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# REVIEW OF LITERATURE ON PREVALENCE OF WRIST/HAND PAIN AMONG AUTOMOBILE WORKERS

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## ABSTRACT
***Background:*** *Work-related musculoskeletal disorders (WMSDs) are a significant global occupational health issue, affecting workers across all industries, including automobile manufacturing. Employees in this sector face high risks of WMSDs, which can severely impact their physical and mental well-being.*
***Objective:*** *The objective of this study is to determine the prevalence of wrist and hand pain in automobile workers.*
***Method:*** *Articles were chosen from multiple platforms like Google Scholar, PubMed, SCISPACE, and ScienceDirect, spanning 2010-2023. Out of 35 articles, only 20 met the study's criteria for inclusion.*
***Results:*** *Wrist pain is a major concern for auto manufacturing workers globally. Factors like gender, age, physical activity, repetitive tasks, poor work environment, long hours, lack of training, and improper wrist posture are linked to WMSDs. These impact worker performance and cause economic losses. To reduce WMSD risk, mechanics should be trained in proper posture and the adoption of ergonomic devices and instruments during work tasks.*
***Conclusion:*** *Musculoskeletal disorders (MSDs) in hands and wrists are common in auto manufacturing and repair workers. Although wrist pain isn't as common as pain in other areas, it still contributes significantly to the overall musculoskeletal burden. Hence, it is vital to focus on prevention strategies such as incorporating ergonomic improvements and enhancing working conditions and the overall work environment to lower the occurrence of work-related MSDs. These strategies can help prevent work-related MSDs and promote the health and protection of these workers.*
**KEYWORDS:** *Wrist/Hand Pain, Repetitive Motion, Automobile Workers, Prevalence Rate.*

## INTRODUCTION
Musculoskeletal disorders encompass a broad spectrum of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves, and blood vessels, with significant global prevalence and socio-economic impacts. Workers across diverse industries and professions face workplace hazards that increase the risk of developing musculoskeletal disorders. These hazards include tasks such as lifting heavy objects, bending, reaching overhead, pushing and pulling heavy loads, and repetitive motions. Exposure to these recognized risk factors heightens the likelihood of sustaining injuries.(1) Musculoskeletal disorders cause pain, reduced physical function, and a decline in mental well-being, all of which impede individuals' capacity to participate effectively in the workforce.(2, 3)

Work-induced musculoskeletal disorders (WMSDs) result from exposure to both physical and psychosocial hazards during work activities, leading to pain, restricted movement, and injuries. They often stem from a combination of factors rather than a singular cause. Physical factors and organizational risks are major contributors. Notably, bending, repetitive forceful movements, uncomfortable or static postures, exposure to vibrations, poor lighting, cold working environments, fast-paced tasks, prolonged periods of sitting or standing, and heavy lifting are significant problematic factors. (4, 5) Moreover, the presence of psychosocial factors and individual characteristics is vital for the emergence of WMSDs. (6, 7)

As per a 2019 survey conducted in China, WMSDs were observed in 42.9% of the overall working population, and wrist pain constituted 13.4% of this figure.(8) Wrist pain is prevalent among individuals engaged in daily manual labour and sports activities but is less frequently reported among the general population and those in non-manual occupations. Despite being less common compared to back, shoulder, hip, or knee pain, wrist pain still contributes significantly to the overall strain on the musculoskeletal system.(9)

Automobile repair has been identified as a dangerous occupation with high injury prevalence of wrist pain. During a standard workday, automotive repair workers assume diverse postures, face challenging psychosocial conditions, and engage

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in repetitive tasks, which may generate stress and increase the risk of injury. [10] Numerous positions in the automotive sector still need on employees to do repetitive tasks, putting them at risk of harm from WMSDs. Hand and wrist injuries occur more frequently when cycle times are shorter. Accelerated work pace leads to increased muscle activity levels, which in turn raises the potential exposure of MSDs and the appearance of muscle fatigue symptoms. Work productivity may be hampered if employees who have musculoskeletal problems are in pain or uncomfortable and continue to work but at a decreased capacity. [11]

