

## RESEARCH ARTICLE

# Role of Leisure Time Physical Activity in Cancer Prevention: Awareness and Practice among Medical Students at Cairo University

Tarek Tawfik Amin<sup>1</sup>, Alshaimaa Mohamed Abdelmoaty<sup>1\*</sup>, Alaa Fouad Abd El Badei<sup>2</sup>, Hamzah Ahmed Obaid<sup>3</sup>, Esraa Mowafy Mohamed<sup>3</sup>, Alaa abosheab<sup>3</sup>, Ali Abdulkarim<sup>3</sup>, Omar Abdelsadek<sup>2</sup>

### Abstract

**Background:** Physical inactivity is accountable for a sizable proportion of breast and colorectal cancers and other non-communicable diseases. The higher the individual's awareness about the protective role of physical activity (PA) in reducing chronic disease, the greater the adoption of PA will be. **Objectives:** To determine the level of leisure-time physical activity (LTPA) and awareness towards the role of LTPA in cancer prevention among a sample of Medical students at Cairo University, Egypt. **Subjects and Methods:** A cross-sectional study, with multistage sampling (a total of 519 students from second to six year students) and a self administered questionnaire covering the study objectives. **Results:** A significant decrease in the actual level of LTPA was noted with students' year of enrollment at the medical school. However, their knowledge about roles of PA in preventing coronary heart, elevated blood pressure, and elevated cholesterol exceeded 80%, with steady increase in relation to the year of enrolment from the second to 6th years. Their knowledge about PA preventive influence for cancer was low irrespective of the year enrolment (32.2% for prevention of colon and 16.2% for breast cancers). The main sources of knowledge about the role of PA in cancer prevention were the internet and media (77%). **Conclusion:** The students demonstrated a decline in their LTPA coupled with poor knowledge about the role of LTPA in cancer prevention. Revision of the current curricula should be considered with inclusion of more information on the role of LTPA in cancer prevention to facilitate better awareness of medical students and through them their future patients.

**Keywords:** Cairo University- cancer prevention- Egypt- medical students- physical activity

*Asian Pac J Cancer Prev*, **18 (1)**, 135-143

### Introduction

Recent projections for cancer incidence are estimated to be increased by 3 folds by 2050 compared to 2013 (Siegel et al., 2015). In Egypt, according to 2012 estimates, 24.5% is the probability of dying between the ages of 30 and 70 years attributed to four main non communicable diseases; hypertension (HTN), coronary heart disease (CHD), diabetes mellitus (DM) and obesity (Mendis et al., 2014).

Control of the predisposing risk factors- including physical inactivity- is the key for non-communicable diseases prevention; being an independent risk factor for hypertension (HTN), coronary heart disease (CHD), diabetes mellitus (DM), obesity and osteoporosis (United States Department of Health and Human services, 1996). Leisure-time physical inactivity or sedentary life style is associated with diabetes and arterial hypertension (Pitanga & Lessa, 2005), and may result in an increase

in the number of hospital admissions (Pitanga & Lessa, 2008). The higher the individual's awareness about the risk factors of chronic diseases and the protective role of Physical activity (PA) in reducing them the more likely the individual adoption of PA compared to those who are not (Veluswamy et al., 2014).

Physical inactivity 'non-engagement in leisure time physical activity (LTPA)' could attribute for 10 to 16% of breast and colorectal cancer cases respectively, 11% of ischemic stroke, 21.5% of cases of ischemic heart disease and 14% of diabetes (Bull et al., 2004). Furthermore the lack of LTPA is attributed to annual 2 million deaths globally; it increases the individuals risk by 20 to 30 % of all causes mortality compared to those who engage themselves in a moderate intensity activity of 30 minutes most of the week days (Vuori, 2004). PA reduces the risk of colon, breast and endometrial cancer by 25 to 30% with an emerging evidence for its beneficial effect on lung, ovarian, prostate and other gastrointestinal cancers. The

<sup>1</sup>Public Health and Community Medicine, Faculty of Medicine, <sup>2</sup>Interns, Faculty of Medicine, <sup>3</sup>Medical Students Faculty of Medicine, Cairo University, Egypt. \*For Correspondence: alshaimaamh@kasralainy.edu.eg ; alshaimaamh@yahoo.com

accumulation of evidence about the role of PA being a modifiable risk factor of cancer has recently attracted the attention (Leitzmann, 2011). A fairly strong evidence is now been considered for the role of PA in the etiology of different types of cancer. A strong convincing causal link between PA and cancer colon have been studied, limited evidence suggestive for the prevention of premenopausal breast cancer, prostate, lung, ovarian gastric and pancreatic cancer, weak evidence for post menopausal breast cancer and probable evidence for endometrial cancer were found (Kurk and Czerniak, 2013).

PA protective effects on cancer risk is thought to be through interrelated pathways; improvement of immune function, decrease in adiposity, changes in biomarkers and insulin resistance, decrease in sexual and metabolic hormones and reduction of inflammation. PA may reduce the risk of cancer by 20-30 % (Kurk & Czerniak, 2013), therefore it is logical to target LTPA as a possible intervention aiming at cancer prevention for a healthy population (Sangrajrang et al., 2013). The protective role LTPA is more likely if stemmed from intentional activity with moderate and vigorous intensity levels rather than the majority of daily occupational and household activities (Kushi et al., 2006). Although transportation activities, household and occupational activities contribute to overall health; LTPA is the most modifiable type of PA and is the main target for health promotion (Sharratt and Hearst, 2007).

