



# A Study to Assess Relationship between Different Obesity Indices and Musculoskeletal Discomfort Score in Agricultural Workers in Southern Districts of West Bengal, India

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## Abstract

Occupation is an important determinant of health in general and its overall positive or negative effect on well-being results from the interaction between individual characteristics and work-related features, the latter comprising biomechanical, psychosocial, and sociological axes. In India, about three fourth of the population are dependent on different type of crop cultivation; of which paddy cultivation is an important one. Paddy cultivation involves in various processes, some of the postures, which were taken by crop cultivators, were very harmful. Some of the works are dominated by static muscular contraction and some other works are involved with repeated dynamic activity. In this backdrop, the present study has been undertaken to assess the relationship between works related musculoskeletal discomforts score and obesity indices among the human resources engaged in paddy cultivation task. Significant association was observed between obesity indices and MSD discomfort score.

**Keywords:** MSD; Agriculture; Obesity; Job demand; Paddy cultivation

## Introduction

Rice is one of the major food crops of the world. It provides the bulk of daily calories; moreover, rice is also one of food which is considered to be a potential food vehicle for the fortification of micronutrients because of its regularly consumption. It is a good source of thiamine (vitamin B1), riboflavin (vitamin B2) and niacin (vitamin B3). The nutrients content of rice varies depending on the variety of rice soil, and the conditions they growth. On the other hand, rice cultivation is an important sector of earning opportunity for the human resources engaged in agricultural task; 58.4% of the human resources are engaged in the different agricultural task during the paddy cultivating time in India. And 43.5% of male and 46.3% of the female human resources are engaged in different agricultural work during the paddy cultivating time in WB. The area under paddy cultivation is about 44.79 million hectares, the largest in the world. Yet, the agricultural sector in the rural villages of India

is still dependent on non-mechanized technique i.e. dependent on the physical effort of the human resources involved [1-4].

During the paddy cultivating time the agricultural workers has to carry out different tasks-ploughing, transplanting, reaping, threshing, and parboiling throughout the year even in a single day too. Earlier studies report that, drudgery is generally conceived as physical and mental strain, agony, monotony, and hardship experienced by human beings [5-8]. While all these results in decline in living and working conditions affecting men and women [9-15]. Therefore, in order to ensure health, wellbeing and thereby improving the work performance, the assessment of occupational health status is considered as an essential factor for the human resources engaged in outdoor occupations especially those who are engaged in different types of tasks during the period of paddy cultivating time [16-22].

Paddy cultivation involves in various processes, some of the postures, which were taken by the food growers were very harmful. Some of the works are dominated by static muscular contraction and some other works are involved with repeated dynamic activity [23-24]. According to public health perspective, effective well-documented initiatives for reducing body weight, improving physical capacity, and reducing musculoskeletal pain among health care workers are therefore required. Moreover, there is lack of evidence about the association between body weight status and musculoskeletal injury in different body regions. In this backdrop the present study aims to assess the relationship between different obesity indices and musculoskeletal discomfort score in human resources occupationally engaged in agricultural task especially paddy cultivating task.

## Materials and Methods

Human resources engaged in paddy cultivation, with no known chronic disease history (self-reported) and having a minimum working experience of three years, regularly working on an average for at least a period of six to six and half hours in the agricultural field in Arambagh subdivision in the district Hooghly [(latitude (23°01'N to 22°39'N) and longitude (88°30'E to 87°39'E)] were approached for participation in the study. The study was carried out on 34 adult Bengalee male food growers (age range 21-30 years) occupationally engaged in paddy cultivation. After obtaining necessary human ethical clearance, along with initial consents from the individuals, the names of volunteers were enlisted, and the procedural requirements were explained elaborately. Basic information regarding participants' age (year), working experience (year) and average working time (hr.day<sup>-1</sup>) recorded in a pre-designed schedule. Socio-economic status (SES) was assessed by using Kuppuswamy's scale [25].

Stature (cm) and body weight (BW) (kg) were measured using anthropometric measurement set and weighing scale respectively. Body mass index (BMI) was calculated from the measured stature (cm) and body weight (kg) data. The pre working heart rate (HR Pre-work) (beats.min<sup>-1</sup>), systolic and diastolic blood pressure (SBP Pre-work) and (DBP Pre-work) (mm Hg) were recorded in the morning hours before the individuals started working using an automated blood pressure monitor in sitting condition. Waist circumference

(cm) [26] and hip circumference (cm) [27] were measured by using non elastic tape. Conicity index (CI) [28], abdominal volume index (AVI) [29], Rohrer index (RI), hip adiposity index (HAI) [30-31] and a body shape index (ABSI) [31] were also obtained. Work related musculoskeletal discomfort was assessed by Cornell University's Musculoskeletal Discomfort Questionnaire (CMDQ) [32]. The obtained data were tabulated for statistical analysis. Obtained data were statistically analyzed. P value lower than 0.05 (P<0.05) was considered significant.

## Results and Discussions

The basic profile including age (year), ethnic background, SES, working experience (year), average working time (hr.day<sup>-1</sup>) of the male food growers are presented in Table 1. The physical and physiological variables in terms of stature (cm), body weight (kg), HR Pre work (beats.min<sup>-1</sup>), SBP Pre work (mm Hg), and DBP Pre work (mm Hg) have been presented in Table 2. Association between different obesity indices in terms of BMI, CI, RI, AVI, HAI and ABSI with CMDQ score have been presented in Figure 1.

