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Content

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An Evaluation of two Approaches to Exercise Conditioning in Pulmonary Rehabilitation for Copd Patients: A Comparative Study

Kumar Muthu*
Kumar Ravi**

ABSTRACT

Study objectives: To compare the effectiveness of two forms of exercise training in pulmonary rehabilitation for COPD patients. **Design:** A prospective, randomized Eight-week study. **Setting:** A hospital-based outpatient pulmonary rehabilitation program. **Patients:** Thirty patients (15 patients in each group) with COPD who were referred for pulmonary rehabilitation. **Interventions:** We compared the short-term effectiveness of a high-intensity shuttle-walking-endurance program with a low-intensity, multicomponent calisthenics program for the rehabilitation of patients with COPD. The high-intensity group trained using the shuttle walking. The low-intensity group performed classroom exercises for approximately 30 minutes per session. For both groups, twice-weekly sessions were held for eight weeks. The primary outcome measure was Quality of Life, measured using the Clinical COPD questionnaire and rate of perceived exertion using Borg Scale. **Measurements and results:** Both groups showed significant post rehabilitation improvement in exertional and overall dyspnea, functional performance, and health status. Patients in the low-intensity group showed greater increase in endurance and greater reduction in exertional dyspnea, whereas those in the high-intensity group showed moderate increase in endurance and exertional dyspnea. **Conclusions:** It has been concluded that both the high-intensity training and low intensity training showed improvement in quality of life, but low-intensity training showed marked improvement in terms of exertional dyspnea and quality of life as this training is easy to perform and less expensive.

Key words: COPD; Shuttle walking pulmonary rehabilitation.

INTRODUCTION

Pulmonary rehabilitation is a multidisciplinary program of care for patients with chronic respiratory impairment that is individually tailored and designed to optimize physical and social performance and autonomy stated by the Committee of American Thoracic Society. The most successful rehabilitation programs are those in which services are provided by a variety of healthcare professionals to coordinate complex medical services. For example, a respiratory or physical therapist, a nurse, a doctor, a psychologist, a social worker, and a dietician are often needed. Most people are enrolled in the program for about 8 to 12 weeks.

Chronic obstructive pulmonary disease (COPD) is a disorder characterized by reduced maximum

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expiratory flow and slow forced emptying of the lungs. The clinical manifestation may be irreversible in some cases and there may be reduced exercise endurance and tolerance. (The American Thoracic Society and the European Respiratory Society).

COPD is the fourth leading cause of death in the United States and its prevalence is increasing. Annually, upto $40 billion is spent in the care of COPD patients. COPD is one of the most prevalent conditions in India and causes 1.5% of death annually. It tends to affect men (average prevalence 3.7%) more than women (2.8%)(S.K.JUIDAL,DBECHERA 2003)

It is the most common lung disease and the major inclusive criteria for the development of pulmonary rehabilitation program for the past 25 years. The pulmonary rehabilitation program is the most important component for the management of COPD patients (BARTOLONE R.CELLI).

The rehabilitation program mainly focuses on the following goals:

- Training in breathing techniques and energy conservation.
- Lessons in how to monitor the symptoms of the disease.
- Lessons in how best to use medications.
- To improve exercise tolerance.
- Patient education and dietary counseling.
- Vocational and psycho-social counseling.

Conventional chest physical therapy is referred to as a combination of postural drainage with airway clearance techniques such as percussion, clapping, vibration and shaking in acute cases to improve breathing and specific endurance exercise to improve exercise tolerance. In a pulmonary rehabilitation program the exercise may be of high and low intensity to improve maximal oxygen uptake, to increase exercise ability in chronic COPD patients, and to improve quality of life.

In this regard, exercises may be high intensity and low intensity exercises focusing mainly on improving the exercise endurance by giving exercises to lower extremity muscles and, thereby, recruiting slow oxidative fibers (SO fibers).The literature sources available favor the two approaches to exercise conditioning in COPD patients in aspects of improvement of quality of life, dyspnea and other symptoms and also show that low-intensity training is effective than high-intensity training in aspects of exertional dyspnea nevertheless, this study was It is done in the background of the null hypothesis, which could be stated as:

"There is no significant difference noted between the two approaches to exercise conditioning in pulmonary rehabilitation for COPD patients in aspects of dyspnea and quality of life and other symptoms".

METHODOLOGY

The study aimed to use two approaches to exercise conditioning in pulmonary Rehabilitation for COPD patients namely high-intensity exercise and Low-intensity exercise.

The following tools were used to evaluate the patient's responses:

1. A baseline evaluation chart.
2. Stethoscope.
3. Sphygmomanometer.
4. Two cones.
5. Stereo Cassette Player.
6. Shuttle walk tape.
7. Chair.

This was an experimental study in which the samples were randomly selected through a chit method and allocated into two groups: -Group I –patients who underwent low-intensity training program; and Group II –patients who underwent high-

intensity training program The study was carried out in the Department of Pulmonology and Critical Care, Sri Ramakrishna Hospital, Coimbatore, Tamilnadu, India from July 2004-June 2005.

Informed consent was obtained and the patients were treated after prior referral from the physician. Before commencing with the recording and treatment, self – demonstration was performed and ensured that the patients understood it. The patients were evaluated twice weekly for eight weeks and were instructed to do the exercises at home also.

Inclusion

Patients referred to physiotherapy through the Department of Pulmnology and Critical Care, Sri Ramakrishna Hospital, Coimbatore with diagnosis of chronic obstructive pulmonary disease with stable clinical signs, forced expiratory volume in 1 second (FEV1) = 30 – 49% predicted and stated as moderate COPD were considered for ranged between the study and allocated to both groups. Both male and female patients age 40 – 50 years.

Exclusion

Patients with pulmonary hypertension, left ventricular dysfunction, infectious diseases and severe dyspnea, patients underwent CABG, patients with acute exacerbations were not considered and also no formal Pulmonary Rehabilitation with the past 12 months.

The following parameters were assessed for the outcome.

- Dyspnea grade using Borg scale of rate of perceived exertion (RPE).
- Quality of life using Clinical COPD Questionnaire(CCQ)

Exercise Training

If the exercise training intensity is of 90% of HRmax, then it may be considered as high intensity. An exercise heart rate of 70% maximum represents exercises with little or no discomfort may be designated low intensity exercise or calisthenics.

In this study, shuttle walking is considered as high intensity training for 30 minutes and chair exercises for 30 minutes are considered as low intensity training or calisthenics.

DISCUSSION

By reviewing the clinical presentation of COPD patients, they had decreased exercise tolerance, breathlessness on exertion and also during various activities. These may lead to functional impairment and reduced health status. To overcome this, these patients were included in a pulmonary rehabilitation program to modify their quality of life and to reduce breathlessness during various activities.

In the pulmonary rehabilitation program, both the high and low intensity trainings incorporated. These two exercise training was focused towards the improvement of exercise endurance and reduce breathlessness during rest and activities. The two methods of training showed improvements in parameters of dyspnea and quality of life, but low-intensity training produced better result in perception of dyspnea clinically and statistically than high-intensity training.