The specific dose of PA for prevention of cancer is not clear yet (Friedenreich et al., 2010). It was recommended that PA should exceed a minimum of 150 minutes per week for greatest benefit of cancer reduction and general health benefit as suggested by research. The American Cancer Society (ACS) recommended at least 225 minutes per week for colon cancer risk reduction of moderate to vigorous intensity PA (Kushi et al., 2006). It was also recommended that adults should participate in at least 60 minutes daily PA or 420 minutes per week of moderate intensity for risk reduction of several types of cancer, including cancers of the breast, colon, prostate, and endometrial cancer (Kushi et al., 2006).

Knowledge about the pattern, levels of LTPA and its determinants may serve as the basis to establish interventions encouraging LTPA among different populations with the development of public policies to prevent physical and mental co-morbidities (Rocha et al., 2011). Medical students represent the future providers responsible for patients' advocacy and management; they will be responsible for counseling, acting as moving platforms of information for their patients and the community at large (Daharamsi, 2010). In Egypt there are no previous studies addressing the awareness and behavior of medical students towards the role of PA in cancer prevention. This study aimed at determining the pattern, level of LTPA and the awareness towards the role of PA in cancer prevention in a sample of Medical students at Cairo University, Egypt.

## Materials and Methods

### Setting and Design

This cross-sectional study was conducted in Kasr Al Ainy Medical School, Cairo University, Egypt, one of the ancient and prestigious medical schools in Africa and the Middle East, along the past centuries it adopted a traditional curriculum, and teacher-centered education. Each year Kasr Al Ainy Medical school graduates about 900-1,000 interns (ranked the 1st based on the number of graduates in Egypt and the Middle East). Along the different years of enrollment at the medical school, the number of students ranged from 800 to 1000, these cohorts pass from the academic departments during the first three academic years, in the fourth year students are exposed to community medicine and start the clinical patients' encountering. Health promotion and chronic disease prevention is delivered by many departments from the second academic year of the program in a fragmented, non-comprehensive fashion "some topics are covered by Community Medicine curriculum; some lectures are covered by other departments (internal medicine), and extracurricular activities (health awareness campaigns)".

### Sampling Procedure

The study targeted Egyptian Medical students at Kasr Al Ainy Medical School during the period from April 15th to June 30th year 2015. The sample size was calculated using open-epi online calculator (<http://www.openepi.com/SampleSize/SSPropor.htm>) and applying the formula:

$$\text{Sample size } n = [\text{DEFF} * Np (1-p)] / [(d^2/Z^2_{1-\alpha/2} * (N-1) + p(1-p))]$$

n=the desired sample size, Z=standard deviation at 95% confidence level (1.96), p is the proportion in the target population estimated to have a particular characteristic. P was therefore the proportion of students with knowledge about the preventive role of PA in chronic diseases prevention. Since there are no previous studies regarding this topic in Egypt, p is taken as 50%, the required sample size was 384 students. Adding a 20% for the possible non-response, the final sample size should include 461 students. Multistage sampling was used for the recruitment of study participants, in the first stage we applied an appropriate sampling fraction, the minimum number required from each year from students at each year in the college (2nd, 3rd, 4th, 5th, 6th year), another sampling fraction was applied to guarantee representation of the both genders. In the second stage we used systematic random sampling method to select students in each year where every fifth student (10% sampling) was selected using statistical software (SPSS 21.0, Statistical package for Social Science) through employing of the students' academic number. Those selected were received an appropriate orientation regarding the objectives and impact of the study, with emphasis on their right not to participate.

### Data Collection Technique

Participants were invited to fill out a self-administered anonymous questionnaire form to gather information on

the following components:

a- Socio demographics: age in years, gender, year at the college, previous receiving educational/orientation about the role of PA in disease prevention.

b- Assessment of pattern and levels of intentional leisure-time PA (LTPA): The Global Physical Activity Questionnaire (GPAQ) version 2.0 was used for data collection and accompanied with a modified show card derived from World Health Organization STEPwise approach to Chronic Disease Risk Factor Surveillance instrument (WHO STEPs, <http://www.who.int/chp/steps/GPAQ/en/index.htm>) which provides examples of types and intensity of PA, modifications were carried out to suit the local community (Amin et al., 2012). We employed the GPAQ to assess the frequency (days) and time (minutes/hours) spent in doing moderate-and-vigorous-intensity PA during a typical week in the leisure-related. GPAQ is derived from International Physical Activity Questionnaire (IPAQ) ([www.ipaq.ki.se](http://www.ipaq.ki.se)). GPAQ is validated and widely employed to assess PA pattern. Previous studies have shown that GPAQ has good test-retest repeatability and relative validity (Bull et al., 2009; Trinh et al., 2009).

c- Knowledge about the role of PA in cancer prevention: Several items were adopted from the available literature (Bennet et al., 2009; Tylor et al., 2013; Amin et al., 2014), the primary form contained 17 items inquiring about:

- The duration (minutes), frequency (days/week) of PA for an average adult to become physically active (two items in multiple options format), correct responses of these two times were summed for each participant as a correct answer),

- Three items about role of PA in prevention chronic diseases namely elevated blood pressure (hypertension), coronary heart disease and lowering of blood cholesterol (three items in true-false-don't know format).

