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Identification of Locomotive Parts Mostlty Contributing to MSD's of Rural Taxi Drivers

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***Abstract*— Taxi drivers' musculoskeletal disorders (MSDs) are more and more hazardous to their health. It is less known about the causes of musculoskeletal (MSK) pain and discomfort in taxi drivers that result in MSDs. The performance of people working in taxi sector, has come to depend on their working environment and psychological work variables. This work compared how different categories of transportation workers are exposed to risk at work and investigated the association between workplace stress and operational performance of public taxi drivers.**

It is planned to gather data for the examination regarding taxi drivers' MSDs. Most issues relating to their working conditions are noted. The locomotive part involvement in MSD's is determined using the next level questionnaire. It provides sums of index values. The methodology includes both descriptive and correlational studies to identify probable connections between the variables. In addition, the difficulties of the individuals will be predicted using hierarchical multiple regressions. Using IBM SPSS (Statistical Package for Social Sciences), statistical analyses are carried out.

The major outcomes of the work are professional drivers' safety is at risk due to work-related stress. This offers proof that job stress has a considerable impact on professional drivers' performance, additionally a statistically significant differences between different taxi drivers' exposure to work-related stress in each occupational category are identified and highlighted the need for specialized occupational safety interventions.

***Keywords*— Occupational Health and Ergonomics, MSD, Occupational Safety and Health Safety, Risk assessment, Industrial Engineering, Hazards,**

I. INTRODUCTION

Driving is a common occupation in our society and many people in our area regard driving to be a full-time job. Driving pain is a complex matter that worsens significantly when you drive for long periods of time. Most of the time, people did not notice their movements because the danger level escalated. Typically, those working as drivers have an intermediate or worse level of economic stability.

Taxi drivers' musculoskeletal disorders (MSDs), which account for over half of all work-related illnesses and one-fourth of all lost-time claims, are increasingly being recognized as hazardous to their health due to the nature of the drivers' aching. Working environment and occupational stress factors have become crucial in determining the performance and general well-being of public transportation workers and taxi drivers. MSDs are a complicated set of painful tendons, muscles, and ligament problems caused by frequent and repetitive job activities or inappropriate occupational posture. Orthopedic condition typically impacts the body's musculoskeletal framework, including tendon, ligaments, joints, nerves, and blood vessels. Musculoskeletal illnesses can result in a lifelong disability, causing substantial problems, and the rising frequency of occurrence is a major contributor to the society's cost burden. Here the work is mostly focused on taxi drivers and pick the most concerned portion in the instance of taxi drivers and establish a possible hierarchy level to reflect the affected loco sections. Also, some resources are offered in the last section to mitigate the threat and they're by expanding noticing the significant affected area.

A. LITERATURE REVIEW

1) Factors associated with musculoskeletal pain and discomfort among canadian truck drivers: across-sectional studyof the worker perspectives (Senthanar & Bigelow, 2018): Musculoskeletal Disorders (MSDs) are injuries that impact the mobility of the human body's Musculoskeletal System. MSDs are sometimes referred to as "repetitive motion injury. In this paper says that over half of Canadian truck drivers suffer from musculoskeletal pain and discomfort, which can eventually lead to the development of musculoskeletal illnesses. MSK pain and discomfort were found to be strongly associated with safety atmosphere and culture, exhaustion/fatigue, and dangerous work-related tasks. These findings are important for employers, health and safety practitioners, and legislators since risk factors are frequently controllable and may be addressed with multi-component approaches.

