



## International Journal of Physiotherapy Research and Clinical Practice

### Research Article

## Prevalence of Fatigue Among Physiotherapy Students - A Cross-Sectional Study

G Pavan Kumar<sup>1</sup>, Ilona Gracie De Souza<sup>2,\*</sup>

<sup>1</sup>Professor, Cauvery College of Physiotherapy, Mysuru

<sup>2</sup>Associate Professor, Cauvery College of Physiotherapy, Mysuru

#### ARTICLE INFO

##### Article history:

Received 14.03.2023

Accepted 06.06.2023

Published 28.12.2023

##### \* Corresponding author.

Ilona Gracie De Souza

[ilonadesouzapt@gmail.com](mailto:ilonadesouzapt@gmail.com)

[https://doi.org/](https://doi.org/10.54839/ijprcp.v2i4.23.1)

10.54839/ijprcp.v2i4.23.1

#### ABSTRACT

Fatigue is expressed in related concepts such as 'overwhelmingly tired', 'exhausted', 'weakness', 'lassitude', 'feeble lethargy', 'lack of energy', 'wrung out' and 'mentally tired'. Persistent fatigue can cause a lack of mental clarity, difficulty in concentrating and in some cases it cause memory loss. It is the body's way of signalling need for rest and sleep. Physiotherapy being one of the flourishing courses in India as well as globally, it is both physically and mentally demanding when compared to many other medical and paramedical courses. Typical Physiotherapy practices involve repeated lifting, bending, twisting, reaching, and performing manual therapy. Thus, the current study aims at focussing on the fatigue severity rate among physiotherapy students. The study was conducted in April 2021 to Dec 2022, to know the prevalence of fatigue among physiotherapy students. Eight hundred students were recruited into the study based on the selected inclusion and exclusion criteria. The demographic data was collected and were asked to complete the visual analogue fatigue severity scale. The data was entered into the statistical package for social sciences software. To examine the baseline characteristics of the subjects, we analyzed the frequency and descriptive statistics and then it was subjected for finding of normality. Inferential analysis was carried out by using Chi- Square test for the outcomes of VAS- F. The result of the present study showed that the demographic data were not statistically significant ( $p > 0.05$ ). Gender and batch were not significant ( $p > 0.05$ ). The prevalence of fatigue was; mild 27.3%, moderate 34.2% and severe 37.9%.

**Keywords:** Fatigue; Physiotherapist; Physical inactivity; Physical Therapy

#### INTRODUCTION

Fatigue is a common subjective experience of having reduced capacity to a common physiologic phenomenon as the result of mental or physical exertion<sup>1</sup>. It describes reduced capacity to sustain force or power output, reduced capacity to perform multiple tasks over time and simply a subjective experience of feeling exhausted, tired, weak or having lack of energy<sup>2</sup>. It can occur without preceding exercise and without associations with known illnesses or diseases, as the fatigue is a disease in itself<sup>3</sup>. Fatigue is expressed in related concepts such as 'overwhelmingly tired', 'exhausted', 'weakness', 'lassitude', 'feeble lethargy', 'lack of energy', 'wrung out' and 'mentally tired'<sup>3</sup>. Persistent fatigue can cause a lack of mental clarity, difficulty in concentrating and in some cases, it causes memory loss. It is the body's way of signalling need for rest and sleep<sup>4</sup>.

Fatigue is characterized by a profound lack of energy, feelings of muscle weakness and slowed movements or central nervous system reactions<sup>4</sup>. It is triggered by stress, medication, overwork, or mental and physical illness or disease<sup>4</sup>. It might be the result of a health undermining way of living, characterized by too much burdening, too less rest, insufficient food, the use of substances, or family dynamics<sup>3</sup>.

On the basis of principles of cellular nutrition and metabolic-control logic there are 5 metabolic causes of fatigue. Those are; depletion of the phosphor-creatine concentration in muscle, accumulation of proteins in muscle, depletion of glycogen in muscle, a decrease in the blood glucose concentration, an increase in the plasma concentration ratio of free tryptophan to branched-chain amino acids<sup>5</sup>.

