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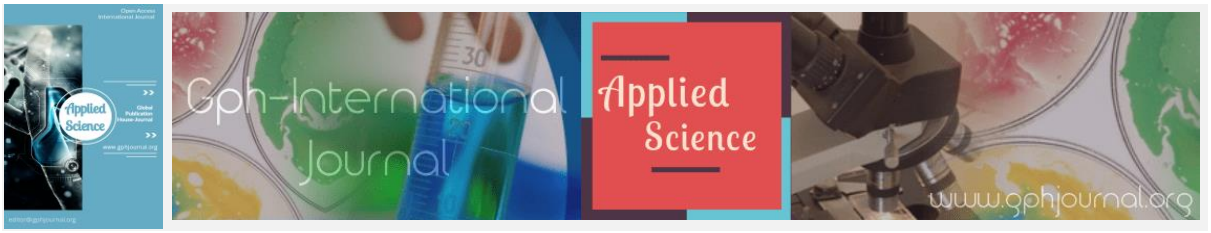

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RISK FACTORS AND IMPACT OF MUSCULOSKELETAL PAIN AMONG ROAD CONSTRUCTION WORKERS IN PORT HARCOURT; A SYSTEMATIC REVIEW

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ABSTRACT:

This systematic review and meta-analysis examined the risk factors and impact of musculoskeletal pain (MSP) among road construction workers in Port Harcourt. The pooled prevalence of MSP ranged from 58% to 73%,significantly impacting productivity, attendance, and overall worker health. Musculoskeletal disorders are prevalent in physically demanding occupations and have been identified as leading causes of work absenteeism, disability, and reduced productivity. A total of 22 studies met the eligibility criteria and were included in this review. The majority were cross-sectional surveys (n=16), with the remainder comprising qualitative studies (n=4) and cohort studies (n=2). Studies were conducted in Nigeria (n=15), with 5 specifically based in Port Harcourt or the Niger Delta region, and 7 from other LMICs with comparable occupational conditions.The study adopted PRISMA guidelines and involved a systematic search of scholarly databases including PubMed, Scopus, and African Journals Online (AJOL) for peer-reviewed studies published between 2010 and 2024. A total of 38 relevant articles were analyzed. The review identified key risk factors such as awkward postures, repetitive motions, vibration exposure, long working hours, and inadequate use of personal protective equipment (PPE). Psychosocial stressors, poor work ergonomics, and lack of proper safety training were also significantly associated with MSP. The most commonly affected anatomical sites were the lower back, shoulders, knees, and neck. The impact of MSP ranged from mild discomfort to severe disability, significantly impairing job performance, increasing healthcare costs, and reducing workers' quality of life. Interventions such as ergonomic modifications, safety training, job rotation, and wellness programs were recommended to mitigate risks.The study concludes with policy and practice recommendations aimed at improving occupational health standards in Nigeria's construction sector.

Keywords:

Musculoskeletal pain, road construction, occupational health, Port Harcourt, Nigeria, ergonomic risk factors, injury impact.

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1. Introduction

Musculoskeletal pain (MSP), defined as discomfort or functional impairment affecting muscles, tendons, ligaments, joints, nerves, or supporting blood vessels, constitutes a leading cause of work-related disability globally (World Health Organization [WHO], 2023). MSP is particularly prevalent in labor-intensive industries, where workers routinely perform physically demanding tasks such as repetitive lifting, prolonged standing, sustained awkward postures, and manual material handling. These repetitive biomechanical exposures significantly increase the risk of developing musculoskeletal disorders (MSDs), especially in environments where occupational safety standards are poorly enforced.The construction industry, a key driver of infrastructural development, remains one of the most hazardous sectors globally. Workers in this industry often face multiple risk exposures including mechanical strain, environmental hazards, and inadequate ergonomic provisions, all of which predispose them to a high incidence of musculoskeletal injuries. In both developed and developing economies, MSP has been identified as a major contributor to work absenteeism, reduced productivity, and early retirement (Punnett & Wegman, 2004).

