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Nutrition Knowledge vis-à-vis Health Status of Indian Punjabi Males with Carcinoma Prostate

Piverjeet Kaur Dhillon[1] and Beenu Tanwar[2]

[1]Department of Food Technology and Nutrition, School of Agriculture, Lovely Professional University, Phagwara 144 411, Punjab, India
[2]Department of Dairy Technology, Mansinhbhai Institute of Dairy and Food Technology, Dudhsagar Dairy Campus, Mahesana 384 002, Gujarat, India
E-mail: [1]<dhillonpiver@yahoo.com>, [2]<beenutanwar@gmail.com>

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ABSTRACT The current research intends to attest the propagation of nutrition knowledge in improving the health status of Punjabi males with carcinoma prostate. Data was collected from 200 Prostate Cancer (PCa) patients with malignancy grade I and II. The patients were segregated equally into two groups *viz.* Group I and Group II. Nutrition counselling was imparted to the subjects in the latter group. Pre and post intervention tests were performed. Patients were examined biochemically both at the beginning and end of the study to see the efficacy of nutrition counselling. Findings indicated almost two fold increment in quantum of improvement in nutrition knowledge among the respondents in group II as compared to group I. Biochemically, serum prostate-specific antigen significantly ($p<0.05$) decreased after the nutrition intervention in the subjects of group II. Nutrition education if intervened at initiation or early stages may have positive impact to prolong the disease.

INTRODUCTION

In India, the estimated prostate cancer cases and deaths caused by prostate cancer has been increased from 31,311 to 37,055 and from 13,146 to 15,562 in year 2011 to 2014, respectively (Indiastat.com 2015). Prostate cancer is the most common visceral malignancy in men, with an average increase of 39 cases per year in Punjab, India (Indiastat.com 2015). Although, prostate cancer tumours have been shown to be affected by inherited genetic factors to a greater extent than many other tumours but currently accepted risk factors for prostate cancer include age, dietary habits and androgen levels (Tang et al. 2005). Vasanthamani and Banitha (2012) enlisted contaminated water supply, poor sanitation, and hygiene, ignorance of good food habits, and lack of consumption of fruits and vegetables and mental stress as the causative agents of cancer. Among various contributing factors, diet and lifestyle have an edge over other factors (Kowsalya et al. 2008) and as reported by Saxena (2015), nearly thirty-five percent of all cancers are related to diet. Lowered consumption of protective foods like fruits and vegetables and increased per capita consumption of animal fat has played a significant role in increasing the incidence of prostate cancer in developing countries like India, China and Japan (Zhang et al. 2012). There is simply no doubt to say that nutrition and cancer are closely interlinked and good nutrition plays a vital role in fighting the deadly disease.

However, diet is likely to affect both the incidence and progression of prostate cancer but the relationships to individual foods and nutrients are not simple (Swami et al. 2007). Cancer cachexia estimated to cause twenty to forty percent of cancer deaths is characterized by anorexia (loss of appetite), early satiety, poor absorption of nutrients, muscle weakness, low immune status and increased risk of infections which ultimately leads to death. Once cancer is diagnosed, coping with the disease becomes a difficult task and harsh cancer treatments leave a patient drained, both emotionally as well as physically. Thus, dietary and nutritional factors are considered important modifying factors in the management of prostate cancer (Saxena 2015). There is no standard diet for all cancer

Address for correspondence:
Piverjeet Kaur Dhillon
H. No. - 1, VPO- Sunet,
Near Durga Mata Mandir,
Ludhiana 141 001,
Punjab, India
Phone: 8427600501
E-mail: dhillonpiver@yahoo.com

patients and the nutritional goals are highly individualized and variable. Thus, dietary counselling and nutritional support early in the treatment can prevent the much-dreaded complication "cachexia" (Hemalatha and Prakash 2002).