Fatigue is a multifaceted. Many studies are done about the factors that causing fatigue. That includes; Physical inactivity, mental disturbances, sleep disturbances,

improper diet, underlying disease, heavy exertion. Fatigue is also a nonspecific symptom in many medical conditions such as chronic inflammatory conditions, bacterial or viral infections, or autoimmune illnesses; and Psychiatric disorders such as major depression, anxiety disorders, and Somatoform disorders<sup>4</sup>.

Physical inactivity is a major contributing factor to the increased fatigability. De-conditioning as a result of restricted Physical activity results in large decreases in muscle mass and strength, as well as increased fatigability due to changes in muscle metabolism. Physical activity potentially could be related to a reduced risk of feelings of low energy and fatigue in the general population. Individuals increase physical activity; they also increase the frequency of feelings of energy and decrease the frequency of feelings of fatigue<sup>1</sup>.

Although Physical activity is effective in reducing fatigue, too much physical exhaustion can also lead to fatigue. Exhaustion can be defined as extreme fatigue, a state in which an individual may exceed his/her physiological limits and then experience a “catastrophic” failure of homeostasis<sup>6</sup>.

Mental disturbance which includes; stress, anxiety, depression and other psychological factors are also one of the leading causes of fatigue. High levels of stress and fatigue are associated with depression and anxiety, decreased Psychological and Physical well-being and a reduced quality of life. Both stress and fatigue as factors that together create negative effects, they are distinct psychological entities<sup>7</sup>.

Adequate sleep is important for better cognitive performance and also to avoid health problems and psychiatric disorders<sup>8</sup>. Sleep problems are highly prevalent in many populations. Subjective sleep quality can account for fatigue more than quantitative sleep measures, such as sleep latency, nocturnal awakenings and early morning arousals<sup>9</sup>.

The determinant factors for fatigue will depend on nutrition also. A number of studies have documented the adverse impact of hunger on the academic, behavioural, physical and mental health of students. Hungry adolescents suffer from two to four times as many health problems, such as fatigue, headaches, irritability, inability to concentrate etc. Hunger is a common experience reported by adolescents. It affects health and academic performance<sup>10</sup>.

Pain is also found to one of the main causes of fatigue. There is a close relationship that exists between muscle pain and fatigue. Pain and fatigue may occur together during sustained exhausting muscle contractions, particularly as the limit of endurance is approached. Both can play a significant role in reducing muscle performance during exercise<sup>11</sup>.

Based on studies, majority of these factors are found to be present in student population. Numerous studies have examined how students experience stress in professional health education. Medical, nursing, dental, pharmacy, occupational therapy, and physical therapy students have reported high levels of perceived stress<sup>7</sup>.

Physiotherapy being one of the flourishing courses in India as well as globally, it is both physically and mentally demanding when compared to many other medical and paramedical courses. Typical Physiotherapy practices involve repeated lifting, bending, twisting, reaching, and performing manual therapy. The manual procedures often involve forward flexion, lateral flexion, and rotation. Work-related physical stresses to the hand, wrist, neck, and shoulder lead to injuries and have been identified through a number of cross-sectional epidemiologic studies<sup>12</sup>. Considering all this, course evaluation instruments administered within universities indicate that students describe their undergraduate education as demanding and academic requirements as stressful<sup>13</sup>.

The available evidence indicates high levels of academic stress among Physiotherapy students<sup>13</sup>. All students reported that academic issues were the greatest sources of stress, and this was significantly greater than personal and financial sources of stress. Student stress often stems from academic load, classroom environment, faculty interaction, illness, and emotional concerns outside of the classroom or clinic<sup>7</sup>.