**Table 1:** Basic profile of the study participants.

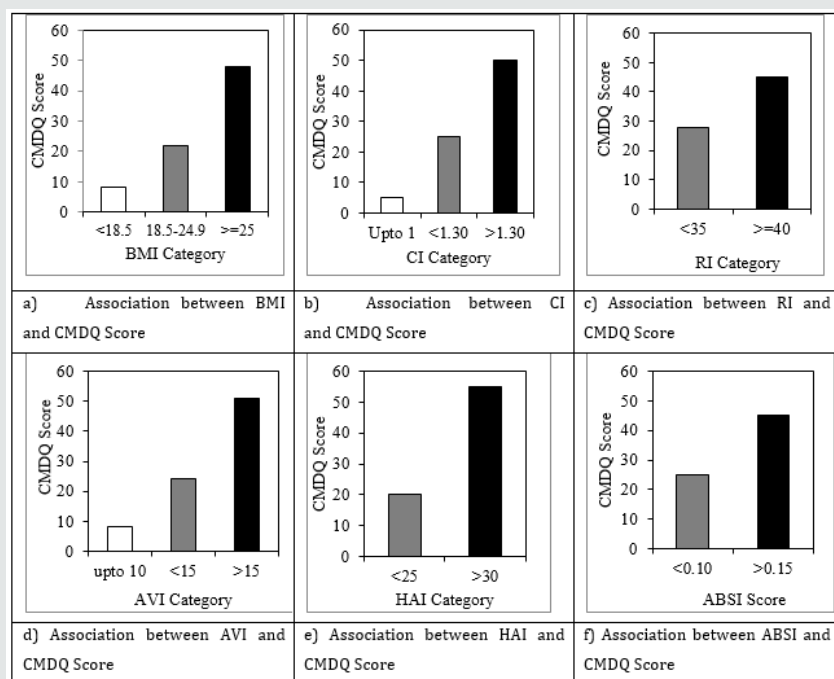
Variables	Values
Age (year)	27.8 ± 2.15
Ethnic Background	Bengalee
SES	Lower middle
Working Experience (year)	8.4 ± 1.19
Working time (hr.day <sup>-1</sup> )	6.9 ± 1.05

AM±SD

**Table 2:** Physical and Physiological profile of the study participants.

Variables	Values
Stature (cm)	157.3 ± 4.27
BW (kg)	56.0 ± 5.11
HR Pre work (beats.min <sup>-1</sup> )	72.0 ± 3.26
SBP Pre work (mm Hg)	118 ± 8.51
DBP Pre work (mm Hg)	78 ± 8.11

AM±SD



**Figure 1:** Association between different obesity indices and CMDQ score.

Obesity is a common condition and its prevalence is increasing worldwide [33-38] and our country is neither an exception [39-40]. It is characterized by excess body fat which is usually accompanied by increased total body mass. It is associated with numerous chronic health conditions, such as type 2 diabetes mellitus, cardiovascular disease, hypertension, and cancer. On the other hand, BMI is considered as one of the most popular indicator of obesity status [41]. In the present study, according to the BMI status of the participants, it was found that 12.9% of the participants were underweight, 35.5% were within normal BMI range and 51.6% of study participants (maximum percentage of subjects) were overweight as per WHO recommendation of BMI classification.

The main focus of the present study was to assess the musculoskeletal discomfort score and to find its association, if any, with the obesity indices among the study participants. CMDQ is a reliable and valid tool, for measurement of WMSD. Maximum CMDQ score has been found with individuals categorized as overweight followed by normal and underweight individuals. Significant association ( $P < 0.01$ ) existed between BMI and CMDQ scores (Figure 1) which is in agreement with earlier studies [3-4,22-23]. In the present study it is observed that, CMDQ score is significantly associated with CI ( $P < 0.01$ ), AVI ( $P < 0.01$ ), HAI ( $P < 0.01$ ) and ABSI ( $P < 0.05$ ), which is in agreement with other studies [7-10]. An earlier study [42] reported that, the risk of musculoskeletal pain among overweight/obese individuals was 1.7-times more as compared to individuals with normal body weight; especially increased BMI value which may be contribute to musculoskeletal

discomforts [42].

Human resources working in front of a computer with high BMI were found to be more prone to WMSD, may be because overweight acts as a contributing factor in increasing the physiological and mechanical load on tissues. Relative disk pressure is being experienced during sitting with various inclinations of the back support. Intra-diskal pressure of the nucleus pulposus, acts as a load transducer and indicates the magnitude of axial loading on the spinal column and the increased pressure indicates a greater muscular effort in maintaining the posture and hence a larger stress on spinal column. Moreover, overweight yields a decreased postural stability and potentially negative impact on control of upper limb movements but its effect on control of balance imposes constraints on goal-directed movements. From a clinical perspective, obese individuals might be less efficient and more at risk of injuries than normal individuals in a large number of work tasks and daily activities especially requiring upper limb movements [43-44]. The result of the present study indicates positive association of obesity indices with MSDs among computer operators, occupationally engaged in organized sector and thereby reducing the performance level of the individual workers.

## Conclusion

From the present study it may be concluded that that obesity indices are associated with musculoskeletal symptoms; and a rise in BMI, CI, AVI, HAI and ABSI increases the chance of MSD occurrence inhuman resources working with a computer in course of their regular occupationally engaged in paddy cultivating task.

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## Conflicts of Interest

Nil.

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