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Assessment of Physical Activity and Obesity in the Prevalence of Primary Signs of Cancer in a Rural Area

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ABSTRACT

Cancer is one of the major threats to public health in the developed world and increasingly in the developing world. Cancer signs and symptoms depend on the specific type and grade of cancer although general symptoms are found. **Objective:** Our objective was to identify the prevalence of primary signs of cancer in certain wards of Eraviperoor grama panchayat during our study period. **Methods:** Our study was a prospective observational study with a total study population of 300. The study population was selected by inclusion and exclusion criteria. Data was collected by means of interview. **Conclusion:** The salient findings of our study were: the common signs in mouth cancer are gum bleeding, in skin cancer, it is change in skin colour. Breathlessness and chest pain is the frequent symptom in lung cancer and weight loss and altered bowel habits in stomach cancer. The symptoms were found to be seen predominantly in males than in females which was due to increased rates of use of alcohol and tobacco. Skin cancer was mainly seen in middle age which was due to increased occupational exposure to ultraviolet rays. Primary signs of lung, stomach and mouth cancer were seen in old age adults (44.4%) when compared to other age groups. Limited physical activity and ever increasing use of alcohol and tobacco were seen generally in the population. Our study suggests that methods to improve the knowledge and detection of primary signs of cancer among the general public has to be devised to promote early diagnosis and treatment.

INTRODUCTION

Cancer is the second most common cause of death after heart disease. Cancer is more curable when detected early.[1] Although some cancers develop completely without symptoms, the disease can be particularly devastating if the symptoms are ignored, as these symptoms may represent cancer. Cancer often has no specific symptom, so it is important that people limit their risk factors and undergo appropriate screening.[1]The risk factors for cancer, are smoking, heavy alcohol use, high sun exposure, and genetics. The best way to fight cancers is by prevention and early detection. Some primary symptoms that may occur with cancer are as follows:

1. Persistent cough or blood-tinged saliva - these symptoms could be cancer of lung, head and neck. Nagging cough that last more than a month or blood in the mucus that is coughed up must be subjected to consultation.

2. Change in bowel habits - Most changes in bowel habit are related to diet and fluid intake. The doctor sometimes detect pencil thin stool with colon cancer. Occasionally, cancer exhibit continuous diarrhoea. A significant change in bowel habits that cannot be easily explained by dietary changes needs to be evaluated.

3. Blood in the stool - Haemorrhoids frequently cause rectal bleeding. But because haemorrhoids are so common, they may exist with cancer. An entire intestinal examination must be done when haemorrhoids are experienced.

4. Change in urination - Urinary symptoms can include frequent urination, small amounts of urine, and slow urine flow or general change in bladder function. Most men will suffer from harmless prostate enlargement as they age and will often have these urinary symptoms. These symptoms may also signal prostate cancer. Men experiencing urinary symptoms need further investigations.

5. Breast lump or breast discharge - Most breast lumps are non-cancerous tumour such as fibroadenomas or cysts. But all breast lumps need to be thoroughly investigated. Discharge from a breast is common, but some forms of discharge may be signs of cancer. If the discharge is bloody or from one nipple, further evaluation is recommended.[2,1]

ROLE OF OBESITY IN INDUCING CANCER:

According to researches, obesity causes severe health problems such as cardiovascular diseases, type II diabetes, dyslipidemia, hypertension, and musculoskeletal disorders and in addition to this, it is also a risk factor for many varieties of cancer, including pancreatic, Non-Hodgkin's Lymphoma (NHL), colorectal, endometrial (the lining of the uterus), hepatocellular (subtype of liver cancer), kidney, cervical (adenocarcinoma of the cervix), oesophagus (adenocarcinoma), thyroid, malignant melanoma (a type of skin cancer), gallbladder and post-menopausal breast cancers. Besides, BMI of 30 or higher have shown critically high risk for myeloma and leukaemia in dose-dependent manner [3].

