Association Between Musculoskeletal Disorders, Body Mass Index, Cardiorespiratory Endurance and Fatigue among Garment Workers

Neha P Patel[1], Dhara Sartanpara[2], Jahanavi Savaliya[3], Ishan A Shah[4], Prakshi P Shah[5]

[1]Assistant Professor, MPT (Community Health & Rehabilitation) [2,3,4,5] BPT Intern, Mahatma Gandhi Physiotherapy College, Gujarat University, Ahmedabad, Gujarat, India

Corresponding Author: Neha P Patel

ABSTRACT

Introduction: Most commonly garment workers are exposed to highly repetitive movements, awkward postures while they are working. It leads musculoskeletal disorders. Cardio-respiratory endurance is an important indicator of physical health and fatigue can be observed on any prolonged and/or intensive work. The present study aims to find association between musculoskeletal disorders, body massindex, cardio respiratory endurance and fatigue among garment workers.

Methodology: This observational analytical study included 50 garment workers who worked as garment factories in Ahmedabad, Gujarat, India. They were explained about the study. Written informed consent was taken from those willing to participate and fulfilling inclusion and exclusion criteria and was included in the study. Assessment was done according to the proforma. Association between musculoskeletal disorders, body massindex, and 6 minute walk test and fatigue severity scale was done by non- parametric test – Spearman's correlation. Level of significance was kept at 5% ($p < 0.05$).

Results: In present study association between musculoskeletal disorder and body mass index and ($r=-0.421$, $p<0.01$), cardio respiratory endurance ($r=-0.442$, $p<0.01$), fatigue ($r=-0.489$, $p<0.01$), association between body mass index and cardio respiratory endurance($r=-0.424$, $p<0.01$), fatigue($r=-0.412$, $p<0.01$),association between cardio respiratory endurance and fatigue ($r=-0.470$, $p<0.01$) among garment workers.

Conclusion: Musculoskeletal disorders moderate negative associates with BMI and cardio respiratory endurance whereas positive associates with fatigue. Cardio respiratory endurance is moderate negative associates with BMI and fatigue whereas BMI is moderate positive associate with fatigue among garment workers.

Keywords: Musculoskeletal disorders, Body mass index, Cardio respiratory endurance, Fatigue, Garment workers.

INTRODUCTION

The garment manufacturing process is a labour intensive task. The workers in this are employed in different sections namely cutting, stitching, ironing and finishing. As these workers perform repetitive tasks throughout the workday, they face several work related problems in daily life.[1]

Musculoskeletal disorders (MSDs) are a major public health problem in both industrialized and developing countries and may result in work restriction, absenteeism, or even the need to change jobs, which are themselves associated with major economic costs resulting in serious impacts on the person's quality of life.[2] The majority of

occupational diseases are work related musculoskeletal disorders are present. They are mainly caused by long-time monotonous work or work in awkward postures. Both office and industrial workers are complaining of musculoskeletal disorders. Manual workers, including garment workers, have a higher risk of developing an occupationaldisease. [3]

Cardio-respiratory endurance refers to the ability of the heart and lungs to deliver oxygen to working muscles during continuous physical activity, which is an important indicator of physical health. From a health perspective, people who have good heart and lung endurance can exercise longer, not get tired as quickly, and avoid all kinds of cardio-respiratory diseases. Improving cardio-respiratory endurance is an important issue for maintaining good health. [4]

Fatigue is intended by the state of being very tired or not being able to uphold expected force while fatigability is the measure on how soon a person gets tired. It affects both mind and body; where an individual is unable to function at their normal level of abilities. Fatigue is the overwhelming sense of tiredness, lack of energy and feeling of exhaustion. It is often related to physiological states such as excessive physical activity. Normal fatigue and some degree of fatigability can be observed on any prolonged and/or intensive work. [5]

Most commonly garment workers are exposed to highly repetitive movements, awkward postures while they are working. It leads musculoskeletal disorders. As well as cardio respiratory endurance is important for maintaining good physical health and not tired easily and improved day to day life. The present study aims to find association between musculoskeletal disorders, body mass index, cardio respiratory endurance and fatigue among garment workers.

MATERIALS & METHODS

Observational analytical study was conducted by Convenience sampling. The study was conducted at different garment factories from Ahmedabad city, Gujarat, India. Data was collected from September 2022 to December 2022.