Studies indicate that work-related injuries arise from various factors, encompassing worker attributes, health conditions, and job-related stressors. Worker traits like gender, age, tenure, lifestyle, body weight, and literacy level play a role in injury rates. Those with pre-existing health issues or psychological discomforts are more prone to injuries. Workplace challenges, like long work hours, cramped workspaces, noisy environments, inadequate tools, and machinery design, also contribute to injury occurrence. Additionally, psychological and social aspects of work, such as heavy workloads, fatigue, cognitive strain, anxiety, and job dissatisfaction, have been identified as significant contributors to the risk of occupational injuries. [10]

## METHODOLOGY

### Materials and Methods

Online search engine that are used to collect journals are Google scholar, PubMed, Medline, PEDro and ScienceDirect based on the available study in the prevalence of wrist pain due to repetitive work or overuse. The articles identified related to keywords and collected them in full text. Overall, 55 articles were collected and only 16 articles are used in this study for the research based on the inclusion and exclusion criteria

### Study Selection

### Inclusion Criteria

- Articles were included from year 2010 to 2023.
- Articles include the prevalence of wrist pain in automobile manufacturing and repairing workers.

### Exclusion Criteria

- Articles before the year 2010 not be included.
- Previous history of surgery or trauma
- Congenital deformities
- People with distal radius or any wrist bone fractures.
- People with rheumatoid arthritis and synovitis.
- Any infectious and inflammatory diseases.
- Sensory loss patients.
- People with tendon ruptures
- People with Zone 3 injuries

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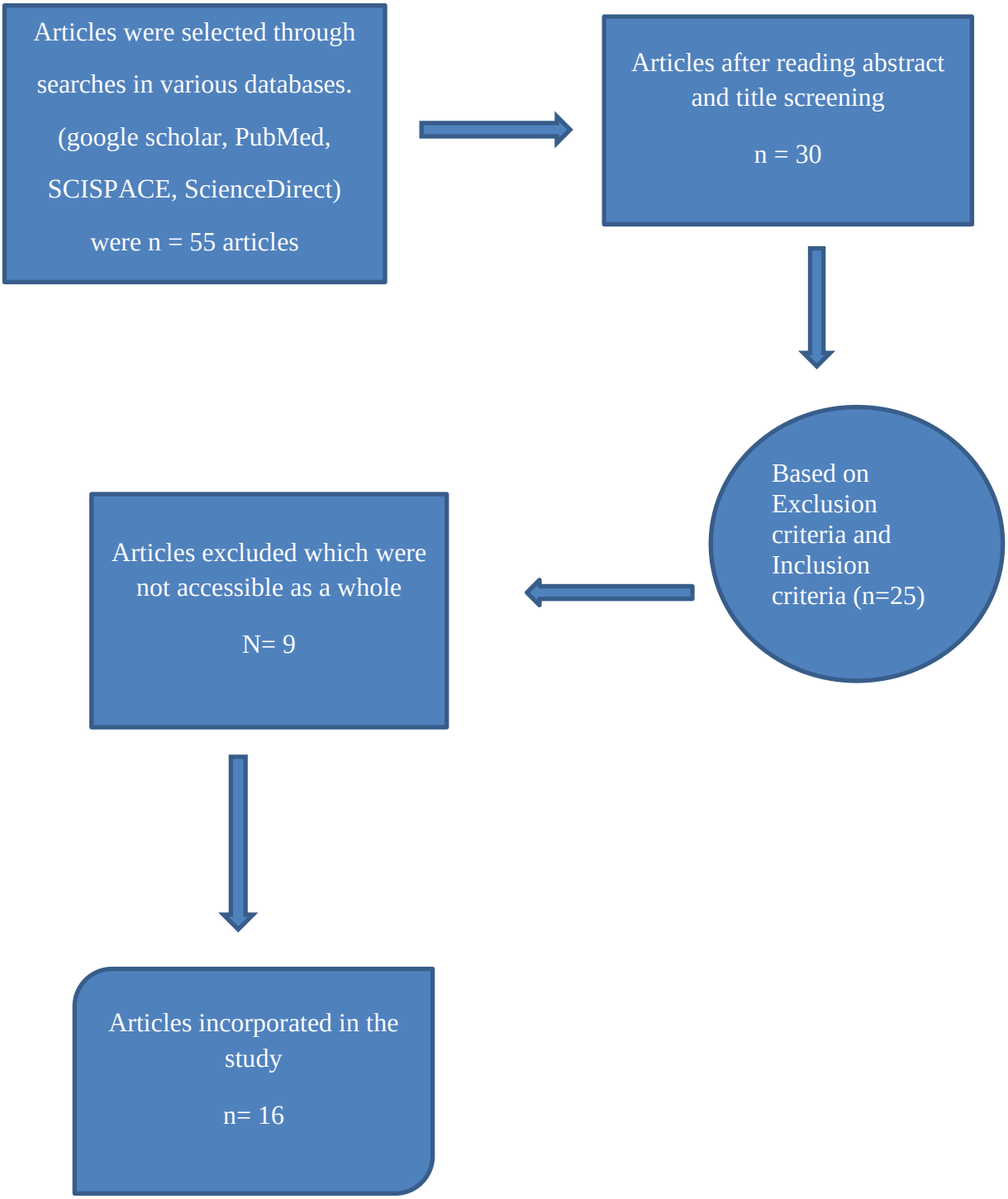
**FLOW CHART**



