International Journal of Research and Review
www.ijrrjournal.com E-ISSN: 2349-9788; P-ISSN: 2454-2237

Original Research Article

A Study of Correlation of Perceived Stress and Pulmonary Function Tests among Working Women in an Urban Population of West Bengal

Dr. Arunima Chaudhuri[1], Dr. Sumanta Ghosh Maulik[2]

[1]Associate Professor, Department of Physiology, Rampurhat Government Medical College and Hospital (Affiliated to West Bengal University of Health Sciences), Rampurhat, West Bengal, India.
[2]Associate Professor, Department of Anaesthesiology, Burdwan Medical College and Hospital (Affiliated to West Bengal University of Health Sciences), Burdwan, West Bengal, India.

Corresponding Author: Dr. Sumanta Ghosh Maulik

ABSTRACT

Background: Psychological factors have long been suspected to influence lung function in asthma. Resilience and vulnerability to stressors as well as intensity of stress response greatly depends on age, gender, intelligence, and numerous characteristics of personality.
Aims: To study correlation of perceived stress and pulmonary function tests among working females in an urban population of West Bengal.
Materials and methods: The present pilot study was conducted in the department of Physiology of Burdwan Medical College after taking institutional ethical clearance and informed consent of the subjects. Six hundred healthy working females were selected from the local population. The Perceived Stress Scale (PSS) of Sheldon Cohen was used to measure perceived stress scores. Subjects were divided into two groups according to perceived stress scores with 300 subjects in each group. Subjects with PSS SCORES 20 and above (Group A) and Subjects with PSS SCORES less than 20 (Group B). Pulmonary function tests were carried in all subjects. SPSS version 16 was used to analyse the data.
Results: There was no significant difference in age between the two groups. Perceived stress scores were significantly higher in group A as compared to group B. Group A had PSS 28.0337± 3.0847 and Group B had PSS 14.347± 2.059; P value <0.0001**. There was significant difference in FEV1 and FVC between the two groups with Group B having significantly higher values of both the parameters as compared to group A. Group A FEV1 2.635± 0.8607 vs. Group B FEV1 2.879± 0.6477; P value 0.000109**; Group A FVC 2.81296 ± 0.8797 vs. Group B FVC 3.0816± 0.644; P value<0.0001**. There was no significant difference in FEV1/FVC% between the two groups. PSS was negatively correlated with all parameters of PFT in both groups.
Conclusions: Most working females perceive high levels of stress which may have adverse outcome in their pulmonary function test results. Increased perceived stress levels may adversely affect lung function in even healthy young individuals.

Keywords: Working females, perceived stress, pulmonary function tests.

INTRODUCTION

Women in India have proved their competence in the work domain. But behind this success there lies a big story of struggle and freedom in the traditional social areas. Working women have to face multiple challenges both at work and home. Recent survey reported that managing the dual roles of mother and worker is extremely hard. It was observed in the study that 60 per cent of working mothers feel they take out their stress on their families. Half of all working

mothers would prefer to be full-time mothers, while around one fifth would like to work from home; Only four per cent of working mothers would elect to work full-time if they had the choice; Nearly eight out of 10 working mothers would quit their jobs if possible. [1]

Quality of working life is the result of many factors inherent in the workplace environment, especially in terms of exposure to psychosocial risks. The risk assessment of quality of working life should take into due account the individual characteristics of workers, with special attention to gender. The physiological, biological, and cognitive differences between women and men are related to the social and psychological constructs which are inextricably connected. Family work still remains almost an exclusive responsibility of women at all stages of life. [2]

In a survey conducted by Kenexa Research Institute, 56% of the women surveyed said their stress level was reasonable, while 26% felt they were under unreasonable stress. Across roles, more women experienced unreasonable amount of stress than men did. While doing front-line supervisory jobs, women experienced 10% more stress than their male counterparts who carried out the same kind of functions. In service and production jobs, women felt 8% additional stress while at middle and upper manager level, the stress levels were up by 6% for them, compared to men. [1]

Psychological factors have long been suspected to influence lung function in asthma. Earlier experimental researches had demonstrated this susceptibility of the airways to suggestion; only recent studies have investigated the impact of various emotional states and stressful challenge on the airways in health and asthma. [3-5]