Inspite of the proper instructions in training and education in aspects of smoking cessation, some of the patients smoked during the training period. This might have interfered with the improvement. However the 't' value (independent and dependent) for parameters of dyspnea and quality of

TABLE – 1 DEPENDENT t TEST-CCQ Score		
GROUP	**MEAN**	**t value**
Group 1	**6.2**	**7.88**
Group 2	**3.6**	**4.90**

TABLE – 2 DEPENDENT 't' TEST- RPE SCORE		
GROUP	**MEAN**	**t value**
Group 1	**3.8**	**11.65**
Group 2	**2.4**	**7.5**

TABLE -3 INDEPENDENT t TEST-RPE SCORE (Group1 and Group 2)	
S.D.	**t value**
1.31	**2.917**

TABLE-4 INDEPENDENT t TEST-CCQ Score (Group1 and Group 2)	
S.D.	**t value**
2.97	**2.389**

life, using RPE Score and CCQ Score respectively has been quite significant at p= 0.05, indicating that the significance is not at the value of p=0.01 and that the 't' value is higher than the table value for both the groups in dependent and independent 't' test. Moreover, the patients performed these exercises with more dyspnea initially and, after intervention, the perception of dyspnea was reduced significantly in both the groups. But the low-intensity training group patients had greater ease than high-intensity training because these exercises are performed at sub-maximal intensity. Quality of life was improved both clinically and statistically in both the groups, and all the patients had no discomfort while doing functional activities. This study mainly focused on outpatient pulmonary rehabilitation and so there was less cost to the patient. These exercises are performed easily without any need of equipment and hence these two methods are cost effective and economical.

CONCLUSION

The outcome of the statistical analysis and literature review reveals that the two exercise training programs improve exercise reconditioning in COPD patients. These two training programs reduce breathlessness and improve health status.

Hence, based on the outcome of the dependent 't' test and independent 't' test and their values being higher than the table value at p=0.05, it is concluded that the null hypothesis is excluded, thereby accepting the experimental hypothesis. Thus, the study is stated in the light of experimental hypothesis be

" There is significant improvement in dyspnea and quality of life in COPD patients using two ex-

ercise training programs. Low-intensity training is effective in aspect of decreased exertional dyspnea than high-intensity training."

LIMITATIONS AND RECOMMENDATIONS

1. Older age people were excluded but may be included in further studies.
2. Gender specific factors can also be considered because most of the male patients had a smoking habit and some had withdrawn during the study period. This might have altered the study.
3. This was a time-bound, small group, and a cost-effective study. Further studies could be achieved by taking a larger sample with more parameters and a follow-up of one year.
4. Inspite of these barriers, the pulmonary rehabilitation program has got its own value and efficacy in modifying the quality of life and health status in COPD patients.
5. Based on this study, we recommend that Exercise Training may improve the endurance and exercise tolerance and reduce breathlessness in COPD patients, provided they can be taken along with other chest physical therapy techniques.
6. In developing countries like India, the pulmonary rehabilitation program may also be included in the treatment regimen to improve exercise conditioning for COPD patients.

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Total CCQ Score

Calculate CCQ scores

Symptom Score

CLINICAL COPD QUESTIONNAIRE FOR MEASURING QUALITY OF LIFE

Name : **Date :**

I.D.No:

Age : **Sex:**

Please check the number of the response that best describes how you have been feeling during the past week.
(Only one response for each question.)

On Average, during the past week, how often did you feel: (symptom score)	**Never**	**Hardly ever**	**A few times**	**Several times**	**Many times**	**A great many times**	**Almost all the time**
1. Breathlessness at Rest?	0	1	2	3	4	5	6
2. Breathlessness doing physical activities?	0	1	2	3	4	5	6
3. Concerned about getting a cold or your breathing getting worse?	0	1	2	3	4	5	6
4. Depressed (down) because of your breathing problems?	0	1	2	3	4	5	6

On average during the past weeks how limited were you in these activities because of your breathing problems (Functional score)	**Never**	**Hardly ever**	**A few times**	**Several times**	**Many times**	**A great many times**	**Almost all the time**
5. Daily activities such as washing yourself, dressing.	0	1	2	3	4	5	6

6.	Minimal activities such as gardening, upper limb & lower limb exercises, cleaning house.	0	1	2	3	4	5	6
7.	Moderate physical activities, such as carrying weights, climbing stairs.	0	1	2	3	4	5	6
8.	Strenuous activities such as cycling, jogging, shuttle walking	0	1	2	3	4	5	6

Functional state score

APPENDIX II

Chair exercises:

1. Head up and down (chin to chest)
2. Turn head to right and then left
3. Ear to shoulder (right and left)
4. Biceps curls (arms over side of chair with palms facing forward, bend elbow and raise hands up)
5. Shoulder circles (arms over side of chair, circle shoulders front and back)
6. More circles (hands on shoulders, circle front and back)
7. Arm stretch (arm straight up, then reach for center of back, right and left)
8. Wrist circles
9. Ankle circles (with leg extended)
10. Flex and point the toes (with leg extended)
11. Chest press

Weights

1 Biceps curls (elbows in toward body, palms facing forward, raise arms up)

2 Wrist curls (with arms over the sides of a chair)

3 Triceps exercise (using both hands bring weight over head then to the back)

4 Shoulder exercise (arms over the side of a chair, with arms extended raise them up and down)

5 Arm exercise (arms in front extended, raise them up and down)

6 Arms beautiful (standing, elbows in, weights to shoulders, press back then bring back up to shoulders)

Sticks

River dance (raise sticks up, over to the side [rotating right and left], back up and down on lap for 2 min)

Standing exercises:

1. Circle torso over top of legs
2. Bend forward (back straight) then back
3. Crescent stretch (reach over head to side with right arm, then left)
4. Shoulder/chest stretch (clench hands in back, then bring shoulders back)

5. Clench hands in front, turn toward right then left
6. Calf raises
7. Quarter knee bends
8. Leg lifts to side
9. Lunge stretch (both heels on ground, front knee bent)
10. Reach for stars
11. March in place with fingertip taps (30 s)

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Awareness about Physiotherapy among Higher Secondary Students and Perseverance among Physiotherapy Students and Professionals in Meerut: A Survey

Yashaswi Agarwal*
Manish Agarwal**
Nalina Gupta***

ABSTRACT

Introduction & Purpose of the study: Physiotherapy is concerned with health promotion, prevention of disease or injury, treatment & rehabilitation. Physiotherapy has been in existence in India since five decades but it has been observed in the last five-six years that the number of students pursuing physiotherapy as a career is declining as is the number of physiotherapy students and professionals continuing the profession. Thus, the purpose of this study is to find out the level of awareness about physiotherapy among higher secondary students & perseverance among students & professionals towards physiotherapy. **Materials & Method:** This was a questionnaire based survey. Subjects included in the study were higher secondary students, B.P.T. final year students, interns, M.P.T. students & physiotherapy professionals. Data was collected by making personal visits to various colleges, hospitals & clinics in Meerut and the questionnaire was distributed to 109 subjects (46 higher secondary students, 51 B.P.T. 4th year students & interns and 12 M.P.T. students & physiotherapy professionals). **Results:** Data was analyzed using descriptive statistics. 41% of higher secondary students had an idea about physiotherapy, 26% of higher secondary students wanted to pursue physiotherapy as a career, and 10% of BPT 4th yr Students and interns did not want to continue with their profession. On the other hand 100% of MPT students and physiotherapy professionals wanted to continue with their profession. **Conclusion:** Awareness of physiotherapy is still lacking among higher secondary students and perseverance towards the profession among students and interns is declining.