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**REVIEW OF LITERATURE**

| Sr no. | Author | Title | Study design | Study results | Conclusion |
|---|---|---|---|---|---|
| 1. | Xiongda He, Bin Xiao et al (2023) | Prevalence of work-related musculoskeletal disorders among workers in the automobile manufacturing industry in China: a systematic review and meta-analysis. | Systematic Reviews and Meta-analyses. Out of 849 references, 26 articles met the inclusion criteria. | Among body regions, the prevalence rates for wrist/hand identified as 26.6%. | According to the conclusion, this study identifies a high prevalence of WMSDs among auto workers in China, emphasizing the urgent need for attention. Effective prevention strategies include implementing ergonomics and improving working conditions and overall environment. |
| 2. | Alka Chandrakanta et al (2023) | An Ergonomic Risk Factor in the Automobile Sector and Prevalence of the Musculoskeletal Disorder. | descriptive and experimental Study. 75 participants assessed with REBA and ART tools showed medium to high-risk repair postures, while musculoskeletal disorders were evaluated using the revised Nordic questionnaire, assessing pain over 12 months, 1 month, and 7 days. | Findings showed that in the past year, 17.33% experienced pain/discomfort in the right wrist/hand, 4% in the left, and 12% in both. Similar trends were observed in the past month, with 14.66% reporting pain in the right wrist/hand, 4% in the left, and 12% in both. Over the past 7 days, 18.66% reported pain in the right wrist/hand, and 8% in both. | According to the study, there was a significant positive correlation between muscle pain and the years of employment among garage workers. These findings indicate high exposure to manual material handling and repetitive tasks, posing occupational health hazards for garage workers. |
| 3. | LI Zheng, WU Jiabing et al (2023) | Influencing factors and attribution analysis of hand/wrist musculoskeletal disorders among welders in an automobile factory. | Five branches of an automobile factory were selected using a convenient sampling method, all eligible welders participated. Data on welders' characteristics, MSDs presentations, and ergonomic factors were collected using the Chinese Musculoskeletal Disorders Questionnaire | The study found that the Prevalence of hand/wrist MSDs among welders was 44.1% (345/782). Population attributable risk percentage (PARP) for major risk factors: holding/pinching objects by hands (32.46%), twisting wrists (21.50%), post-work fatigue (15.28%), and insufficient operating space (8.18%). | In conclusion, High prevalence of hand/wrist MSD symptoms observed. Gender, holding or pinching objects by hands, twisting wrists, post-work fatigue, and insufficient operating space significantly affect hand/wrist MSDs among welders. Among these, holding or pinching objects by hands and twisting wrists emerge as the primary intervention priorities. |
| 4. | Nengzhou Chen, Guanlin Li et al (2022) | Prevalence status and associated factors of wrist postural injury in the Chinese occupational population | A cross-sectional study was conducted across 15 industries, including automobile manufacturing. Multivariable binary logistic | The study found that 13.2% of the population experienced wrist injuries, with the highest rates observed in toy manufacturing (29.1%), animal | The study concluded that Gender, age, physical activity, and abnormal wrist posture were linked to WMSDs. Regular exercise reduced the odds of wrist injury, suggesting improved posture and physical activity could |

