

Evaluation of Ergonomic Problems of Mf285 Tractors

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ABSTRACT: Musculoskeletal disorders (MSDs) are major parts of the occupational diseases in workplaces. Protection from such diseases is dependent on assessment and improvement of job postures by using job analysis methods in ergonomics. This study was conducted among MF285 tractor drivers with the objectives of determination of WMSDs prevalence and evaluation of level of exposure to WMSDs risk factors in darehshahr city. This study was a descriptive- analytical approach performed on 140 drivers at 4 task and 20 working posture by using REBA method. The prevalence of MSDs was obtained by using Nordic Musculoskeletal Questionnaire (NMQ). The data were analyzed by independent t-test, Chi-square and Proportions test with $P < 0.05$ as the limit of significance. Means of age, weight and length were 37.22 years, 87.47 kilogram and 179.27 centimeters. Respectively 85% of the drivers suffered from some kind of symptoms during the last 12 months. The highest prevalence was reported in neck (82.86%), knees (44.29%) and wrist (41.14%). Result of evaluation method REBA showed, 7 postures at average risk have access to necessary corrective action and 13 posture are at high risk and possible correction actions should be about them. This studied demonstrated that WMSDs occurred at a high rate in the study population. Major ergonomic problems were found to be awkward postures force on knee, force on wrist and neck rotation. Based on the results REBA, implementation of interventional corrective measures to reduce level of workers' exposure to WMSDs risk factors was essential.

Key words: Ergonomics, Musculoskeletal Disorders, REBA, MF285 tractor Drivers

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INTRODUCTION

Agriculture is one of the important sectors in developed industrial countries and developing industrial countries. Hence an adequate attention should be paid to the practical application of ergonomic measures and changes of activity in agricultural practices in order to reduce work related accidents and illnesses that result in improved living conditions and increased productivity [1]. According to the International Labor Organization about, 2.3 million people die due to occupational accidents and Work-related diseases every year. Latest estimates based on 2003 data indicate that 337 million occupational accidents and 160million occupational illnesses take place in the whole world every year. According to a study by the European Commission in 2000, more than four percent of gross domestic production (GDP) is wasted in terms of accidents and illness in the world [2]. One of the jobs in the agricultural sector which are directly related with machines and different devices, are tractor drivers. Although studies have been done on the condition of the tractor drivers' ergonomics, but because of issues, including difficulty of working conditions, yet these segments of society are in relatively poor health. Moreover, the adversity of their job are affected by geographical location, climatic condition, individual characteristics and the type of machine. It is essential to seriously investigate these realistic working conditions on different machines and in different geographical areas. About 85 percent of the world's total farms have less than two hectares that are classified as small farms, according to the World Bank definition. The average ownership level of agricultural land in Iran is also relatively low [3, 4]. For example, the average ownership level for peanuts production in Gilan province is about 0.8 hectares [5]. Driving tractor in small farms and doing the agricultural activities within such farms requires more frequent clutching, braking and steering. With no doubt in such circumstances, physical problems and the fatigue of the driver are the main concerns. So paying attention to any of these equipments in high lighting and identifying the causes of drivers' physical problems is effective. According to the report of Agriculture Mechanization Development Center, from 245,989 supplied tractors during years 1371-89, about 67 percent were MF285 tractor and about 9% were MF399 tractor. In other words these models of tractors (MF285) dominate the tractor types in Iran [6]. Considering the above issues, the aim of this study was to investigate the forces acting on driver's feet when clutching, breaking, steering and rear gear in agriculture action. In order to evaluate the ergonomic problems of these factors, used REBA software and also to provide guidelines in order to optimize and fit the above factors of the tractors with the tractor driver's health condition.