Sample size: A sample size was estimated on the basis of pilot study and the sample size obtainedwas 60.

$$N= \{Z\alpha+Z\beta) / C^2\}$$

Where; $C = 0.5 \times$ in $\{(1+r)/ (1-r)\}$, r = correlation coefficient

Inclusion and exclusion criteria: 20-60 years old garment workers, with ≥2 years of experience as garment worker, working as garment worker for minimum 8 hours/day were included in present study. Neurological disorders (stroke, Parkinson, multiple sclerosis etc.), severe cardiovascular and pulmonary disease (myocardial infarction, asthma, chronic obstructive pulmonary disease, Peripheral vascular disease), recent traumatic conditions, any type of recent surgery (last 3 months), dementia, depression, etc., any assistive device (cane, crutch, walker, orthosis etc.), malignancy were excluded.

Procedure: This observational analytical study included 50 garment workers who worked as garment factories in Ahmedabad, Gujarat, India. Total 68 individuals were screened, out of which 10 individuals did not match the inclusion criteria and 8 were not interested in this study. So total 50 garment worker included in the study. They were explained about the study. Written informed consent was taken from those willing to participate and fulfilling inclusion and exclusion criteria and was included in the study. Assessmentwas done according to the proforma.

Outcome measure:
1) **Nordic Musculoskeletal Questionnaire (NMQ):**
The NMQ-E is completed by self-administration or face-to-face interview and provides reliable information on the onset, prevalence and outcomes of MSP in nine body regions (the neck, shoulder, upper

back, elbow, wrist/hand, low back, hip/thigh, knee, and ankle/foot). The NMQ-E interrogates ache, pain or discomfort experienced in the nine body parts to date, for the last 12 months, for the last four weeks and on the day of the administration, with binary choice questions (yes or no).[6]

2) Body mass index (BMI):

The weight in kilograms and height in centimeters was measured as per the standard guidelines laid down by World Health Organization (WHO). Height (HT) was measured in barefoot to the nearest 0.1cm using a vertical height scale. Body weight (WT) was recorded to the nearest 0.1 kg using a portable weighing machine. Body Mass Index (BMI) was calculated using the standard formula weight (in Kg) divided by height (in cm) squared (kg/cm^2). [7]

3) 6 minute walk test (6 MWT):

Each individual performed 6 MWT to assess the cardio respiratory endurance. This is moderate to high-intensity test in is valid for assessing cardio respiratory endurance or aerobic capacity. [8] Subject should rest for approximately 10 minutes before starting the test. Measure the baseline heart rate and oxygen saturation, baseline dyspnea by using the Borg scale. Set the lap counter and timer. Provide the patient with detailed instructions on how to proceed during the test. The patient is then positioned at the starting line and allowed to walk unassisted once the test begins. As each minute passes, the patient should be informed of the time left to complete the test and encouraged to continue. At the end of the test, record the

Borg dyspnea, check heart rate and oxygen saturation, the number of laps from the counter or marks on the worksheet, and total distance walked.[9]

## 4) Fatigue severity scale (FSS):

Fatigue was measured using the FSS, which is a 9-item questionnaire rated on a scale from 1 to 7, where 1 indicates strongly disagree and 7 indicates strongly agree. The FSS contains statements on the severity of fatigue, and also the effect on a person's activities and lifestyle. The developers of the FSS have suggested a cut-off of 4 for severe fatigue. [10]

STATISTICAL ANALYSIS

Data analysis was done using SPSS version 20 and Microsoft excel 2019. Prior to statistical tests, the data was screened for normality. As the sample size was less than 50 in Shapiro wilk test was used to check normality. Data of all the outcomes were not normally distributed. Association between musculoskeletal disorders, body mass index, and 6 minute walk test and fatigue severity scale was done by non-parametric test – Spearman's correlation. Level of significance was kept at 5% ($p < 0.05$).