Key words: Awareness, perseverance, physiotherapy, professionals

INTRODUCTION

Physiotherapy is a science-based health care profession in which principles from biological, physical and behavioural sciences are integrated and applied. It is concerned with health promotion, prevention of disease or injury, treatment & rehabilitation. Hippocrates advocated massage and Hector used hydrotherapy (water therapy) in 460 B.C. The earliest documented origins of actual physical therapy as a professional group date back to 1894 when nurses in England formed the Chartered Society of Physiotherapy. Other countries soon followed and started formal training programs, such as the School

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of Physiotherapy at the University of Otago in New Zealand in 1913. In the United States, Physical Therapy began in 1914 in Portland, Oregon, with Reed College and Walter Reed Hospital graduating the first physical therapists, then called "reconstruction aides." These were nurses with a background in physical education needed to help manage the devastating effects of the First World War [1,2].

Research has been a part of profession since the its early beginnings; the first physical therapy research was published in the United States in March 1921 in the first edition of The PT Review. This was the year when Mary McMillan, PT, first organized the Physical Therapy Association, which eventually changed its name to the American Physical Therapy Association (APTA). This was a landmark year, as educational standards for university professional PT programs were instituted and programs became accredited by a national body. Scientific research and technology started to shape the profession [1,2].

Physical therapists joined the team for medical research with the American Physical Therapy Association (APTA) cooperating with the Salk vaccine trials, which led to having a vaccine for Polio in 1956 that is now considered commonplace [1]

In India, physiotherapy has been in existence since five-six decades, but it has been observed in the last five-six years that number of students pursuing physiotherapy as a career is declining as is the number of physiotherapy students and professionals continuing the profession. Physiotherapy is such an integral part of health care without which complete recovery of an individual with any disorder is not possible. But, inspite the profession is on a decline in India. Thus, the aim of this study was to find out of this, the level of awareness of physiotherapy among higher secondary students & perseverance among students and professionals towards physiotherapy in Meerut.

MATERIALS & METHOD

This was is a questionnaire based survey. Two questionnaires were drafted - Questionnaire 1: Regarding awareness among higher secondary students; Questionnaire 2: Regarding perseverance among physiotherapy student and professionals. Subjects included in the study were higher secondary students, B.P.T. final year students, interns, M.P.T. students & physiotherapy professionals in Meerut.

Questionnaire 1 was distributed to higher secondary students [Group 1] and Questionnaire 2 was distributed to two groups – Group 2(a), consisting of B.P.T. final year students and interns, and Group 2(b), consisting of M.P.T. students & physiotherapy professionals.

Data was collected by making personal visits to various schools, colleges, hospitals & clinics in Meerut. Schools visited were Dayawati Modi Academy-I, City Vocational Public School and Sanatan Dharm Inter College. Colleges visited were Subharti College of Physiotherapy, IIMT College of Physiotherapy and College of Applied Education and Health Sciences. Hospitals & clinics visited were KMC Hospital Research Centre, Lokpriya Hospital, and Koshish Physiotherapy Centre, Meerut.

Questionnaires were distributed to 109 subjects (46 higher secondary students, 51 B.P.T., 4th yr. & interns and 12 M.P.T. students & physiotherapy professionals) and data was analysed by using descriptive statistics.

RESULTS

The subjects were into three groups: Group 1, Group 2a and Group 2b.