2) Working conditions, job strain, and traffic safety among three groups public transportdrivers (Useche et al., 2018): When the neck and upper shoulders are maintained in a fixed, unnatural position for long periods of time can develop chances for accident also Job strain turns out to be the most powerful factor to explain the occurrence of traffic accidents in the occupational context of professional driving. The findings from this study is the majority of

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accident causation variables among professional drivers are concerned occupational stress and mainly individual health. Also There were some particular overlaps with other study findings, implying that age and experience, psychosocial aspects at work and duration are among the key explanatory variables of driving accidents and fines among public transportation drivers

3) Effect of long term driving ondriver discomfort and its relationship with seat fidgets and movements (sfms) (Sammonds et al., 2017): Lastly, the laboratory study results suggest that a measure of SFMs may accurately predict subjective total car seat discomfort. Fitting the data in this experiment revealed a high link between predicted discomfort using SFM data and observed subjective overall discomfort. More research is needed to confirm the procedure, however there is the possibility of analysing pain via remote monitoring. The technique should be validated in the future, and the association between overall driver discomfort and driver seat fidgets and movements should be investigated further. The strategy should be evaluated in other laboratory settings with various vibration stimuli to see if the same association is obtained with a varied discomfort gradient

4) Investigating the factors affecting th distance travel and health conditions of e-bike users in toronto (Hasnine et al., 2020): This research explores the tradeoff between a specialised transportation market's physical health status and trip distance, which is generally ignored in traditional household surveys. The research also explores the linked elements that influence physical health and travel distance. It makes use of data from a study of ebike and bicycle riders in Toronto. According to the physical health condition model, ebikers from lowincome families have a higher health risk than ebikers from highincome households. This discovery has important policy implications. The model results also show that handicapped and parttime employees who ride ebikes are more likely to have poor health. Female ebikers are also more likely to have bad health, according to model results.

II. Objectives

A. Broad Objective

To identify the major part associated in musculoskeletal disorders of rural taxi drivers.

B. Specific Objectives

1) For the case of chosen individuals, representation of each locomotive body component risk occupying hierarchy in a graphical format..

2) The identified risks are classified into different categories.

III. Methodology

A. The project work was divided into three sections. The first step entails an existing literature. The fundamentals of risk assessment were explored. During this step, sample impact studies were also considered. The second step refers to data collecting. During this step, I physically visited the taxi drivers and collected all of the essential data. During this step, the problems were discovered. The final phase entails processing the data acquired by Microsoft Excel. The outputs were then classified, and management tasks to eliminate these concerns were found.

Fig 1: Methodology

A. Data Collection

For the examination of characteristics affecting taxi drivers' MSDs, informal meeting was held, and a questionnaire is utilized to collect data. The key specifics of difficulties concerning working conditions are primarily noted. The questions at the beginning were used to forecast the risk level, thus we obtain values based on the index values or scales linked with this. A random sample of drivers completed the first phase of the questionnaire the followed the second phase which include : physical, organizational, and individual factors.

NAME	AGE	RESPONSE FOR THE INTIAL QUESTIONNAIRE (ASSIGN VALUES FROM 1 TO 5)										TOTAL INDEX
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
KANAN	32	3	4	3	5	3	4	2	1	4	1	30
RAJESH	28	3	3	3	5	3	3	1	2	1	1	25
ANI	45	2	3	3	5	3	3	2	2	4	3	30
SWADISH	30	2	4	3	5	3	2	1	1	1	1	23
VIJAYAKUMAR	63	3	2	4	4	3	4	5	5	4	4	38
ARUN	32	3	3	4	5	2	3	1	1	4	2	27
SHIBU	46	3	3	4	4	4	3	2	5	5	4	37
MANOHARAN	54	3	3	3	4	4	4	5	5	5	4	40
ANILKUMAR	52	3	4	4	5	4	4	5	5	5	5	44
SUNILKUMAR	50	3	2	3	5	4	4	5	5	4	4	40
NITHIN	27	3	3	3	4	3	2	2	1	1	1	23
UMESH	30	3	4	3	5	2	2	1	2	2	2	26
VINOD	42	2	2	3	5	3	3	2	5	2	3	30
RATHESH	32	3	3	3	5	3	2	1	2	2	2	26
PRAVEEN	38	3	3	4	5	2	3	1	2	3	3	29
VILBER JOJI	50	3	3	3	5	3	4	1	5	4	4	35
SAJI	34	3	3	3	5	2	3	1	2	1	1	24
SURESH D	48	2	3	3	5	4	4	2	1	3	4	31
ANIL1	42	2	4	4	4	4	4	1	1	3	2	29
BIJU	52	2	5	2	5	4	4	2	1	3	2	30
MANU	34	3	2	3	4	3	3	2	2	4	4	30
KRISHNAPRASAD	34	3	3	4	5	2	3	2	2	4	4	32
AVERAGE OF AGE	40.682											