RESULT

The present study was conducted to find association between musculoskeletal disorders, BMI, cardio-respiratory endurance, fatigue among garment workers Total 50 participants, completed the study. The mean age of participants was 35.04 ± 8.46 years (Graph 1). Graph 2 shows type of garment workers in present study.
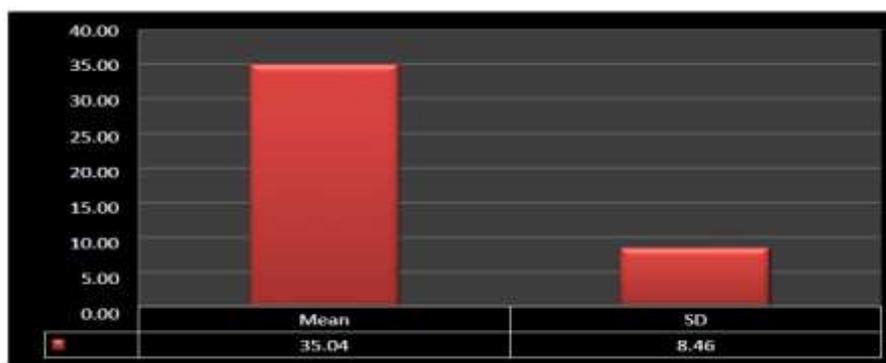
Graph 1: Age distribution (in years)
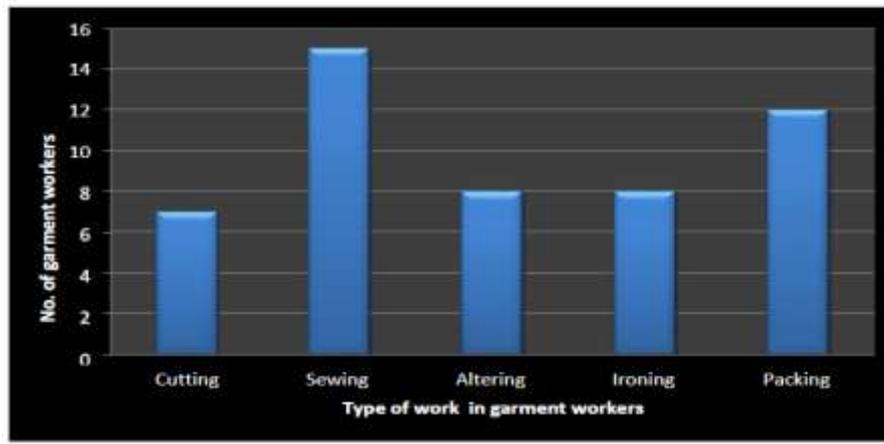
Graph 2: Type of work in garment workers

Association between NMQ, BMI, 6 MWT and FSS among garment workers:

Data was found to be non-parametric, so Spearman correlation coefficient was used to find association between NMQ , BMI, 6 MWT and FSS among garment workers as shown in Table 1 and Graphs 1.

Outcome measures	Spearman correlation coefficient (r - value)	p – value
NMQ and BMI	-0.421	<0.01
NMQ and 6 MWT	-0.442	<0.01
NMQ and FSS	0.489	<0.01
BMI and 6 MWT	-0.424	<0.01
BMI and FSS	0.412	<0.01
6 MWT and FSS	-0.470	<0.01

Table 1: Correlation between NMQ, BMI, 6 MWT and FSS

DISCUSSION

In present study moderate association between musculoskeletal disorder and body mass index and (r=-0.421, p<0.01), cardio respiratory endurance (r=-0.442, p<0.01). Bonney E et al found that increased body mass correlates with decreased cardio respiratory and musculoskeletal fitness. [11]

In present study moderate negative association between musculoskeletal disorder and fatigue (r=-0.489, p<0.01). Daneshmandi H et al concluded that severity of musculoskeletal discomfort/pain in different body regions was correlated to different aspects of fatigue, including degree and severity, distress that it causes degree of interference with activities of daily living, and timing of fatigue.[12]

In present study moderate negative association between body mass index and cardio respiratory endurance (r=-0.424, p<0.01) among garment workers. Setty P found that highly significant negative correlation between obesity and VO2max in middle age population. Greater the BMI, more severe will be the functional impairment, suggesting excessive amount of body fat on cardio respiratory functions and oxygen uptake by working muscles. [13]

In present study moderate positive association between body mass index and fatigue (r = -0.424, p<0.01) among garment workers. Gell N et al found that Lower extremity fatigue that interfered with activities outside of work had additional risk factors including higher BMI, prior diagnosis of osteoarthritis, and increased hours per week spent working.[14]

In present study moderate negative association between cardio respiratory endurance and fatigue (r=-0.470, p<0.01) among garment workers. Kriswanto ES et al found that there is significant relationship between cardio respiratory fitness and level of fatigue in the learning ability of movement coordination. [15]

Limitations in present study: Age range was wide, medical condition was not taken in details, Multivariate analysis between age, type of garment workers, musculoskeletal disorders, body mass index, cardio respiratory endurance and fatigue were not done.

CONCLUSION

The findings indicate that musculoskeletal disorders moderate negative associates with

BMI and cardio respiratory endurance whereas positive associates with fatigue. Cardio respiratory endurance is moderate negative associates with BMI and fatigue whereas BMI is moderate positive associate with fatigue among garment workers. Workplace strategies are needed to prevent musculoskeletal disorders, promote cardio respiratory fitness and work related fatigue reduced. Thus, improvement of working conditions, proper organization of work, and implementation of ergonomic interventions in the workplace are recommended as necessary measures to decrease musculoskeletal discomfort/pain among garment workers.

Declaration by Authors
Ethical Approval: Approved
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

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