Group 1- Awareness among higher secondary

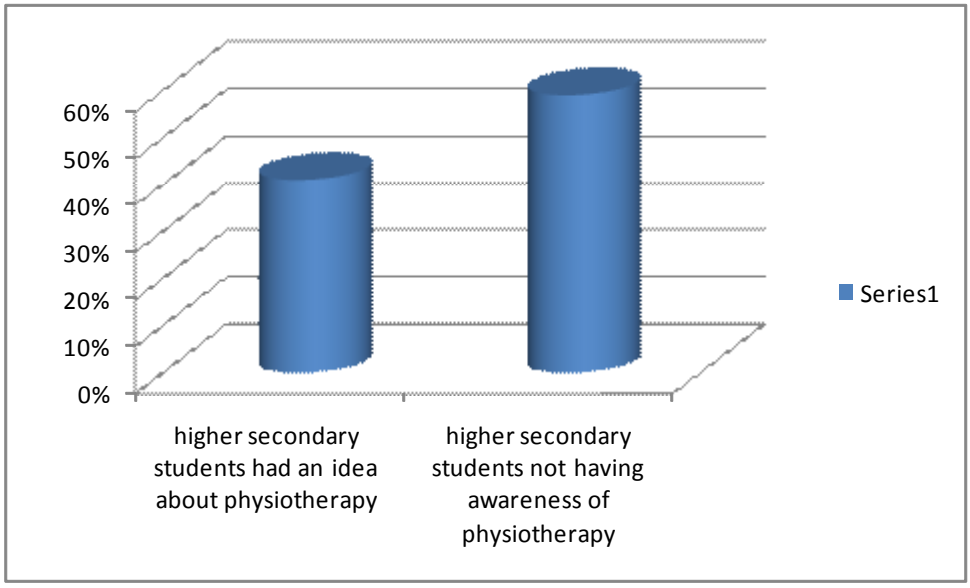

Fig. 1

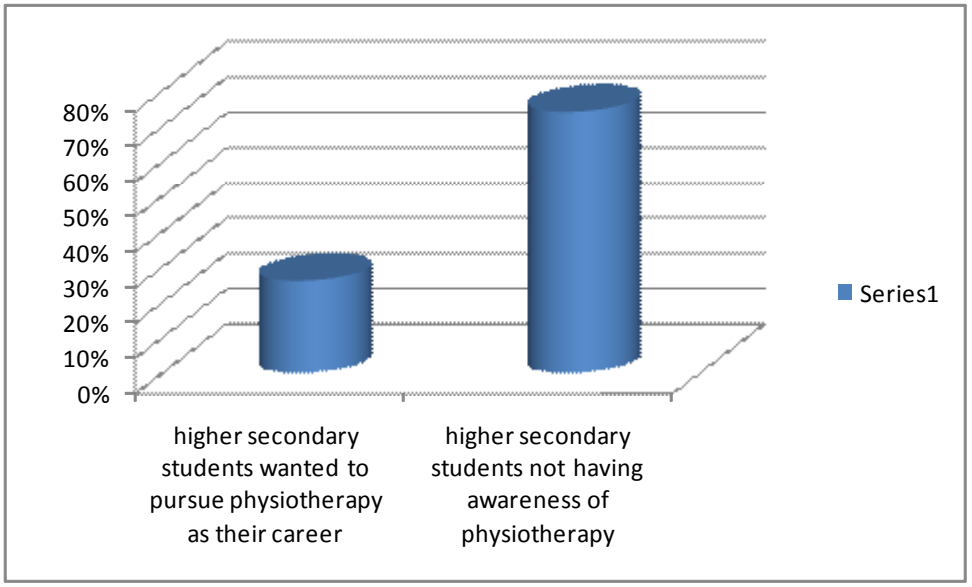

Fig. 2

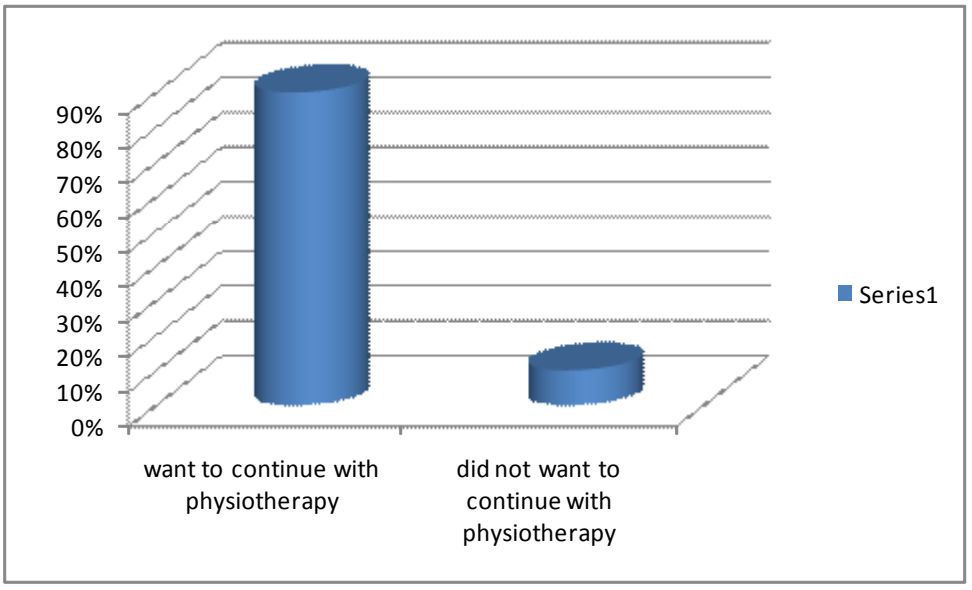

Fig. 3

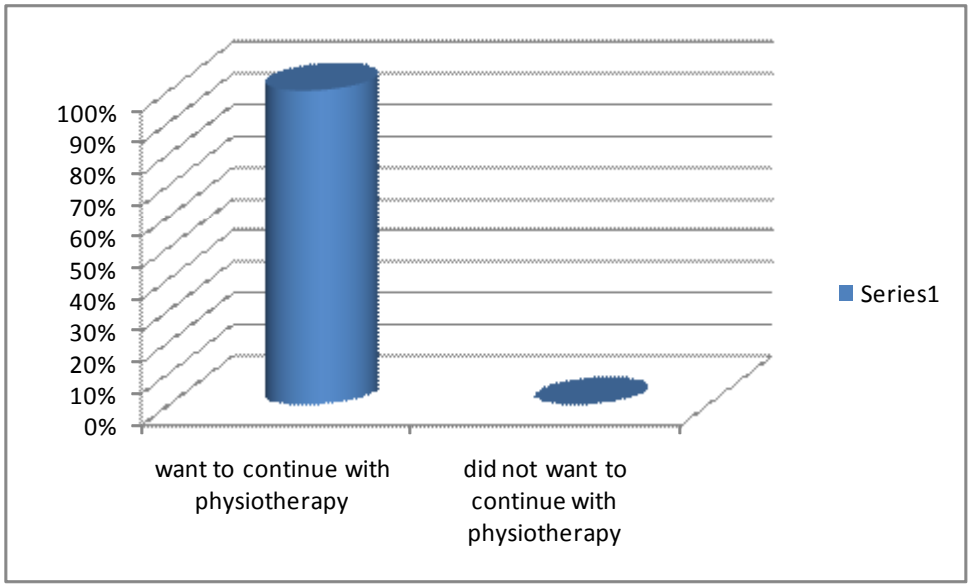

Fig. 4

students.

41% of higher secondary students had an idea about physiotherapy (Fig.1) and only 26% of higher secondary students wanted to pursue physiotherapy as their career (Fig.2).

Group 2 (a)- Perseverance among B.P.T. final year students and interns.

10% of BPT final year students and interns did not want to continue with their profession (fig.3).

Group 2(b)- Perseverance among M.P.T. students and professionals.

All M.P.T. students & physiotherapy professionals wanted to continue with the profession (fig.4).

DISCUSSION

For the sake of understanding, we will discuss results in following categories:

Group 1- Awareness among higher secondary students.

It was found that only 41% of higher secondary students had an idea about physiotherapy, but their ideas were vague in that it is a field that deals with bones, it is an aid given to person suffering from arthritis or it is a treatment by massage, exercises, heat and shocks that improve mobility. In our study, we found that only 26% of higher secondary students wanted to pursue physiotherapy as their career while most of them wanted to pursue only if they didn't get through pre-Medical Tests.

Group 2 (a)- Perseverance among B.P.T. final year students and interns.

10% of B.P.T. final year students and interns did not want to continue with their profession. The reasons for not continuing the profession were lack of jobs and low pay scales, government jobs open to diploma holders only or lack of discrimination between diploma and degree holders, no physiotherapy council, not much support from medical personnels, lack of team approach in hospital setups and lack of recognition among general population.

Group 2(b)- Perseverance among M.P.T. students and professionals.

All M.P.T. students & physiotherapy professionals wanted to continue with the profession and most of them were continuing just because they had already spent many years in this profession.

CONCLUSION

Awareness of physiotherapy is still lacking among higher secondary students and perseverance among physiotherapy students and professionals is declining.

LIMITATIONS OF THE STUDY

Small sample size, thus results cannot be generalized.

Individuals included were students and professionals from Meerut only.

IMPLICATIONS

1.) There is a need to have mass awareness programs about physiotherapy.
2.) There should be better job avenues in private as well as government sectors.
3.) There is a great need to have physiotherapy council.
4.) Steps need to be taken to gain recognition in society.
5.) Team approach needs to be emphasized among medical and paramedical personnels in hospital setups for full recovery of an individual with any disorder.

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Blood Pressure Pattern in Pregnant Women of Different Body Mass Index in Three Trimesters of Pregnancy

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ABSTRACT

Study of blood pressure (BP) changes during pregnancy is essential for understanding the complications of pregnancy like birth defects, gestational diabetes, pre-eclampsia, bleeding disorders etc. Determinants of blood pressure systolic blood pressure (SBP), diastolic blood pressure (DBP) influenced by the pre-pregnancy body mass index (BMI) and its values gradually change during all the three trimesters. At present, little is known about the association of BP parameters with different grades of BMI in all the trimesters of pregnancy so our objective of this study was to elucidate the aforesaid relationship. We selected 200 pregnant women from antenatal clinics of obstetrics & gynaecology, J.N.Medical College, A.M.U.,Aligarh. Pre-pregnancy body mass index (BMI) was calculated by using Quetlet's Index. On the basis of BMI, all participants were divided into three groups: underweight, normal, overweight. Reading of blood pressure of participating women was taken by using a standard mercury sphygmomanometer in each of the three trimesters. Mean values were calculated and compared between different BMI groups in all the trimesters and of pregnancy. The statistical software SPSS (version 16) was used for data analysis and unpaired t- test was applied. SBP,DBP of underweight, and overweight pregnant women were not significantly decreased from first to second trimester and were not significantly increased from second to third trimester. In pregnant women of normal weight, there was a significant fall in SBP,DBP in mid pregnancy followed by which further increase up to the third trimester. The nonsignificant fall in BP parameters in underweight and overweight pregnant women in mid pregnancy was related to the increase in the risk of development of pre-eclampsia. The cause of pre-eclampsia may be explained by the mechanism involved in endothelial dysfunction which will be discussed later on. We found that the level of risk for complications of pregnancy is increased with abnormal BP parameter patterns in pregnant women having different BMI; thus, women with unhealthy weight should be offered preconception counseling, nutritional consultation, exercise program, and careful screening of obstetrics complications during pregnancy.