MATERIAL AND METHODS

Using the Cochran method, the sample size was set at 140 drivers of MF285 tractors. The research was conducted in the second half of year, 1392 in darehshahr city. This study was a descriptive- analytical approach performed on 140 drivers at 4 task and 20 working posture by using REBA method [7]. The prevalence of MSDs was obtained by using Nordic Musculoskeletal Questionnaire [8]. The data were analyzed by independent t-test, Chi-square and Proportions test with $P < 0.05$ as the limit of significance [9].

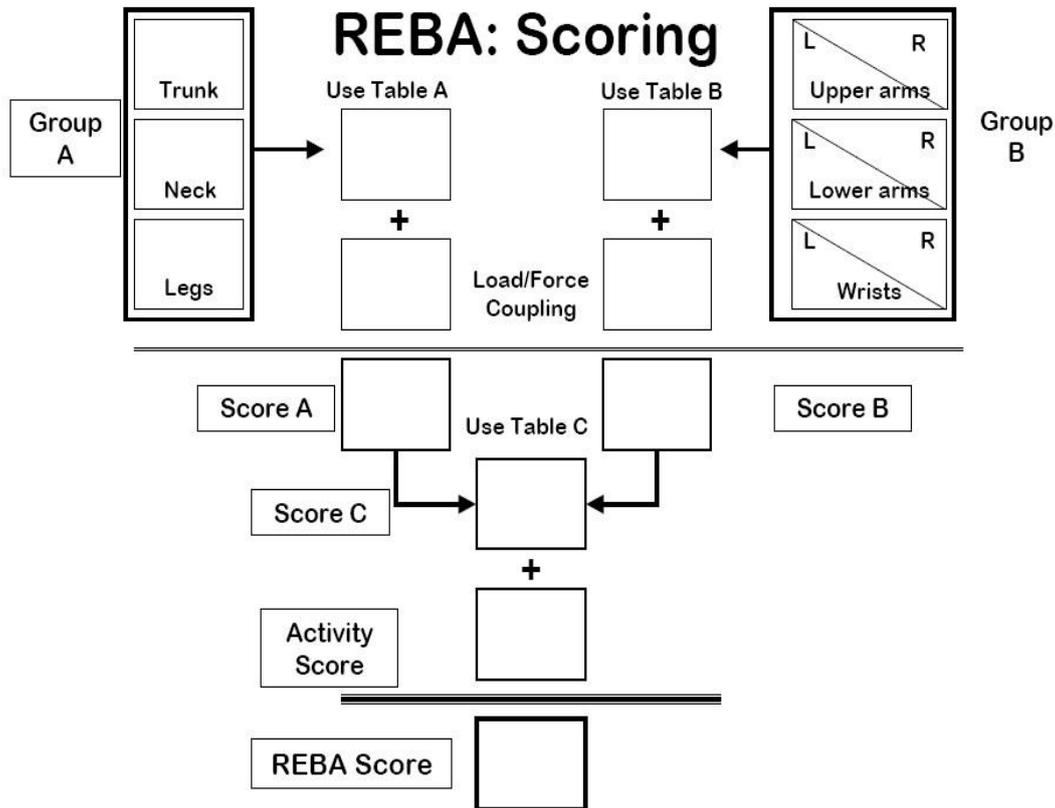


Fig 1. Algorithm of Reba software for method proposed in this article.