Zhang et al. showed that students experience high levels of stress while performing an objective clinical examination, and these stress levels negatively impact their performance and eventually lead to fatigue. This in turn negatively impacted academic experience and professional development. This continues as a vicious cycle<sup>7</sup>.

A study done in 2016, assessed to find the sleep habits and disorders in the adolescent and adult paramedical personnel among which were Physiotherapy students. On analysis of the data on the basis of quality of sleep, it was found that 76% of BPT students used to feel sleepy and unrefreshed on awakening. 18% of BPT students felt chronically sleepy<sup>8</sup>.

As students progress through medical courses, they are faced with multiple challenges such as examination pressures, fear of failure, intense competition among peers, lack of leisure time, and perceived mistreatment; all of which may subject medical students to academic, personal and social challenges. Students suffering from depressive and anxiety symptoms often have “empathy fatigue” and feel emotionally detached from their patients with professional and ethical consequences that may compromise patient safety and care. This is also true for Physiotherapy students<sup>14</sup>.

Medical education is intended to prepare graduates for a career that is personally, professionally, and intellectually rewarding. But this growth gets obstructed when students are mentally and physically drawn to fatigue level. As these students will become future health care providers, it is important for institutions to know the fatigue level of their students so that proper strategies can be developed to overcome it<sup>14</sup>. Fatigue is subjective feeling and its ill effect are frequently seen in many ways. It leads to task performance decrement, cognitive impairment,

sleep problem, and emotional disturbance. In students it leads to decline attention deficit, academic performance, negative health outcome and refusal to attend the class. Medical, nursing, dental, pharmacy, occupational therapy and physiotherapy students reported high level of stress that leads to fatigue. And till date no studies have been done to know the prevalence of fatigue among physiotherapy students.

## METHODOLOGY

### Aim of the study

To find out the prevalence of fatigue among Physiotherapy students in Mysuru.

### Objective

To find out the prevalence of fatigue using “visual analogue scale (VAS-F)” in order to evaluate fatigue severity among Physiotherapy students in Mysuru .

- Study Design - Cross- sectional study
- Study Population- physiotherapy students in Mysuru
- Sampling - Purposive
- Study Duration- April 2021 to Dec 2022
- Sample Size- 800
- Study Setting- All physiotherapy colleges in Mysuru

### Selection Criteria

- Inclusion Criteria
  - Students between the age group of 18 to 25 years
  - Students pursuing Physiotherapy degree and undergoing clinical postings on a regular basis
  - Clinical posting duration of 4 hrs and above. Both Male and female
- Exclusion Criteria <sup>15-17</sup>
  - Students diagnosed with respiratory condition as anemia, emphysema, asthma.
  - Smoking person
  - Diagnosed with type-1 diabetes mellitus
  - Acute rheumatic disorder
  - Sever illness- malaria, thyroid, jaundice
  - Neurological disorder like – epilepsy
  - Married Students
  - Hereditary connective tissue disorders

### Assesment Tools

Visual analogue scale to check severity of fatigue (VAS-F)- Questionnaires using visual analogue scale to evaluate fatigue severity (VAS- F). A valid instrument using visual analogue scales to estimate fatigue should be useful in assessing individual changes in fatigue over time or comparing perceptions of fatigue across population. Since a visual analogue line contains no numbers and has few words,

individuals can read and mark a line in a few seconds. The scale consists of 18 items related to fatigue and energy, has simple instructions, and is completed with minimal time and effort. It is a valid and reliable visual analogue instrument to assess the level of fatigue and energy in both normal and patient populations <sup>18</sup> .

### Procedure

For the study number of physiotherapy colleges will be identified in Mangalore. All the physiotherapy students will be taken in to consideration based on the selection criteria. Then informed consent will be projected. As they agree to participate in the study, the form containing demographic data will be displayed. Once the demographic data are filled up then questionnaire will be displayed. Data will be collected for further evaluation.