Apart from the healthcare amenities and adequate nutrition, the need for additional health determinants in terms of the social and physical environment has also been recognized (Public Health Agency of Canada 2006; Ratzan 2001). Nutrition knowledge can be affected by various factors such as literacy, employment, socio-economic status and so on. Poor nutrition knowledge can be associated with inadequate intake of functional foods, results in poor nutritional as well as the health status of the patient (Friedman and Hoffman-Goetz 2008). Nutritional and health status of an individual might be assessed through recording and analyzing the anthropometric and biochemical parameters *viz.* height, weight, body mass index and haemoglobin, serum minerals, antioxidant levels etc. and along with that, the degree of the disease can be determined by estimating serum prostate-specific antigen (PSA).

Nutrition literacy is considered a most significant predictor of diet quality (Gibbs et al. 2018). To ensure good health status of the patient, it is pragmatic to upgrade nutrition knowledge, promote a positive attitude and inculcate good health practices among the patient and his next of kin's as well. For that reason, nutrition education should be imparted and strengthened via promoting awareness regarding the disease, its causative factors, and preventive measures, through different educational aids such as compact disc, booklets, pamphlets etc. (Bisht and Raghuvanshi 2007). Additionally, carcinoma prostate is considered to be ideal for nutrition intervention because of its long latency time (Ansari 2002). Thus, intervening the progression of prostate cancer by creating nutrition awareness is advantageous, not only it will have less side effects, it can be implemented on a broader population base with less economic burden (Mukhopadyay 2010). As a whole, PCa is a multifactorial disease, requiring a multidimensional approach, for its prevention and treatment. Hence, it was thought of interest to find out causative factors of PCa and to impart nutritional counselling to PCa patients, which may have greater efficacy for prostate cancer prevention rather than using any individual component.

Objectives

Numerous literature reports indicated a positive impact of nutrition counselling in management of different degenerative diseases. Research evidences on role of nutrition counselling in altering Prostate Specific Antigen (PSA) level and Bone Mineral Density (BMD) in prostate cancer patients is not appropriately available. Hence, the present study is planned with the following objectives:

1. To study the causative factors of prostate cancer (PCa) by determining the nutritional knowledge and health status of PCa patients.
2. To impart nutrition counselling to selected subjects by administering PCa specific extension aids.
3. To study the impact of nutrition counselling on knowledge, attitude, practice and health status of PCa patients.

MATERIAL AND METHODS

The present study was undertaken from April, 2016 to January, 2017 to investigate the health status through using general information, health related information, anthropometric measurements, Knowledge, Attitude and Practice (KAP) questionnaire and biochemical assessment. The materials and methods worked out for the present investigations have been discussed under the following headings:

Selection of the Subjects

A statistically adequate sample of 200 post-operative patients suffering from PCa were selected randomly from three different hospitals of Bathinda City, Punjab, India and divided equally into two groups viz. Group I (Control) and Group II (Experimental).

Development of Questionnaire

An open-ended questionnaire consisting of two parts that is, (i) general, lifestyle and health related information and (ii) A multiple choice

questionnaire to assess the knowledge, attitude and practices regarding PCa and its management was developed. The face/content validity of the questionnaire cum interview schedule was carried out by obtaining the comments regarding the above-designed questionnaire cum interview schedule of an expert panel consisting of Assistant Scientist, Department of Food and Nutrition, Punjab Agricultural University, Ludhiana and dieticians of concerned hospitals. Simultaneously, the feasibility and reliability of the questionnaire were carried out by pre-testing on ten subjects. Based on the response received during pre-testing, certain necessary changes were incorporated in the questionnaire. Hence, the pre-tested and reconstructed questionnaire was used to collect data for the study.

Development of PCa Specific Extension Aids

An information booklet containing information such as the difference between benign prostate hyperplasia and prostate cancer, causative factors, signs and symptoms, complications, timely detection of disease, treatments, prevention and control, dietary requirements, important foods to help prevent PCa, different methods of cooking, household practices to minimize the pesticide residues, fluoride toxicity, importance of reverse osmosis in water purification, promoting organic farming etc. was developed to impart awareness among masses.