Associations between psychological factors and asthma symptoms have been documented in different studies, but the relationship between airway inflammation and psychological factors remains been largely unexplored. To examine the association of changes in current negative mood and long-term daily hassles with changes in lung function and airway inflammation in patients suffering from asthma and in healthy controls a study was conducted by Kullowatz A et al in 2008. [5] Data were analyzed from 46 asthma patients and 25 controls who completed questionnaires on current mood and daily hassles at two assessments 3 months apart. Lung function was measured by spirometry (forced expiratory volume in the first second (FEV1) and airway inflammation by the fraction of nitric oxide in exhaled air (FeNO). Regression analyses controlling for allergen load and air pollution (ozone) were calculated to study the association between changes in psychological factors and changes in lung function and airway inflammation, and to look into the mediational role of airway inflammation within the stress-lung function association.

In patients with asthma, increases in negative emotions were associated with decreases in FEV1 and increases in FeNO. As regards daily hassles, a reverse pattern of associations was found. Decreases in daily hassles were found to be linked to decreases in FEV1 and increases in FeNO. Mediation analyses revealed that FeNO was a significant mediator of the association of both negative affect and daily hassles with lung function changes. No significant associations between these factors were seen in healthy controls. Psychological variables were consistently associated with lung function and airway inflammation in asthma patients in the study. It was suggested that in asthma patients, effects of acute negative emotional factors must be distinguished from more chronic distress due to daily hassles. [5]

The present study was conducted to assess the effect of perceived stress on pulmonary function tests of normal individuals. As working females of reproductive age group has been found to be more stressed in different studies we included them as our study population. [1-2,6] Among varieties of procedure for assessing

lung function, the most common is the Spirometry and in the present study we measured FEV1, FVC, FEVI/FVC% for assessing lung functions in our subjects.

MATERIALS AND METHODS

The present study was conducted in the department of Physiology, Burdwan Medical College in a time span of one year after taking institutional ethical clearance and informed consent of the subjects.

• Inclusion criteria: Working women under without any gross systemic, metabolic and infective disease in the reproductive age group were selected.

• Exclusion criteria:

Subjects suffering from chronic debilitating diseases such as:

1. Cardiac arrhythmias.
2. Hypertension.
3. Diabetes mellitus.
4. Ischemic heart disease.
5. Nephropathy.
6. Respiratory diseases.
7. Neuropathy.
8. Smokers.
9. Subjects on treatment from psychiatry problem or with past history of treatment were excluded.
10. Pregnant women, puerperal mothers were not included.

On the first appointment, particulars of the subject, personal history, family history, history of past illness, treatment history, and dietary history of the subjects were carefully recorded.

Informed consent was obtained from the subjects. After clinical examinations were conducted and pre-test instructions were given to avoid consumption of any drugs that may alter the autonomic function 48 h prior to the test, the subjects were advised to have a good restful sleep. The subjects were advised to have light dinner within 8 p.m. and go to bed early, and avoid stressful situations during the day before the tests were conducted. Relaxing bedtime routine, such as soaking in a hot bath or hot tub and then reading a book or listening to soothing music, was advised. They were asked to avoid caffeine (e.g. coffee, tea, and soft drinks, chocolate), nicotine (e.g. cigarettes, tobacco products), and alcohol close to bedtime.

On the day of the test, no cigarette, nicotine, coffee, or drugs was permitted. Perceived stress scores of the subjects were measured.

Perceived Stress Scale [7]

Perceived stress scale of Sheldon Cohen, the most commonly used psychological instrument for measuring perceived stress was used to measure perceived stress. It is a measure of degree to which situation in one's life are appraised to be stressful. The questions ask about the feelings and thoughts during the last month. It comprises of 10 items.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?.....0 1 2 3 4
2. In the last month, how often have you felt that you were unable to control the important things in your life?.....0 1 2 3 4
3. In the last month, how often have you felt nervous and “stressed”? 0 1 2 3 4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?.....0 1 2 3 4
5. In the last month, how often have you felt that things were going your way?.....0 1 2 3 4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?.....0 1 2 3 4
7. In the last month, how often have you been able to control irritations in your life?.....0 1 2 3 4
8. In the last month, how often have you felt that you were on top of things? 0 1 2 3 4
9. In the last month, how often have you been angered because of things that were outside of your control? 0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?.....0 1 2 3 4

Perceived Stress Level was _____
SCORE – 13 or less, considered average.
SCORE – 20 or more, considered high.
Study groups: The subjects were grouped into two: Subjects with PSS SCORES[398] 20 and above (Group A) and Subjects with PSS SCORES less than 20 (Group B) with 300 subjects in each group. There was no significant difference in age between the two groups (32.82 ± 2.85 vs. 33.45± 2.46; P 0.48).
The test score results were not revealed to the subjects and the examiners who were examining the subjects to prevent any bias.