RANGE OF RESPONSE VALUE SUM	NO.OF PEOPLE INCLUDED	PERCENTAGE VALUE	
(0-10)	0	0	(0-10)- LESS AFFECTED
(10-20)	0	0	(10-20)-SLIGHTLY AFFECTED
(20-30)	9	40.91	(20-30)-MODERATELY AFFECTED
(30-40)	10	45.46	(30-40)-VERY AFFECTED
(40-50)	3	13.63	(40-50)- EXTREMELY AFFECTED

Fig 2: Primary questionnaire converted to numerical values

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NAME	ISSUES IN LOCOMOTIVE ORGAN	NECK	SHOULDER	ELBOWS	WRIST/HAND	FINGERS	UPPER BACK	LOWER BACK	KNEES	ANKLE	HIP	TOTAL INDEX VALUE
KANAN	YES	4	5	5	5	5	3	3	2	2	4	38
RAJESH	OFTEN	2	3	2	1	1	2	2	1	1	1	16
ANI	YES	4	4	5	4	4	4	4	4	3	4	40
SHADISH	NO	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	0
VIJAYAKUMAR	YES	5	4	2	4	4	4	4	3	4	3	37
ARUN	OFTEN	2	3	1	3	3	3	3	2	2	1	23
SHIBU	YES	4	4	3	3	3	4	4	3	3	3	34
MANOHARAN	YES	4	4	4	4	4	4	4	3	3	3	37
ANILKUMAR	YES	3	4	4	3	3	5	5	5	5	4	41
SUNILKUMAR	YES	4	4	3	4	5	5	5	4	4	4	42
NITHIN	NO	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	0
UMESH	OFTEN	2	1	1	1	1	2	1	2	1	1	13
VINOD	YES	4	5	4	3	2	4	4	5	3	2	36
RATHESH	OFTEN	1	2	1	1	1	2	1	2	1	1	13
PRAVEEN	YES	4	3	3	4	4	3	4	3	4	4	36
VILBER.I.DI	YES	4	4	3	5	5	5	5	4	3	4	42
SAJI	NO	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	NILL	0
SURESH D	YES	4	3	4	4	4	4	3	3	4	5	38
ANILL	YES	4	3	4	4	4	4	4	4	3	4	38
BIJU	YES	5	3	3	3	3	4	3	4	3	4	35
MANU	YES	4	3	3	4	4	3	4	4	4	5	38
KRISHNAPRASAD	YES	4	3	5	5	5	4	4	3	5	5	43
	TOTAL INDEX VALUE OF PARTS	66	65	60	65	65	69	67	61	58	62	

Fig 3: Representation of locomotive parts-based index data

B. Data Interpertation

For data interpretation, Microsoft Excel 2021 software is utilized. Each response is assigned a number ranging from 1 to 5. A table is built by utilizing the index value. The total of index values for each person is determined on that basis. This determined value represents categorization and range. Most people fall into a specific range. The most common index value range is 30-40, where most persons are included, and it may reach a percentage of 45. The following level of Questionnaire data is used for locomotive component engagement in MSD's. It returns the total of index values, which may be used to verify the prior forecast. (Whether or not the "30-40" range index value contains persons). Finally, for everyone, generate each component index value, and apply these values for hierarchy selection. Calculate the proportion of possibilities and display the results in an appropriate graphical way. Following are the steps followed for the work,

a. Journal study.
b. Questionnaire preparation.
c. Direct conversation between selected taxi drivers.
d. Finding issues in their working period.
e. Assigning index values for answers based on the scaling from 1to 5.
f. The total values were used for plotting and finding the result.