- Two questions were included to inquire about the role of PA in preventing cancers namely colon and breast in multiple options format.

- Further inquiries then followed about the role of home chores in cancer prevention, the beneficial role of PA in cancer prevention through being lifelong-long term, intensity required for cancer prevention, and its value in cancer cases (five items in true-false-do not know format).

- The duration (minutes/day), frequency (days/week) and intensity of PA recommended for cancer prevention were added (three items with multiple options format, of which items related to the frequency and duration required for PH to prevent cancer were summed for each participant).

- One question was added to assess the value of PA even after cancer diagnosis (with options of true, false and don't know).

- Finally two open ended questions were added to probe the participants' knowledge about the prevention of common cancer namely colon and breast for which mentioning of PA was considered to be a correct answer.

- The sources of students' knowledge were assessed by an open ended question.

- Three items were in the provisional data collection form had been removed after the pilot testing, and they were inquiring about the possible mechanisms of PA in cancer prevention. The data collection tool was administered in English as it is the formal educational language used in the college.

- The tool was piloted on 44 students in the 2nd year conveniently chosen (beyond the sample size and they were excluded from the sampling frame) to clarify terms and assess any potential difficulty in questionnaire administration.

- During the pilot phase the provisional data collection (included the 17 items) form yielded an internal consistency reliability coefficient (Cronbach' alpha) of 0.6 which was increased to 0.7 after removal of three items mentioned about the mechanisms with a validity coefficient (criterion-related coefficient 'r') of .731.

#### *Definitions and Analysis Procedures*

Data collection and processing followed the GPAQ version 2.0 analysis protocol. According to the GPAQ analysis framework, LTPA is classified into the following levels:

- Sufficiently active: Participants who met the LTPA recommendations meeting the minimum recommendations of 30 minutes of moderate-vigorous intensity LTPA or a total of 150 minutes/week of moderate vigorous intensity/week.

- Insufficiently active: Those ranged from 1-149 minutes of moderate-vigorous intensity LTPA/week.

#### *Statistical Analysis*

Data entry and analysis were carried out using SPSS 21.0 (SPSS Inc. IBM, USA) and Epi-Info version 7.0 (Centers for Disease Control and Prevention, Atlanta GA.). Data cleaning and analysis were performed according to GPAQ protocol. Elimination was done in response to:

a) Missing information on one or more items (12 records). b) Over-reporting of total minutes spent in LTPA /day ">1,440 minutes/day" (11 records). The total eligible records for final analysis were 518. For LTPA, Shapiro-Wilk test for normality revealed a statistical value of 0.7 (p=0.001) for hours of LTPA/week which rejects normality. LTPA was expressed using median and interquartile range (IQR), mean was also reported. Nonparametric tests of significance namely Kruskal Wallis (one way) and Mann Whitney were used for comparison of continuous variables. Categorical variables were reported as proportions with 95% confidence intervals (CI); Chi-square test for trend was used when appropriate. For the knowledge section, for the first two questions correct responses to both were considered as a single correct choice, for the other items correct response was assigned one point while the incorrect and no response were assigned nil. Items relevant to physical activity and its role in chronic disease prevention including cancer were considered for analysis with a total score of 14 points. The knowledge score was expressed using median, interquartile range and mean, using Mann Whitney and Kruskal Wallis tests for comparison. P value of <0.05 was

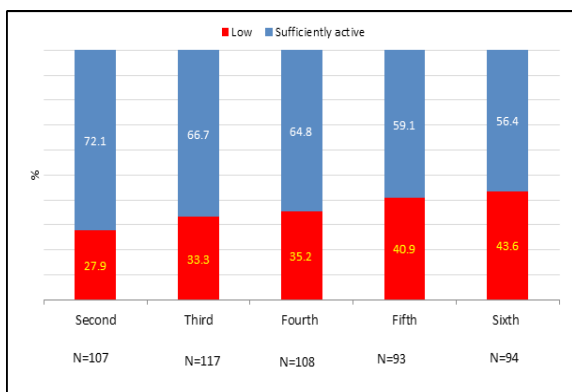


Figure 1. Leisure Time Physical Activity Levels Among Medical Students in Relation To Year of enrollment, Cairo University, Egypt

considered significant.

Ethical Considerations

Participants were provided with full explanation of the study with the emphasis on the right of not to participate.

Results

A total of 519 medical students were included, 107 from the 2nd year, 117 from the 3rd, 108 from 4th, 93 from the 5th and 94 from the 6th year, 265 (51.3%) of the respondents were males and 253 (48.7%) were females, age ranged from 19 to 23 years, mean 21.6±1.5 years. The male to female ratio was 0.9 for the 2nd year (50 males/57 females), 1.0 for the 3rd (58 males/59 females), 0.9 for the 4th year (50 males /58 females), 1.7 for the 5th year (57 males/36 females) and 1.1 for the 6th year (50 males/44 females).

