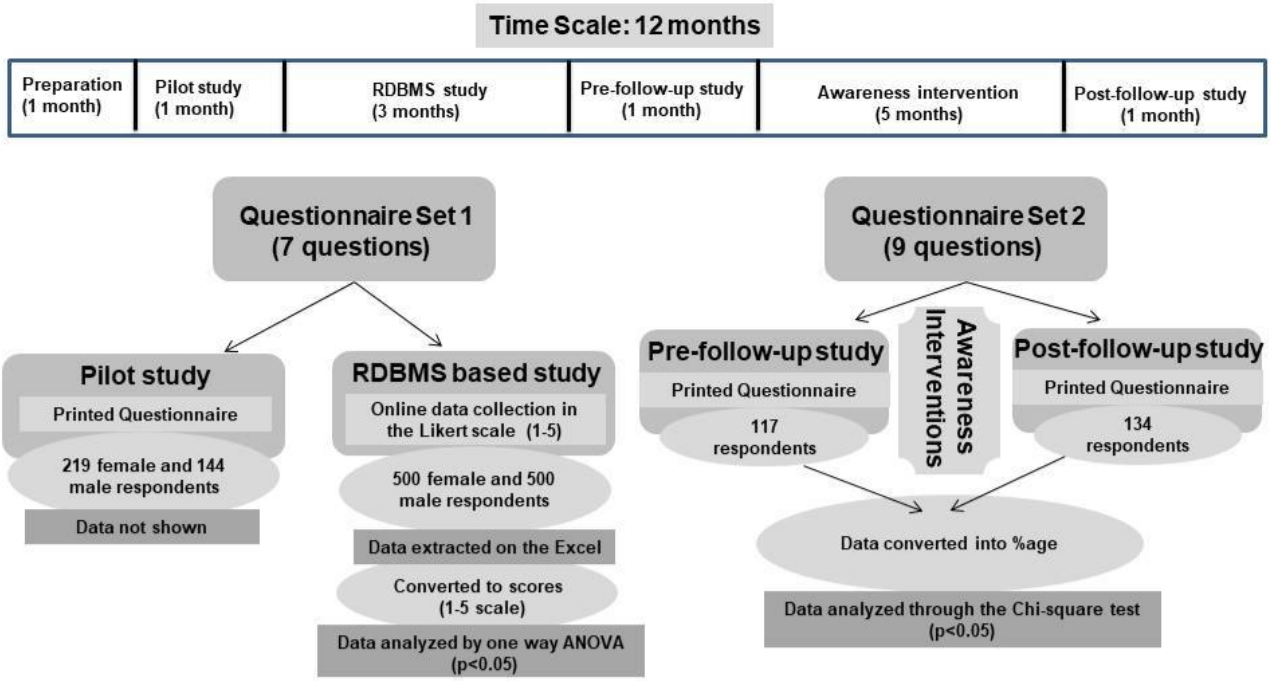
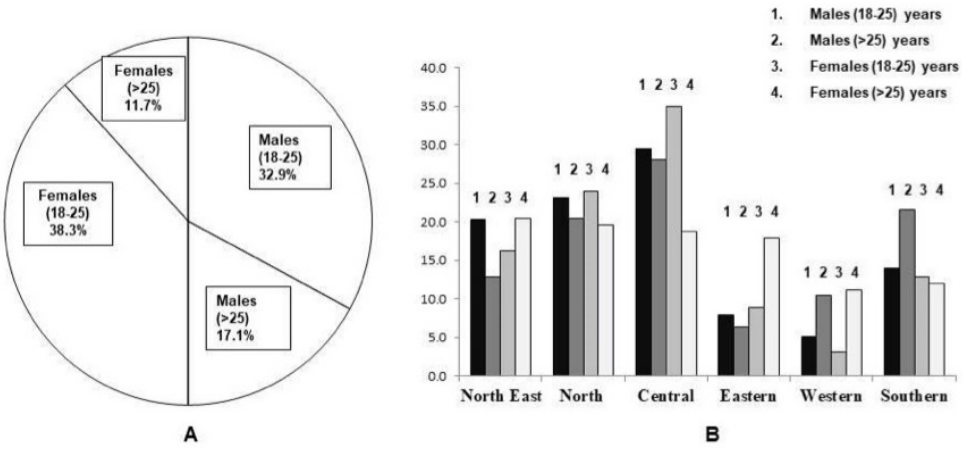


Figure 1. Scheme of workflow. A schematic representation of the flow of the components of the present study with the timeline. Two sets of questionnaires were used for the present study. While the set 1 was used to test the attitude and awareness of the students about cancer; the set 2 was used for the follow-up study. The awareness interventions were conducted between the pre- and the post-follow-up study.

