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Awareness of Cardiopulmonary Fitness: A Survey Among Final Year Physiotherapy Students in Karachi

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ABSTRACT

Background of the Study: Cardiopulmonary fitness is a major component of healthy life and it is a fundamental component of physical and psychological wellness. Healthy persons can raise their metabolic rate markedly producing the energy required for continuous exercises. CPF exercises assist the body development more effectively and well-enhanced to handle ADLs and tasks. It also reduces the possibility of several chronic diseases. This study aims to evaluate awareness and knowledge of cardiopulmonary fitness among physical therapy students in Karachi.

Methodology: A cross-sectional survey was conducted at physiotherapy institutes. A sample of 230 was selected via a non-probability purposive sampling technique. Data was collected using a self-designed questionnaire derived from literature, for its validity pilot testing was done prior to the survey. Consent was taken after explaining the study's aims and objectives. Participants were asked to fill out the questionnaire.

Results: The majority of the students (66.9%) had fair awareness of cardiopulmonary fitness, only 12.6% were well aware of CPF. 82.6% and 80.4% of students knew about the CPF exercise's nature and mode respectively. Regarding the frequency and duration of CPF exercises only 24.3% and 31.3% of students respectively, knew accurately and only 32% knew how CPF exercises differ from general exercises. Only 27% of students knew about the muscle fiber type used in CPF exercises. 82.2% of participants were aware of the energy consumption mechanism used in CPF exercises.

Conclusion: The outcome of this study shows that there is a lack of cardiopulmonary fitness awareness and inconsistency in related knowledge Majority of the students were not well aware of cardiopulmonary fitness among physiotherapy students.

Keywords: *Cardiorespiratory fitness, physiotherapy students, physical fitness, health, cardiopulmonary exercises, awareness.*

INTRODUCTION

Cardiopulmonary fitness denotes the capability of pulmonary and cardiovascular systems to deliver muscles with O2 throughout sustained physical activity. Existing evidence has shown that cardiopulmonary fitness (VO_2 max) can considerably progress the predictive capacity of both short- and long-term CVD risk when added to traditional hazards. In addition to serving as an

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strong predictor of heart diseases and death due to all causes[1,2]. Physical activity above a certain level and duration is necessary for the improvement of CPF (>150min/week, moderate intensity)[3]. It is more difficult to measure physical activity than physical fitness, physical activity is important for improving and maintaining cardiovascular function and long-term cardiovascular health. The literature has suggested that cardiopulmonary fitness is inversely relative to mortality due to all causes[4,5]. While it is acknowledged that there isa strong relationship between physical inactivity and chronic diseases, 1 in 4 adults is not active sufficiently or has a sedentary lifestyle[6]. According to WHO cardiopulmonary fitness andmuscular fitness is associated with improved health and reduced risk of diseases[7].Studies also observed that there is an association between higher cardiopulmonary fitness and lower all-causemortality risk, in which an increase of each MET of CPF was linked to a 24% decrease in all- cause mortality[8]. In age-related prevalence, the ratio of cardiopulmonary fitness levels is similaramong females and male adolescents i.e. (34.4%) and (32.9%) respectively, but with increasing age, it is comparatively higher in males than females. Males have high VO2 max compared to females regardless of their age[1]. According to AHA in USA due to increasing age the burden of CVD will increase by 40% by 2030[9].The American College of Sports Medicine (ACSM) makes the following recommendations for the parameters and better accuracy of training for thedevelopment and maintenance of cardiopulmonary fitness in healthy individuals: 1. The frequency of 3 to 5 days a week, 2. The intensity is recommended as 55% to 90% of maximum heart rate (HR max), or in the form of oxygen uptake it should be 40% to 85% of maximum O_2 uptake reserve (VO_2 R) or heart rate max reserve (HRR), The less-intensity are mostly relevant for unhealthy people, 3. The duration is 20-60 minutes of constant or discontinuous aerobic exercises. Duration and intensity of the cardiopulmonary fitness exercises are interrelated; thus, if the intensity is lowered then there should be a longer duration of the exercise i.e. 30 minutes ormore, on the other hand, the duration of cardiopulmonary exercise training should be at least 20 min or more if the intensity of the training is high, 4. Any physical activity in which large musclegroups are involved should be rhythmic or aerobic and of continuous mode[10]It is evident that Physical Fitness and Cardiopulmonary Fitness in actuality underpin productivity, job efficiency, and general maintenance of cardiovascular health and general wellbeing, among other things[11] and it is proved that higher levels of cardiopulmonary fitness and advanced physical activity levelsare leading to improved health outcomes[12]. Studies have found that the cardiopulmonary fitness of physical therapy students was not good [13] and as it has been proven by the studies that physiotherapy students who have high cardiopulmonary fitness have a good mental state [14]. It is essential that students must know about the impact and health benefits of cardiopulmonary fitness.This study was to evaluate the awareness of cardiopulmonary fitness among physical therapy students. The importance of cardiopulmonary fitness is already acknowledged in developed countries but lacks in developing nations this study has been conducted to evaluate its awarenessso that the future physical therapist can be provided with sufficient knowledge about cardiopulmonary fitness for the use of this knowledge for their benefits and others. Moreover, there is a very small amount of literature provided about awareness of cardiopulmonary fitness.