Pulmonary function test [3-5]
Apparatus: Computerized Spirometer, Helios 401.
Procedure: The subjects were asked to sit comfortably on a chair. After taking normal breathing for a minute they were asked to inspire as deeply and as fully as possible to fill the lungs. Then keeping the nostrils closed by nose clip the mouth piece of the transducer held firmly between the lips. Then they were asked to expel forcefully with maximum effort through the mouth piece of the transducer. Now the computer graphically displayed the results. The procedure was done for two more times for each patient. The best one was taken as result.
Calculation: FVC, FEV_1, FEV_1: FVC % were taken as parameters of pulmonary function test.

Statistical analysis: The computer software "Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. Chicago, SPSS Inc.) was used to analyse the data. The difference between the groups was considered significant and highly significant if the analysed probability values (*P* value) were $P < 0.05$* and $P < 0.01$**, respectively.

RESULTS

Six hundred working females were included in the present study and divided into two groups according to PSS. Group A had PSS 28.0337± 3.0847 and Group B had PSS 14.347± 2.059; P value <0.0001** (Table 1). Perceived stress scores were significantly higher in group A as compared to group B (figure 2). All our subjects belonged to middle socioeconomic group. They were educated and graduation was the minimum level of qualification. No unmarried subject was included in the study. It was observed that most of the subjects who perceived less stress were either pursuing any stress management programme or music or other hobbies during leisure time. There was significant difference in FEV1 and FVC between the two groups with Group B having significantly higher values of the parameters as compared to group A. Group A FEV1 2.635± 0.8607 vs. Group B FEV1 2.879± 0.6477; P value 0.000109**. Group A FVC 2.81296 ± 0.8797 vs. Group B FVC 3.0816± 0.644; P value<0.0001** (Table 1; Figure1-2). There was no significant difference in FEV1/FVC% between the two groups (Table1). PSS was negatively correlated with all parameters of PFT in both groups (Table2; Figure 3-8).

TABLE 1: COMPARISON OF PSS AND PFT OF THE TWO GROUPS

PARAMETER	Group A MEAN ± SD	Group B MEAN ± SD	P VALUE
PSS	28.0337± 3.0847	14.347± 2.059	<0.0001**
FEV1(L)	2.635± 0.8607	2.879± 0.6477	0.000109**
FVC (L)	2.81296 ± 0.8797	3.0816± 0.644	<0.0001**
FEV1/FVC%	93.24% ± 6.7	93.35 ± 0.0717	0.855

TABLE 2: CORRELATION OF PSS WITH PFT

PARAMETER	Group A (CORRELATION WITH PSS)	Group B (CORRELATION WITH PSS)
FEV1	-0.118803727	-0.127909333
FVC	-0.110463735	-0.103380224
FEV1/FVC%	-0.117672315	-0.09095713