C. Scaling

INTENSITY LEVEL	
VERY LOW	1
SLIGHTLY	2
MODERATE	3
HIGH	4
SEVERE	5

Fig 4: Scaling

It means, the physiological components have problems that are expressed numerically. If a serious problem is recognized, the greater scale is often used, and these values are added together to acquire the entire numeric weightage of the inquiry.

IV. About the Industry

The rural taxi sector in India is primarily dominated by small and medium-sized local operators who offer point-to-point transportation services within rural areas. These operators usually use non-air conditioned taxis, such as small cars, vans, and autorickshaws, to transport passengers.
One of the main challenges in the rural taxi sector is the lack of proper infrastructure, such as roads and transportation hubs, which makes it difficult for operators to provide timely and efficient services. In addition, the sector also faces issues such as high operating costs due to rising fuel prices and maintenance costs.
The sector also provides employment opportunities for local drivers and helps to stimulate economic activity in rural areas.
In recent years, there has been a rise in the use of technology and mobile apps by rural taxi operators to improve their services and increase their reach. Overall, the rural taxi sector in India is an essential part of the transportation ecosystem, providing critical services to the rural population and contributing to the growth of the rural economy.

V. Results and Discussion

A. Results

The first interview part holds details to anticipate the possibility of disorder in which individuals, and the provided values for each query are listed in the first table, then cumulative index value for everyone is obtained from the database and That is consider as the central issue because most participants included in that index value amount. Assessing each person's index values for a certain topic, the total of index values was calculated. Most of the drivers are in the 30-40 range of index value, and they are in significant trouble. This would be the initial guess, and we learn that 45 to 46 percent of taxi drivers are included in this sector, and they select alternatives that support the index value range of 30-40. It is illustrated by a graphical representation, and it provides a clear picture of the conclusion.

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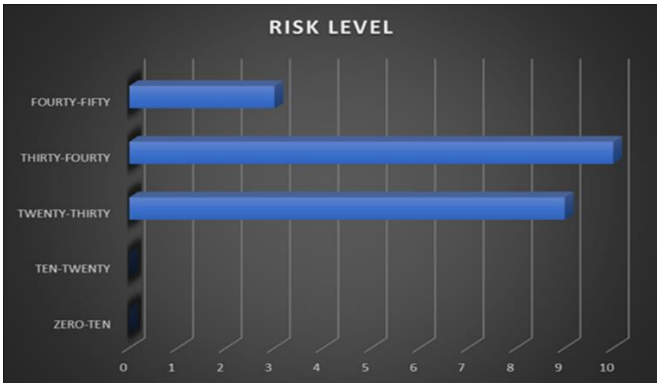

FIG 5: Represent risk level and range of index value sum

In the following level, present three options: yes, no, and often. If the individual has locomotive parts troubles as a result of driving, the correct choice is yes; if not, he can pick no, and the option often is an intermediate level. People respond yes and often gather further information about the sections. The led to improvements is an organs-based survey, which is likewise tabulated based on specified index values and determines a total for everyone as well as for each single component and for plotting the result frequency table also created.

RANGE OF INDEX VALUE SUM	NO.OF PEOPLE INCLUDED	PERCENTAGE
(0-10)	3	13.64
(10-20)	3	13.64
(20-30)	1	4.545
(30-40)	10	45.46
(40-50)	5	22.73

Fig 6: Frequency table for graph

The risk level of people is depicted here based on an index of values assigned for locomotive organ-based data. The study also reveals that respondents in the 30-40 index range are more likely to be affected by high-level issues. This amounts to a rate of around 45 to 46.
The final figure displays the data for each part as well as the total sum for the parts level score analysis. The upper back area has the highest percentage value when compared to other zones. As a result, the upper back is most affected while driving.