Table 1 depicts the LTPA both vigorous and moderate in hours/week for students at different years of enrollment

Table 1. Leisure-Related Physical Activity Patterns (hours/week) and Sedentary Time (hours/day) of The Included Medical Students by Their enrollment Year at Medical School, Cairo University, Egypt

Year of enrollment	Vigorous physical activity	Moderate physical activity	Total Physical activity	Sedentary
<b>Second (n=107)</b>				
Mean (95% confidence)±SD	2.1 (1.5-2.6)±3.0	4.1 (3.1-5.1)±5.1	6.2 (4.9-7.3)±6.1	6.5 (5.9-7.0)±2.6
Median (IQR)	1.0 (0.0-3.0)	2.8 (0.0-6.0)	3.6 (1.0-7.3)	7.0 (4.0-9.0)
<b>Third (n=117)</b>				
Mean (95% confidence)±SD	2.6 (2.0-3.3)±3.3	3.3 (2.5-4.1)±4.4	5.9 (4.8-7.0)±5.9	6.2 (5.8-6.7)±2.7
Median (IQR)	1.0 (0.0-3.3)	2.0 (0.0-5.0)	3.2 (1.0-7.8)	6.0 (4.0-8.0)
<b>Fourth (n=108)</b>				
Mean (95% confidence)±SD	1.9 (1.4-3.1)±3.1	4.4 (4.2-6.1)±4.5	7.4 (5.8-8.9)±7.8	6.6 (6.5-7.1)±2.8
Median (IQR)	0.5 (0.0-3.0)	2.6 (0.0-7.0)	3.4 (1.0-7.7)	7.0 (4.0-9.0)
<b>Fifth (n=93)</b>				
Mean (95% confidence)±SD	1.7 (1.9-3.5)±4.1	3.7 (2.9-4.6)±3.9	5.4(5.1-7.7)±6.2	6.4 (5.8-7.0)±2.8
Median (IQR)	1.0 (0.0-3.5)	2.0 (1.0-5.5)	2.8 (1.0-6.5)	6.0 (4.0-9.0)
<b>Sixth (n=94)</b>				
Mean (95% confidence)±SD	1.9 (1.3-4.8)±6.9	3.1 (1.9-6.2)±4.5	5.7 (5.2-7.2)±6.4	6.1 (5.5-6.6)±2.8
Median (IQR)	1.0 (0.0-2.5)	2.0 (0.0-6.0)	2.9 (1.0-7.0)	6.0 (4.0-8.0)
P value*	0.026	0.085	0.676	0.62

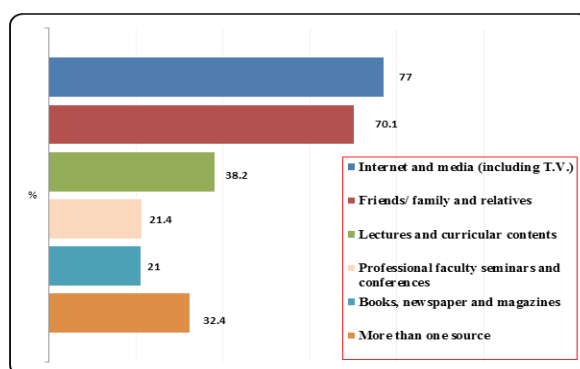


Figure 2. Sources of Knowledge about Role of PA in Cancer Prevention as Mentioned by the Students

in medical school, for vigorous LTPA, the results demonstrated a downward trend in this domain by year of enrollment where it was maximum for those in the second and third year followed by decline in the following years (highest decline among those in the 6th year), (Kruskal Wallis P=0.026), the moderate and the total LTPA also show the same trend but without statistical significance. Table 1 also displays the sedentary behavior among the included medical students by year of enrollment which shows a progressive decline in the hours/day spent in sedentarism from the second year of 7 hours/day to 6 hours in the final year. Out of the included participants, 185 (35.6%) were classified as being with low LTPA level (<149 minutes/week), more among medical students at 5th and 6th years (41.53 and 38.55 respectively), while those classified as sufficiently active were 334 (64.4%).

Figure 1 demonstrates the classification of medical students in relation to the LTPA pattern, there is a significant increase of those being classified as being low with the year of enrollment in the medical school (Chi-square for trend=18.3, P=0.001).

Males were significantly more active in the vigorous

Table 2. Leisure Time Physical Activity (hours/week) and Sedentary Behavior (hours/day) by Gender of Medical students, Cairo University, Egypt

Domains of Leisure time physical activity	Females (n=253)	Males (n=265)	P value*
<b>Vigorous</b>			
Mean (95% C.I)±SD	1.1 (0.0-2.3)±2.9	2.1 (1.0-3.0)±4.2	
Median (IQR)	0.5 (0.0-2.0)	1.0 (0.0-3.0)	0.001
<b>Moderate</b>			
Mean (95% C.I)±SD	1.5 (1.1-3.1)±5.1	3.6 (1.5-4.8)±5.3	
Median (IQR)	1.5 (0.0-3.8)	2.0 (0.0-6.0)	0.324
<b>Total</b>			
Mean (95% C.I)±SD	2.0 (1.6-5.2)±6.3	6.9 (5.9-8.4)±8.3	
Median (IQR)	2.0 (0.1-4.8)	2.6 (1.0-7.0)	0.479
<b>Sedentary</b>			
Mean (95% C.I)±SD	6.3 (6.0-6.6)±2.7	6.4 (6.1-6.8)±2.7	
Median (IQR)	6.0 (4.0-8.5)	6.0 (4.0-9.0)	0.62
<b>Physical activity levels: No. (%)</b>			
Low	111.0 (43.9)	74.0 (27.9)	0.001**
Sufficiently active	142.0 (56.1)	199.0 (72.1)	

\* Mann Whitney test, \*\* Chi-square test of independence

domain of LTPA compared to females (Mann Whitney,  $P=0.001$ ), while there was no significant difference in the moderate LTPA domain or the sedentary behavior of both genders (table 2). Of the included female medical students 111 (43.9%) were classified with low LTPA compared to males (27.9%), ( $P=0.001$ ).