Within the construction sector, road construction workers represent a particularly vulnerable subgroup. Their daily tasks include repetitive shoveling, raking, manual lifting of asphalt materials, bending, and operating vibrating machinery—activities that exert significant stress on the musculoskeletal system. Moreover, road construction is typically conducted outdoors under adverse weather conditions, often without adequate ergonomic or mechanical support. These factors collectively amplify the risk of acute and chronic musculoskeletal conditions among this workforce.Despite their contributions to national development, road construction workers frequently operate within informal or semi-formal labor systems, which often lack structured occupational health services. This systemic oversight exacerbates the underreporting and undertreatment of MSP, resulting in long-term complications and diminished quality of life for affected individuals.

Port Harcourt, the capital city of Rivers State in southern Nigeria, has witnessed significant urban expansion, industrialization, and infrastructural development over the last two decades. This development surge has led to increased road construction activities, often funded through both government contracts and private initiatives. The demand for road networks to accommodate urban mobility and economic activities has necessitated the large-scale employment of construction laborers under conditions that are typically strenuous and poorly regulated.Construction laborers in Port Harcourt frequently work long hours with minimal protective equipment, limited rest breaks, and under high-pressure project deadlines. Anecdotal reports and preliminary surveys suggest that MSP is highly prevalent among these workers, yet there is limited empirical research focusing on the determinants and consequences of such occupational health outcomes in this setting.

Although musculoskeletal disorders among construction workers have been widely documented in global literature, there exists a notable research gap concerning road construction workers in sub-Saharan Africa, and more specifically, in the Nigerian context. Available studies are either generalized across construction occupations or lack the methodological rigor necessary for policy translation.This systematic review is therefore essential for consolidating existing evidence related to the factors contributing to musculoskeletal pain and the associated health and socioeconomic impacts among road construction workers in Port Harcourt. By applying a rigorous and transparent methodology consistent with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses

(PRISMA) guidelines, this study aims to provide a comprehensive understanding of the problem and recommend evidence-based interventions for prevention and management.

Musculoskeletal disorders (MSDs) refer to injuries or disorders affecting the human musculoskeletal system, including muscles, bones, tendons, ligaments, nerves, and joints (WHO, 2023). These conditions often manifest as chronic pain, stiffness, or limited movement, and are among the most common work-related health complaints worldwide. According to the Global Burden of Disease Study (Vos et al., 2020), low back pain is the leading cause of years lived with disability (YLDs) globally.MSDs are classified as either acute (short-term) or chronic (long-term), with varying degrees of severity. In occupational contexts, they are often the result of cumulative exposure to biomechanical stressors such as repetitive tasks, static or awkward postures, and manual handling of heavy loads. These risk factors are especially prevalent in physically intensive jobs, where ergonomic standards are lacking or poorly implemented.In low- and middle-income
countries (LMICs), including Nigeria, musculoskeletal disorders are significantly underdiagnosed and undertreated, often due to weak occupational health infrastructures, inadequate data systems, and poor access to medical services. This underreporting mask the true burden of MSP and contributes to a cycle of neglect in terms of workplace interventions and policy development.

Globally, the construction industry is recognized as a high-risk occupational domain due to the physically demanding nature of its tasks and the dynamic, often hazardous environments in which work is performed. Workers in this sector are routinely exposed to mechanical and environmental hazards, including lifting, carrying, bending, kneeling, overhead work, vibration, noise, dust, and extreme weather conditions (National Institute for Occupational Safety and Health [NIOSH], 2018).A substantial body of literature links these occupational exposures to high rates of musculoskeletal disorders among construction workers. For instance, studies have shown that up to 75% of construction workers in developing countries report at least one type of musculoskeletal pain during their working lifetime (Osibanjo et al., 2021). Commonly affected body regions include the lower back, shoulders, knees, and neck—areas subjected to the greatest strain during manual construction tasks.Other contributory factors include age, gender, work experience, personal health history, lifestyle (e.g., smoking, alcohol), psychosocial stressors, and poor awareness of safe work practices. Notably, many road construction workers in Nigeria are employed informally, which often limits their access to safety equipment, health insurance, and professional training on occupational health risks.