The relations between obesity and cancer can be explained by variations in the metabolism of endogenous hormones (insulin, insulin like growth factors and sex steroids) which may cause impairment of the normal balance between cell proliferation, differentiation and apoptosis. The reason is that adipose tissue is considered as an active endocrine and metabolic "organ" through autocrine, endocrine and paracrine activities and eventually, different assumed biological mechanisms consisting of changes in the bioavailability and synthesis of sex steroid hormones, insulin resistance, release of growth factors and/or pro-inflammatory cytokines and deviant energy disposal and expenditure can cause progression and genesis of cancer.[4]

Obesity is defined as excess accumulation of adipose tissue in an attempt to accommodate excess calories. Excess adiposity, in the form of increased triacylglycerol (TAG) levels and adipocyte dysfunction, results in increased release of fatty acids and is often associated with hyperinsulinemia, low-grade inflammation and impaired adipokine secretion [9]. Adipocytes mobilize free fatty acids from the triacylglycerol pools in a series of reactions catalyzed by adipose triglyceride lipase (ATGL), hormone sensitive lipase (HSL), and monoacylglycerol lipase (MAGL). ATGL favors TAG substrates and catalyzes the rate-limiting first step of lipolysis. In the second step, diacylglycerol (DAG) is hydrolyzed by HSL, which has broad substrate specificity and also hydrolytic activity against TAG [3]. The orchestrated activation of ATGL and HSL are required for complete lipolysis to occur in adipocytes. The interaction between breast cancer cells and lipid-loaded "obese" adipocytes focusing on the ability of breast cancer cells to mobilize stored energy-dense fatty acids from adipocytes and whether this energy transfer promotes breast cancer cell proliferation and migration.[5]

The risk of cancer in adult life was increased by 9% in comparison to childhood BMI. Also, an excess of weight in teenagers was linked to doubling the mortality risk of colon cancer in adulthood. Because of the time lag in cancer development in the presence of adiposity, the typical follow-up is longer than 10 years in cohorts assessing cancer risk, and it is thought that this is an "average" lag-period for obesity-related cancer development. However, the lag period may be shorter when hyperoestrogenemia is a predominant mechanism, as it occurs in postmenopausal breast and endometrial cancer.[6]

RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND CANCER

Physical activity is the movement that uses skeletal muscles and requires energy than resting. Aerobic physical activity, such as running, increases oxygen uptake and improves cardiovascular function, whereas anaerobic physical activity such as resistance training using weights, increases muscle strength and mass.[7] Physical activity has an effect on immunologic, endocrinologic and metabolic processes. It also helps to maintain a healthy weight and protect against cancer. Physical activity is classified into three types: total physical activity, recreational physical activity and occupational physical activity.[8] The World Health Organization estimates in 2010, globally about 23 percent of adults did less than 150 minutes of moderate intensity aerobic physical activity per week. Any type of physical activity/exercise performed at any age decreases the risk of developing breast cancer; in particular, older and postmenopausal women with normal weight benefit from incorporating activities and well-balanced nutrition in their way of life. [9]Recently published recommendations with regard to primary prevention indicate that physical activities should be carried out for 30, or better 45–60 min/day, on 5 days/week[7].

First of all, acute and chronic workloads (in the sense of training) have an impact on various parts of the immune system. It is assumed that this is caused by the exercise-induced release of hormones, in particular catecholamines and cortisol. As a consequence, the number of cells and, moreover, the function of cellular and humoral defense mechanisms change. This is mainly understood with regard to natural killer cells or cytotoxic T cells, but also to transmitters of the immune system, the so-called cytokines (e.g. C-reactive protein (CRP)). Among others, catecholamines lead to a dose-dependent augmentation of natural killer (NK) cells by approximately 150–300% and of cytotoxic T cells by 50–100%. However, within the first 2 hours after workload, a strong decrease is observed. Basically, this effect occurs when cortisol is released, and it is an explanation why high load intensities provoke more

prominent reactions. The low levels of monocytes and macrophages seen after intensive workloads sometimes even remain depleted for several days. The function of the NK cells may enhance by around 40–100% and decrease according to the intensity-by around 25–35% below baseline. The phagocytic and cytotoxic functions of the macrophages seem to be enhanced especially after moderate physical activities.[10]