Of the included medical students, only 17.3% stated correctly the number of days a week an average adult should perform physical activity (exercise) to stay healthy, while more correct responses about the duration of PA per day (in minutes) were mentioned by (53.9%), increasing from 2nd year and reach its' peak by the fifth year medical students ( $P=0.001$ ) and then followed by decline in the final year. Only 11.9% of the included medical students stated correctly the number of days and duration of PA recommended for an adult to stay healthy. The role of PA in preventing coronary heart, elevated blood pressure, and elevated cholesterol was so prevalent (with the exception of the role of PA in lowering elevated blood pressure) and exceeding more than 80%, with steady increase in relation to the year of enrolment (Table 3). The role of PA in preventing cancer was low irrespective of the year enrolment (32.2% for prevention of colon and 16.2% for breast cancers respectively), although both responses showed incremental increase especially by students at the final year. One in every three and less than two for every ten medical students were aware of the role of PA in preventing colon and breast cancers respectively.

Another misconception about the role of PA in cancer prevention was it should be too strenuous for the preventive purpose as more than 60% of them agreed wrongly about this statement. Less than 10% of the included students stated correctly the number of days/week and duration of PA minutes/day for the prevention of cancer, there was a universal lack of knowledge about the cancer prevention recommendations irrespective of the year of enrollment at the medical school. For the open ended questions, PA as a method of preventing CRC was mentioned by only

25.2% (most of the responses were centered about healthy diet, increase fiber intake, spicy foods and smoking as the main preventive measures against CRC), while for PA and its role in preventing breast cancer only 18.9% mentioned the role of PA in prevention (most responses were about banning hormonal contraception, care of breast hygiene, screening and breast self-examination). The overall knowledge score was  $5.4\pm 2.7$  points (out of 14), with a median of 6.0, there was an increased trend of knowledge score in relation to year of enrollment with a peak at the fifth year ( $P=0.001$ ), those at the clinical years were scored higher compared to those at the 2nd and 3rd year. Gender did not influence on the medical students' knowledge as the scores of both showed no significant difference (figure 2), while the year at enrollment at the medical school showed significant effect on the overall knowledge state ( $P=0.001$ ).

The main sources of knowledge mentioned by medical students about the role of PA in cancer prevention included internet and media (77%), followed by friends, family and relatives (70.1%), lectures and curricula in 38.2%, seminars and conferences in 21.4%, and lastly books, magazines and newspaper in 21% (Figure 2).

## Discussion

The results of the study showed that 35.6% of the included medical students were classified as being with low LTPA level while 64.4% were categorized as being sufficiently active. The results are relatively higher than those reported by El Gilany et al., (2011) among El Mansoura University students, Egypt, who reported that 11.3% of participants were physically inactive. Also, the results of this study were much higher than those found by Musharrafieh et al., in 2008 where only 26.4% of Lebanese university students were engaged in physical exercise. One in every three university students were found to be physically in active as reported by Chinese

Table 3. Knowledge of the Included Medical Students (by Year of Enrollment) Towards the Role of Leisure Time Physical Activity in Chronic Diseases and Cancer Prevention

Correct responses: No. (%)							
Items	Second year (n=107)	Third year (n=117)	Fourth year (n=108)	Fifth year (n=93)	Sixth year (n=94)	Total (n=519)	P value*
1-Days a week an average adult should perform physical activity (exercise) to stay healthy.	20 (18.9)	21 (17.9)	15 (13.9)	16 (17.2)	18 (19.1)	90 (17.3)	0.859
2-On these days, an average adult should be physically active to stay healthy.	46 (43.4)	53 (45.3)	57 (52.8)	66 (71.0)	58 (61.7)	280(53.9)	0.001
Correct 1+2	11 (10.4)	13 (11.1)	8 (7.4)	16 (17.2)	14 (14.9)	62(11.9)	0.227
3-Regular LTPA (exercise) can prevent increase in blood pressure. (T)	73 (68.9)	94 (80.3)	94 (87.0)	85 (91.4)	88 (93.6)	434(83.6)	0.001
4-Regular LTPA (exercise) can prevent coronary heart disease. (T)	82 (77.4)	102 (87.2)	98 (90.7)	87 (93.7)	88 (93.6)	457(88.1)	0.001
5-Regular LTPA (exercise) can reduce high blood cholesterol level. (T)	42 (39.6)	64 (54.7)	62 (57.4)	55 (59.1)	40 (42.6)	263(50.7)	0.011
6-LTPA (exercise) can reduce the risk of the following cancer among men (options): Colon.	15 (14.2)	35 (29.9)	46 (42.6)	35 (37.6)	36 (38.3)	167(32.2)	0.001
7-LTPA (exercise) can reduce the risk of the following cancer among women (options): Breast	13 (12.3)	21 (17.9)	15 (13.9)	13 (13.9)	22 (23.4)	84(16.2)	0.006
8-For women, routine physical activity at home can prevent breast cancer. (F)	63 (59.4)	75 (64.1)	76 (70.4)	74 (79.6)	78 (83.0)	336(64.7)	0.001
9-LTPA (exercise) can reduce the risk of cancer if it is lifelong. (T)	33 (31.1)	67 (57.3)	59 (54.6)	55 (59.1)	48 (51.1)	262(50.5)	0.009
10-LTPA (exercise) should be too strenuous to reduce cancer risk. (F)	34 (32.1)	46 (39.3)	39 (36.1)	46 (49.5)	36 (38.3)	201(38.7)	0.148
11-LTPA (exercise) that causes sweating, increase in heart rate is more protective against cancer. (T)	11 (10.3)	8 (6.8)	18 (16.7)	17 (18.3)	12 (12.8)	66(12.7)	0.64
12-To reduce cancer risk, an average adult should exercise for ----days /week: (options) 5 or more	12 (10.7)	17 (14.5)	16 (14.8)	11 (11.8)	8 (8.5)	64(12.3)	0.001
13-To reduce cancer risk, an average adult person should exercise for ---/minutes each day. (options: 45 minutes or more	17 (15.9)	18 (15.4)	17 (15.7)	16 (17.2)	22 (23.4)	90(17.3)	0.001
Correct 12+13	8 (7.5)	12 (10.3)	10 (9.3)	10 (10.8)	7 (7.4)	47(9.1)	0.139

