

Prevalence of Breathing Dysfunction in Musculoskeletal Complaints: A Cross Sectional Study

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ABSTRACT

Breathing is the most vital and important function of our body which helps in the maintenance of homeostasis of our body. Breathing being the multifactorial function dependant on Biochemical, Biomechanical, Psychosocial and Neuromusculoskeletal components. The vector of all components results breathing as the complex yet crucial function of our body. This breathing can be affected in any of the conditions affecting any of the above mentioned components. One of the reasons being the imbalance between parasympathetic (PNS) and sympathetic (SNS) component of Autonomous Nervous System (ANS). Imbalance between PNS and SNS can result in the “Flight and Fight mode” which keeps the Pain factor on resulting in faulty breathing leading to Breathing Dysfunction. In the present observational cross sectional study, 200 individuals with various musculoskeletal complaints were identified and given, “Self assessment of breathing questionnaire” and “Nijmegen Questionnaire” as these questionnaires covers Biomechanical and Psychosocial aspects of breathing respectively. Scoring for both the questionnaires were done for each individual and data was recorded and analysed using pie chart. we concluded that breathing dysfunction is present in various musculoskeletal complaints predominantly in back pain, followed by neck pain, shoulder pain, and knee pain. Most affected gender is female affecting the Biomechanical as well as psychosocial component. We recommend further research for detailed assessment of breathing in various musculoskeletal conditions.

Key Words: Breathing Dysfunction, Musculoskeletal complaints, SEBQ, Nijmegen, Autonomous Nervous system.

INTRODUCTION

Breathing is the most important function of the body required for the oxygen transportation from outer environment to the cells of the organs⁽¹⁾. Sound breathing is a three dimensional activity and synchronised Motion of upper rib cage, lower rib cage and abdomen, crucial to maintain the homeostasis of the body^(1,2,3). This Synchronised motion can also be defined as the “Normal Breathing Wave” where pelvis

is considered as a foundation of this wave. And the wave progresses towards Thorax through Abdomen without any thrust, provided no abnormality is present in terms of Biomechanical abnormalities in the spine, Pain, muscular and fascial tightness etc^(1,2,3).

Other than synchronised abdomino-thoracic breathing, any form of breathing can be termed as abnormal breathing or Breathing Dysfunction. And in order to maintain the homeostasis of body adaptive

breathing dysfunction can occur in an individual which in turn leads to Breathing Pattern disorders in later stage^(3,4).

Amongst the above mentioned reasons of Breathing Dysfunction pain plays an important role. Pain is an unpleasant emotional and sensory response of a body to any emotional or mechanical stimulus. Pain affects the breathing by affecting its volume, frequency and rhythm^(5,6,7). An immediate physiological response in terms of activation of sympathetic Nervous system and withdrawal of parasympathetic nervous system is a body's defence mechanism to any kind of painful stimulus. This activation of Sympathetic Nervous System will affect the muscle contractility, Muscle circulation, inflammation, results in pain and discomfort. Further leads to perceived stress, fatigue and physical inactivity, resulting in chronic pain and widespread symptoms. Increased Respiratory rate, heart rate are again the consequences of upgraded sympathetic nervous system in order to maintain the increased allostatic load on the body. This again results into hyper arousal state of sympathetic nervous system and down gradation of parasympathetic nervous system keeping the pain factor on. As a result of all, individual adapts abnormal breathing pattern unknowingly, this eventually affects the posture and body functions. In this way there are remarkably vast numbers of people suffering from breathing dysfunctions. Due to imbalance, overuse, tension in muscles and fascia, poor posture, inadequate descent of diaphragm, inappropriate or abnormal breathing is present in a variety of individuals with musculoskeletal Complaints or dysfunctions^(5,6,7,10).

Unfortunately, in the treatment of any kind of musculoskeletal pain or complaint the breathing dysfunction is always overlooked or neglected. Hence it becomes important to know the prevalence of breathing dysfunctions in various musculoskeletal complaints.

As Breathing is the complex phenomena influenced by multifactorial

components like, Biomechanical, Biochemical, Psychosocial, and neurological, standard gold criteria is unavailable to diagnose. This could be one of the reasons of negligence in the diagnosis of Breathing Dysfunction. Various diagnostic tools, like, questionnaires, manual techniques, breath hold tests, pulmonary function tests, are collectively for the diagnosis of breathing dysfunction^(2,4,9).