Nutrition Counselling

Nutrition counselling was imparted to the subjects in Group II for 90 days with an interval of one week.

Impact of Nutrition Counselling on Knowledge, Attitude, Practices and Health Status of PCa Patients

Impact of nutrition counselling was assessed by comparing the pre and post intervention test scores obtained by the subjects; anthropometric and biochemical parameters of the subjects at the end of the study.

Collection of Data

General Information

Information pertaining to age, occupation, education, socio-economic status etc. was elicited.

Anthropometric Measurements

Information regarding height and weight were recorded by using standard methods (Jelliffe 1966). Body Mass Index (BMI) was calculated by following formula to assess the proportionality of physique of the subjects.

Body Mass Index (BMI) = Weight (kg.)/ Height (m^2)

Knowledge, Attitude and Practices Regarding PCa and Its Management

Pre and post tests were conducted in order to obtain the score for knowledge, attitude and practices regarding prostate cancer and its management.

Biochemical Assessment

Values for prostate cancer biomarker that is, prostate-specific antigen (PSA) and bone mineral density (BMD) were noted from the medical records of the subjects. Biochemical parameters *viz*. haemoglobin, serum albumin, serum globulin, serum vitamin-A, vitamin-E, vitamin-C, iron, selenium and zinc were also noted both at the beginning and the end of the study to find out the relationship of these parameters to nutrition counselling.

Statistical Analysis

The obtained data was analyzed statistically through working out one-way analysis of variance (ANOVA) with Tukey's test using GraphPad Prism software version 5.01 in order to determine significant ($p<0.05$) difference between the average anthropometric measurements, KAP scores and biochemical parameters.

RESULTS

General information pertaining to age, education, occupation, socio-economic status of

Table 1: General information of prostate cancer patients (N= 200)

Particulars	*Number of patients*	
	Group I (N=100)	*Group II (N=100)*
Age (years)		
40-50	00	08
50-60	17	09
60-70	39	48
70-80	33	29
80-90	11	06
Educational Level		
Illiterate	37	34
Primary	26	19
Middle	14	17
Matriculation	16	14
Intermediate	07	09
Graduation	05	05
Post-graduation	00	04
Doctorate	00	00
Occupation		
Agriculture	65	53
Business	09	11
Service	10	04
Labourer	08	10
Unemployed	00	00
Any other:	08	22
I. Agriculture+Service	06	18
II. Agriculture+ Business	02	04
Employment Status		
Full time	03	27
Part time	68	22
Retired	29	51
Religion		
Hindu	13	07
Sikh	87	93
Locality		
Rural	67	71
Urban	24	19
Semi-urban	09	10
Marital Status		
Married	88	96
Widower	12	04
Type of Family		
Joint	87	93
Nuclear	13	07
Family Size		
2-4	10	05
5-7	61	49
8-10	28	38
>10	06	08
Socio-economic Status		
Low income group	44	18
Middle income group	40	82
High income group	16	00

prostate cancer patients has been described in Table 1. A total number of 200 patients were studied to determine the demographic information of the respondents. To start with the very important and uncontrollable variable that is, aging process, it was observed that the incidence of the disease was highest (39% and 48%) among the individuals between the age group of 60-70 years and 70-80 years (33% and 29%) followed by 50-60 years (17% and 9%) and 80-90 years (11% and 6%) in group I and group II, respectively. Regarding education, most (37% and 34%) of the respondents were illiterate in both the groups whereas only seven percent received higher education. Further, majority (65% and 53%) of the subjects belonged to farm community. As far as the employment status was concerned, the percentages of part time workers and retirees were quite higher (68% and 51%) as compared to the workers involved in full-time work. Further, it was reported that sixty-seven and seventy-one percent of subjects in group I and group II were based in rural households. Data regarding the familial system of the patients demonstrated that joint family set up was widespread in both the groups as the corresponding values were eighty-seven and ninety-three percent along with majority of the family size reported from 5 to 10 members. This could be the reason for ignorance of individual nutrition. Classification of socio-economic status has shown that PCa was particularly widespread among the respondents from middle income strata (61%) preceded by low income group (31%).