SD, standard deviation, IQR, Interquartile range; \* Chi-square of independence, \*\* Kruskal Wallis test.

and Brazilian studies (Abdullah et al., 2005; Fontes et al., 2009), while in USA, it was reported that 17% of university students were physically inactive and 47% of them did not engage in vigorous physical activity (Suminiski, 2002). In Canada it was reported that less than 50% of University students participated in exercise three times per week or more (Makrides et al., 1998) compared to another USA study reported that 39% of the students exercised in the same weekly rate (Habermann and Luffe, 1998). In 2011, Staten et al., (2005) stated that 39% and 41% of university students were vigorously and moderately physically active respectively. One in four of young people are known to be physically inactive as found in national statistics of many countries (Centers for Disease Control [CDC], 2005). The variation in the level of physical inactivity across different countries could be attributed to socioeconomic development, cultural factors, technology and urbanization.

A downward trend in the duration and intensity of PA

was noticed by medical students' year of enrollment, it was maximum among the second and third year students and the highest decline was among those in the 6th year. The increased academic commitments with each year could explain this decline or could be the universal lack of awareness about the disease prevention role of PA due to curricular deficiency. In as American study conducted in Boston University older college students had less PA behavior, the same study showed that older college students have less healthful physical activity behavior (Greaney et al., 2009). Gómez-López et al., (2010) suggested that laziness, lack of time and motivation are among the factors that hinder regular PA among university's students.

In this study, males were significantly more active in the vigorous domain of LTPA compared to females, 43.9% of the investigated females were classified with low LTPA compared to males (27.9%). Being a traditional community social pressures linking the physical power

to maleness and femininity being inconsistent with sport play and vigorous activities. Cultural values and norms restricts female and are considered more permissive for males in the domestic domains in Egypt as mentioned by Shafy, 1998 (Shafy 1998). El Gilany et al., (2011) in their study showed similar findings where physically inactive females were almost double the males in number. Similar results were reported by (Abdel-Aty et al., 1999; Abdullah et al., 2005; Edwards and Tsouros, 2006).

Accurate knowledge of PA recommendations may be an important first step in raising awareness about its importance in non-communicable diseases reduction including cancer and motivating people to adopt a more physically active lifestyle. There was a general lack of knowledge about the number of days / week an adult should perform PA to stay healthy and only 11.9% of the included medical students indicated correctly the number of days and duration of PA recommended for an adult to stay healthy. This finding is similar to the findings reported by a study carried out on Saudi general population, where 11.4% of the total sample correctly mentioned the duration and frequency of exercise / week in order to remain active (Amin et al., 2014). Medical student are expected to be more knowledgeable than a general population in context of being the future medical care givers and counselors for the population. These results identify a gap that need to be filled in this domain of the medical school curricula and extracurricular activities of the students.

The knowledge about the role of PA in preventing coronary heart, elevated blood pressure, and elevated cholesterol was so prevalent (with the exception of the role of PA in lowering elevated blood pressure) and exceeding more than 80%, with steady increase in relation to the year of enrolment. The responses of the investigated medical students about the role of PA in preventing hypertension, lowering blood cholesterol and preventing heart diseases were comparable to those found elsewhere in studies from developed countries. Taylor et al. (2012) reported that three quarters of their sample of U.S Asians knew the preventive role of PA in high blood cholesterol, high blood pressure, diabetes and heart disease.

In this study, knowledge about the role of PA in preventing cancer was low irrespective of the year enrolment (32.2% for prevention of colon and 16.2% for breast cancers respectively). One in every three and less than two for every ten medical students were aware of the role of PA in preventing colon and breast cancers respectively. According to Taylor et al. (2012) only 56% and 47% succeeded to know that PA can prevent colon and breast cancer respectively. Another national based study conducted in the United States of America that examined the awareness about physical activity and cancer risk reduction among different racial and ethnic groups reported that 62% knew that PA can decrease the probability of getting cancers of certain types (Oh et al., 2010).