In the present study Self Evaluation of Breathing questionnaire (SEBQ) and Nijmegen Questionnaire were used as a diagnostic tool as the previous covers the broad spectrum of elements affecting the Breathing and it is easy to explain to the patients and the latter concerns about the psychosocial factor of the breathing. It is recommended to use both the questionnaire together for the interpretation of breathing questionnaire^(11,12).

SEBQ comprises 24 questions and the score more than 11 is suggestive of breathing dysfunction where there are 16 questions in Nijmegen questionnaire and score of 23 is suggestive of Breathing Dysfunction. The reason behind choosing both the questionnaire is also to find out the involvement of psychosocial factor in the breathing dysfunction in any of the musculoskeletal complaints^(11,12,13).

MATERIAL AND METHODOLOGY

The aim of this study was to find out the prevalence of breathing dysfunction in the individuals having musculoskeletal complaints.

After getting the approval from institutional ethical committee, a cross sectional study was conducted in Dr. D. Y. Patil College of Physiotherapy Pimpri Pune, having the sample size of 200, including both the genders between the age group of 20 to 40 years with any of the musculoskeletal complaints. Written consent was taken from each individual prior to the enrolment in the study. After signing the written consent, each individual was given the Nijmegen Questionnaire and

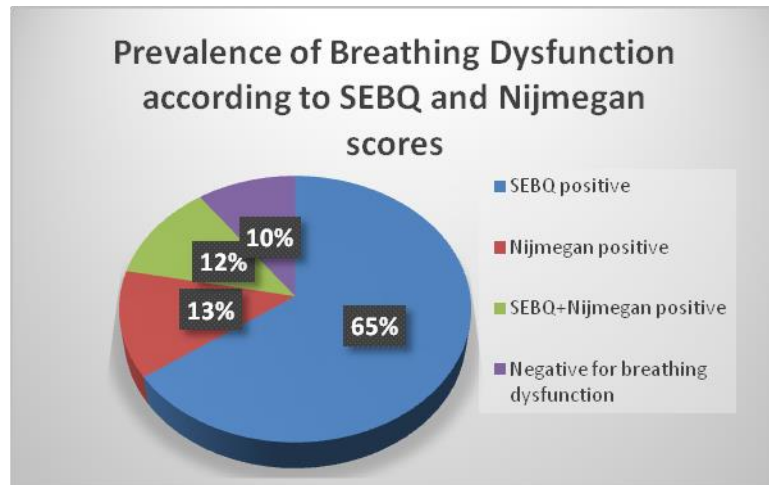
Self Evaluation of Breathing Questionnaire. Sufficient time was given to each Individual to fill the questionnaire. Data was collected and recorded in the master chart. Descriptive analysis was done, by tables and Graphs.

Prevalence of Breathing Dysfunction according to SEBQ and Nijmegen scores

Table:1-

Questionnaire	Positive
SEBQ positive	65.5%
Nijmegen Positive	13%
SEBQ+Nijmegen positive	12.5%
Negative for Breathing Dysfunction	10%