An increasing number of investigations deal with the role of physical activity during tumor therapy. The disease and side effects of the therapy lead to a variety of negative effects on muscle strength, physical performance capacity, body composition, and mood. However, it has been shown that physical activity may counteract the loss of performance capacity and muscle strength, and may improve the mood.[9] Moreover, the therapy can cause side effects, and some of the individuals concerned may experience symptoms like breathlessness, fatigue or nausea because of which their quality of life can potentially be reduced. Without doubt, this background knowledge supports the importance of changing the lifestyle and taking up a healthy way of life, i.e. not to smoke, to reduce alcohol consumption, to decide on healthy nutrition and on physical activity. Physical activity is not only associated with reduced risk of recurrence and cancer-related death from colorectal cancer, but it also improves cardiorespiratory fitness, strength, fatigue, depression, and quality of life in cancer survival. [10]

AIM: To evaluate the primary signs of cancer in certain rural areas of Eraviperoor panchayath. This study mainly focuses on assessment of obesity and physical activity in inducing cancer.

OBJECTIVES:

1. Assessment of obesity in inducing cancer.

2. Assessment of physical activity in inducing cancer.

BACKGROUND AND REVIEW OF LITERATURE

Lee K M. *et al.,* conducted a randomized controlled study in 2018 on **effect of the 6 week home based exercise program on physical activity level and physical fitness in colorectal cancer survivors.** This study aimed to examine the feasibility and efficacy of the 6-week home-based exercise program on the level of physical activity and physical fitness in stage II

to III colorectal cancer survivors. The study concluded that 6-week home-based mixed aerobic and resistance exercise program was feasible and effective for increasing physical activity level and physical fitness in stage II to III colorectal cancer survivors[9]

Witlox L. *et al.*, in 2018 conducted a multi-centered randomized controlled trial on **Four-year effects of exercise on fatigue and physical activity in patients with cancer.** The present study assessed long-term effects of the exercise program on levels of fatigue and physical activity 4 years after participation in the Physical Activity during Cancer Treatment (PACT) study. The study concluded that patients with breast or colon cancer who participated in the 18-week exercise intervention showed significant higher levels of moderate-to-vigorous total physical activity levels and a tendency towards lower physical fatigue levels 4 years post-baseline[16].

Nattenmuller J C. ***et al.*** conducted epidemiological study in 2018 on **Obesity as risk factor for subtypes of breast cancer: results from a prospective cohort study.** Formalin-fixed and paraffin-embedded (FFPE) tumor tissues of 657 incident breast cancer cases were used for histopathological analyses. Analyses by BMI tertiles showed a significantly lower risk of less aggressive tumors for women in the highest tertile. [12]

Stone W T. *et al.*, conducted a review on **Obesity and cancer: Existing and new hypotheses for a causal connection** in 2018. The hypotheses regarding obesity associated cancer were reviewed and it suggests a major role for chronic inflammation in cancer risk, possibly involving dietary content. Evidence for a role of the kynurenine pathway in carcinogenesis then provides a potentially major link between obesity and cancer. [5]

Thomas J R. *et al.*, in 2017 conducted **a scientific review on Exercise induced biochemical changes and their potential influence on cancer.** It summarized that exercise is one of several lifestyle factors known to lower the risk of developing cancer and is associated with lower relapse rates and better survival.[10]

Rajarajeswaran. P and Vishnupriya. R in 2016 conducted a review on **Exercise in cancer** using guidelines for exercise prescription Review of recent literature by electronic search of MEDline (Pub Med), Cancer lit, Cochrane libraries, CINAHL. The study showed strong evidence for reduced risk of colorectal and breast cancer with possible association for prostate, endometrial and lung cancer with increasing physical activity. The study concluded

that exercise would help cancer survivors cope with and recover from treatment and extend survival. Physical exercise will benefit throughout the spectrum of cancer[14].