### Statistical Analysis

The data will be collected and all the variables and its characteristics will be described using tables and graphs. The data was then entered and coded in to software SPSS. For descriptive data, mean and SD was calculated for normally distributed data. We analyzed descriptive statistics for demographic data .We also analyzed frequency statistics to find out the percentage. For categorical data chi square was incorporated <sup>19,20</sup> .

## RESULT

Table 1 shows descriptive statistics for demographic data

Table 2 Inferential statistics

Table 3 Inferential statistics

**Table 1: Shows descriptive statistics for demographic data**

Variable	Values
Subject	160
Age	21.54 ± 1.741
Gender(N=160)	Male 44 (27.3 %)
	Female 116(72 %)
Year (N=160)	3 <sup>rd</sup> Yr 28(17.4 %)
	4 <sup>th</sup> YR 54 (33.5 %)
	Intern 56 (34.8 %)
Score(N=180 )	PG 22(13.7 %)
	Mild 44(27.3 %)
	Moderate 55 (34.2%)
	Severe 61 (37.9%)

Data were collected using online forms . A total of 207 data were collected. Among them 37 students were excluded on the basis of selection criteria. A total of 160 subjects (44 males, 116 females) with mean age of (21.54 ± 1.741) were recruited in our study. The data including demographic and for all parameters were recorded on online data collection

**Table 2: Inferential statistics**

Fatigue Level	p value	Male %	Female %
Mild	.167	34.1	65.9
Moderate	.483	25.5	74.5
Severe	.561	24.6	75.4

**Table 3: Inferential statistics**

Fatigue Level	P value	3 <sup>rd</sup> yr %	4 <sup>th</sup> yr %	Intern %	PG %
Mild	.639	15.9	34.1	36.4	13.6
Moderate	.595	25.5	40.0	29.1	5.5
Severe	.169	11.5	27.9	39.3	21.3

form and then converted it into tabular form. The data was entered into the software SPSS 16(Statistical Package for Social Sciences) in windows. To examine the baseline characteristics of the subjects, we analyzed the frequency and descriptive statistics and then it was subjected for finding of normality. Inferential analysis was carried out by using Chi- Square test for the outcomes of VAS- F. The result of the present study showed that the demographic data were not statistically significant ( $p>0.05$ ). Gender and batch were not significant ( $p>0.05$ ). The prevalence of fatigue was; mild 27.3%, moderate 34.2% and severe 37.9% .

## DISCUSSION

Fatigue is a universal symptom not only associated with most acute and chronic illnesses, but also with normal healthy functioning in everyday life<sup>21,22</sup>. It impacts negatively on work performance, daily functioning, family and social life and other relationship<sup>23</sup>. It affects all kind of occupation and in our study, we focused on physiotherapy student<sup>24,25</sup>.

Nowadays, we can observe an increasing demand for physiotherapist services, as the number of patients and working hours is increasing<sup>26,27</sup>. As a result, physiotherapists experience growing work-related load and fatigue so assessment of fatigue in physiotherapists is important both in managing the negative consequences of fatigue, as well as to prevent chronic fatigue<sup>28,29</sup>.

Literature revealed the physical fatigue, cognitive weariness and global burnout scores were higher in physiotherapists with higher workload and this is reinforced by the significant association between daily working hours and number of patients treated<sup>30</sup>. Another literature stated that physiotherapists spent largest amount of time with the patient, compared to doctors and nurses<sup>28 36</sup>

Literature attributed that there was direct relationship between the presence of musculoskeletal discomfort/pain and fatigue. It stated that holding a static and awkward posture for long periods during the work could lead to discomfort/pain and chronic fatigue [37] and the therapist are mostly involved in many discomfort position.

Work like Performing manual orthopaedic techniques, lifting or transferring dependent patients, assisting patients during gait activities, carrying, lifting, or moving heavy materials or equipment, unanticipated sudden movements or falls by patient, applying modalities, performing repetitive tasks, responding to an unanticipated or sudden movement by patient and working in the same position for long periods are factors prone to cause fatigue<sup>29,31</sup>.