DATA ANALYSIS



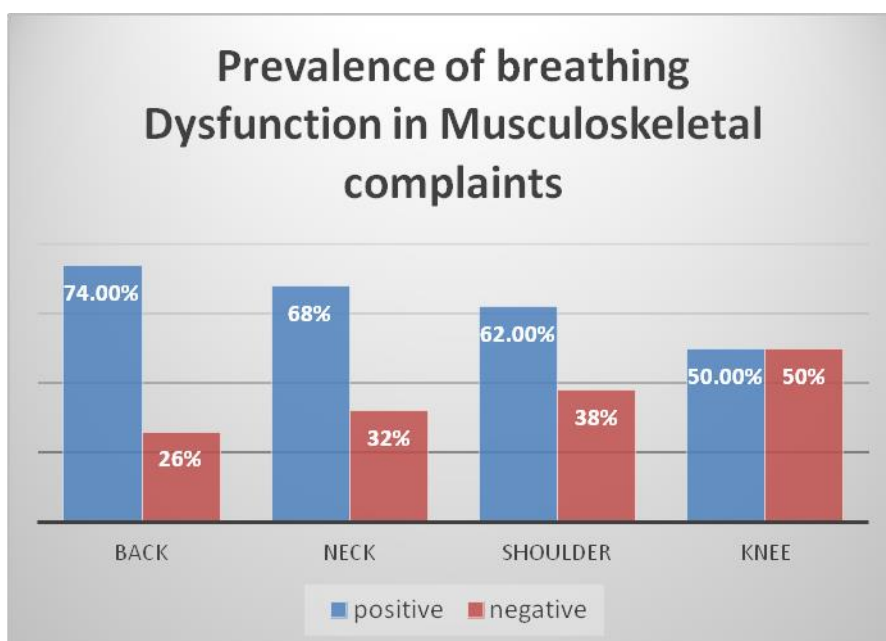
Graph:1

Interpretation of Graph -1: This graph infers that 65% of the sample population had breathing dysfunction according SEBQ

Prevalence of Breathing Dysfunction in musculoskeletal complaints

Table:2

Musculoskeletal complaint	Positive	Negative
Back pain	74%	26%
Neck pain	68%	32%
Shoulder pain	62%	38%
Knee	50%	50%



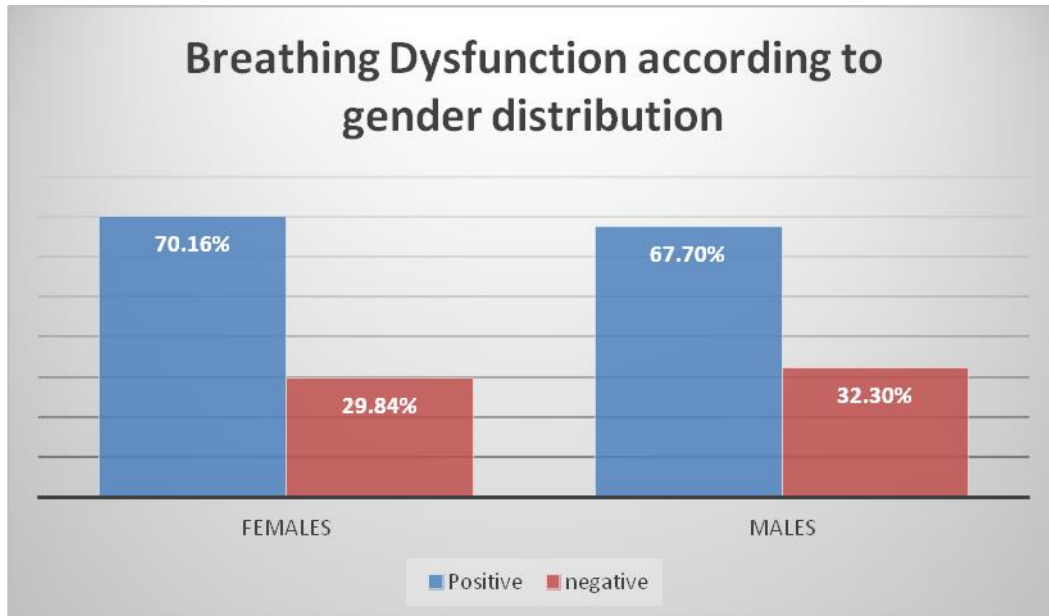
Graph:2

Graph:2 interpretation: This graph depicts a higher prevalence of Breathing dysfunction amongst all individuals having back pain.