Sun W J. *et al.,* conducted a meta-analysis on **Obesity and risk of bladder cancer: A dose-response meta-analysis of 15 cohort studies** in 2015. The aim of the study was to find out the relation between obesity and bladder cancer. Findings from this dose-response meta-analysis suggest obesity is associated with linear increased risk of bladder cancer. [11]

Obama K *et al.* conducted a cross sectional descriptive study in 2015 on **Cancer related fatigue and physical activity among premenopausal cervical and endometrial cancer survivors in Japan.** The aim of the study was to examine the relationship between cancer-related fatigue (CRF) and physical activity in daily living in premenopausal disease-free cervical and endometrial cancer survivors. The study results suggested that the higher level of physical activity in daily living itself had no relationship with decreasing CRF among premenopausal cervical and endometrial cancer survivors. [7]

Castillo J J. *et al.* conducted a study in 2014 on **Obesity is associated with increased relative risk of diffuse large B-cell lymphoma: A meta-analysis of observational studies.** The aim of the study was to evaluate the relation between obesity and diffuse large B-cell lymphoma (DLBCL). The results showed that increased BMI is associated with higher RR of DLBCL regardless of sex and there was a linear association between BMI and DLBCL incidence. [3]

Pergola D G and Silvestris F. conducted a review in 2014 on **Obesity as a major risk factor for cancer.** It was concluded that obesity is responsible for approximately 20% of all malignancies. The association between obesity and higher cancer risk is mainly due to anthropometric parameters (BMI, weight increase and body fat and lifestyle factors) which activate different biological mechanisms.[4]

Arner E. *et al*. conducted a cross sectional study in 2014 on **Ceruloplasmin is a novel adipokine which is overexpressed in adipose tissue of obese subjects and in obesity-associated cancer cells.** Three different cohorts of subjects were used in the study. The result concluded that there is a causal relationship between adipose overexpression of ceruloplasmin and cancer development in obesity cannot be answered by these cross-sectional comparisons.[6]

Joshi K R. *et al.* conducted a case control study and meta-analysis on **association between obesity related adipokines and colorectal cancer: A case-control study and meta-analysis** in 2014. The aim of the study was to examine the association between obesity-related adipokines (adiponectin, leptin, resistin, interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α) and colorectal cancer (CRC) risk. The results suggested a negative association of leptin, positive associations of resistin and TNF-α, and null associations of adiponectin and IL-6 with CRC. [13]

Rogers Q L. *et al.*, in 2014 conducted a cross-sectional study on **Physical activity correlates and barriers in head and neck cancer patients.** The aim of the study was to determine physical activity correlates and barriers among head and neck cancer patients. The results showed that the strongest independent correlates of physical activity were social cognitive (i.e., enjoyment) and treatment-related (i.e., symptom index). Treatment-related activity barriers were frequent and significantly associated with reduced activity. Efforts to enhance exercise adherence in head and neck cancer patients should focus on optimizing enjoyment and managing treatment-related barriers. [8]

Kim J. *et al.* conducted a review in 2013 on **the effects of physical activity on breast cancer survivors after diagnosis.** Based on studies, this review suggested that the increased breast cancer mortality risk was higher among survivors with sedentary lifestyle compared with those who were physically active and survivors may have the greatest health benefits from walking at moderate intensity compared with other types of activities (e.g., recreational, sports, or occupational activities)[15]

METHODOLOGY

Design of study: Prospective observational study

Location of The Study: The study was carried out in a few wards of Eraviperoor grama panchayat, Pathanamthitta, after obtaining approval from the Institutional Review Board at the college.