For the RDBMS-based survey, the distribution of the participants in different age groups is shown in Fig. 2A. Further, the demographic data indicated that these participants belonged to different regions of India. The representation of student participation is indicated in Fig. 2B. The data obtained from the Likert scale was extracted and converted into score x ($0<x<5$) as previously described. A theoretical average value of the responses by a group was set as 2.5 on the 5 points scale. Thus, any score below 2.5 was considered low; and above 2.5 was considered high. Further, the significance of the scores for a particular question was tested by using one-way ANOVA at a significance level of $p<0.05$.



Fiure. 2. Demographic data of the student respondents. A. The pie chart represents the percentage of student respondents, males and females of both age groups (18-25 and >25). **B.** The total student respondents (male or female) of the age groups 18-25 years or >25 years were further subdivided into 6 zones as indicated. The Histogram demonstrates the percent representation of students from the 6 zones of India.

Testing the knowledge and attitude of the students towards cancer using Questionnaire Set 1

Question Q1 of the questionnaire Set 1 assessed the knowledge of different risk factors for cancer. The respondents were asked to rate 9 risk factors contributing to the development of cancer (Table 1, Q1). The obtained scores were significantly distinct ($p<0.05$). Out of the nine risk factors, genetics, ageing, smoking, alcohol consumption and environmental factors were unanimously given high scores by all 4 groups (i.e. >2.5). However, for the other factors, the groups provided mixed responses.

Table 1. Responses of the Delhi University North Campus students to the questionnaire on cancer knowledge and attitude.

Factors	Males (18-25 years)	Females (18-25 years)	Males (> 25 years)	Females (> 25 years)	P (0.05) One way ANOVA
(Q1) Cancer risk factors					
Genetic	3.1	3.3	2.7	3.9	0.015224
Ageing	3.4	4.1	3.1	4.2	
Smoking	4.2	4.0	4.6	4.7	
Alcohol consumption	3.9	3.7	4.1	4.5	
Occupational Hazards	3.9	3.2	1.7	1.2	
Stress	4.2	3.6	1.1	1.1	
Being overweight	3.7	3.4	2.9	2.1	
Environmental Factors	3.8	3.5	4.1	3.9	
God's will	4.1	1.4	1.2	1.7	

Factors	Males (18-25 years)	Females (18-25 years)	Males (> 25 years)	Females (> 25 years)	P (0.05) One way ANOVA
(Q2) Attitude towards cancer symptoms					
An unexplained lump or swelling	3.3	3.5	2.6	3.9	0.4394
Persistent unexplained pain	2.7	3.9	2.4	3.1	
Unexplained bleeding	3.0	2.7	1.8	4.7	
A persistent cough or hoarseness	2.9	2.8	2.9	4.5	
A persistent change in bowel or bladder habits	3.0	2.7	3.4	1.1	
Persistent difficulty in swallowing	2.7	3.1	1.4	1.2	
A change in the appearance of a mole	2.5	3.3	3.7	2.1	
A sore that does not heal	2.3	2.9	2.1	3.9	
Unexplained weight loss	2.6	3.1	1.6	1.7	
(Q3) Likely hood of visiting a doctor in case having the above symptoms					
An unexplained lump or swelling	3.4	4.4	3.1	4.6	0.1984
Persistent unexplained pain	3.4	4.6	2.1	2.4	
Unexplained bleeding	3.9	4.3	3.6	4.1	
A persistent cough or hoarseness	3.3	2.8	3.1	2.7	
A persistent change in bowel or bladder habits	3.3	3.4	3.6	3.9	
Persistent difficulty in swallowing	3.3	2.9	2.1	3.7	
A change in the appearance of a mole	3.0	2.7	4.1	4.4	
A sore that does not heal	3.2	3.3	3.0	2.9	
Unexplained weight loss	3.6	3.0	2.4	3.4	
(Q4) Types of cancer predominant in males					
Lungs	3.2	3.5	3.1	3.9	0.00002
Oral, Esophageal and Stomach	4.8	3.7	4.6	4.3	
Colorectal	2.6	2.6	2.4	2.0	
Blood	2.7	3.7	3.7	2.3	
Breast	1.6	1.7	1.2	1.1	
(Q5) Types of cancers predominant in females					
Cervical	3.5	3.2	3.9	3.8	0.00001
Oral, Oesophageal and Stomach	2.2	2.3	2.1	2.4	
Ovarian	2.9	3.3	3.1	3.2	
Blood	2.1	3.3	2.7	2.9	
Breast	4.3	4.2	4.4	4.7	
(Q6) Age susceptibility to cancer					
0-20	4.5	1.0	3.9	1.3	0.8172
20-40	2.2	2.9	4.3	3.8	
40-60	1.6	2.9	3.2	2.7	
60-80	2.7	2.0	2.8	2.4	