METHODOLOGY

A cross-sectional survey design (descriptive) using a (self-structured) questionnaire. The study was conducted on final year students of Doctor of Physical Therapy at different institutes of Karachi offering Doctor of Physical Therapy programs including Dow Institute of Physical Medicine & Rehabilitation, Sindh Institute of Physical Medicine & Rehabilitation, Baqai Institute of Physiotherapy and Rehabilitation Medicine, College of Physical therapy Ziauddin University, College of Physiotherapy JPMC, Liaquat National School of Physiotherapy. Calculated through Open Epi version 3.0 Sample size of 230 was calculated the hypothesized frequency is 66.70(knowledge of health-related fitness), the confidence limit is 5%, design effect is 1% and confidence level is 95%[15]. Non-probability purposive sampling technique was used. Male and

female Physical therapy students. Final year doctor of physical therapy students. Students of both public and private sectors. Students with any diseases or comorbidities were excluded. Students who did not give consent were excluded. A total of 230 final year physical therapy students fulfilled the inclusion criteria after clarifying the study and taking their consent. After approval of synopsis, the research was conducted. The study was done at multiple physical therapy institutes in Karachi. After the head of the department of the respective institute gave permission the questionnaires were distributed among final year Physical therapy students who satisfied the inclusion criteria and the data was collected. Data was entered in and analyzed by SPSS version 20. Frequencies and percentages were taken out for all qualitative variables. Descriptive statistics such as means and standard deviations were reported for quantitative variables. Chi-square test was applied to identify any significant associations between qualitative variables. (P-value < 0.05 was considered significant). A self-made questionnaire contains seventeen closed-ended questions derived from the literature. A study was accompanied to confirm that participants would be able to understand each question. It was accepted that if the members fill the survey then this would be considered as assent for cooperation in the examination. The information collected through a survey is solely used for the purpose of research. The Questionnaire is divided into two parts, the first part assesses the demographic details of the participants while the other one evaluates the awareness of cardiopulmonary fitness.

RESULTS

The majority of the students (66.9%) had fair awareness of cardiopulmonary fitness, 19.1% had poor awareness, and 1.3 % had very poor awareness. Only 12.6% of the students are well aware of cardiopulmonary fitness.

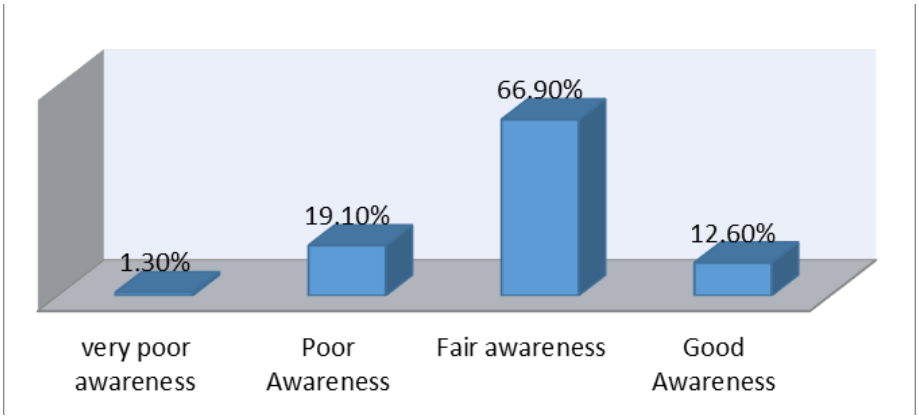

Figure 01: relative awareness among final year DPT students in Karachi

All participants confirmed that they were aware of the cardiopulmonary fitness. About the cardiopulmonary fitness exercises majority of participants said cardiopulmonary fitness exercises are aerobic exercises Participants were asked about cardiopulmonary fitness exercises 7.8% replied jogging,3.5% replied cycling,2.6% replied swimming,3.5% replied anaerobic exercise and 82.6% replied aerobic exercise.