As depicted in Table 2, medical history of the subjects was observed by recording family history of cancer (both PCa in specific and other types of cancer), degree of the disease in terms of its stage, treatment opted, symptoms (PCa specific and general), onset of the disease, other complications and allied diseases. It was seen that overall thirteen and eight percent of the subjects were having family history of PCa and other types of cancer, respectively. The medical records of the patients described the degree of disease as stages I and II. Almost ninety-five percent of the total patients had received surgical treatment to cease the progression of the diseases although only five percent treated with other cancer therapies such as chemotherapy. Among disease characteristics, lesser urine output and exertion during urination were experienced by all (100%) the patients while other symptoms (loss of appetite, weakness and fa-

Table 2: Health related information of prostate cancer patients (N=200)

Particulars	*Number of patients*	
	Group I (N=100)	*Group II (N=100)*
Number a. Family History of the Disease		
Prostate cancer	18	08
Other cancers	10	06
b. Stage		
I	51	41
II	49	59
c. Treatment Opted		
Surgery	61	56
Chemotherapy	08	02
Surgery + Radiotherapy	21	15
Surgery + Chemotherapy	05	16
Surgery + Radiotherapy + Chemotherapy	05	11
Medication	100	100
d. Clinical Signs and Symptoms of Prostate Cancer		
i. General Symptoms		
Weight loss	15	13
Hair loss	04	02
Weakness	83	69
Weight gain	00	00
Fatigue	77	71
Loss of appetite	99	61
ii. PCa Specific Symptoms		
Pelvic pain	82	94
Lesser urine output	100	100
Exertion during urine	100	100
Enlargement of prostate	95	87
iii. Other Complications		
Constipation	88	62
Piles	06	04
Frequent urination	04	02
Off odour during urination	01	07
e. Onset of the Disease		
Gradual	81	63
Sudden	05	18
Off and on	14	19
f. Aggravating Factors		
Exertion	39	81
Diet	48	12
Both	13	07
g. Allied Diseases		
Diabetes mellitus	11	09
Renal disease	00	04
Cardio-vascular diseases	04	00
Respiratory diseases	02	02
h. Other Disorders		
Hypertension	08	04
Uric acid	01	01

tigue) were found as common in most (80%, 76% and 74%) of the patients. Constipation was also reported as a major complication by the subjects in group I (44%) and group II (31%), respectively. Onset of the disease as explained by the subjects was found gradual in nature as most common (81% and 63% in group I and group II, respectively) irrespective of some exceptions. Further, both exertion (39% and 81%) and diet (48% and 12%) had been reported as aggravating factors in disease progression among the subjects of group I and group II, respectively. Other major lifestyle related diseases such as diabetes, hypertension and uric acid were observed among eleven and nine percent, eight and four percent and one and one percent of the subjects in group I and group II, respectively.

Table 3 shows the anthropometric measurements of the subjects in both the groups. The data revealed that there was a significant ($p<0.05$) difference in the body weights possessed by the subjects both at the beginning and at the end of the study. Conversely, no significant ($p>0.05$) difference was observed in the heights measured for the subjects in both the groups and found within the reference range (ICMR 2010). Further, a significant ($p<0.05$) increase had

Table 4: Distribution of the subjects according to KAP score

Parameters	*Group I (N=100)*		*Group II (N=100)*	
	Pre-test score	*Post test score*	*Pre-test score*	*Post test score*
Knowledge				
1-8	100	100	100	22
9-17	0	0	0	78
18-25	0	0	0	0
Attitude				
1-5	100	85	97	0
6-10	0	15	03	66
11-15	0	0	0	34
Practice				
1-5	100	100	100	1
6-10	0	0	0	78
11-15	0	0	0	11