Factors	Males (18-25 years)	Females (18-25 years)	Males (> 25 years)	Females (> 25 years)	P (0.05) One way ANOVA
Above 80	4.4	1.1	2.7	1.2	
(Q7) Contribution of various sources to cancer awareness					
Pamphlets	3.9	3.7	3.4	3.5	0.000000035
Journals	4.0	4.2	3.7	3.8	
Social Media Campaigns	2.6	1.9	2.4	1.6	
Government Intervention	3.6	3.9	4.1	3.9	
Advertisements	2.3	1.9	1.6	1.9	

Table 1. Responses of the Delhi University North Campus students to the questionnaire on cancer knowledge and attitude. The 1000 student respondents of the survey were categorised into 4 groups based on their age and gender (males 18-25 years, females 18-25 years, males >25 years and females >25 years). A structured questionnaire comprising seven questions was given to these students and responses were scored using an RDBMS on a Likert Scale of 1 to 5 (less likely to most likely respectively). The Likert Scale data were converted to scores, x ($0<x<5$) as described in the Material and Methods. The significance of the values was tested by using one-way ANOVA, among the group and between the groups, for a given question, as indicated.

The second question (Q2) assessed the knowledge about the symptoms of cancer. The respondents were asked to rate the most prevalent symptoms of cancer as indicated in Table 1 (Q2). The obtained scores were not significantly distinct ($p>0.05$), indicating that the respondents had difficulty in identifying the symptoms of cancer. To further analyse the attitude of students towards these symptoms, the 3rd question enquired about the likelihood of visiting a doctor in the case of having the above symptoms (question 2). The P (0.05) value of the obtained scores (Table 1, Q3) indicated that the respondents had difficulty in identifying the plausible symptoms correctly ($p>0.05$). All the groups rated a marginally higher probability of visiting a doctor (score >2.5) for many symptoms.

The next two questions assessed the knowledge about different types of cancer in both males and females and their prevalence in both. In Q4, the respondents were asked to name the most prevalent types of cancer in Indian males (Table 1, Q4). The obtained scores were significantly distinct ($p<0.05$). All the respondent groups gave high scores for oral, stomach oesophageal and lung cancer in males. In Q5, the respondents were asked to estimate the prevalence of the types of cancer in Indian females (Table 1, Q5). The obtained scores were significantly distinct. While a high score was given for breast cancer, a marginally high score was given for cervical and ovarian cancer. These two questions indicated that the students had knowledge about the types of cancer in Indian males and females. The next question evaluated the understanding of age-dependent susceptibility for cancer, if any (Table 1 Q6). The obtained scores were not significantly distinct ($p>0.05$). Further, no group could build a common consensus on any age-related susceptibility to cancer, suggesting a lack of knowledge about the age-dependent susceptibility of cancer in India. Similarly, question "Q7" was intended to examine the knowledge about the contribution of different media and initiatives toward cancer awareness programs (Table 1, Q7). The obtained scores were not significantly distinct ($p>0.05$), suggesting a lack of clear opinion

about cancer-awareness sources. All respondents rated the contribution of journals with high scores.