From this study, we found that about 92.2% got information about cardiopulmonary fitness from their degree course. About 61.3% also got information other than degree courses out of them, 8% got information from conferences, 53% from the internet, 7% from books/articles, 6% from other sources, and 26% replied they got information from all types of sources. When further questions were asked about the duration of cardiopulmonary fitness exercise most of them (30%) replied daily, 16.1% replied twice a week, 23.3% replied more than 2 days a week, 24.3% replied at least five times a week, very few replied (5.2%) that they don't know about it. When they were asked about the minimum time for cardiopulmonary fitness most of them replied 20-30 minutes, less

than half replied 20-60 minutes, very few think more than hours or 2 hours, and about 3.5% have no idea regarding the duration of exercise recommended by guidelines.

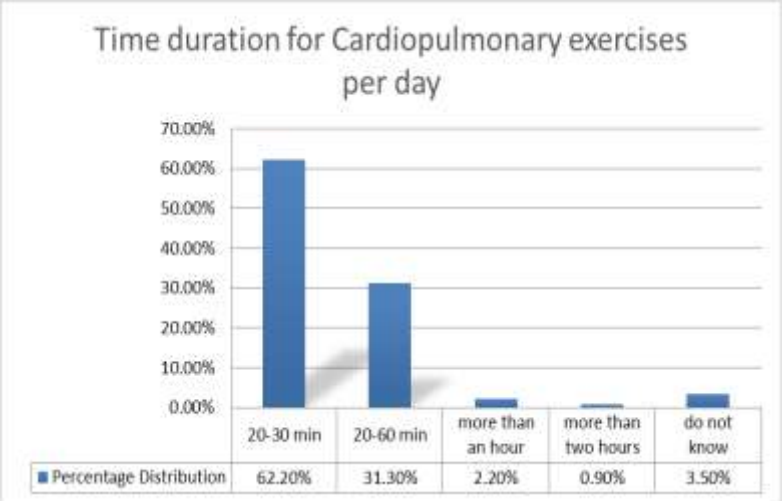

Figure 02: duration for cardiopulmonary exercises per day

When they were asked if cardiopulmonary fitness plays a key role in general wellbeing most of them (96.5%) think that cardiopulmonary fitness plays a key role in general wellbeing, very few 0.9% said no, 2.2% replied that may be, and some of them, 0.4% replied they don't know. When participants were asked which exercise is beneficial for cardiopulmonary fitness 22.2% answered walking, 7.8% said jogging, 9.6% replied swimming, 1.3% think cycling, and 59.1% replied all.

Perceptions	Frequency	%
Do you think cardiopulmonary fitness plays a role in general wellbeing? (n=230)		
Yes	222	96.5
No	2	0.9
May be	5	2.2
Don't know	1	0.4
Which fitness exercise is most beneficial for cardiopulmonary fitness? (n=230)		
Walking	51	22.2
Jogging	18	7.8
Swimming	22	9.6
Cycling	3	1.3
All of the above	136	59.1

Table 01: perception of study participants about cardiopulmonary fitness exercises in general well being

It is clear from Table 2 that the majority of the participants were aware that cardiopulmonary exercises are different from the general exercises which is 212 out of 230 participants. Regarding the difference between cardiopulmonary exercise and general exercise, almost all the participants (92.2%) think they are different and 7.8% said there is no difference. Table 4 also shows that participants, who said yes there is a difference, how are they different out of 92.2%. 9.9% replied by their nature, 16.5% said by time duration, 39.6% replied by energy consumption mechanism, 32.0% said all, and a few 1.8% said they don't know.