Key Words: Pregnancy; BP monitoring; Pre-eclampsia; BMI.

INTRODUCTION

Blood pressure studies in pregnancy reflect information regarding pregnancy outcomes. In human pregnancy, vast changes occur in the cardiovascular system which include an initial fall in systemic vascular tone, 40% increase in the cardiac output and an equally great expansion of the plasma volume

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INTRODUCTION

Blood pressure studies in pregnancy reflect information regarding pregnancy outcomes. In human pregnancy, vast changes occur in the cardiovascular system which include an initial fall in systemic vascular tone, 40% increase in the cardiac output and an equally great expansion of the plasma volume simultaneously during the first eight weeks of pregnancy and which persist throughout the pregnancy [1]. These changes are thought to ensure adequacy of uteroplacental perfusion through the different stages of pregnancy [2]. Several studies have been done on the normal pattern of blood pressure in pregnancy which showed an initial decrease in diastolic blood pressure (DBP) during 13 to 20 weeks of gestation, then further increase to slightly above the previous value [3,4]. Pregnancy is also influenced by body mass index (BMI), so pre-pregnancy body mass index is a parameter which influences the blood pressure throughout the pregnancy. BMI can be divided into underweight, normal weight, and overweight or obese. All these grades of BMI affect blood pressure parameters through different mechanism. In pregnant women, increased adiposity, measured using pre-pregnancy BMI, has been consistently associated with important medical complications of pregnancy such as pre-eclampsia, gestational diabetes mellitus, abruptio placentae, and operative delivery [5,6,7].

In pregnant women who are clinically healthy, blood pressure, most notably diastolic blood pressure, falls steadily until the middle of gestation and then rises again until delivery [8]. In women who develop pre-eclampsia, this mid-pregnancy fall in blood pressure does not occur; instead, blood pressure tends to remain stable during the first half of pregnancy and then rise continuously until delivery [8]. It is also the case that, even before pre-eclampsia manifests itself, these women have higher blood pressure levels in early pregnancy than pregnant women who remain normotensive [8].

Research indicates that hypertensive diseases of pregnancy, including pre-eclampsia, may be early manifestations of essential hypertension and cardiovascular disease in later life. It has, therefore, been postulated that pregnancy may be a "stress test" that reveals women with hypertensive tendencies [9,10].

When blood pressure is high before 20 weeks, it is more likely to be chronic hypertension (i.e. pre-existing or occurring before pregnancy) [11]. If it is pregnancy-induced high blood pressure, it usually occurs after 20 weeks of pregnancy and this condition is known as pre-eclampsia, where there is appearance of protein in urine, with swelling of feet, ankles and face in addition to raised blood pressure [12]. The most severe form of BP in pregnancy is called eclampsia with seizures (fits, convulsions) in mother, endangering the life of both the fetus and the mother. Blood pressure (BP) levels and body mass index (BMI) are known risk factors parameters for pre-eclampsia and gestational hypertension. In pregnant women, increased adiposity, as measured using pre-pregnancy BMI, is of global concern. There are few instances where investigators have assessed the extent to which the body mass index had clinically important consequences on maternal blood pressure levels during the different trimester, of pregnancy. The aim of this study is to observe the association of BP with pre-pregnancy BMI in a large population of pregnant women in different trimesters of pregnancy.

MATERIAL AND METHODS

This prospective study was conducted in the Department of Physiology in collaboration with Department of Obstetrics & Gynaecology, J. N. Medical College, A.M.U., Aligarh. Two hundred

Table No.1, Distribution of Pregnant women according to the different grades of body mass index.

S. No.	Characteristics	Cut-off values	Grade	Pregnant women(n=200) No. (%)	Mean values of BMI
I	BMI	<18.5	Under weight	29 (14.5)	16.52±0.94
		≥18.5 - <24.9	Normal	104(52)	22.48±1.48
		>25.0	Over weight	67 (33.5)	27.36±1.54

Table No.2, Mean values of blood pressure parameters in different groups of BMI in all the three trimester of pregnancy

S.No.	Trimester of Pregnancy	Underweight		Normal		Overweight	
		SBP	DBP	SBP	DBP	SBP	DBP
1.	First- First 12 weeks	137.0±5.56	85.0±2.66	118.0±8.30	84.4±5.37	130.0±1.83	77.0±2.88
2.	Second- 13 to 28 weeks	139.4±4.98	83.43±3.81	120.8±7.44	73.56±6.34	132.9±1.59	78.66±1.96
3.	Third- 29 to 40 weeks	145.8±3.66	86.6±2.81	124.8±6.32	83.43±4.74	140.8±1.66	80.41±2.34

SBP- Systolic blood pressure, DBP- Diastolic blood pressure

Table No. 3, Comparative significance of change of blood pressure (SBP, DBP) in different trimesters of pregnancy

S.No.	Trimester of Pregnancy	Underweight		Normal		Overweight	
		SBP	DBP	SBP	DBP	SBP	DBP
1.	First Trimester versus Second Trimester	0.205	0.382	0.243	0.021*↓	0.228	0.500
2.	Second Trimester versus Third Trimester	0.263	0.344	0.342	0.004*↑	0.736	0.364

(*P value < 0.05 was taken as significant.)

SBP- Systolic blood pressure, DBP- Diastolic blood pressure

pregnant women were selected from antenatal clinics of obstetrics & gynaecology, J.N.Medical College, A.M.U.,Aligarh. Details of each pregnant woman were filled in antenatal visit proforma which included questions regarding smoking history, physical activity, alcohol consumption, socioeconomic & educational status, and investigations like hemoglobin, urine albumin or protein or sugar. Females who had major disorder (cardiac, respiratory, renal or hematological disorder) and those taking antihypertensive medications or cholesterol-lowering medications were not considered in the study. Pre-pregnancy body mass index (BMI) was calculated using Quetlet's Index, which is body weight (in kg) divided by height (in meter2). On the basis of BMI ,all subjects were divided into three groups, that is underweight whose BMI [13,14] was less than 18.5kg/m2, normal whose BMI was between 18.5 and 24.9kg/m2, and overweight whose BMI was more than 25 kg/m2. Body weight was measured on the digital weighing scale with shoes off and wearing the least possible clothes (to the nearest 0.5kg) with each subject. Height was measured in cm (to the nearest 0.5 cm) with the subject standing in an erect position without shoes, against a vertical scale attached on the wall. Reading of blood pressure of participating women of different BMI group was taken in each of the trimesters. First trimester is the first 12 weeks, second trimester is 13 to 28 weeks, and third trimester is 29 to 40 weeks of gestation [15]. For B.P measurement, three readings were taken at 3 minutes. interval in sitting position on the left arm by using a standard mercury sphygmomanometer, and the average value was recorded. systolic blood pressure (SBP) and diastolic blood pressure (DBP) were defined as the points of the appearance and disappearance of Korotkoff sounds, respectively. Mean values of SBP and DBP were calculated and compared between different BMI groups in all the trimesters of pregnancy. The statistical software SPSS (version 16) was used for data analysis and we applied unpaired t- test. Comparative significance of change of SBP, DBP in different trimester of pregnancy was assessed among pregnant women of different BMI. P value < 0.05 was taken as significant.

OBSERVATION & RESULTS

A total of 200 pregnant women of different pre-pregnancy body mass index participated in the study.