Table 3: Anthropometric measurements of prostate cancer patients (N=200)

Parameters	*Group I (N=100)*		*Group II (N=100)*		*Reference value**
	Initial	*Final*	*Initial*	*Final*	
Height (cm)	175.5± 9.42[a]		178.25± 7.53[a]		161.4-172.3
Weight (kg)	70.13± 6.75[a]	67.12± 7.92[ab]	70.53± 8.15[ab]	72.60± 6.96[bc]	48.9- 66.6
BMI (kg/m^2)	22.77± 1.63[a]	21.79± 1.59[ab]	22.20± 2.12[ab]	22.85± 1.98[bc]	18.5- 24.9[**]

[*]ICMR 2010, [**]WHO 2004

been recorded in body mass index (BMI) of the patients belong to group II whereas in group I, an opposite trend was observed. The average calculated BMI was found within the reference range (WHO 2004).

Health literacy is vital for helping the masses navigate the appropriate health care system leading towards maintenance of their health status. At the beginning of the study, pre-testing scores of majority of the subjects in both the groups were categorized as low as between 1-8, 1-5 and 1-5 for knowledge, attitude and practice, respectively (Table 4). The mean scores obtained for all the three parameters were recorded as quite less (4.3 and 7.4, 3.1 and 3.3 and 2.5 and 2.7) in group I & II, respectively. In contrast to this, a significant ($p<0.05$) increase was observed under gain in score, simultaneously, it was seen that there was almost two fold increment in quantum of improvement in nutrition knowledge among the respondents in group II as compared to the subjects in group I (Table 5).

The biochemical assessment of the respondents has been summarized in Table 6. Prostate specific antigen (PSA) has been extensively used as a reliable diagnostic tool in the screening for PCa. During the present study, mean PSA values were 15.59 and 12.23ng/mL and 20.05 and 14.47ng/mL as initial and final figures among the subjects of group I and group II, respectively which were 2 to 4 times higher than the reference range (0 to 4ng/mL). Serum prostate specific antigen was significantly ($p<0.05$) decreased (from 20.05 to 14.47ng/mL) after the nutrition intervention in the subjects of group II. The mean scores (0.34 and 0.42 and 0.52 and 0.67) for bone mineral density (BMD) were observed within the normal range (0 to -1) during both initial and final stages in two groups, respectively. Moreover, BMD and vitamin-A remained almost constant to its recommended figure among the respondents in group II. It was evidently seen that the values for albumin, and vitamin- C were raised in the serum levels of the patients in the

Table 5: Gain in KAP score after nutrition counselling

Parameters	*Group I (N=100)*		*Group II (N=100)*		*Gain in score*		*Quantum of improvement*	
	Pre-test score	*Post test score*	*Pre-test score*	*Post test score*	*Group I*	*Group II*	*Group I*	*Group II*
Knowledge	4.3± 1.78[a]	6.2± 2.04[b]	7.4± 3.64[ce]	19.8± 2.33[df]	1.9	12.4	1.44	2.67
Attitude	3.1± 1.35[a]	3.7± 1.71[a]	3.3± 1.51[ab]	10.2± 2.23[ab]	0.6	6.9	1.23	3.10
Practice	2.5± 1.04[a]	2.8± 1.43[ab]	2.7± 1.02[ab]	9.1± 1.70[bc]	0.3	6.4	1.12	3.37
Overall mean ±SD	3.3± 1.39	4.2± 1.73	4.5± 2.10	13.0± 2.16	1.1	8.5	1.27	2.89

Gain in Score = Post test score – Pre-test score
Quantum of Improvement = Post test score/Pre-test score

Table 6: Biochemical assessment of prostate cancer patients (N=200)