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| | | | regression analyses were utilized to identify factors linked with work-related musculoskeletal disorders (WMSDs). | husbandry (19.1%), automobile manufacturing (14.9%), shoe manufacturing (14.9%), and biopharmaceutical manufacturing (14.0%). | help reduce the risk of such injuries. |
| 5. | Hulya Sirzai, Emine Ahi Dundar et al (2022) | A cross-sectional study determining the prevalence of musculoskeletal diseases in automotive factory workers | Cross-sectional study investigated musculoskeletal disease prevalence among 200 automotive factory workers diagnosed with WMSD within the past year. | Results obtained that the most prevalent conditions were low back disorder (66.5%), neck and shoulder issues (58%), and upper extremity disorders (23%). | In conclusion, neglecting proper posture at work leads to health issues across various body regions. Promoting ergonomic practices among automotive employees is essential for prevention. |
| 6. | Isabel Moreira-Silva, Joana Azevedo et al (2021) | Predicting musculoskeletal symptoms in workers of a manufacturing company. | The study involved 202 workers of various job types. They used the Nordic questionnaire to assess symptoms and the International Physical Activity Questionnaire to measure physical activity and sitting time. | Results indicated a 7-day prevalence of work-related musculoskeletal symptoms of 41.6% (n = 84), with the wrist/hand having a prevalence rate of 17.3%. | They came to the conclusion that older workers reported symptoms more often based on their job type and the importance of implementing workplace interventions to prevent musculoskeletal symptoms in this population. |
| 7. | Mandar Kulkarni1, Trupti Yadav et al (2020) | Prevalence of cumulative Trauma disorder of wrist joint in auto mechanical workers | Observational study, 60 subjects with over 5 years of experience were examined. | In a study of auto mechanical workers, 4 special tests were conducted. Sharper's test yielded negative results for all, with 5% testing positive in carpal compression, 18.33% in Phalen's, and 10% in Finkelstein's, resulting in a 23.33% prevalence of cumulative trauma disorders (CTD). | The results of the current study found that the average age of the study subjects was 36 years, with noticeable and significant pain prevalence in older age groups compared to younger ones and highlighting the importance of ergonomic considerations and preventive measures in this occupational setting. |
| 8. | R. Ferguson, N. D. Riley et al (2019) | Wrist pain: a systematic review of prevalence and risk factors–what is the role of occupation and activity? | A systematic review of 32 cross-sectional studies, including one longitudinal study. | Short-term prevalence in the general population and non-manual workers was 6%, medium-term was 4.2%. Physically demanding occupations and sports had higher rates: 10% short- | It concluded that physically demanding activities like manual labour and sports are associated with higher rates of wrist pain, whereas it's less common among general population and non-manual workers. |

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| | | | | term, 24% medium-term. | |
| 9. | Akram Sadat Jafari Roodbandi et al (2019) | Prevalence of musculoskeletal disorders and posture assessment by qec and inter-rater agreement in this method in an automobile assembly factory: Iran-2016. | This study involved 148 workers who completed the MSDs Nordic questionnaire using census sampling. Posture analysis was carried out using the QEC method by two experienced evaluators. | Found a high prevalence of MSDs among assembly workers, particularly in the back/hip (78.3%), wrists/hands (59.5%), shank/feet, shoulders, and knees (about 55%). Notably, 87.2% of assembly line workers reported experiencing at least one MSD. | The study concluded that the QEC method's high scores correlated with the observed prevalence of MSDs. Consequently, urgent ergonomic interventions are required to enhance the workplace conditions and mitigate MSD risks in the car assembly plant. |
| 10. | Meisam Moradi et al (2017) | REBA method for the ergonomic risk assessment of auto mechanics postural stress caused by working conditions in Kermanshah (Iran). | A cross-sectional descriptive-analytical study99 auto mechanics participated, and data on work-related musculoskeletal disorders (WMSDs) were collected through Nordic Body Map questionnaires and REBA method. | The results showed that the prevalence of wrist/hand musculoskeletal disorders (MSDs) within the past 12 months was found to be 54.5%. Additionally, the REBA posture assessment revealed that 55.5% of auto mechanics were categorized as being at a high or very high risk level for developing MSDs due to poor working conditions | To prevent WMSDs, auto mechanics should receive training on proper body positioning, posture, and the use of ergonomic equipment and tools during work tasks. |
| 11. | Ayub Parno, Kourosh Sayehmiri et al (2017) | The prevalence of occupational musculoskeletal disorders in Iran: A meta-analysis study. | A systematic review and meta-analysis using databases like SID, Google Scholar, Medlib, and PubMed. 6,090 workers were involved across 27 articles, with an average sample size of 225. | The prevalence of upper limb musculoskeletal disorders, specifically wrist-related, was found to be 34.6%. | Recommendations include implementing ergonomics and providing occupational health training to mitigate the risk of WRMSDs. |
| 12. | H. O. Adeyemi, O. O. Akinyemi et al (2016) | Assessment of work-space and work-method designs in Nigeria automobile service and repair industry | Surveys were conducted among 252 workers to assess the prevalence of work-related injuries | Of these workers, 26.6% reported shoulder and wrist/hand pain. Such discomfort may result from the repeated twisting and forceful gripping of automobile parts and tools, particularly during tasks like tightening wheel nuts, | In conclusion, the recommended measures to enhance safety and reduce injuries in automobile services and repair works include the use of hand gloves or padding to minimize frictional effects associated with forceful gripping. |