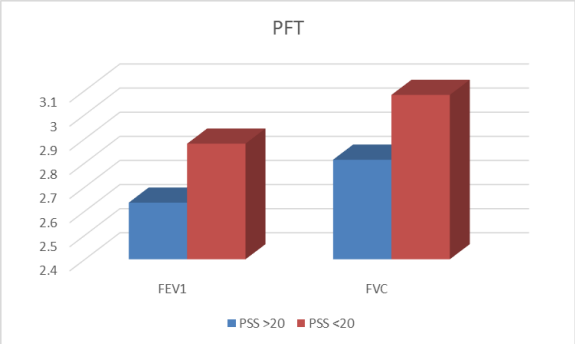

FIGURE 1: COMPARISON OF PFT OF THE TWO GROUPS

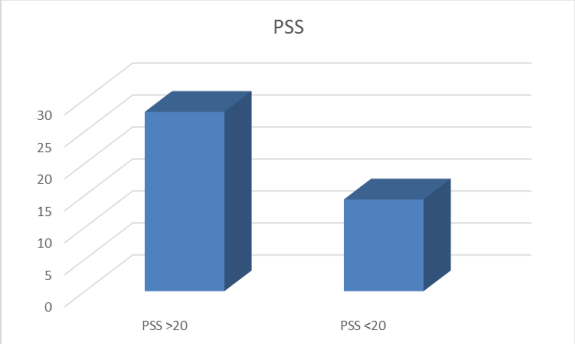

FIGURE 2: COMPARISON OF PSS OF THE TWO GROUPS

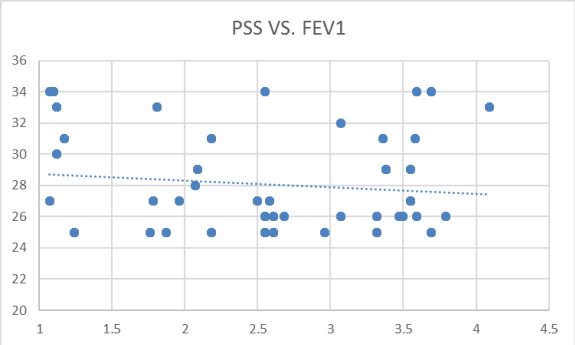

FIGURE 3: GROUP A: CORRELATION OF PSS AND FEV1

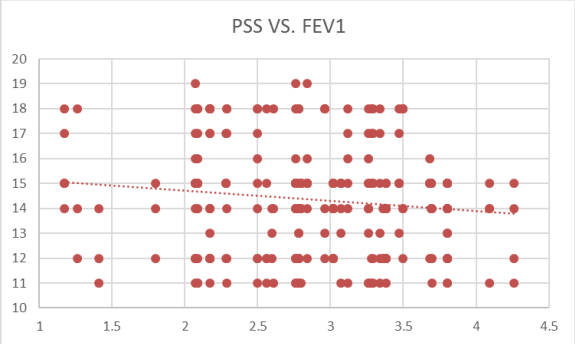

FIGURE 4: GROUP B: CORRELATION OF PSS AND FEV1

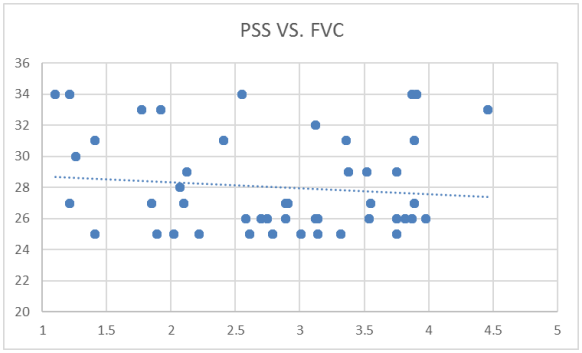

FIGURE 5: GROUP A: CORRELATION OF PSS AND FVC

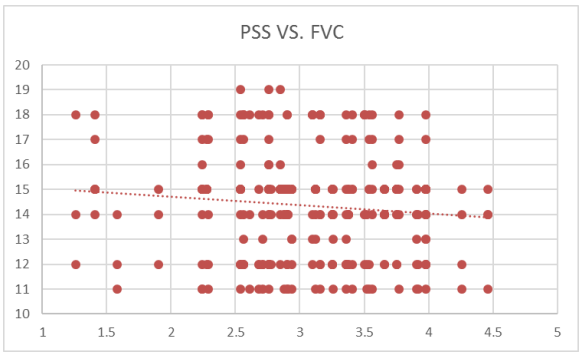

FIGURE 6: GROUP B: CORRELATION OF PSS AND FVC

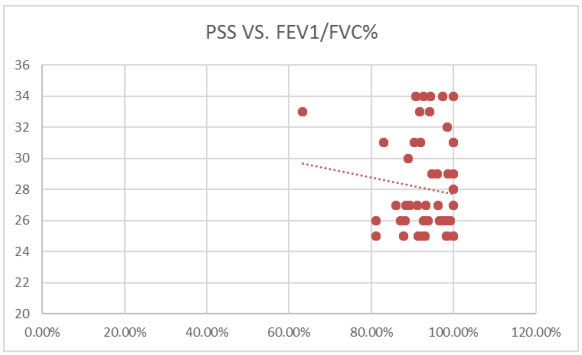

FIGURE 7: GROUP A: CORRELATION OF PSS AND FEV1/FVC%

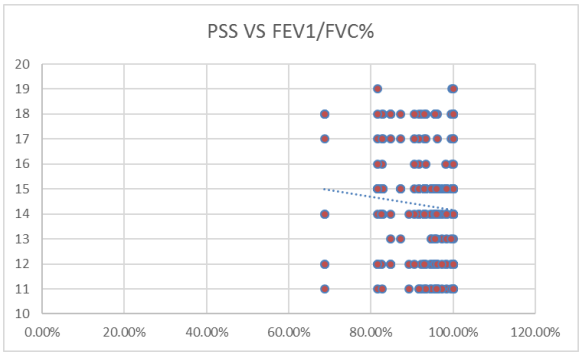

FIGURE 8: GROUP B: CORRELATION OF PSS AND FEV1/FVC%

DISCUSSION

Stress is not a simple, stimulus-response reaction, but the interaction between an individual and the environment,