Some work related issues like Performing the same task over and over, treating a large number of patients in one day, working scheduling, not enough rest breaks during the day, personal work factors like working at or near your physical limits, continuing to work when injured or hurt, inadequate training in injury prevention and working when physically fatigued are lead to cause more fatigue. Some repeated activities like performing overhead activities, bending/twisting, reaching, climbing stairs and squatting also cause fatigue<sup>29,31</sup>. A therapist needs to be sufficiently focused, engaged and motivated at work. It is same for a student<sup>28</sup>. They have to focus on their study, clinical classes and also in treating patient. Literature stated university students are often faced with study stress, resulting from high study demands, and concern about academic grades. The prevalence of study-related fatigue, and its negative impact on health and on academic performance. Both psychological and physiological working mechanisms may underlie potential positive effects of exercise on study-related fatigue [38].

Some associated factors are responsible for causing fatigue; as physical activity, stress, depression, anxiety, sleep disturbance, inadequate nutrition, underlying disease & heavy exertion. Based on studies, majority of these factors are found to be present in student population also. Several literatures has been published on this statement. In current study we described these factors<sup>1,4,6,7,9-11</sup>.

On gender basis fatigue affects on both group. In our study we took both male and female student, however the proportion of females was much higher in our study comparative to male as per table 2. It's because of many causative factors like thyroid problems, heart disease, vitamin D deficiency, Iron deficiency, sleep apnea, emotional exhaustion and lack of sleep. W.Wang et al stated that excessive fatigue and iron deficiency are common complications in young women<sup>32</sup>.

Numerous studies have identified prevalence of fatigue among different professional like drivers, foresters, pilots, air traffic controllers and marine traffic controllers. Another group studied included medicine-related jobs, with studies on both doctors and nurses. The available literature lacked a study on physiotherapists and there was no study among physiotherapy student population<sup>28</sup>. Current study focused on prevalence of fatigue among physiotherapy students in Mangalore and the prevalence of fatigue in the last year was; mild - 27.3 %, moderate - 34.2 % & sever- 37.9 % per 160

physiotherapy students in college of Mangalore.

Literature reveals assessment of subjective fatigue with the Japanese questionnaire in Polish Physiotherapists and found highest level of fatigue with decrease in activity (47%) after work, the decrease in motivation was 28%, physical fatigue was 38% and general fatigue was 42%<sup>28</sup>.