Table 1 shows the distribution of pregnant women according to the different grades of body mass index. Maximum (52%) females had of normal pre-pregnancy body mass index, 33.5% were obese and 14.5% were underweight.

Table 2 shows the mean values of blood pressure parameters in different groups of BMI in all the three trimesters of pregnancy. Mean values of SBP were increased from first trimester to third in all the groups of BMI. DBP was decreased from first to second, then increased from second to third trimester in underweight and normal BMI groups, but it gradually increased from first to third trimester in overweight females.

Table 3 shows the comparative significance of change of blood pressure (SBP, DBP) in different trimesters of pregnancy. We have seen that SBP and DBP of underweight and overweight pregnant women were not significantly decreased from first to second trimester and it were not significantly increased in the third trimester. 2nd pregnant women of normal weight, there was nonsignificant increase in SBP from first to second and third trimester. At the same time, there was a significant fall in DBP in second trimester, from first trimester known as mid pregnancy fall, which further increased in third trimester in normal weight pregnant women.

DISCUSSION

The present study is intended to understand the association of BP with pre-pregnancy BMI in a large population of pregnant women in different trimesters of pregnancy. In healthy pregnant women, blood pressure, most notably diastolic blood pressure, falls gradually until the mid trimester and then rises again until delivery. In healthy pregnancies, this mid pregnancy fall in diastolic pressure is a physiological phenomenon triggered by a decrease in total peripheral vascular resistance, which is due, in turn, to vasodilatation starting in early gestation [16]. In our study, we found that diastolic pressure of pregnant women with normal BMI decreases significantly from first trimester to second trimester and then increases significantly from second to third trimester. This observation of normal physiological mid pregnancy fall in diastolic pressure was seen in normal weight pregnant women only, whereas underweight and overweight pregnant women, SBP and DBP, were not significantly decreased from first to second trimester and not significantly increased from second to third trimester. So, in these women mid-pregnancy fall in blood pressure was not seen; rather, blood pressure tends to remain stable during the first half of pregnancy and then rise continuously until delivery. The lack of such a fall in underweight and overweight pregnant women, which has also been noted in patients with pre-eclampsia, suggests failure of normal cardiovascular adaptation to pregnancy which might be due to endothelial dysfunction [17,18]. Recent studies have provided evidence that endothelial dysfunction, as indicated by a lower flow-mediated vasodilatation, precedes the development of pre-eclampsia, suggesting that endothelial dysfunction is a possible cause of pre-eclampsia [17,19]. Etiology of pre eclampsia in not clear exactly, but it is believed that pathophysiology of pre-eclampsia is endothelial cell dysfunction and intense vasospasm which is related with placental factors induced by impaired perfusion to placenta. Endothelial cell injury occurs due to oxidative stress and inflammatory mediators, and causes intravascular coagulation so there is loss of fluid. This increases the vascular sensitivity to vasopressors leading to vasospasm, responsible for abnormal blood pressure change during pregnancy. Endothelial cell injury and vasospasm both are in a vicious cycle. Dekker GA et al [20] postulated the hypothesis to know the pathophysiology of pre-eclampsia in which they described four etiologies, i.e., placental ischemia, very low-density lipoprotein versus toxicity, immune maladaptation, genetic imprinting. Another study by Roberts et al., (1989) [21] and Roberts and Redman, (1993) [22] focusing on the etiologies of pre eclampsia suggests that inappropriate systemic endothelial activation and dysfunction were the causes of pre-eclampsia and, therefore, complications, associated with it are more prominent in women having diabetes, obesity, thrombophilia, chronic hypertension, etc.(Dekker and Sukcharoen, (2004) [23] , Redman and Sargent, (2005) [24] and Sibai et al., (2005) [25]. All the above studies defined the etiologies and mechanism of pre-eclampsia which also support our study where the role of abnormal pre-pregnancy body mass index on blood pressure parameters in all the three trimesters has been established the mechanism responsible for its pathophysiology. Our study as well as correlates the BP changes during different trimesters with all the grades of BMI and some of the mechanisms of the cause, except in underweight women where the mechanism behind these changes in blood pressure is not fully understood. It, therefore, has been well established that abnormal body mass index affects blood pressure parameters in pregnant women

which may lead to pre-eclampsia which further affects mother as well as fetus.

CONCLUSIONS

1.) In pregnant women, abnormal body mass index, as measured by pre-pregnancy BMI, has been consistently associated with important medical complications of pregnancy, such as pre-eclampsia.

2.) Pre-eclampsia is also a leading cause of perinatal and maternal mortality.

3.) In view of the above risks the American College of Obstetricians and Gynecologists (ACOG) has recommended :

(a) Body mass index (BMI) should be recorded for all women at the initial prenatal visit, and information concerning the maternal and fetal risks of a very elevated BMI in pregnancy should be provided.

(b) Preconception counseling for obese women who are planning a pregnancy.

(c) Women at an unhealthy weight should be offered both nutrition consultation and an exercise program.

(d) Consultation with weight loss specialists before attempting another pregnancy.

(e) Physical activity alone produces only a modest reduction in weight compared with dieting alone.

(f) According to the American College of Sports Medicine (ACSM). Those who are obese or overweight can begin with activities such as walking, starting with a 5-minute workout and gradually working up to their goal over many weeks .

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Role of Physiotherapist in the Management of on Ground Sport Injuries: A Case Study of Hockey

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ABSTRACT

Study design: Prospective cohort study of Indian women field hockey players. **Background**: Ground sport injury is a challenging task for physiotherapists around the world and lack of literature data makes it more difficult. In India it is still in the growing phase. This first case study provides the basic baseline data regarding potential areas of injury, their types, treatments, and outcome of the treatment on subjects and on game results. **Case description**: This study covers 16 Indian women field hockey players who participated in 15th Asian Games held at Doha from 1st Dec to 15 Dec, 2006 where they played a total of matches, each of 70 minutes. **Outcomes**: Throughout the tournament, 39.3% total players got injured: atleast three body parts were affected by seven different types of injuries and rehabilitated according to symptoms by using physical therapy which is cost effective. Occurrence of muscle related injury was the highest (35%) and cut injury on head and eye were the least (2%). Forwards were at highest risk (43%) while goal keeper at least risk (0%). The effect of treatment was 100% and recovery time ranged from 5 min to 35 mins. Out of 22 total goals scored, forwards scored the maximum (19 goals-86%) followed by midfielder (2 goals-9%) and defender (1 goal-5%). The fact that after rehabilitation, injured players scored significantly ($p<0.01$) more goals (68%) than the non-injured (32%), shows physiotherapy enhanced the game performance. **Discussion:** Musc related injuries which were found most were probably due to running or less flexibility in the muscles. Forwards being affected the most may have been due to their quick responses and chasing the ball at both the end goals.

Key words: Field hockey, sports injury, physiotherapy, rehabilitation

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INTRODUCTION

Physiotherapy in sports is now an integral part of many sports around the world. Management of ground injuries is a challenging task for many physiotherapists and lack of literature data makes it more difficult. In India it is still in the growing phase.

Sports physiotherapy is a well recognized profession that demonstrates advanced competencies in the promotion of safe physical activity participation, provision of advice and adaptation of rehabilitation and training intervention for the purposes of preventing injury, restoring optimal function, and contributing to the enhancement of sports performance in athletes of all ages and abilities, while ensuring a high standard of professional and ethical practice [1]. Sports physiotherapy is a combination of manual and therapies that use a number of different techniques, including manipulation and mobilization, massage, hydrotherapy, exercise programmes, electrotherapy (ultrasound and interferential therapy), and some cases rest. Physiotherapists not only treat the problem but are often able to show the patient how to help prevent the problem happening again. The purpose of physiotherapy is to decrease body dysfunctions, reduce pain caused either by trauma, inflammation, degeneration, and surgery.