Duration of study: 6 months (November 2018-May 2019)

Sample size: A sample size of 300 people was selected.

Study eligibility:

Inclusion criteria

- Population willing to participate

Exclusion criteria

- Patients who are not willing to participate

Study variables

- Patient demographic data such as: as age, sex, occupation, height and weight
- Social habits
- Family history
- Dietary habits
- Physical activity
- Coughing up blood
- Lumps in the body
- Changes in skin viz colour, itchy patches or lesions
- Ulcer
- Unexplained weight loss
- Altered bowel habits

Data collection tool:

Pre-designed data collection form was used.

Data collection procedure:

This prospective observational study was conducted in certain wards of Eraviperoor grama panchayat, Kerala. It was a 6 months study in which patients were recruited based on the inclusion and exclusion criteria.300 eligible study subjects were taken prospectively and the data was collected according to the approved pre-designed data collection form. All people were provided with a brief introduction regarding the study and confidentiality of the data.

Data required as per the data collection proforma was collected prospectively by means of interview.

Data Analysis:

The data collected were entered in Microsoft excel -2010 version and results were analysed and presented in tabular form as frequency and percentage.

RESULTS

In the six months study, 300 eligible populations were enrolled as per the inclusion exclusion criteria. The results are as follows**.**

1. DISTRIBUTION OF PHYSICAL ACTIVITY

TABLE No. 1: DISTRIBUTION OF PHYSICAL ACTIVITY

Sr. No.	PHYSICAL ACTIVITY	FREQUENCY	PERCENTAGE (%)
1	YES	156	52
2	NO	144	48
	TOTAL	300	100

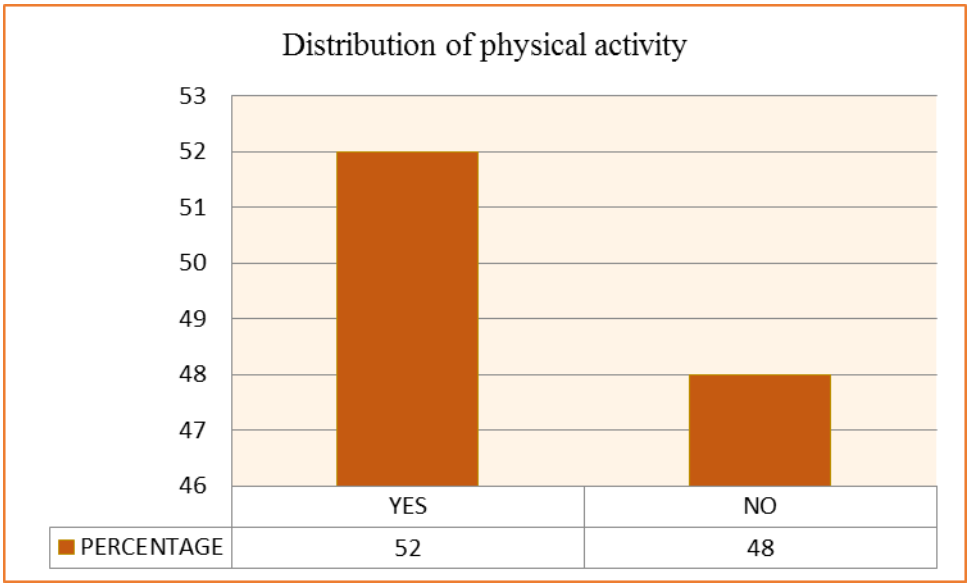

FIGURE No. 1: DISTRIBUTION OF PHYSICAL ACTIVITY

In this study, 52% of the total population was found to perform exercise and 48% did not.

