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Review Article

Physical Activity as Primary and Secondary Prevention of Pancreatic Cancer Risk

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Abstract

Physical activity is a panaceum, working like miraculous drug for all humans, for healthy and for sick people. Almost everyone can smile and take deep breath. Under the surveillance of family doctors or specialists, we can perform on daily basis physical activity, from few seconds to many hours. Being active, means less seating, less drinking alcohol, keeping proper body weight.

Physical activity reduces cardiovascular diseases, neoplasm including cancers, stress, anxiety, depression and probably protects against hundred more ailments and bad behaviours.

The best examples is aerobic activity as climbing the stairs, cross-country skiing, brisk walking, cycling, aerobics or dancing when the more blood is supply to all vital organs, delivers oxygen and nutrients. On many ways helping our cells to respond to insulin, reduces inflammation, improving immune system function, decrease exposure of carcinogens in the digestive system.

Leading causes of death aged over 45 are chronic diseases, coronary heart diseases, cerebrovascular diseases, cancers, dementia and Alzheimer disease. All this ailments need more oxygen and others vital nutrients. Just exercising only 15 minutes daily, add 3 years of life, 30 min a day 4 percent more and 50 - 120 minutes a day prolong our life span additionally another 5 percent. It is additional few months of life. Lack of physical activity is a main reason for developing degenerative diseases. More new scientific evidence pointed out that sedentary lifestyle are responsible mostly for cancers, cardiovascular diseases, diabetes, and Alzheimer diseases. Physical activity can reduce oxidative stress, preserve DNA, stabilize proteins of telomeres and reduce telomere shortening.

Physical activity should be perform as early as possible to the last years of our life. Adults who were overweight or obese as teens had a 60 percent higher risk of pancreatic cancer (PC).

Mostly, people who exercise, are not smokers. Tobacco is the main culprit of PC.

Our paper has emphasise the role of physical activity as preventive measure and try to convince everyone for higher (greater) prevalence of regular exercises in society.

Keywords: *Physical Activity; Pancreatic Cancer; Exercise*

Introduction

The comprehensive review of scientific literature have indicated benefits of exercise among people while mitigating injury risk and accidents. On other side, inactivity is considers as harmful, detrimental on health. Optimizing physical activity in general population from minimum levels of 15 minutes a day to 30 minutes a day of moderate-intensity or 75 minutes a week of vigorous-intensity exercise is associated with health benefits [1-3]. The current public health guidelines issued for adults at least 150 minutes of moderate-intensity aerobic activity (e.g. brisk walking, cycling, aerobic, dancing, climbing the stairs) per week to reach the minimum amount to reduced risk of chronic diseases [3].

Cancer mortality rates declined with physical activity and is consider as a cancer preventive measure. Physical activity has strong evidence in reducing the risk of colon cancer, breast cancer, endometrial cancer and possibly reduces the risk of 13 other cancers, including pancreatic cancer. Physical activity is essential for well-being. Also, physical activity perform during cancer treatment is associated with better outcomes, alleviate symptoms such as pain, nausea, fatigue, anxiety and depression and help to maintain functional capacity.

Most of primary care visits around the world are for prevention and treatment of preventable chronic diseases but only small percentage of patients have being ask about physical activity [1].

Many physiological processes are regulated by exercise training to reduced some cancers mortality, directly or non-directly. This physical activity influences tumor physiology and metabolism, reduces incidence, tumor growth or tumor multiplicity [4]. More studies are needed to establish these mechanisms from limited to convincing medical evidences. But strongest link is found for colon cancer, weaker for postmenopausal breast cancer and endometrium cancer [5,6]. Decreases risk is associated for lung, prostate, ovary, gastric and pancreatic cancer when physical activity was performed and is estimated as risk reduction in the range 25% - 30% [5,7,8]. Also, what earlier was rare to find in literature, occupational physical activity plays a positive role to reduce risk of pancreatic cancer [9]. Exercise can protect DNA and telomeres, while shorter telomeres were associated with faster aging and higher risk of pancreatic cancer. Physical regular activity protect against shortening of telomeres, leading to reduced oxidative stress and preservation of DNA and telomeres [10]. Some meta-analysis studies mention significant reduction in pancreatic cancer risk with moderate activity, occupational and with higher levels of total activity [11].

Actually, more than 10 percent of world's population is obese and one-third of world is overweight and suffer health problems due to their weight. These trends were on the rise in the last decade. Unhealthy diet, no adequate amount of physical activity or urbanization are the main cause of overweight and obese, resulting in the risk of many diseases. The leading cause of death for a high BMI are cardiovascular disease, follow by diabetes, but also certain cancer including pancreatic cancer [12,13]. Exocrine and endocrine glands of pancreas are induced negatively, causing dysfunction of this organ by obesity, diabetes and aging. The consequences may result in malabsorption and malnutrition. If the problem starts earlier with higher BMI, the higher risk of pancreatic cancer and others malignancies [13]. Voluntary wheel running, exercises on tread mill, chronic swimming in rats induced pancreatic secretion, pancreatic weight, protein content and enzyme activity. Any kind of physical activity, voluntary or compulsory can cause better synthesis and secretion of pancreas in rats [12].