Sports medicine, sports physiotherapy and nutrition are newer fields, yet to be utilized to their optimum potential. During the recent past, sports have now become very competitive and much of the scientific research and support towards sports teams is found to be rewarding:- team doctors, team sports physio services have become very essential for most of the teams, health, SPA (sports physiotherapy for all) and health gymnasiums.

Hockey is an ancient sport thought to be the forerunner of all 'stick and ball' games, played in most of the countries around the world. It is a game of strength, speed, and skill. It is among the most difficult to master, the costliest to equip, the fastest to watch, and the most dangerous to play. It requires a combination of power, endurance, and flexibility. It is a game of control and lack of control, both of emotions and flying objects.

Epidemiological studies have consistently shown that injuries in hockey are numerous and can be serious. Most serious injuries result from being struck by the stick or the ball. Overuse injuries to the ankles and lower back are a frequently occurence [4,5]. Most injuries presenting to hospitals are to the upper limb (mostly injuries to the hand and forearm), face (mostly struck by stick or ball), and lower limb (mostly ankle, foot, and knee injuries). Injuries to the eyes are infrequent,

Table 1. Player's characteristics who participated in 15th Asian games held at Doha, 2006

Player no/ Jersey no	Age (yrs)	Height (m)	Weight (kg)	Position of play	International Match played (no)	Tournament goal scored (no)
1	26	1.57	60	goal keeper	71	0
3	25	1.65	59	defender	62	0
4	27	1.66	57	mid fielder	38	0
5	21	1.64	58	mid fielder	36	1
8	16	1.58	61	forward	7	0
9	24	1.54	49	forward	94	8
10	25	1.60	48	forward	86	2
12	23	1.64	57	goal keeper	13	0
13	18	1.68	59	defender	13	0
14	15	1.56	50	forward	8	0
18	19	1.64	58	forward	52	1
20	28	1.53	46	forward	172	5
23	25	1.57	52	defender	78	0
24	21	1.57	50	forward	51	3
25	26	1.56	51	defender	36	1
30	20	1.55	51	mid fielder	66	1

Table 2. Date wise on ground injuries, their types, treatments and outcome of the treatments

Date	Number	Type	Treatment	Outcome
03	6	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (1)	Ice, Crape bandage	Improved, Fit to play
		Muscle pain (3)	Taping	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS	Improved, Fit to play
05	6	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (1)	Ice, Crape bandage	Improved, Fit to play
		Thigh muscle pain (2)	Taping,	Improved, Fit to play
		Cut injury at eye (1)	Stitching, antibiotics,analgesic	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS,	Improved, Fit to play
06	7	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (1)	Ice, Crape bandage	Improved, Fit to play
		Thigh muscle pain (3)	Taping	Improved, Fit to play
		Low back pain (1) +	Taping, DMST, TENS,	Improved, Fit to play
		Cut injury at head (1)	Antibiotics, analgesic	Improved, Fit to play
08	7	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (1)	Ice, Crape bandage	Improved, Fit to play
		Thigh muscle pain (3)	Taping	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS	Improved, Fit to play
		Wrist injury (1)	Taping	Improved, Fit to play
09	7	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (2)	Ice, Crape bandage	Improved, Fit to play
		Thigh muscle pain (2)	Taping	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS	Improved, Fit to play
		Wrist injury (1)	Taping	Improved, Fit to play
11	6	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (1)	Ice, Crape bandage	Improved, Fit to play
		Thigh muscle pain (2)	Taping	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS	Improved, Fit to play
		Wrist injury (1)	Taping	Improved, Fit to play
13	6	Knee pain (1)	Taping, Ultrasound	Improved, Fit to play
		Ankle pain (2)	Ice, Crape bandage	Improved, Fit to play
		Thigh muscle pain (1)	Taping	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS	Improved, Fit to play
		Wrist injury (1)	Taping	Improved, Fit to play
		Low back pain (1)	Taping, DMST, TENS	Improved, Fit to play
		Wrist injury (1)	Taping	Improved, Fit to play

Table 3. Player wise each day injuries and game results

Date	P1	P3	P4	P5	P8	P9	P10	P12	P13	P14	P18	P20	P23	P24	P25	P30	Result
3	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	1	1
5	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	1	0
6	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	1	1
8	0	0	0	1	0	1	1	0	1	0	0	1	1	0	0	1	1
9	0	0	0	1	0	1	0	0	1	0	1	1	1	0	0	1	0
11	0	0	0	1	0	1	0	0	1	0	0	1	1	0	0	1	0
13	0	0	0	1	0	1	0	0	1	0	0	1	1	0	0	1	1

0- not injured/loss, 1-injured/win

although tend to be severe [14].

In literature, most of the studies describe single case reports with specific injury and its treatment and do not cover group injuries (team), especially ground injuries during a game [15,16,17]. For the first time, this case study was aimed to explore ground injuries related to hockey and the outcome of treatments. Beside this, the effect of treatment on game results was also observed. Basic data of this case study may be helpful for other physiotherapistsj.

CASE DESCRIPTION

This case study [13] was done on 16 Indian women hockey players who participated in the 15th Asian Games held at Doha from 1st Dec to 15 Dec, 2006. Each player's characteristics are presented in Table 1. As this case study is about ground injuries during the game, the details of the injury its treatment and outcome of the treatment are summarized in Table 2; date wise individual injury and game results in Table 3. The players age, height and weight ranged from 15-18 yrs, 1.53-1.68 m and 46-61 kg respectively with an average 22.44 yrs, 1.60 m and 54.13 kg respectively. Similarly, numbers of matchs played (international) and goals scored in this tournament ranged from 7-162 and 0-8 respectively with an average 55.19 and 1.31 respectively. 16 of the players, 2 were goal keepers, 3 midfielders, 7 forwards, and 5 defenders among these, 5 were reserved (interchangeable) players (P4, P8, P12, P13 and P14).

The physiotherapist joined 15 days before the tournament in India. In his first screening, five players (P5, P9, P13, P20 and P3) had chronic injuries (low back pain, knee pain, ankle injury and thumb injury) even though they were fit in their daily activities, including play. According to symptoms, they were rehabilitated before the tournament. These players also joined general physiotherapy rehabilitation programme with others while their stay in India. None of the participants had had a systematic intensive course of physiotherapy before. During the game at Doha, individual injury and type of injury was recorded by the physiotherapist. A player who suffered multiple injuries of the same kind was counted as 1. The injured player was rehabilitated on the ground and off the ground. This study did not require any patient consent.