Parameters	*Group I (N=100)*		*Group II (N=100)*		*Reference range*
	Initial	*Final*	*Initial*	*Final*	
Serum PSA (ng/ml)	15.59±22.63[a]	12.23±18.6[ab]	20.05±15.25[ac]	14.47± 9.03[ab]	0.0 to 4.0
Bone mineral density	0.34± 0.23[a]	0. 42± 0.13[b]	0.52± 0.19[ab]	0.67± 0.16[ac]	0 to -1.0
Serum albumin (g/dl)	4.15± 0.55[a]	3.73± 0.45[b]	3.77± 0.39[bc]	4.40± 0.28[cd]	3.5 to 5.5
Serum globulin (g/dl)	2.59± 0.46[a]	2.50± 0.43[ab]	2.81± 0.35[bc]	3.30± 0.28[ce]	2.0 to 3.5
Haemoglobin (g/dl)	11.18± 1.75[a]	11.27± 1.29[ab]	9.79± 1.39[bc]	12.3± 1.31[ce]	12 to 15
Serum vitamin-A (ì g/dL)	42.4± 8.12[a]	29.2± 6.24[b]	47.1± 7.49[c]	42.9± 7.87[ad]	30 to 65
Serum vitamin-C (mg/dL)	0.76± 0.26[a]	0.56± .21[b]	0.64± 0.27[bc]	0.85± 0.22[ac]	0.4 to 1.5
Serum vitamin-E (ì g/mL)	13.95± 3.67[a]	11.40± 2.67[b]	14.10± 3.11[ac]	9.93± 2.18[bd]	5.5 to 17.0
Serum iron (ìg/dl)	54.1±10.6[a]	47.3± 7.52[b]	46.8± 7.21[c]	52.4± 6.53[d]	55 to 160
Serum selenium (ìmol/l)	0.99± 0.41[a]	1.00± 0.39[ab]	1.08± 0.21[ab]	1.12± 0.13[bc]	1.0 to 1.5
Serum zinc (ìmol/l)	57.9±12.14[a]	61.53±11.23[b]	57.12± 7.78[ac]	76.30± 5.71[bd]	70 to 100

latter group. On the contrary, these parameters were at the diminishing end (from 4.15 to 3.73g/dl and from 0.76 to 0.56mg/dL) among group I patients. The mean haemoglobin levels of the subjects were detected as 11.18 and 11.27g/dl and 9.79 and 12.3g/dl during initial and final phases of the study for group I and group II, respectively. The average figures for zinc were noted quite lower (57.9 and 57.12μmol/l in group I and II) when compared to the reference range (70 to 100μmol/l). The values were significantly ($p<0.05$) raised in the respondents of group II (by 19.18μmol/l) subsequent to the nutritional intervention through providing individual nutrition counselling and information booklet. This could be the reason for improving PSA level among the respondents of group II.

DISCUSSION

During present study, the factors such as age, educational level and socio-economic status have come up with special reference to health status of prostate cancer patients. In this regard, a survey was carried out on socio-demographic characteristics of cancer patients in Malaysia and it revealed that 47.5 percent of the total population was retired (Shahmoradi et al. 2009). Moreover, it has been reported that the peak incidence of prostate cancer is usually observed in the age group above 65 years, thus, considered as the disease of elderly (Lalitha et al. 2012). Similarly, majority (82%) of the respondents were educated upto secondary level (Shahmoradi et al. 2009). After scrutinizing the data focused on relationship between socio-economic status and prostate cancer from California Cancer Registry (A population based surveillance, epidemiology and end results [SEER] registry), it was abstracted that the socio-economic status (SES) portrays itself as a strong determinant in incidence of the disease as the highest quintile had a twenty-eight percent higher rate of incidence as compared to the lowest one. Simultaneously, it is likely to be an interplay between several other factors such as social, environmental and genetic etc. Further, the researchers explained that prostate cancer may be affected by lifestyle practices as well as awareness level and accessibility to health care service (Cheng et al. 2009).