RESULTS

Means of age, weight and length were 37.22 years, 87.47 kilogram and 179.27 centimeters. Respectively 85% of the drivers suffered from some kind of symptoms during the last 12 months. The highest prevalence was reported in neck (82.86%), knees (44.29%) and wrist (41.14%). Please correct numbers Result of evaluation method REBA showed, 7 posture at average risk have access to necessary corrective action and 13 posture are at high risk and possible correction actions should be about them. This studied demonstrated that WMSDs occurred at a high rate in the study population. Major ergonomic problems were found to be awkward postures force on knee, force on wrist and neck rotation. Based on the results REBA, implementation of interventional corrective measures to reduce level of drivers' exposure to WMSDs risk factors was essential. Among position of driving with MF285 tractors, in farming actions, four position that have highest risk were study with REBA method, clutching with score REBA point 8, was in high level of risk. Based on the result of REBA method, implementation of interventional corrective measures to reduce of driver's exposure to WMSDS risk factors was essential. In comparing REBA score point with Nordic questionnaire result, among REBA point of body organs, trunk at 46.78% of observation has point 2 that showing high risk of this organ. among self-reported by tractor drivers 43% of them has disorder in this organ. 63.75% of REBA point at neck observation has point 2, that show more than twenty degree flexibility toward rear. abundance of neck disorder among drivers 82.86% reported. 50% of REBA point at foot observation has point 3 that show flexibility between 30 to 60 degree in one or two foot. Abundance of knee disorder among drivers 44.29% reported. 50% of REBA point at wrist observation has point 2 that show more than 15 degree flexibility or deflection in hands. Abundance of wrist disorder among drivers 41.14% reported. The results of the measured force required for clutching in MF285 tractor indicated that the required clutching force for tractor MF285 was 340 newton. For clutching in this tractors, 340 Newton force is required respectively [10]. Tractors MF285 utilized more force than the amount of optimum force ergonomic criteria for clutching, which indicates that the tractors can exert unusual pressure to the drivers.

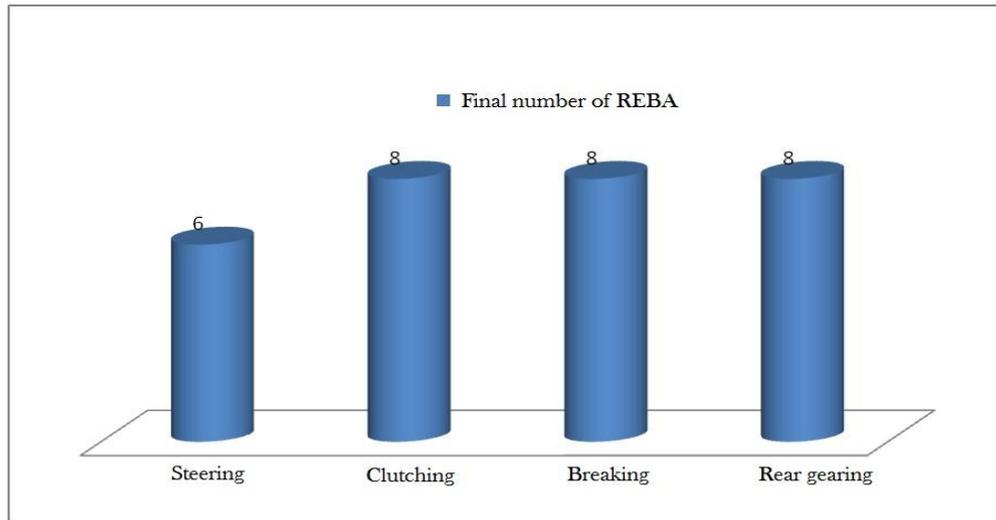


Fig2. Final number of REBA results

DISCUSSION

The results show that the clutching mechanism in MF285 tractor is need the required force much more than the recommended amount, however, this problem is acute. It is recommended to the manufacturer's tractor, in order to reduce the input power for clutching the tractor MF285 and more welfare of drivers, necessary rearrangements should be done. Given that this tractor is considered as lightweight tractors and its production rate and its usage in Iran agricultural sector much more than other tractor, paying attention to its optimization will have more roles in occupational health of agricultural sector. It is recommended as an introductory offer, the joint of force transmission between the pedal and disc in clutching mechanism is made of cast iron, because if this piece is made from this material, when applied the force, its state will not change significantly and hence it prevents much more applying force. Doing statistical research about abundance of disorder posture when driving with MF285tractors.designing suitable options, seat, pedals and livers according to anthropometric criteria of drivers is necessary for preventing drivers fatigue and MSDs.

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