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| | | | | which can lead to strain injuries | |
| 13. | Mujtaba BAQAR et al (2015) | Prevalence of work-related musculoskeletal symptoms (WMSS) among the motorcycle mechanics of Lahore, Pakistan. | 260 motorcycle mechanics were examined utilizing a self-administered questionnaire survey. | Over the last 12 months, WMSS prevalence was notably elevated among motorcycle mechanics, particularly affecting directly involved body organs, with the wrist being implicated in 44% of cases. | Study concluded that motorcycle mechanics prone to WMSS due to poor environment, long hours, lack of training. High WMSS rates hinder work, cause economic losses. Urgent global action needed for mechanic safety. |
| 14. | Nurhayati Mohd Nur et al (2014) | The prevalence of work related musculoskeletal disorders among workers performing industrial repetitive tasks in the automotive manufacturing companies. | Out of 400 distributed Standardized Nordic Musculoskeletal Questionnaires (NMQ), 152 were completed. Descriptive statistical techniques were utilized for data analysis. | The findings revealed that within the past twelve months, the highest prevalence of MSDs was observed in the neck (49.3%), followed by the hand/wrist (48.0%) and shoulder (46.7%) regions, with an overall MSD prevalence of 76.97%. | The researcher concluded that workers in automotive manufacturing, particularly those performing repetitive tasks, face a significant risk of upper limb WMSDs. The prevalence of WMSDs is notably high, which could adversely affect worker performance. |
| 15. | Su-hyung Park, Deog-hwan Moon et al (2013) | Musculoskeletal Symptoms Prevalence and Its Related Factors of Workers in Manufacturing Industry of Automobile Parts in Gimhae City | Author conducted a survey on musculoskeletal symptoms prevalence and related factors using structured self-administered questionnaires. Out of 225 collected, 223 were analyzed following NIOSH criteria, excluding 2 with invalid responses. | The prevalence rate of musculoskeletal symptoms in the hand/wrist among all examined body regions was determined to be 35%. | In conclusion, prevalence and stress scores were higher in automobile parts manufacturing workers compared to other occupations. Drinking and smoking were associated with stress scores, while age significantly influenced musculoskeletal risk. |
| 16. | MOHD NASRULL ABD RAHMAN et al (2010) | Survey of body part symptoms among workers in a car tyre service centre. | 12 workers at a car tyre service centre were examined. | The hand/wrist (91.7%) experienced the most discomfort, followed by the shoulder (83.3%), elbow/forearm (75%), and lower back (30%). | According to the conclusion, to address ergonomic hazards, both engineering controls (adjusting workstation layout, tools, materials) and administrative controls (policy changes) can be implemented. |

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## DISCUSSION

Musculoskeletal disorders encompass a broad spectrum of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves, and blood vessels, with significant global prevalence and socio-economic impacts.[1]Work-induced musculoskeletal disorders (WMSDs) result from exposure to both physical and psychosocial hazards during work activities, leading to pain, restricted movement, and injuries.[4,5] Moreover, the presence of psychosocial factors and individual characteristics is vital for the emergence of WMSDs.[6,7] Automobile repair work is hazardous, with a high incidence of wrist pain due to diverse postures, repetitive tasks, and stressful conditions. [10]