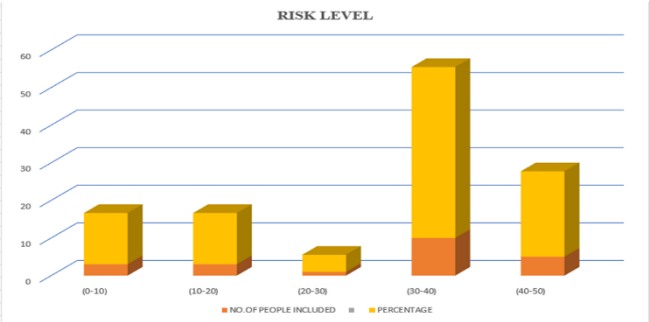

Fig 7: Locomotive parts-based index value sum for each driver

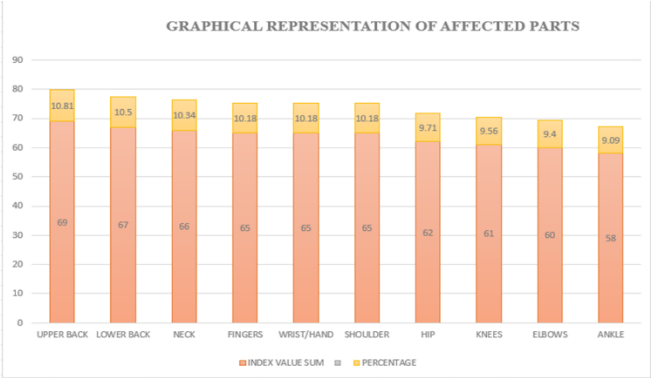

Fig 8: Graphical representation of hierarchy of affected parts

HIERARCHY OF AFFECTED PARTS	INDEX VALUE SUM	PERCENTAGE
UPPER BACK	69	10.81
LOWER BACK	67	10.5
NECK	66	10.34
FINGERS	65	10.18
WRIST/HAND	65	10.18
SHOULDER	65	10.18
HIP	62	9.71
KNEES	61	9.56
ELBOWS	60	9.4
ANKLE	58	9.09

Fig 9: Hierarchy of potential cause for parts

B. Discussion

Here proceed by adjusting the seat to the 'initial set up position.' Raise the seat as high as is comfortable to improve your road view. Check that you have enough clearance from the roof and make sure you have a clear view of the road. Adjust the cushion tilt angle so that your thighs are supported all the way down the cushion. Avoid applying pressure behind the knees. Adjust the back rest so that it gives continuous support down the length of your back and is in touch with your shoulders.
Avoid reclining the seat too far since this might induce excessive forward bending of the head and neck and lead you to slide forward on the cushion. Maintain a decent driving posture while also moving in your seat and changing your position from time to time If your car is stopped in traffic and stationery, you may have a safe chance to move your shoulders and neck. Take a short break for every hour of driving. Get out of the vehicle to use the phone, eat lunch or do 'paper' work. Walk around and do some stretches, do not stay in the vehicle, or seated in a restaurant or rest area. For each reach, turn the steering wheel backwards and downwards. When utilizing pedals, make sure there is enough space for things and knees. Check that the panel display is clear and not obscured. Pedal positions and angles that are both comfortable. Broad visibility angles, Mirror may be easily adjusted to improve visibility on the road. Compatibility with vibration standards

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VI. CONCLUSION

The final section of this study focused on the most impacted region of a driver when driving. Get a sense of the largely affected categories from the initial questionnaire section. Here, ten people were classified as having a high risk level, making up the majority of this sector. Also nine people are followed the majority category in the second position. The key issue is to determine the most dangerous section of a locomotive, we obtain the answer that it is the upper back, followed by the lower back and neck. Furthermore, the majority of possible causative groups falls within the range of "30 to 40" of the entire index score. The severe category have a percentage value upto 11 and the second group posses nearly eqal to 10.5. Here not a large margin of difference is present but increasing the sample size may be produe observable change. So here almost 11% of the persons in the sample have upper back injuries as a result of prolonged driving and it is considered as the most affected region and compared to these result the ankles and elbows are the least impacted and they have a "9 to 9.5" percent chances of developing MSDs.

FUTURE SCOPE

The idea for future research with public transportation drivers should be highlighted by the study and guidelines utilized for the enhancement of occupational health. Investigate the relationship between job strain and operational performance of public transportation drivers. To compare different types of transportation employees' exposure to risk behaviors at work. Comparative study of different age groups and MSD's chances.

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