Gender Distribution

Table 3

Gender	Females	Males
Positive	70.16%	67.70%
Negative	29.84%	32.30%



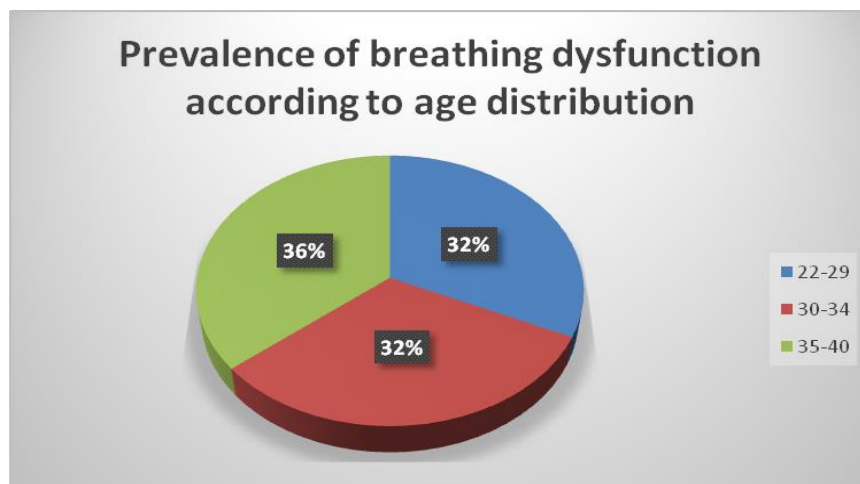
Graph: 3

Graph:3 Interpretation- This graph shows that there is a higher prevalence of breathing dysfunction in females as compared to males.

Age Distribution

Table: 4

Age group	Positive
22-29	32%
30-34	32%
35-40	36%



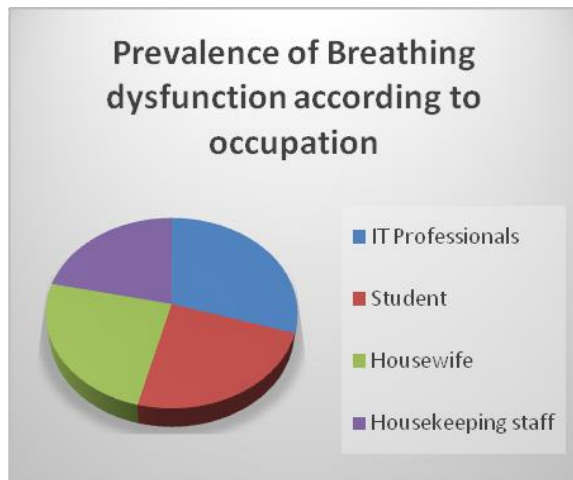
Graph:4

Graph:4 interpretation- this graph suggests the involvement of individuals between 35-40yrs as the most affected age group in Breathing Dysfunction

OCCUPATION DISTRIBUTION

Table:5

occupation	Positive
Student	24%
IT professionals	30%
Housewife	24%
Housekeeping staff	22%



Graph:5

Graph:5 Interpretation- This graph suggests a higher prevalence of Breathing Dysfunction among IT Professionals.

DISCUSSION

The current study was designed to find out the prevalence of breathing dysfunction in patients having musculoskeletal complaints. A total of 200 samples that had the most common complaints such as back pain, neck pain, knee pain, shoulder pain and multiple joint pains were included in this study.

In this study, SEBQ was used which has a high test retest reliability and is a comprehensive questionnaire this can be justified using a study, 'Reliability, Determinants of Self Evaluation of Breathing Questionnaire' by A. J. Mitchell. Along with SEBQ, Nijmegen was also used which has been validated for hyperventilation syndrome^(11,12).

Results of our study showed positive SEBQ in 65.5% population of the total samples, thus it can be said that musculoskeletal complaints are significantly correlated with Breathing Dysfunction. Prevalence of positive SEBQ score showed, the involvement of Biochemical as well as Biomechanical components of breathing in musculoskeletal complaints leading to dysfunctional breathing. This can be supported by, "Preliminary investigation of a measure of dysfunctional breathing symptoms: The Self Evaluation of Breathing Questionnaire (SEBQ)" a

research report by Rosalba Courtney et. al. in 2009^(11,12,13).

13 % of population showed positive Nijmegen Questionnaire which suggests biochemical involvement for breathing dysfunction⁽¹²⁾.

It is suggested to use both the scales together for the assessment of breathing dysfunction; in our study we found 12.5% population positive for both the scales, having prevalence of breathing dysfunction in musculoskeletal complaints^(12,13).