Variables			How are cardiopulmonary exercises and general exercises different?		
			yes	How different	
Do you think cardiopulmonary exercises and general exercises are different?	Yes		212	Their nature	21
	No	18		Time duration	35
				Energy consumption mechanism	84
				All	68
				Don't know	04

Table 02: The difference between cardiopulmonary and general exercises

When participants were inquired about type of muscle fiber used in cardiopulmonary fitness exercise 27% replied type 1 muscle fiber,10.9% replied type 2a muscle fiber,8.3% said 2b muscle fiber,26.6% replied both type 1 and type 2, some of them 27.8% said they don't know. When they were further inquired about type of metabolism and energy consumption used in cardiopulmonary fitness majority of them (82.2%) answered oxidative(aerobic), 2.6% replied non oxidative,4.8% mentioned immediate(explosive) energy system ATP and CP,6.5% mentioned oxidative phosphorylation, few 3.9% said they don't know.

Which types of muscle fiber are used in cardiopulmonary fitness exercises? (n=230)	Frequency (n=230)	Percentage
type 1 muscle fiber	62	27.0
type 2a muscle fiber	25	10.9
type 2b muscle fiber	19	8.3
both type 1 and 2 muscle fiber	60	26.1
do not know	64	27.8
Which type of metabolism and energy consumption is used in cardiopulmonary fitness? (n=230)		
oxidative(aerobic)	189	82.2
non- oxidative(anaerobic)	6	2.6
immediate energy system ATM and CP	11	4.8
oxidative phosphorylation	15	6.5
do not know	9	3.9

Table 03: types of muscle fiber are used in cardiopulmonary fitness exercises and which type of metabolism and energy consumption is used in cardiopulmonary fitness

Question about the involved body structures in cardiopulmonary fitness exercises 44.8% participants were answered that the whole body is involved which is true. 45.6% participants stated that there are lungs and cardiac muscles involvement, 5.7% answer were cardiac muscles only, 0.4% said that there are lungs only while 3.5% participants chose skeletal muscles involvement.

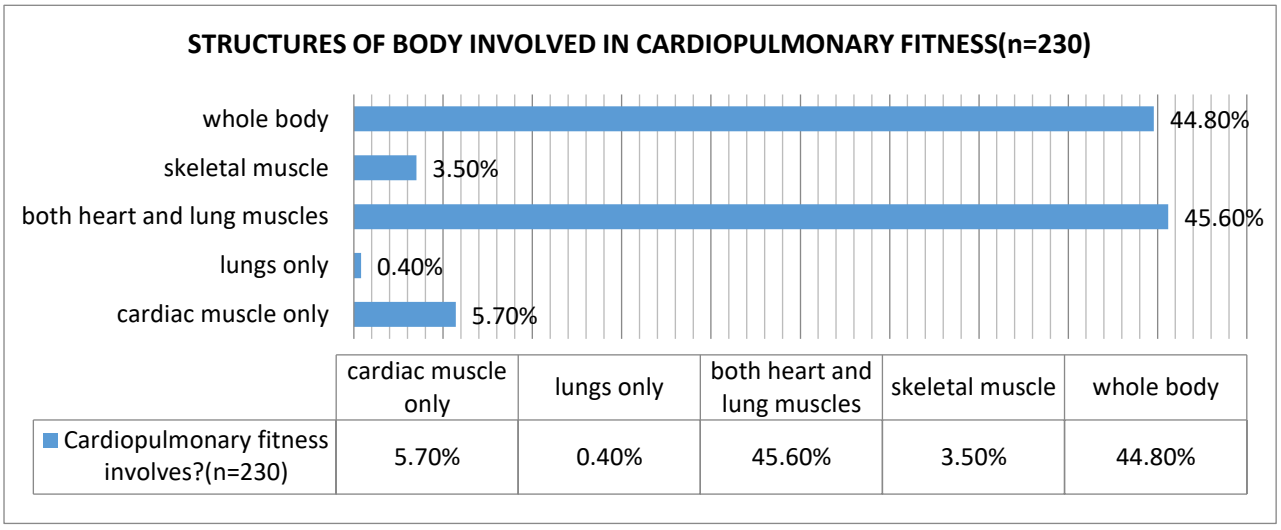

Figure 3: the awareness about which structures of the body are involved in cardiopulmonary fitness