2. DISTRIBUTION OF PATIENTS ACCORDING TO BODY MASS INDEX

TABLE No. 2: DISTRIBUTION ACCORDING TO BODY MASS INDEX

Sr. No.	WHO CLASSIFICATION	BMI(Kg/m^2)	FREQUENCY	PERCENTAGE (%)
1	Underweight	Less than 18.5	15	5
2	Normal weight	18.5-24.9	152	50.6
3	Over weight	25.0-29.9	107	35.7
4	Obese class I	30-34.9	21	7
	Obese class II	35-39.9	5	1.7
	Obese class III	Above 40	0	0
	TOTAL		300	100

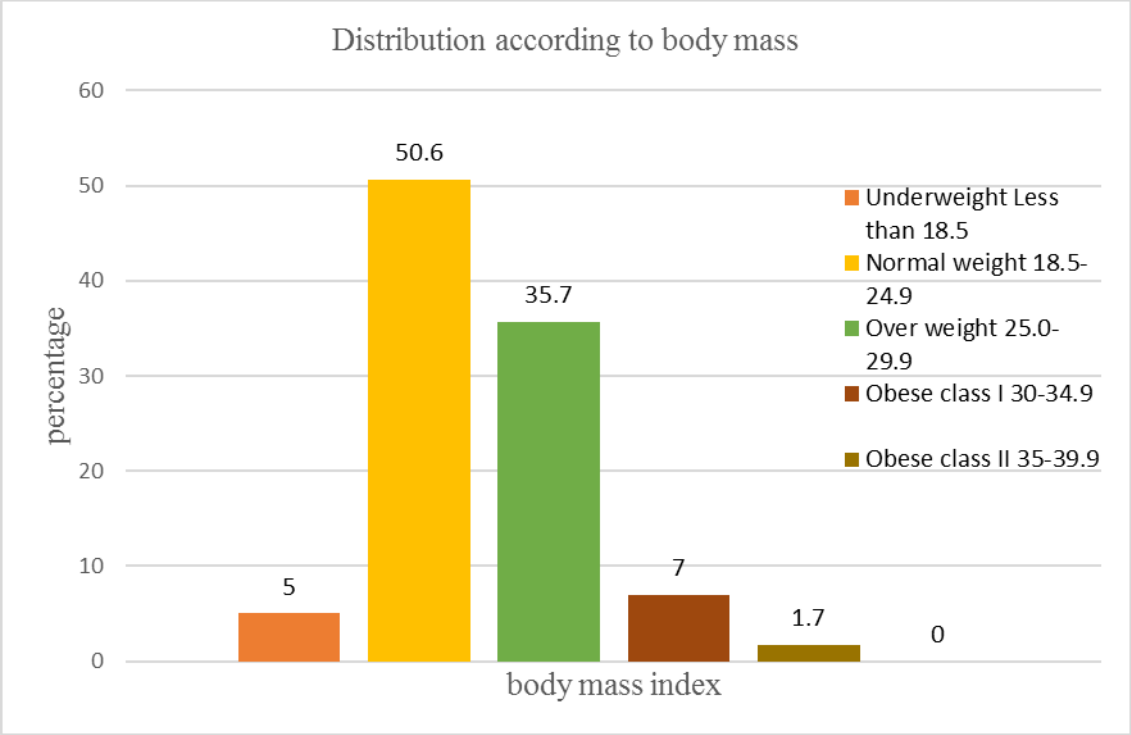

FIGURE No. 2: DISTRIBUTION ACCORDING TO BODY MASS INDEX

WHO classifies obesity by body mass index (BMI), which related to both percentage body fat and total body fat. The frequency is as follows:-

- 5% of the total population were found to be in the underweight category.
- 50.6% of the total population were found to weigh normal.
- 35.7% of the population belonged to over-weight category.
- A total of 8.7% of the population were categorized in the obese class viz, obese class 1, 2 and 3.