Research findings suggest that occupational injuries arise from various factors, encompassing worker attributes, health conditions, and job-related stressors. [10] Xiongda He, Bin Xiao et al (2023) investigated the prevalence of work-related musculoskeletal disorders (WMSDs) among workers in the automobile manufacturing industry in China, The study found that the overall 12-month prevalence of WMSDs among automobile workers in China was 53.1%. When stratified by body regions, the lower back/waist was the most affected (36.5%), followed by the neck (36.0%), shoulder (31.4%), upper back (25.7%), elbow (12.5%), wrist/hand (26.6%), buttocks/leg (13.8%), knee (19.2%), and ankle/feet (21.8%), the study identified several factors associated with a higher prevalence of WMSDs, including obesity, higher educational levels, longer job tenure, female gender, and specific job categories such as logistic and foundry workers and emphasizing the urgent need for attention. This study also states that effective prevention strategies include implementing ergonomics and improving working conditions and overall environment. In year 2022 Nengzhou Chen, Guanlin Li a cross-sectional study was conducted to investigate the prevalence and associated factors of wrist postural injuries among Chinese workers across 15 industries, the study found that 13.2% of the population experienced wrist injuries, with the highest rates observed in toy manufacturing (29.1%), animal husbandry (19.1%), automobile manufacturing (14.9%), shoe manufacturing (14.9%), and biopharmaceutical manufacturing (14.0%). Isabel Moreira-Silva, Joana Azevedo et al (2021) study investigated musculoskeletal symptoms among manufacturing workers, analyzing their 7-day prevalence across various body regions and assessing the impact of individual, lifestyle, and occupational risk factors on disorder development. Results indicated a 7-day prevalence of work-related musculoskeletal symptoms of 41.6% (n = 84), with the wrist/hand having a prevalence rate of 17.3%.

R. Ferguson, N. D. Riley et al 2019, a systematic review of 32 cross-sectional studies, including one longitudinal study, examined wrist pain prevalence and risk factors. Short-term prevalence in the general population and non-manual workers was 6%, medium-term was 4.2%. Physically demanding occupations and sports had higher rates: 10% short-term, 24% medium-term. It concluded that physically demanding activities like manual labour and sports are associated with higher rates of wrist pain, whereas it's less common among general population and non-manual workers. In the year 2017 Meisam Moradi conducted a cross-sectional descriptive-analytical study in Kermanshah, Iran, aiming to assess ergonomic risks among auto mechanics using the Rapid Entire Body Assessment (REBA) method, the results showed that the prevalence of wrist/hand musculoskeletal disorders (MSDs) within the past 12 months was found to be 54.5%. Additionally, the REBA posture assessment revealed that 55.5% of auto mechanics were categorized as being at a high or very high risk level for developing MSDs due to poor working conditions. Nurhayati Mohd Nur et al (2014) study investigates Work-Related Musculoskeletal Disorders (WMSDs) prevalence among automotive industry workers engaged in repetitive tasks. Descriptive statistical techniques were utilized for data analysis. The findings revealed that within the past twelve months, the highest prevalence of MSDs was observed in the neck (49.3%), followed by the hand/wrist (48.0%) and shoulder (46.7%) regions, with an overall MSD prevalence of 76.97%. However, there is a wealth of published literature that indicates automobile manufacturing and repair workers are at a greater risk of wrist/hand pain. The field of automobile repair is acknowledged for its risks, notably the prevalence of wrist pain injuries among workers. In their daily routines, automotive repair professionals are subject to varied physical positions, confront challenging psychosocial factors, and engage in repetitive duties, all of which can lead to increased stress and susceptibility to injury. [10] In various automotive positions, employees often engage in repetitive tasks, increasing their vulnerability to work-related musculoskeletal disorders (WMSDs). Shorter cycle times notably heighten the occurrence of hand and wrist injuries. The intensified pace of work elevates muscle activity levels, raising the risk of MSDs and the manifestation of muscle fatigue symptoms. Moreover, if workers with musculoskeletal problems persist in their duties despite pain or discomfort, it can lead to reduced productivity. [11]

## CONCLUSION

Musculoskeletal disorders (MSDs) in the hands and wrists are common among workers in automobile manufacturing and repair. Although wrist pain is not as prevalent as pain in the back, shoulders, hips, or knees, it still represents a notable portion of the overall musculoskeletal burden. Therefore, it is important to focus on prevention strategies such as incorporating ergonomic improvements and enhancing working conditions and the overall work environment to minimize the risk of work-related MSDs. These measures can help prevent work-related MSDs and promote the health and safety of these workers.

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