DISCUSSION

The purpose of the study was to evaluate the awareness of cardiopulmonary fitness among final-year physiotherapy student. In this research results were measured on a scale whose parameters were very poor (<4), poor (4 to 6), fair (7 to 9), and good (10 to 12). Twelve open-ended questions were asked. According to the majority of the students cardiopulmonary fitness exercises are aerobics exercises as mentioned in ACSM (American College of Sports Medicine) guidelines, for the recommendation of quantity and quality of exercise for development and maintenance of cardiopulmonary and muscular fitness, and flexibility in healthy individuals[16]. Activities like walking, jogging, swimming, and biking are endurance exercises that increase your breathing and heart rate. Almost all the participants get this information regarding cardiopulmonary fitness from their degree courses Other than degree courses on this topic many students also get information regarding cardiopulmonary fitness from other sources like the internet, conferences, etc. About the frequency of cardiopulmonary fitness exercises, only 24% of students replied that at least five times per week of exercise is required, which is supported by ACSM guidelines, exercise recommendations can be met through moderate-intensity exercise five days/week. About the duration of cardiopulmonary fitness exercises, less than half of the students stated that 20-60 min a day which is supported by ACSM guidelines the recommendation of 20 to 60 minutes duration; cardiopulmonary exercises can be accounted for in a particular session or more[10].Regarding the kind of program for cardiopulmonary fitness majority of the students suggest that cardiopulmonary fitness exercises are endurance training and evidence also suggests that cardiopulmonary endurance is the capability of the body to accomplish continuous, large group of muscle activity, a key component of health-related fitness achieved through active exercise of moderate to high level of intensity[16].Most of the students think that cardiopulmonary fitness plays a role in general wellbeing and that all exercises involving large muscle groups (walking, jogging, swimming, and cycling) are beneficial for cardiopulmonary fitness which is supported by ASPC (American society of preventive cardiology)[17]. The estimated prevalence of CVD is approaching approx. 20% of the global population by 2030 in over 65 years' age people[18]. In the elderly population exercises like swimming and walking can prevent the early disposition of CVD and promote health.[19]When asked about the difference between cardiopulmonary fitness exercises and general exercises most of them think they are different, few students think there is a difference in time duration, some stated that they are different in energy consumption mechanism, some answered that they are different in all aspects and very few of them do not know the difference. Question regarding the muscle fiber involved in cardiopulmonary fitness exercises is the one in which the majority of participants lack knowledge, only 29% think type 1 muscle fibers are used in cardiopulmonary fitness exercises guided by evidence Slow-twitch (ST or Type I) fibers are identified by a slow contraction time and a high resistance to fatigue. Functionally, ST fibers require low-level force production, such as walking and maintaining posture, and are used for aerobic activities. ST fibers are used in most activities of daily living[20]. Exercises can increase the cross-sectional area of muscle fibres in turn increasing strength and endurance[21]. Regarding the type of metabolism and energy consumption mechanism used in cardiopulmonary fitness majority replied that the oxidative (aerobic) system is used in cardiopulmonary fitness, supported by evidence. The oxidative energy consumption system needs O_2 for producing ATP for which it is called an aerobic system. It is responsible for providing energy during most of the daily activities for a sustained duration but it is not a rapid source of producing energy as other two systems. The oxidative system is used in daily activities such as running, swimming, hiking, or even standing[22]. The involvement of structures less than half of the students responded both heart and lung muscles are involved, and almost half of the students responded the involvement of the whole body, as the evidence suggested that cardiopulmonary endurance exercises are the activities that comprise the periodic use of larger groups of muscles for a sustained duration.

Fitness exercises not only involve the heart and lungs but also have a positive impact on the entire body and help prevent age-related chronic disorders[23].

Limitations of the study

There were limitations because not every institute permitted us to collect samples and the research was started at a time when all institutes in Karachi were on their post-examination leave so there was a delay in the process of data collection

CONCLUSION

The outcome of this study shows that there is a lack of cardiopulmonary fitness awareness and inconsistencies in related knowledge among final-year physiotherapy students. This study will provide a baseline for future researchers to identify the potential factors responsible for this poor awareness of cardiopulmonary fitness among students to take the necessary steps to overcome this knowledge gap.

AUTHORS' CONTRIBUTION:

The following authors have made substantial contributions to the manuscript as under:
Conception or Design: Asma Batool, Khadija Nafees, Tahireen Naz, Naseem Ghazal
Acquisition, Analysis or Interpretation of Data: Asma Batool, Khadija Nafees, Tahireen Naz, Naseem Ghazal
Manuscript Writing & Approval: Asma Batool, Khadija Nafees, Tahireen Naz, Naseem Ghazal
All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

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