OUTCOMES

During their stay at Doha, the players played seven matches, each of 70 minutes. In the seven matches, India scored a total of 22 goals, won in four along with a bronze medal. Out of 112 (16 players X 7 games), total 44 players (39.3%) got injured. During the tournament, a total of seven types of injuries occurred which were low back injury (pain), ankle

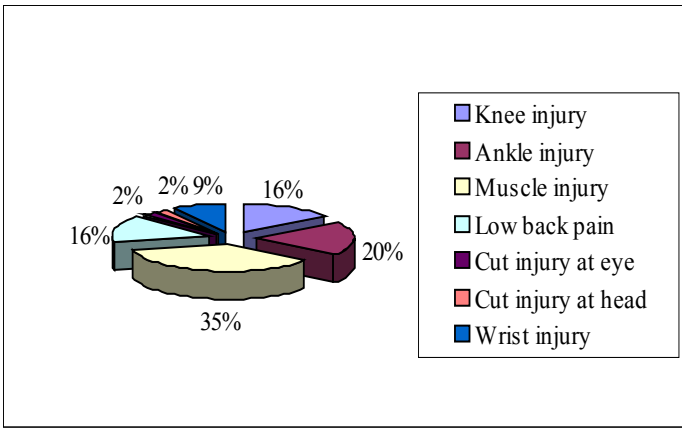

Fig. 1. Area wise distribution of injuries (%).

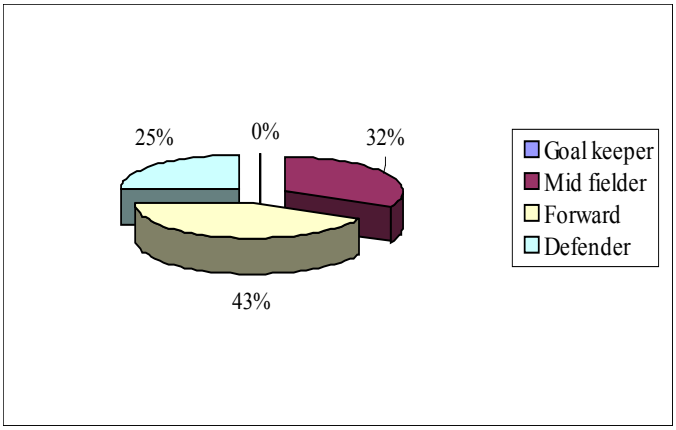

Fig. 2. Position wise distribution of injuries (%) during the game.

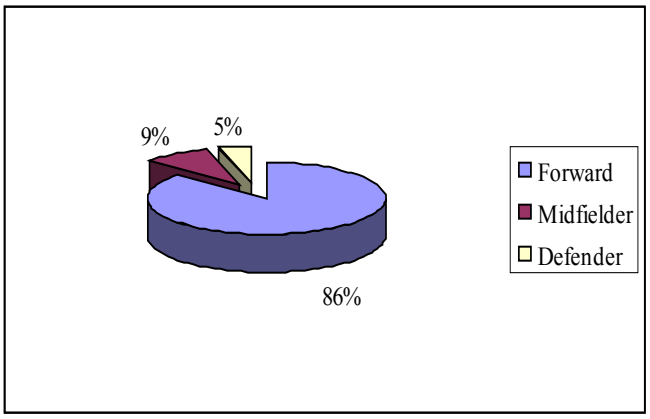

Fig. 3. Position wise distribution of goal scored.

injury, knee injury, wrist injury, muscle injury, and hit and cut injury at the head and corner of eye. Eight players did not get injured throughout the tournament. Only one player (P20) had multiple injuries (low back pain and cut injury at head) during the third match. Most of the injuries occurred when the player was near the goal or within the 25-yd line and were caused by contact with stick or ball, or with players, or chasing the ball; head and eye injuries were caused when penalty was called.

Except hit injuries, the rehabilitation of other injuries was done by the physiotherapist. According to symptoms, treatments were instituted, such as taping, mobilization, manipulation, dynamic muscular stabilization technique (DMST), cold therapy, ultrasound, TENS, stretching exercises and relaxation exercises, crape bandage and strengthening exercises. Except for ultrasound, TENS and relaxation exercises, other treatments were given on the ground during the game. In all the interventions rate of recovery was 100% and the time of recovery was from 5 minutes to 35 minutes.

Area-wise distribution of injuries (Fig. 1) shows that the occurrence of muscle (thigh and calf) related injury was the highest (35.6%) and hit and cut injury at head and eye was the least (2.2%). Ankle injury was the second highest (20.0%) followed by low back pain, knee injury (15.6%) and wrist injury (8.9%). Similarly, position wise distribution of injuries (Fig. 2) show that forwards were the highest at risk (31.8%) while goal keepers the least (0%). Midfielders were second highest at risk (31.8%) followed by defenders (25%).

Out of 22 total scored goals, forwards scored the maximum (19 goals-86.4%) followed by midfielders (2 goals-9.1%) and defenders (1 goal-4.5%) (Fig. 3). Comparing goals scored between the non-injured and injured players, the ratio of goals scored by injured players [17] was significantly high ($p<0.01$) than the non-injured [5]. Interestingly, out of 22 total scored goals, five players (31.3%) who were injured before the tournament and remained with their injury throughout the tournament scored 15 goals (68.2%) thereby proving that physiotherapy

not only rehabilitated their injury and improved their playing skills and power, but also enhanced mental, physical strength, and game performance.

DISCUSSION

Case research plays an important role in gathering evidence for more efficient practice, especially in relation to physiotherapy, where it is common to find interventions that are context-dependent and multifaceted [2]. Exercise therapy is generally prescribed to be a specialist clinical skill and the most complex and difficult part of physiotherap [7]. This case report describes the rapid recovery of an athlete in case of ground injury and her achievement and satisfaction with the outcome after physiotherapy intervention. It has been suggested that physiotherapist should, at the initial examination, identify the patient's goals and objectives in order to maximize outcomes of physiotherapy intervention. Core aspects of physiotherapy management in ground injuries are reduction in pain, improvement in function, and prevention of further deterioration.

All the physiotherapeutic interventions (taping, mobilization, manipulation, dynamic muscular stabilization technique (DMST), cold therapy, ultrasound, TENS, stretching exercises and relaxation exercises, crape bandage and strengthening exercises) provided during the tournament are well documented [6,8,9,10,11]. and practitioners use these in their daily treatments. These treatments may block pain pathways, mobiles bound neurological structures or enhance the musculoskeletal efficiency [12].

In this case study, 39.3% total players got injured. Three body parts were affected by seven different types of injuries and rehabilitated according to symptoms. Occurrence of muscle-related injury was the highest (35%) and cut injury at head and eye the least (2%). Forwards were at highest risk (43%) while goal keepers the least were at risk (0%). The effect of treatment was 100% and recovery time ranged from 5 minutes to 35 minutes. After rehabilitation, injured players scored significantly ($p<0.01$) more goals (68%) than the not injured (32%), which shows physiotherapy enhanced the game performance. Musc related injuries which were found most may have been due to running or less flexibility in the muscles. Forwards affected most may have been due to their quick responses and chasing the ball at both the end goals.

This case study strongly recommends that all hockey players should undergo at least a pre-season fitness screening for general strength, flexibility, and endurance. Coaches should be trained to screen players and to refer them to appropriate professionals if problems are evident. Equipment (requiring helmets and padded gloves) and rule changes (to decrease field congestion near the goal) as well as evidence-based injury prevention interventions (prophylactic ankle taping/bracing, neuromuscular balance exercise programs) may be viable prevention initiatives for reducing injury rates in women as well as men field hockey players [18].

The objective of a physiotherapist while rehabilitating the ground injured sports person is "to make a player fit for play within the shortest possible time". In this study it varied from 5 minutes to 35 minutes. The other possible physiotherapeutic interventions with optimal time may be highly imperative. The basic baseline data of this case study may be beneficial in future to other physiotherapis.

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