involving subjective perception and assessment of stressors, thus constituting a highly personalized process. Specific inherited characteristics, early experience in life, and particular, learned cognitive predispositions make individuals more or less susceptible to the effects of stressors. Resilience and vulnerability to stressors as well as intensity of stress response are greatly dependent on age, gender, intelligence, and numerous characteristics of personality, such as hardiness, locus of control, self-efficacy, self-esteem, optimism, hostility (component of type A personality) and type D traits (negative affectivity and social inhibition). [8] To understand the relation between personality and stress, it is essential to recognize the impact of individual differences in four aspects:

- choice or avoidance of environments that are associated with specific stressors, challenges or benefits,
- way of interpreting a stressful situation and evaluating one's own abilities and capacities for proactive behaviour so as to confront or avoid it,
- intensity of response to a stressor,
- coping strategies employed by the individual facing a stressful situation. [8]

But, persons with mature and integrated personalities when exposed to prolonged stress may even experience failure of their adaptive capacities and psychological or somatic decompensation.

The aim of a study by Dumitru VM et al [9] was to investigate the stress level in a group of nurses and to correlate the stress level and its subsequent symptoms with personality factors. The study was conducted on 34 psychiatric nurses, 68% of them being female. The average age of the male subjects was 32.25 years with a standard deviation of 6.21 years, while the average age of the female subjects was 35.18 years. The analysis focused on the stress level, stress symptoms, age, duration of employment and personality factors. The findings showed that female staff members were more affected by stress as they grow older and have spent a longer time on the job, while male staff members were subjected to higher stress levels at the beginning of their activity. Correlations between personality factors and stress both in concerns of perceived stress and the level of subsequent stress symptomatology were identified. High stress levels were identified in people with low social presence and low empathy. A higher intensity of psychological symptoms following stress was also associated with low social presence, low empathy, low independence, low good impression, low well-being state, low tolerance, low intellectual efficiency, low psychological intuition, low work orientation and increased femininity. Keeping the results of these studies we had included only females in the present study.

Several personality factors, such as social presence, empathy, independence, good impression, intellectual efficiency, psychological intuition, work orientation, femininity render individuals more vulnerable to stress. There are significant differences between females and males in what concerns stress adaptation. [9]

In the present study we included working females and divided them according to perceived stress scores into two groups with subjects having PSS 20 or more are more likely to develop disease. It was observed that there was significant difference in FEV1 and FVC between the two groups with subjects having higher PSS showing decreased values of FEV1 and FVC, but group with lower PSS had no significantly higher values of FEV1/FVC% as compared to the other group. PSS was negatively correlated with all parameters of pulmonary function tests.

Putt MT et al. in 2008 conducted a study to determine if a specific hold and relax stretching technique was capable of (1) reversing the effect of tight chest wall muscles by increasing chest expansion, vital capacity, and shoulder range of motion and (2) decreasing perceived dyspnea and RR in persons with chronic obstructive pulmonary disease. No significant effect on axillary and

xiphisternal chest expansion, perceived dyspnea, or RR was observed. [10]

Lahmann C et al. in 2009 showed a positive effect of functional relaxation on respiratory parameters and suggested a clinically relevant long-term benefit from functional relaxation as a non-pharmacological and complementary therapy treatment option in asthma. [11]

Prem V et al. in 2011 [12] compared the effectiveness between diaphragmatic breathing exercise and Jacobson's PMR technique on cardiorespiratory parameters in healthy men. The cardiorespiratory parameters selected for measurement were blood pressure, HR, and RR. Diaphragmatic breathing technique was found to be more effective in the reduction of respiratory parameters compared to PMR. In the present study we only observed the effect of PSS on PFT and did not give any intervention to the subjects.