## REFERENCES

- Puetz TW. Physical Activity and Feelings of Energy and Fatigue. *Sports med.* 2006;36(9):767–780. Available from: <https://doi.org/10.2165/00007256-200636090-00004>.
- Kaasa S, Loge JH, Knobel H, Jordhøy MS, Brenne E. Fatigue. Measures and relation to pain. *Acta Anaesthesiologica Scandinavica.* 1999;43(9):939–947. Available from: <https://doi.org/10.1034/j.1399-6576.1999.430911.x>.
- Baker RJ, Sinemma G, Kuis W, Van De Putte E. Exercise in social context contributes to a favorable outcome in fatigued children and adolescents. 2009. Available from: <https://doi.org/10.1136/adc.2009.162586>.
- Namath HP, A T, Kutty R. Low intensity running as an exercise intervention for students with study related fatigue. *Indian J Appl Res.* 2018;4(8):86–95.
- Newsholme EA, Blomstrand E, Ekblom B. Physical and mental fatigue: metabolic mechanisms and importance of plasma amino acids. 1992. Available from: <https://doi.org/10.1093/oxfordjournals.bmb.a072558>.
- Cordeiro LM, Rabelo PCR, Moraes MM, Teixeira-Coelho F, Coimbra CC, Wanner SP, et al. Physical exercise-induced fatigue: the role of serotonergic and dopaminergic systems. 2017. Available from: <https://doi.org/10.1590/1414-431X20176432>.
- Kizhakkeveetil A, Vosko AM, Brash M, Ph D, Philips MA. Perceived stress and fatigue among students in a doctor of chiropractic training program. *J Chiropr Educ.* 2016;31(1):8–13. Available from: <https://doi.org/10.7899/JCE-15-27>.
- Sehgak S, Nijhawan A, Nijhawan M, Singh RP, Agarwal R, Sardana P. To study the sleep habits and prevalence of sleep disorders in the adolescent and adult paramedical personnel - a questionnaire-based study. *J Evolution Med Dent Sci.* 2016;5(87):6501–6508. Available from: <https://doi.org/10.14260/jemds/2016/1470>.
- Lavider M, Weller A, Babkoff H. How sleep is related to fatigue. *Br J Health Psychol.* 2003;8(1):95–105. Available from: <https://doi.org/10.1348/135910703762879237>.
- Banerjee S, Dias A, Shinkre R, Patel V. Under-nutrition among adolescents: A survey in five secondary schools in rural Goa. *Natl Med J India.* 2011;24(1):8–11. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4991764/>.
- Mastaglia F. The relationship between muscle pain and fatigue. *Neuromuscular Disorders.* 2012;22(3):S178–S180. Available from: <https://doi.org/10.1016/j.nmd.2012.10.003>.
- Bid D, Alagappan T, Dhanani HP, Goyani PS, Narielwala ZS. Musculoskeletal health, quality of life, and related risk factors among physiotherapy students. *Physiotherapy - The Journal of Indian Association of Physiotherapists.* 2017;11(2):53–53. Available from: [https://doi.org/10.4103/PJIAP.PJIAP\\_20\\_17](https://doi.org/10.4103/PJIAP.PJIAP_20_17).
- Tucker B, Jones S, Mandy A, Gupta R. Physiotherapy students' sources of stress, perceived course difficulty, and paid employment: Comparison between Western Australia and United Kingdom. *Physiotherapy Theory and Practice.* 2006;22(6):317–328. Available from: <https://doi.org/10.1080/09593980601059550>.
- Mahroon ZA, Borgan SM, Kamel C, Maddison W, Royston M, Donnellan C. Factors associated with depression and anxiety symptoms among medical students in Bahrain. *Acad Psychiatry.* 2017;42(1):31–40. Available from: <https://doi.org/10.1007/s40596-017-0733-1>.
- Lee YC, Chien KL, Chen HH. Lifestyle Risk Factors Associated with Fatigue in Graduate Students. *Journal of the Formosan Medical Association.* 2007;106(7):565–572. Available from: [https://doi.org/10.1016/S0929-6646\(07\)60007-2](https://doi.org/10.1016/S0929-6646(07)60007-2).
- Rajalaxmi V, Vijayalakshmi B, Shalini V, Motcharakkini, Tharani. To analyse the Physical Fitness of Female Physiotherapy Students and its Correlation with Depression and Anxiety. *Int J Cur Res Rev.* 2017;9(2):19–23. Available from: [https://ijcrr.com/uploads/2347\\_pdf.pdf](https://ijcrr.com/uploads/2347_pdf.pdf).