3. DISTRIBUTION OF SUBJECTS ACCORDING TO OBESITY

TABLE No. 3: DISTRIBUTION ACCORDING TO OBESITY

Sr. No.	Cancer	BMI Classification	Frequency	Percentage (%)
1	LUNG CANCER	Under weight	0	0
		Normal weight	0	0
		Over weight	0	0
		Obese class I	2	12.5
		Obese class II	1	12.5
		Obese class III	0	0
		Obese class IV	0	0
2	STOMACH CANCER	Under weight	0	0
		Normal weight	0	0
		Over weight	0	0
		Obese class I	1	6.2
		Obese class II	2	12.5
		Obese class III	2	12.5
		Obese class IV	0	0
3	MOUTH CANCER	Under weight	0	0
		Normal weight	1	6.2
		Overweight	1	6.2
		Obese class I	1	6.2
		Obese class II	1	6.2
		Obese class III	0	0
		Obese class IV	0	0
4	SKIN CANCER	Under weight	0	0
		Normal weight	1	6.2
		Overweight	1	6.2
		Obese class I	1	6.2
		Obese class II	1	6.2
		Obese class III	0	0
		Obese class IV	0	0

In this study, 12.5% of the total population having primary signs of lung cancer were found to be in class 1 and class2 obesity each. 12.5% of the population experiencing primary signs of stomach cancer were in class 2 and class3 obesity each. 6.2% of the population experiencing primary signs of both mouth and skin cancer were found to be in class 1and 2 obesity and in normal and overweight categories each.

DISCUSSION

ASSESSMENT OF OBESITY IN INDUCING CANCER:

In this study, lung cancer and stomach cancer were found to have a clear association with obesity (12.5% each – obese class 1 & 2). This was due to increasing sedentary lifestyle and unhealthy food habits. According to a study conducted by Giovanni D. et al., (2014) obesity is responsible for 20% malignancies. They concluded that anthropometric parameters and lifestyle factors which activate different biological mechanisms are responsible for this.

ASSESSMENT OF PHYSICAL ACTIVITY IN INDUCING CANCER:

In our study, we observed that 52% performed exercise whereas 48% did not. Both lack of physical activity and various other environmental factors can act as additive etiological factors that would lead to cancer. In a study conducted by Mi K. et al., (2018) concluded that a 6-week home-based mixed aerobic and resistance exercise program was feasible and effective for increasing physical activity level and physical fitness in cancer survivors. P. Rajarajeswaran and R. Vishnupriya (2013) conducted a review on Exercise in cancer. The study showed strong evidence for reduced risk of colorectal and breast cancer with possible association for prostate, endometrial and lung cancer with increasing physical activity. Physical exercise will benefit throughout the spectrum of cancer.

CONCLUSION

Cancer is a major disease of concern in the present scenario. Early detection helps in early cure of the disease. This study was aimed at evaluating the primary signs of various cancers as well as the etiological factors associated with it. A total of 300 population was interviewed to analyse these factors.

The study has shown that the most commonly occurring signs of cancers are coughing up blood, breathlessness, decreased appetite and unexplained weight loss. Sedentary lifestyle

would increase the levels of adipocytes which elevates the body mass index and can cause cancers and cardiac dysfunctions. The signs and symptoms occur in old age adults and primarily in males that is due to a combined effect of lack of physical activity and use of alcohol and tobacco.

Occupational exposure plays a significant role in skin cancer. The early signs of skin cancer such as grey discolouration, itchy patches occur predominantly in farmers due to increased ultraviolet exposure. Overuse of cosmetics also is attributed to this.

Thus, our study strongly suggests more effective methods for creating awareness regarding the importance of early detection of cancer signs which would aid at improving prognosis of the disease. As well as programmes to increase the public awareness of harmful etiologic factors such as smoking and alcohol, could lead to its reduction and thus reduce the resulting harmful consequences.

There are also some limitations in this study by its sample size. Time constraints of six months do not allow us to perform a follow up of those who showed the signs to determine if they occur due to any other reasons. There was no control group in our study to compare the results. There is limitation owing to response bias to the questionnaires. Also, no laboratory tests were performed to confirm diagnosis.

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