Ritz T et al in 2005 [3] reviewed studies from 15 years that have used experimental emotions and stress induction techniques or longitudinal diary observations to explore these influences of stress on lung function tests. Findings suggest that unpleasant emotional states are associated with a decline in lung function in health and asthma. Changes were usually small on average, but usually reached clinical significance in a subset of patients. Pleasant emotional states were also sometimes associated with a lung function decline, suggesting a susceptibility of the airways to arousal in general. From longitudinal studies, more evidence for effects of both pleasant and unpleasant states were available, but also highly idiosyncratic associations between mood, stress, and lung functions were observed. While initial findings indicated the importance of specific autonomic, ventilatory, and immunological pathways for emotion-induced lung function changes, more research needs to be conducted to thoroughly understand underlying mechanisms.

The objective of a study by Renee D et al in 2007[4]was to determine the association between lung function and mental health problems among adults in the United States. Data were drawn from the First National Health and Nutrition Examination Survey (1971−1975), with available information on a representative sample of US adults aged between 25–74 years. Lung function was assessed by spirometry, and provisional diagnoses of restrictive and obstructive airway disease were made based on percentage of expected forced expiratory volume. Mental health problems were assessed with the General Well-Being scales. Restrictive lung function and obstructive lung function, compared with normal lung function, were each associated with a significantly increased likelihood of mental health problems. After adjustment for differences in demographic characteristics, obstructive lung function was associated with significantly lower overall well-being ($p = 0.025$), and restrictive lung function was associated with significantly lower overall well-being ($p < 0.001$), general health ($p < 0.0001$), vitality ($p < 0.0001$), and self-control ($p = 0.001$) and with higher depression ($p = 0.002$) subscale scores compared with no lung function problems. Consistent with previous findings from clinical and community-based studies, these results extended available data by providing evidence of a link between objectively measured lung function and self-reported mental health problems.

A prospective, randomized controlled trial by Lolak S et al in 2008 [13] examined the effect of progressive muscle relaxation (PMR) training on anxiety and depression in patients with chronic breathing disorders receiving pulmonary rehabilitation (PR). Eighty-three subjects with chronic breathing disorders entering this 8-week rehabilitation program were randomly assigned to a standard care or intervention group. The standard program included 2 days per week of exercise, education and psychosocial support delivered by a multidisciplinary team. The

intervention group received additional sessions of PMR training using a prerecorded tape for 25 min/week during weeks 2–8. Primary outcome measures in the study were levels of anxiety and depression evaluated by the Hospital Anxiety and Depression Scale. For anxiety, there was an overall significant improvement within each group over time (p=0.0001). There was no statistically significant group time interaction (p = 0.17) and no statistically significant difference between the groups (p = 0.22), despite lower scores for every time point in the PMR group. For depression, there was an overall significant improvement within each group over time (p=0.0001). Although the difference between the groups (p = 0.09) and group-time interaction (p = 0.07) did not reach statistical significance, the results again favored the PMR group for weeks 5–8. Depression scores were lower for the PMR throughout the period of study.

Subjects with chronic Obstructive Pulmonary Disease (COPD) suffer from severe physical impairments, which often elicit significant psychological distress which have negative impact in their quality of life. This meta-analysis by Volpato E et al in 2015 [14] was aimed to assess evidence from the scientific literature on the effects of relaxation techniques. The study investigated 9 databases and included both inpatients and outpatients with COPD. Both respiratory and psychological outcomes were considered. Relaxation techniques showed a little positive effect on the value of the percentage of predicted FEV1 (d = 0.20;95%Cl:0.40–−0.01) as well as light effect on levels of both the anxiety (d = 0.26;95%Cl:0.42–0.10) and depression (d = 0.33;95%Cl:0.53–0.13). The higher effect size was found in the quality of life value (d = 0.38;95%Cl:0.51–0.24). The assessed quality of the studies, based on the PEDro Scale, which was generally medium/ high. They concluded that relaxation training can have a moderate impact on both psychological well-being and respiratory function, resulting in noticeable improvements in both.

Li Y et al in 2015 [15] explored the effects of progressive muscle relaxation (PMR) on anxiety, depression, and quality of life (QOL)in patients with pulmonary arterial hypertension (PAH). One hundred and thirty Han Chinese patients with PAH were randomly assigned to a PMR group (n = 65) and a control group (n = 65) in the study. In a 12-week study duration, the PMR group received hospital-based group and in-home PMR practice, while the control group received hospital-based mild group stretching and balance exercises. After12 weeks of intervention, only the PMR group showed significant improvement in anxiety, depression, overall QOL, and the mental component summary score of QOL (P< 0.05) but not the physical component summary score of QOL or the 6-minute walking distance.