- M C. The Epidemiology of Self-Perceived Fatigue among Adults. *Prev Med.* 1986;15(1):74–81. Available from: [https://doi.org/10.1016/0091-7435\(86\)90037-x](https://doi.org/10.1016/0091-7435(86)90037-x).
- Lee KA, Hicks G, Nino-Murcia G. Validity and reliability of a scale to assess fatigue. *Psychiatry Research.* 1991;36(3):291–298. Available from: [https://doi.org/10.1016/0165-1781\(91\)90027-m](https://doi.org/10.1016/0165-1781(91)90027-m).
- Hughes JR, Crow RS, Jacobs DR, Mittelmark MB, Leon AS. Physical activity, smoking and exercise induced fatigue. *J Behav med.* 1984;7(2):217–225. Available from: <https://doi.org/10.1007/BF00845388>.
- Varni JW, Limbers CA, Bryant WP, Wilson DP. The PedsQL™ Multidimensional Fatigue Scale in type 1 diabetes: feasibility, reliability, and validity. *Pediatric Diabetes.* 2009;10(5):321–328. Available from: <https://doi.org/10.1111/j.1399-5448.2008.00482.x>.
- Sandikci SC, Ozbalkan Z. Fatigue in rheumatic diseases. *European Journal of Rheumatology.* 2015;2(3):109–113. Available from: <https://doi.org/10.5152/eurjrheum.2015.0029>.
- Marrelli MT, Brotto M. The effect of malaria and anti-malarial drugs on skeletal and cardiac muscles. *Malaria Journal.* 2016;15(1):1–6. Available from: <https://doi.org/10.1186/s12936-016-1577-y>.
- Louwerens M, Appelhof BC, Verloop H, Medici M, Peeters RP, Visser TJ, et al. Fatigue and fatigue-related symptoms in patients treated for different causes of hypothyroidism. *European Journal of Endocrinology.* 2012;167(6):809–815. Available from: <https://doi.org/10.1530/EJE-12-0501>.
- Aaronson LS, Teel CS, Cassmeyer V, Neuberger GB, Pallikkathayil L, Pierce J, et al. Defining and Measuring Fatigue. *Image: the Journal of Nursing Scholarship.* 1999;31(1):45–50. Available from: <https://doi.org/10.1111/j.1547-5069.1999.tb00420.x>.
- Connaughton J, Patman S, Pardoe C. Are there associations among physical activity, fatigue, sleep quality and pain in people with mental illness? A pilot study. *Journal of Psychiatric and Mental Health Nursing.* 2014;21(8):738–745. Available from: <https://doi.org/10.1111/jpm.12122>.
- Ettinger AB, Weisbrot DM, Krupp LB, Coyle PK, Jandorf L, Devinsky O. Fatigue and Depression in Epilepsy. *Journal of Epilepsy.* 1998;11(2):105–109. Available from: <https://scholars.mssm.edu/en/publications/fatigue-and-depression-in-epilepsy>.
- Aller F. Some Factors in Marital Adjustment and Academic Achievement of Married Students. *The Personnel and Guidance Journal.* 1963;41(7):609–616. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/j.2164-4918.1963.tb02355.x>.
- Okhria M, Truszczynska-Baszak A, Tarnowski A. Assessment of work-related fatigue in Polish physiotherapists and of its effect on their diagnostic accuracy and physiotherapy planning. *International Journal of Occupational Safety and Ergonomics.* 2020;26(2):406–412. Available from: <https://doi.org/10.1080/10803548.2019.1690215>.
- Jean C, Robertson VJ, Best MO. Work-Related Musculoskeletal Disorders in Physical Therapists : Prevalence, Severity, Risks, and Responses. *Phys Ther.* 2000;80(4):336–351. Available from: <https://doi.org/10.1093/ptj/80.4.336>.
- Emery J, Rose P. Hereditary haemochromatosis : never seen a case? *Br J Gen Pract.* 2001;51(466):347–355. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1313995/>.
- Juriena D, De Vries. Exercise as an Intervention to Reduce Study-Related Fatigue among University Students:A Two-Arm Parallel Randomized Controlled Trial. *PLoS One.* 2016;11(3):1–21. Available from: <https://doi.org/10.1371/journal.pone.0152137>.
- Al-Eisa E, Buragadda S, Shaheen AAM, Ibrahim A, Melam GR. Work Related Musculoskeletal Disorders: Causes, Prevalence and Response Among Egyptian and Saudi Physical Therapists. 2012. Available from: [https://scholar.cu.edu.eg/sites/default/files/amal Hassan/files/work\\_related\\_musculoskeletal\\_disorders-libre.pdf](https://scholar.cu.edu.eg/sites/default/files/amal Hassan/files/work_related_musculoskeletal_disorders-libre.pdf).