Inconsistent to our findings, Pietrzyk et al. (2015) reported that 63.6% of their sampled medical students knew that PA can prevent colorectal cancer. In a study conducted among adults in Saudi Arabia Primary health care providers only 18.6% and 23.1% correctly picked

up types of cancers prevented by PA namely colon and breast cancers respectively (Amin et al., 2014). Coups et al. (2008) found that only 15% of the included U.S sample knew about the role of PA in colon cancer prevention, a close figure to ours.

Our results also showed the lack of knowledge about the number of days/week and duration of PA for cancer prevention, only 10% of the included students picked up correctly irrespective of the year enrollment. This universal lack of knowledge about cancer prevention recommendations could be attributed to the fact that oncology education is delivered in a fragmented manner over the span of study at medical schools (Mattes et al. 2015). Another misconception revealed from this study was about the role of PA in cancer prevention for which it should be too strenuous for the preventive purpose as expressed by over 60% of the included participants.

In the current study, the overall knowledge score was relatively increasing in relation to the year of enrollment in medical school that can be linked to the cumulative knowledge delivered from different courses. In this study, the main sources of knowledge mentioned by medical students about the role of PA in cancer prevention chiefly stemmed from the internet and media (77%), compared to lectures and curricula as a source of knowledge which was only (38.2%), seminars and conferences (21.4%) which is considered unacceptable for medical student who are going to be the future plat form of knowledge and will be counseling the patients in few coming years. These findings could be attributed to the adoption of traditional curriculum in the developing countries as well as the traditional teaching methods, emphasizing the curricular defects and the lack of curricular development that cope with the recent scientific updates. The previous finding highlighted the need for curricular development based on recent research updates and evidence based medicine as well as the importance of inclusion of teaching methods like e- learning and m-learning to cope with the favorite channels of the nowadays students.

The results of this study can be considered in the light of the following limitations: The time of data collection coincided with end of the year and pre-exams period which may influence the responses especially about the pattern and level of LTPA among medical students. Also, the subjective nature of the inquiry with the possibility of social desirability especially about the duration and intensity of LTPA, and finally the data collection form for assessing their knowledge about the role of PA in cancer prevention which provided a chance for guessing the answers.

Medical students at Kasr Al Ainy Medical School demonstrated a decline in their LTPA in relation to their enrollment in the medical school, this was coupled with poor knowledge about the role of LTPA in cancer prevention, revising the current curricula is to be considered and inclusion of the role of LTPA in cancer prevention must be assured for the farewell of medical students and their future patients.