The result of the present study demonstrated higher prevalence of BPD in patients with Low back pain. Out of the total samples having back pain, 74% were found to have Breathing Dysfunction while out of the total positive sample population, 29% with back pain were found to have Breathing Dysfunction. This is because the diaphragm acts as a trunk stabilizer along with its role in respiration. Other trunk stabilizers include the Transversus Abdominis, pelvic floor muscles and the multifidus muscle. Most of the individuals with low back pain are found to have weakness of the transverse abdominis muscle. This weakness leads to a delay in its contraction along with insufficient muscular stabilization and kinematics of the diaphragm and pelvic floor muscles which leads to changes in respiratory pattern^(6,9,15,16,17) which is supported by a study titled, 'Presence of Respiratory Disorders in patients with Low Back Pain: A systemic review' by Nele Beeckmans et al. In addition to this, the diaphragm plays an important role in maintaining the posture by contributing to the spinal stiffness through the influence of intra-abdominal pressure and, mechanical effect and attachments of the diaphragm which may be influenced during Low Back Pain⁽¹⁴⁾. It is also observed that patients with Low Back Pain tend to wear lumbar belts for stability which in turn further increase the intraabdominal pressure leading to Thoracic dominant breathing as supported by an article titled, 'Respiratory characteristics of individuals with non-specific low back pain: A cross-sectional

study' by Vikram Mohan et al.⁽¹⁵⁾

The second most involved condition which causes BPD was found to be neck pain. Out of all the neck pain individuals in the current study, 68% were found to have Breathing Dysfunction according to the SEBQ score, while out of the total positive population, 27% with neck pain were found to have Breathing Dysfunction. The muscles participating in primary inspiration are namely, the Diaphragm, the external internal intercostal muscles, parasternal, internal intercostal muscles, scalene group and the levatores costarum out of which the diaphragm provides 70%-80% of the inhalation force.⁽²⁾ The SCM, upper trapezius, pectoralis major and minor, s. ant, lats dorsi take over or support the primary muscles during increased demand or dysfunctional breathing. There is a continuity of fascia between the apex of the diaphragm and the base of the skull. Any discontinuity or stress affecting its structure will have direct repercussions on other parts of the structure which compromises the breathing mechanism resulting in dysfunctional breathing^(2,5,17). The study of prevalence of Breathing Dysfunction in individuals with neck pain titled, "Pain and faulty breathing: a pilot study' conducted by Maria A. Perri et al. and another study titled, 'Neck pain causes respiratory dysfunction' by EleniKapreli et al. support our findings.

Back and neck were followed by shoulder at a prevalence of 62% and lastly knee at a prevalence of 50%.

Coming down to the most involved gender, of all the female samples with musculoskeletal pain, 70.16% were found to be positive and among all the male samples taken, 67.7% were found to be positive for Breathing Pattern disorders. As the reduced efficiency of pelvic floor muscles is associated with breathing pattern disorders specially in women with incontinence in whom pelvic floor muscles are insufficient. This concludes a higher prevalence of females as compared to that of males which

is supported by a study conducted by Damas-Mora et al., 1980.

Among the total sample population, individuals between 35-40yrs were found to be most affected with breathing pattern disorders with a prevalence of 73.8%, followed by individuals between 30-34yrs with a prevalence of 64.7% and lastly, 22-29yrs with a prevalence of 63.8%. Though we couldn't find any significant supporting article for the involvement of age but this may occur due to prolonged working hours, fatigability, faulty postural adaptations, physical as well as mental stress etc.

There have been various studies regarding the most common occupations affected with musculoskeletal pain. According to this study, IT professionals with musculoskeletal complaints were found to have breathing dysfunction with a prevalence of 30%. Some may be due to long hours of work while others may be due to the postures adopted during the course of time. Computer based workers are found to have forward neck posture due to ill ergonomic design and prolonged periods of work resulting in muscles of neck, upper back, and shoulders which lead to muscular fatigue and discomfort (musculoskeletal condition).⁽¹⁵⁾ This results in shortening of the neck flexors and lengthening of the neck extensors which leads to pain, poor circulation and stiffness and may contribute to disturbance in the balance of healthy adults.^(4,15) This is supported by a study titled, 'Knowledge and practices of ergonomics in computer users' by Rakhshan Khan et al and another study titled, 'Neck pain causes respiratory dysfunction' by EleniKapreli et al.

CONCLUSION

From the present study we can conclude that Breathing Dysfunction is commonly observed in Musculoskeletal complaints predominantly in Back pain followed by Neck pain and shoulder pain.

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Ethical Approval: Approved

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