Family history of the disease appeared as one of the strongest factors after meta-analysis of numerous investigations which reported that males having first-degree relatives (father, brother, son) prostate cancer history have two to three fold elevated risk of developing the disease. Besides, it has been analysed too that the male inherited twenty percent chance if his father develops prostate cancer before the age of 60 years while this risk remains only eight percent when it comes with absence of this type of history (Sharma et al. 2016). Further, it has been reviewed in another study that prostate cancer cases from registries available at Mumbai and history of diabetes and hypertension was four and three fold among the affected population when compared to the control group (Ganesh et al. 2011).

The relationship between Body Mass Index (BMI) and Prostate-Specific Antigen (PSA) levels in prostate cancer patients of North India was studied (Singh et al. 2013). The researchers found that there was no significant impact of BMI on the risk of prostate cancer.

Health literacy along with nutrition counselling has gained advocacy as this type of education practice specifically emphasizes to motivate the sufferers towards gaining understanding of the disease and using that information in the promotion and maintenance of good health (Friedman and Hoffman-Goetz 2008; Nutbeam 1998). Further, it was stated that the poor health knowledge was associated with increased hospital rates as well as late cancer diagnosis (Baker et al. 2002; Wolf et al. 2005; Lindau et al. 2006; Bennett et al. 1998). The quantum of improvement was reported as 1.54, 1.39 and 1.46 in knowledge, attitude and practices score of post-menopausal women, respectively (Kaur 2014). Furthermore, gain in knowledge was found to be forty-seven percent through comic book and 37.13 percent though audio cassette during nutritional intervention (Bisht and Raghuvanshi 2007).

It has been explained that the lower BMD level and higher PSA levels were correlated since prostate cancer cells stimulate cytokines release which help activating osteoclasts formation and bone resorption (Kim et al. 2009). Similar trend was observed in contemporary research. The

review available for the necessity of nutrition education for the prostate cancer patients was systematized and revealed that adequate nutrition knowledge is imperative during the treatment in order to avert serious complication such as osteoporosis deteriorating bone mass density which may occur as a common side effect after androgen deprivation therapy (ADT) (Millar and Davison 2012). Decreased albumin levels in the patients indicates presence of inflammation and some inflammatory mediators such as interleukin-1 (IL-1), IL-6, necrosis factor α and acute phase reactants release which increases the transcapillary escape rate of albumin and decreases albumin synthesis by hepatocytes and recurrence of the tumor by increased gleason score thereby progression of the disease (Mantovaani et al. 2008; Sejima et al. 2013; Wang et al. 2017). During present study, the average figures for zinc values were significantly ($p<0.05$) raised in the respondents of group II (by 19.18μmol/l) subsequent to the nutritional intervention through providing individual nutrition counselling and information booklet. This could be the reason for improving PSA level among the respondents of group II. The relationship of zinc and gleason score in North Indian prostate cancer patients had been investigated so as to find out the therapeutic implication of the nutrient to prolong the disease. The scientists originated that the association between low level of zinc is negatively associated with increased gleason score (Zn: r = - 0.68 and G score: 7). These results suggested that improved zinc status may contribute to decrease tumour burden in stipulations of lesser gleason score vis-à-vis sustain the prostate cell integrity (Abhishek et al. 2017).

CONCLUSION

During present investigation, it is scrutinized that there were numerous factors particularly age, educational level, type of family and socio-economic status affecting the health status of PCa patients. Furthermore, the biochemical parameters such as PSA and BMD; serum albumin and PSA, serum zinc and PSA levels were interrelated towards the status of PCa. It is to bring to a close that nutrition knowledge provided in the form of nutrition counselling ensured a significant level of upgrading the nutrition knowledge and health status in terms of KAP scores and biochemical parameters, respectively, of the PCa patients.

RECOMMENDATIONS

It is recommended that:

- Self-sufficiency is the key factor for management of the disease.
- Awareness regarding onset of PCa and its management must be spread.
- Screening for PSA level should be there before attainment the age of 40 years.
- Nutrition education should be disseminated in the early hours as possible during the disease.

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