#### Competing Interests Statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

## References

- Abdel-Aty MA, Qayed MH, Kawthar AF (1999). Health related behaviors among adolescents and youth in Assiut Governorate, Upper Egypt. *Bull High Inst Public Health*, **29**, 447-74.
- Abdullah AS, Wong CM, Yam HK, Fielding R (2005). Factors related to non-participation in physical activity among the students in Hong Kong. *Int J Sports Med*, **26**, 611-65.
- Amin TT, Al-Hammam AM, AlMulhim NA, et al (2014). Physical activity and cancer prevention: Awareness and meeting the recommendations among adult Saudis. *Asian Pac J Cancer Prev*, **15**, 2597-606.
- Amin TT, Al Khoudair AS, Al Harbi MA, Al Ali AR (2012). Leisure time physical activity in Saudi Arabia: prevalence, pattern and determining factors. *Asian Pac J Cancer Prev*, **13**, 351-360.
- Bennett GG, Wolin KY, Puleo EM, Mâsse LC, Atienza AA (2009). Awareness of national physical activity recommendations for health promotion among US adults. *Med Sci Sports Exerc*, **41**, 1849.
- Bull FC, Maslin TS, Armstrong T, et al (2004). Comparative quantification of health risks global and regional burden of disease attributable to selected major risk factors. Physical inactivity. WHO.1.754
- Bull FC, Maslin TS, Armstrong T (2009). Global physical activity questionnaire (GPAQ): nine country reliability and validity study. *J Phys Act Health*, **6**, 790.
- Centers for Disease Control and Prevention (CDC) (2005). Adult participation in recommended levels of physical activity-United States, 2001 and 2003. MMWR. Morbidity and mortality weekly report, **54**, 1208-12. 2606.
- Coups EJ, Hay J, Ford JS (2008). Awareness of the role of physical activity in colon cancer prevention. *Patient Educ Couns*, **72**, 246-51.
- Dharamsi SH, Osei-Twum J, Shroff F, Mu L, Woollard R (2010). The health advocate role: preparing future physicians for socially responsive practice (Doctoral dissertation, University of British Columbia). <http://dx.doi.org/10.14288/1.0074591>.
- Edwards P, Tsouros A (2006). Promoting physical activity living in urban environments; the role of local governments. The solid facts. Copenhagen. World Health Organization Regional Office for Europe.
- El-Gilany AH, Badawi K, El-Khawaga G, Awadalla N (2011). Physical activity profile of students in Mansoura University(Egypt). *East Mediterr Health J*, **17**, 694.
- Fontes A,Vianna R (2009). Prevalence and factors related to low level physical activity among university students in a public university in the northeast region of Brazil. *Rev bras Epidemiol*, **12**, 20-9.
- Friedenreich CM, Neilson HK, Lynch BM (2010). State of the epidemiological evidence on physical activity and cancer prevention. *Eur J Cancer*, **46**, 2593-2604.
- Greaney ML, Less FD, White AA, et al (2009). College students' barriers and enablers for healthful weight management: a qualitative study. *J Nutr Educ Behav*, **41**, 281-86.
- Haberman S, Luffey D (1998). Weighing in college students' diet and exercise behaviors. *J Am Coll Health*, **46**, 189-91. <http://www.openepi.com/SampleSize/SSPropor.htm> IPAQ website: [<http://www.ipaq.ki.se/>].
- Kruk J,Czerniak U (2013). Physical activity and its relation to cancer risk: updating the evidence. *Asian Pac J Cancer Prev*, **14**, 3993-4003.
- Kushi LH, Byers T, Doyle C, et al (2006). American cancer society guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin*, **56**, 254-81.
- Leitzmann MF (2010). Physical activity and genitourinary cancer prevention. *Physical Activity and Cancer*, **7**, 43-71.
- Makrides L, Veinot P, Richard J, McKee E, Gallivan T (1997). A cardiovascular health needs assessment of university students living in residence. *Can J Public Health*, **89**, 171-75.
- Gómez-López M, Gallegos AG, Extremera AB (2010). Perceived barriers by university students in the practice of physical activities. *J Sports Sci*, **9**, 374-81.
- Mattes MD, Patel KR, Burt LM, Hirsch AE (2015). A nationwide medical student assessment of oncology education. *J Cancer Educ*, **10**, 1-8.
- Mendis S, Armstrong T, Bettcher D, et al (2014). Global Status Report on noncommunicable diseases.WHO. Retrieved from <http://www.who.int/nmh/publications/ncd-statusreport-2014/en/>.
- Musharrafieh U, Tamim HM, Rahi AC, et al (2008). Determinants of university students physical exercise: a study from Lebanon. *Int J Public Health Res*, **53**, 208-13.
- Oh A, Shaikh A, Waters E, et al (2010). Health disparities in awareness of physical activity and cancer prevention: findings from the National Cancer Institute's 2007 Health Information National Trends Survey (HINTS). *J Health Commun*, **15**, 60-77.
- Pietrzyk Ł, Torres A, Denisow P, Torres K (2015). What do we know about education in colorectal cancer prevention? survey among 1130 medical students. *J Cancer Educ*, **15**, 1-7.
- Pitanga F, Lessa I (2005). Prevalence and factors associated with sedentary leisure time in adults. *Cad Public Health*, **21**, 870-77.
- Pitanga F, Lessa I (2008). Association between physical inactivity free time and hospital admissions in adults in Salvador, Brazil. *Rev Bras Cineantropom Performance Hum*, **10**, 347-53.
- Rocha SV, Almeida M, Araújo T, Virtuoso Júnior J (2011). Factors associated with leisure-time physical activity among residents of urban areas from a municipality in northeastern Brazil. *Rev Bras Cineantropom Performance Hum*, **13**, 257-64.
- Sangrajrang S, Chaiwerawattana A, Ploysawang P, et al (2013). Obesity, diet and physical inactivity and risk of breast cancer in Thai women. *Asian Pac J Cancer Prev*, **14**, 7023-27.
- Shafy HE (1998). Leisure time and its implications on Adolescence and state policy in Egypt, Ch VI. Cairo, Egypt, The population council, regional office for West Asia and North Africa.
- Sharratt MT, Hearst WE (2007). Canada's physical activity guides: background, process, and development. *Appl Physiol Nutr Metab*, **32**, 9-15.
- Siegel RL, Miller KD, Jemal A (2015). Cancer statistics 2015. *CA Cancer J clin*, **65**, 5-29.
- Staten RR, Miller K, Noland MP, Rayens MK (2005). College students' physical activity: application of an ecological perspective. *Am J Health Stud*, **20**, 58-65.
- Suminski RR, Petosa R, Utter AC, Zhang JJ (2002). Physical activity among ethnically diverse college students. *J Am Coll Health*, **51**, 75-80.
- Taylor VM, Liu Q, Yasui Y, et al (2012). Physical activity among Cambodian Americans: An exploratory study. *J Community Health*, **37**, 1040-48.
- Trinh OT, Do Nguyen N, van der Ploeg HP, Dibley MJ, Bauman, A (2009). Test-retest repeatability and relative validity of the Global Physical Activity Questionnaire in a developing country context. *J Phys Act Health*, **6**, 46.
- U.S. Department of Health and Human Services (1996). Physical



activity and Health: A report of the surgeon general. Atlanta, GA: Centers for disease control and prevention (CDC), national centers for chronic disease prevention and health promotion.

Veluswamy SK, Maiya AG, Nair S, et al (2014). Awareness of chronic disease related health benefits of physical activity among residents of a rural South Indian region: a cross-sectional study. *Int J Behav Nutr Phys Act*, **11**,1.

Vuori I (2004). Physical inactivity is a cause and physical activity is a remedy for major public health problems. *Kinesiology*, **36**, 123-53.

WHO STEPs. <http://www.who.int/chp/steps/GPAQ/en/index.htm>.