Awareness interventions and follow-up study

To improve the knowledge, attitude and practices for cancer among the students, awareness programmes were conducted among the different clusters of the University; staged between the pre- and the post-follow-up studies, distributed in a 5-monthly timeline. The campaign included poster events, pamphlet distributions, student talks, online video screening in smaller groups and discussions, etc. The knowledge and awareness gained by these students following the awareness campaign were tested by the follow-up survey. The follow-up survey was distributed in two phases: the pre- and the post-follow-up survey and the awareness campaigns were staged in between them (Fig. 1). Questionnaire Set 2 in a printed form, containing 9 'yes/no/don't know' questions, was used for the pre-follow-up and the post-follow-up surveys (Table 2).

Table 2. Evaluation of change in the knowledge and awareness of Delhi University North Campus students towards cancer through a follow-up survey.

Questionnaire	**Pre-follow-up Survey (N= 117)**				**Post-follow-up Survey (N= 136)**				
	Yes* %	**No %**	**Don't Know %**	**No* + don't know %**	**Yes* %**	**No %**	**Don't Know %**	**No* + don't know %**	**Chi-square test ($p<0.05$)***
Do you think cancer is curable if detected early?	69	10	21	31	90	3	7	10	0.00089
Do you think screening is the best way for early detection of cancer?	77	4	19	23	94	3	3	6	0.00148
Have you ever discussed the need for cancer screening with your family/friends?	8	86	6	92	43	54	3	57	0.00002
Do you know your family history for cancer, if any?	11	78	11	89	53	39	8	47	0.00022
Are you aware that prostate cancer is specific to males only?	38	49	13	62	64	32	4	36	0.00578
Are you aware of the availability of a vaccine for cervical cancer?	21	67	12	79	53	44	3	47	0.00288
Are you aware of the female age groups, eligible for vaccination of cervical cancer?	5	45	50	95	31	45	24	69	0.02546
Are you aware that in India, women of >40 years should be screened at least once a year for breast cancer?	8	58	34	92	47	37	16	53	0.0008

Questionnaire	Pre-follow-up Survey (N= 117)				Post-follow-up Survey (N= 136)				
	Yes* %	No %	Don't Know %	No* + don't know %	Yes* %	No %	Don't Know %	No* + don't know %	Chi-square test (p<0.05)*
Do you discuss with the elderly females (>40 years) of your family about getting screened for breast cancer?	8	79	13	92	37	52	11	63	0.01226

Table 2. Evaluation of change in the knowledge and awareness of Delhi University North Campus students towards cancer through a follow-up survey. A follow-up survey was conducted among the students of the University, distributed in two phases as 'pre-follow-up survey' and 'follow-up survey'. A different set of a questionnaire (Set 2) comprising 9 questions was used for the survey. The responses were recorded in percentage (%) form as indicated in the table. Further, the significance of the responses in yes/no+don't know together for the pre- and the post-follow-up survey were analysed through the Chi-square test at P value < 0.05. Accordingly, the Chi-square value $p<0.05$ was considered significant. * Indicates the columns used for the Chi-square test.

117 and 134 respondents responded to the pre-follow-up and the post-follow-up surveys, respectively. The responses were converted into percentages. A careful comparison of the pre- and the post-follow-up data indicated that there was an overall increase in the 'yes' responses with a concomitant decrease in the 'no and don't know' responses. This strongly suggested that the awareness intervention programs had positively impacted the knowledge, awareness and attitude of the students towards cancer. Further, the awareness gained was significant, as the Chi-square test ($p<0.05$) indicated that the differences were significant ($p<0.05$). It must be noted here that respondents of the follow-up survey were not necessarily the same and may not have been part of the awareness campaigns. However, the word of mouth and the poster etc. seemed to have worked positively towards making the students aware of cancer-related information.