Sufficient evidence supporting relationship between overweight and obese population and cancer of esophagus, colon and rectum, liver, gallbladder and biliary tract, pancreas, breast, uterus, ovary, kidney, need global attention, strategies and proper execution [14,15].

When it comes to pancreatic cancer prevention, physical activity plays only potential role, being stated as suggestive or limited suggestive. But consistent physical activity, for high versus low, was found statistically significant in reduction of pancreatic cancer risk [16]. Greater body fatness is convincing risk of pancreatic cancer and being active helps reduce pancreatic cancer risk by control body weight, improve hormone levels and immune system [17].

Methods

Over 20 studies conducted for the protective effect of physical activity of pancreatic cancer, found the evidence as limited-suggestive with average risk reduction between 40 - 50 percent [5]. Meta-analyses of 28 studies reported with a 25% to 30% decrease in pancreatic

cancer risk, suggested reduction in abdominal fat as a mechanism linked to this neoplasm [6]. Another epidemiological case-control and cohort studies suggested that physical activity itself may be protective against pancreatic cancer [7]. In prospective studies, people in the highest of moderate activity had a significant reduction in the risk of pancreatic cancer compare with the lowest level of activity [8]. Protective association was found also between leisure time activity and pancreatic cancer risk in multiple cohort and case-control studies [9]. However, from twenty-five studies, significant reduction in pancreatic cancer risk were seen with higher levels of physical activity [11].

Some of the pancreatic risk factors and physical activity

We know a lot of benefits of regular physical activity in general population, and we know of detrimental effects of inactivity on health. Optimizing physical activity for healthy people, with disabilities, in any group of age, is very important task, leading to reduced risk of diseases. Health professionals should determine intensity, frequency, duration and mostly cardiac and pulmonary status. Family doctors have a special role to influence and motivate their patients to sustain in the adoption of regular physical activity [1,2].

Convincing and plausible risk factors of pancreatic cancer:

1. Smoking
2. Obesity and overweight
3. Diabetes type II
4. Aging
5. Chronic inflammation
6. Heavy alcohol consumption
7. Physical inactivity
8. Genetic predisposition
9. Red meat
10. Parity

Mechanism of exercise

When we are running, jogging, swimming, biking etc., we are reducing the risk of many cancer, including pancreatic cancer. Evidence based medicine support physical activity and concluded that exercise reduces the risk of 13 cancer or more. The metabolic, antioxidant, anti-inflammatory, hemodynamic and psychophysical aspects are well know during activities, protect against major chronic diseases. People who exercise are more likely to switch to healthy lifestyle changes and vice versa, sedentary ones would avoid healthy habits [9].

Alteration of sex and metabolic hormone levels

Exercise decrease sexual (estrogens, androgens) and metabolic (insulin, glucose) hormones [5]. Concentration of plasma glucose, insulin resistance and hyperinsulinemia have been studied and found positive association for pancreatic cancer. Data indicate higher prevalence of diabetes among people with body mass index over 25 kg/m^2 and for people whose smoked more cigarettes in the past [8]. Lowering insulin level, improved insulin resistance, increasing insulin stimulated synthesis of glycogen in muscles, elevated tolerance to oxidative stress is crucial to protect us against pancreatic cancer. This goal can be achieve by different form of exercise. Leisure time physical activity reduces the risk of pancreatic cancer with 11 percent particularly among young population. Evidence suggests a protective effect of occupational physical activity on pancreatic cancer incidence. It is well recognized that insulin resistance, hyperinsulinemia and hypoglycemia are the probable culprit in pancreatic carcinogenesis [9]. A systemic review of epidemiological studies have found significant reduction with pancreatic cancer incidence or mortality due to insulin sensitivity improvement and attenuated glucose intolerance [9,11].

Alteration of body fat

Nearly 70 percent of deaths are related to high body mass index and prevalence of obesity is increasing in the last decades. Reduction of abdominal fat depots improve insulin sensitivity [6]. Hyperinsulinemia and activation of insulin-like growth factor 1 which provokes cell proliferation is associated with hyperglycemia [7,11].

Change in intestinal transit time of meal is important factor risk for many ailments

Greater amount of food, have create, particularly in short time, problems for all body organs like heart, brain, kidney, digestive system but also for pancreas. The longer are inside, the more cancerogenic substances infiltrate our body and circulating in the blood vessels, promote tumors growth and increase body weight. Cooking meat in high temperature like red meat, smoking meat, produces harmful heterocyclic amines, polycyclic aromatic hydrocarbons and positively associate with pancreatic cancer. Most studies indicate double the risk of disease [2,7,8].

Change in immune function which is responsible for infections

Exercise can enhance immune cell proliferation and natural killer cells. Chronic inflammation can damage many vital organs, including pancreas. Chronic pancreatitis is plausible risk factor for pancreatic cancer. Some of the studies have found associations between gallstones and cholecystectomy, which spurred the levels of the gastrointestinal hormone. This process can cause pancreatic hyperplasia and hypertrophy. Hypergastrinemia stimulates pancreatic cell growth. Gastritis reduces absorption of anti-oxidants. Whereas, higher level of secretin has trophic effects on the pancreatic ductal epithelium [7,9,12].