So from the above discussion it is evident that increased perceived stress levels may adversely affect pulmonary function tests even in healthy individuals. Stress management programmes were found to improve pulmonary functions in different studies by decreasing perceived stress levels. [12-15]

CONCLUSIONS

Most working females perceive high levels of stress which may have adverse outcome in their pulmonary function test results. Increased perceived stress levels may adversely affect lung function in even healthy young individuals.

REFERENCES

1. Tripathi P, Bhattacharjee S. A study on psychological stress of working women. International Journal of Multidisciplinary Research. 2012; 2 (2): 434-446.
2. De Sio S, Cedrone F, Sanità D, Ricci P, Corbosiero P, Di Traglia M et al. Quality of Life in Workers and Stress: Gender Differences in Exposure to Psychosocial Risks and Perceived Well-Being. Hindawi BioMed Research International Volume

2017, Article ID 7340781, 6 pages. https://doi.org/10.1155/2017/7340781.
3. Ritz T, Kullowatz A. Effects of Emotion and Stress on Lung Function in Health and Asthma. Current Respiratory Medicine Reviews 2005; 1(2):209-218.
4. Renee D. Shirley G, Nicole C, Mark S, Daniel D, Pine S. Association between Lung Function and Mental Health Problems among Adults in the United States: Findings from the First National Health and Nutrition Examination Survey. American Journal of Epidemiology 2007; 165 (4)2007: 383–388, https://doi.org/10.1093/aje/kwk026
5. Kullowatz A, Rosenfield D, Dahme B, Magnussen H, Kanniess F, Ritz T. Stress effects on lung function in asthma are mediated by changes in airway inflammation. Psychosom Med. 2008;70(4):468-75. doi: 10.1097/PSY.0b013e31816f9c2f.
6. Kar SK, Yadav S, Agarwal V. Impact of culture on gender roles: A mental health perspective. Indian J Soc Psychiatry 2016; 32: 337-8.
7. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983; 24: 385-96.
8. Lecic-Tosevski D, Vukovic O, Stepanovic J. Stress and personality. Psychiatriki. 2011; 22(4):290-7.
9. Dumitru VM, Cozman D. The relationship between stress and personality factors. International Journal of the Bioflux Society. 2012; 1(4): 34-39.
10. Putt MT, Watson M, Seale H, Paratz JD. Muscle stretching technique increases vital capacity and range of motion in patients with chronic obstructive pulmonary disease. Arc Phys Med Rehabil 2008; 89: 1103-7.
11. Lahmann C, Nickel M, Schuster T, Sauer N, Ronel J, Noll-Hussong M, et al. Functional relaxation and guided imagery as complementary therapy in asthma: A randomized controlled clinical trial. Psychother Psychosom 2009; 78: 233-9.
12. Prem V, Krishna RB, Maiya GA. Comparison of Jacobson's progressive muscle relaxation and diaphragmatic breathing on cardio-respiratory parameters in healthy adults – A randomized cross over trial. Indian J Physiother Occup Ther An Int J 2011: 5; 117-21.
13. Lolak S, Connors GL, Sheridan MJ, Wise TN Effects of Progressive Muscle Relaxation Training on Anxiety and Depression in Patients Enrolled in an Outpatient Pulmonary Rehabilitation Program. Psychother Psychosom 2008; 77: 119–25.
14. Volpato E, Banfi P, Rogers SM, Pagnini F Relaxation Techniques for People with Chronic Obstructive Pulmonary Disease: A Systematic Review and a Meta-Analysis. Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine Volume 2015, Article ID 628365, 22 pages http://dx.doi.org/10.1155/2015/628365
15. Li Y, Wang R, Tang J, Chen C, Tan L, Wu Z, Yu F, Wang X. Progressive Muscle Relaxation Improves Anxiety and Depression of Pulmonary Arterial Hypertension Patients. Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine Volume 2015, Article ID 792895, 8 pages http://dx.doi.org/10.1155/2015/792895

How to cite this article: Chaudhuri A, Maulik SG. A study of correlation of perceived stress and pulmonary function tests among working women in an urban population of West Bengal. International Journal of Research and Review. 2019; 6(7):324-332.

******