DISCUSSIONS

The present study on the first hand evaluated the knowledge and attitude of Delhi University students towards cancer. Further, it also explored the results of the cancer awareness intervention programs in enhancing the knowledge and attitude of the students towards cancer. The Q1 of Questionnaire 1 assessed the knowledge about cancer risk factors. While some factors were given unanimously high scores, others such as occupational hazards, stress, being overweight and God's will received mixed reactions. Previous studies have already suggested that a female's susceptibility to breast cancer increases with age [19,20]. Here, a higher rating of ageing by females (4.1 and 4.2) compared to the males of the respective groups (3.4 and 3.1) was thus understandable. Conversely, in the case of risk factors such as occupational hazards and stress, while the 18-25 years age groups rated them high, the other group (>25 years) rated them low. It could be opined that the other age group (>25 years) might have adapted better while mentally being prepared for jobs and thus might be also equipped better to cope with stress. Being overweight was also given a

high score as a cancer risk factor by all, except the females of the >25 years age group (2.1). Compared to their male counterparts, some of the females of the >25 years age group in India usually get married at this age and this might have contributed to such responses by them. Similarly, "God's will" as a risk factor was given low scores by all the groups except for the males of the 18-25 years age group, as males of this age group take higher risks in terms of smoking and consumption of alcohol etc., they might leave cancer incidences to chance factors.

"An unexpected lump or swelling" and "a persistent cough or hoarseness" were only given marginally high scores even by the female groups, indicating their lack of knowledge even of breast cancer. Also, unexplained pain or bleeding during menstruation was given a marginally high score. Poor menstrual health and complications during menstruation can lead to HPV infections, which can lead to cervical cancer, which is prominent in India [9,21,22]. Further, females rated a higher probability of visiting a doctor (4.4 and 4.6) compared to their male counterparts (3.4 and 3.1), in case of an unexplained lump or swelling. It may be concluded from the comparison of questions 2 and 3 that females of both age groups did not suspect an unexplained lump or swelling to be cancer but did consider visiting a doctor for advice.

For the knowledge about the most prevalent cancer types in males and females of India, the scores were in line with the reported recent cancer incidences in males in India [23,24]. As per the Indian Council of Medical Research (ICMR) cancer statistics, the top 5 cancers in Indian males include oral, lung, stomach, colorectal, and oesophageal cancer. Conversely, breast cancer in the case of Indian males was rated low (scores <2.5) by all groups. A few recent reports indicate that there is an increasing trend in breast cancer incidences in Indian males [25]. In Kashmir, the male breast cancer incidence is higher (4.1%) compared to the national average (0.5%) [26]. The chance of male breast cancer goes higher with ageing and with a family history of the same, suggesting the need for awareness of male breast cancer in Indian males. Similarly, no group could conclusively indicate age-dependent susceptibility to cancer, indicating their lack of knowledge about this topic. Conversely, published reports suggest that there is a remarkable increase in cancer incidences with increasing age [27]. Additionally, none of the groups could conclusively indicate the sources for awareness about cancer, with only selected science journals as major sources of awareness.

Hence, the survey broadly indicated that while the students had some knowledge about the occurrence and prevention of cancer, they lacked knowledge about many factors, suggesting the need for awareness and intervention programmes. A post-follow-up survey following awareness intervention further revealed that there was a significant increase in the knowledge towards cancer. Since the awareness campaign targeted a broader audience, it was concluded from the analysis that the posters and word of mouth had worked in enhancing the overall awareness among the Delhi University students.

RECOMMENDATIONS

This study broadly assessed the knowledge and attitude of the student community towards cancer. Further, evaluation of the knowledge gained through intervention studies indicated the need for awareness campaigns for cancer among the Indian student community. It is proposed that such awareness campaigns should also be conducted for the Indian community.

ACKNOWLEDGEMENT

We thank Mr. Nick Landman, Netherlands Cancer Institute and Mr. Stetoslav Minchev for their suggestions in the capacity of English 'native' speakers.

FUNDING

JSP acknowledges financial support in the form of a research grant from the Indian Council of Medical Research, India (5/10/FR/51/2020), the Department of Science and Technology, India (EMR/2016/002571) and R&D grant from the University of Delhi.

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