Implementation of physical activity

The main task is to implement physical activity among society, convince them to the regular exercise outdoors and indoors and explain how it works on the body [14].

We can determine physical activity as:

- Low Intensity
- Moderate
- Vigorous
- Transport – Walking and/or Cycling as a form of Commuter Activity
- Occupational
- Recreational
- Leisure-Time

Numerous studies link reduction in pancreatic cancer risk with higher levels of total and occupational physical activity but nonsignificant reduction with increasing transport activity. Mainly to randomized trials, the effects of exercise training have found convincing reductions in body weight, body mass index and waist and hip circumferences in people. It was reduction also of abdominal fat [11]. Despite a positive association between physical activity and pancreatic cancer, some papers didn't confirm this relation for occupational activity but confirm as protective factor for leisure-time exercise, with 35 percent decrease in the risk [13].

As long as pancreatic cancer is most deadlier of all cancer and so far less establish what else after tobacco is causing it, probably most scientific papers agree that being physically inactive ranks second to smoking habit to the cancer burden [15]. From observational to meta-analyses paper, physical activity indicates very important benefits for humans health and may reduce the risk of pancreatic cancer [1,2,4].

More than 90 percent of the pancreas are exocrine glands, which secrete digestive enzymes and are important for intestinal digestion. Whereas obesity, type 2 diabetes and aging can make dysfunction of these glands and cause malabsorbtion and malnutrition. It being the fact that exocrine glands are the major source of enzymes responsible for food digestion. Either chronic swimming, voluntary wheel running or any kind of endurance exercise may accelerate exocrine pancreatic secretion, increased pancreatic weight, protein content in rats. Moderate exercise training appeared more protective than vigorous activity [11,12].

Results

Only tobacco use is an well-established cause of approximately 25 percent of pancreatic cancer [17].

According to American Institute for Cancer Research, pancreatic cancer risk could be preventing annually by 39 percent through healthy diet, regular physical activity and proper body weight [5]. Body fatness like body mass index and abdominal fatness (waist circumference, waist-to-hip ratio) showed a statistically significant increased of pancreatic cancer risk, particularly with increasing BMI from < 25 in early adulthood to > 30 at recruitment. Greater waist circumference increased risk a 2% per 1 cm, meta-analyses showed an 11% increased risk per 10 cm. Highest waist-to-hip ratio in meta-analyses studies reported a 19% statistically significant increased risk per 0,1 units. Moderate physical activity has found in the United States a significant 55 % reduction of pancreatic cancer [7,17]. An inverse relation was observed for moderate activity among individuals with higher a BMI of at least 25 kg/m^2 but was not associated with a BMI of less than 25 kg/m^2. People with a BMI of > 30 had a 72% increase in the risk of pancreatic cancer [8].

Our summary of literature search identified multiple abstracts and full text reviewed eligible for meta-analysis of physical activity and pancreatic cancer risk. There was a protective, suggestive association for leisure time physical activity like > 150 min/wk of moderate or > 75 min/wk of vigorous with median age of < 50 years but no effects in 50 to 60 years old [9]. The leisure time physical activity in case-control study in the Czech Republic in 2006 - 2009 reported a statistically significant inverse association and a 35 % decrease pancreatic cancer risk [13].

Discussion

Whereas tobacco use is establish as risk of pancreatic cancer, body fatness was found as convincing. Evidence for physical activity is less consistent, mostly as limited – no conclusion [17]. But overwhelming evidence indicates that physical activity may positively protects against obesity, diabetes type 2 and is one of the best modifiable factors [1-3]. The evidence of protective role of physical activity and pancreatic cancer risk involves decrease in adiposity, decrease metabolic hormones, reduce glucose intolerance and BMI. Physical activity improves insulin resistance, elevated tolerance to oxidative stress, and therefore could attenuate risk. The most protective effect were observed amongst people < 50 years old. Higher levels of total activity like moderate activity was found more protective [5,8,9,11].

Conclusions

Influence of physical activity on incident and mortality of pancreas cancer [13,15]:

1. Decreases glucose levels, increases utilization of glucose
2. Affects lipid profile
3.Reduces body fat
4. Diminish the risk of type2 diabetes
5. Decreases DNA damage
6. Increases effectiveness of antioxidant enzymes
7. Influences cell proliferation and apoptosis
8. Reduces inflammation
9. Improves the immune system
10. Protects against shortening of telomers
11. Can slow aging processes and increases longevity.

Multiple studies underline the relationship between moderate-vigorous physical activity and a reduction in pancreatic cancer risk within 25% to 30% [6].

Exercise has been found as tremendous improvements on healthy individuals and patients with pancreatic cancer. Positive outcomes were found as larger physical capacity, better functional ability, to become better with quality of life and sleep quality [10].

Conflict of Interests

The authors declare no conflict of interests regarding the publication of this article.

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