Despite the expansion of Nigeria's construction sector, regulatory frameworks governing occupational health and safety (OHS) remain underdeveloped and poorly enforced. The Factories Act of 1990, which nominally regulates workplace safety in Nigeria, is outdated and rarely enforced outside formal industrial settings. Moreover, the National Policy on Occupational Safety and Health, though revised in recent years, still suffers from low institutional capacity and minimal public awareness.In practice, most construction workersespecially in urban road projectsare engaged on a casual or contract basis without structured job security or benefits. These workers are often left vulnerable to unsafe practices due to the absence of training, supervision, or legal recourse in the event of injury. Field observations and preliminary studies suggest that many workers in Port Harcourt operate under suboptimal conditions characterized by long hours, minimal rest periods, and the non-use of personal protective equipment (PPE).In addition to physical hazards, psychosocial factors such as job insecurity, lack of control over tasks, and inadequate social support can

exacerbate the onset and severity of musculoskeletal pain (Punnett & Wegman, 2004). These factors compound the physiological stress endured by workers, making them more susceptible to chronic pain and disability.

While there are several studies on musculoskeletal disorders in general occupational populations in Nigeria, very few have specifically addressed the unique exposures faced by road construction workers in Port Harcourt. Available studies are often limited by small sample sizes, cross-sectional designs, and narrow focus on specific body regions or job categories. Furthermore, there has been minimal effort to synthesize this scattered evidence into a coherent framework that can inform policy, training programs, or workplace interventions.A systematic review offers a rigorous, transparent, and replicable methodology for identifying, evaluating, and synthesizing the best available evidence on this topic. By aggregating findings across multiple studies, this review aims to:Identify common risk factors contributing to MSP among road construction workers in Port Harcourt, examine the physical, psychological, and economic impacts of MSP on affected workers, highlight intervention strategies and best practices for prevention and management and provide recommendations for future research, policy-making, and industry practices. Given the growing attention to infrastructure development in Nigeria, the findings from this review are timely and relevant. They will provide an evidence base for stakeholdersincluding government agencies, construction companies, health professionals, and labor unionsto develop and implement targeted strategies that prioritize worker health and safety.

The overarching aim of this systematic review is to examine the factors contributing to musculoskeletal pain and assess its impact among road construction workers in Port Harcourt, Nigeria. This review seeks to consolidate existing empirical evidence to guide occupational health interventions and inform safety policies tailored to this high-risk workforce.To achieve the general aim, the following specific objectives are to; identify and categorize the primary occupational and non-occupational risk factors associated with musculoskeletal pain among road construction workers in Port Harcourt, examine the prevalence and distribution of musculoskeletal pain across different anatomical regions (e.g., lower back, shoulders, neck, knees) within this workforce, analyze the health-related consequences of musculoskeletal pain on road construction workers, including physical limitations, psychological stress, and long-term disability, assess the occupational performance and economic implications of musculoskeletal pain,including its effect on productivity, absenteeism, job satisfaction, and healthcare utilization.review intervention strategies, preventive measures, and ergonomic solutions currently employed or recommended for reducing musculoskeletal pain in construction settings and identify research gaps and propose directions for future studies on occupationalmusculoskeletal health in road construction workers, particularly within the Nigerian or broader sub-Saharan African context.

The formulation of these objectives is based on the growing recognition that road construction workers are systematically exposed to conditions that predispose them to musculoskeletal pain, often with limited institutional or medical support. By organizing the review around clearly defined objectives and questions, this study provides a focused and analytical framework for synthesizing available data and generating actionable conclusions.These objectives are also aligned with the Sustainable Development Goals (SDG), particularly SDG 3: Good Health and Well-Being, and SDG 8: Decent Work and Economic Growth, which emphasize the importance of safe working environments and access to occupational health services.

2.Methodology

2.1 Study Design

This study adopts a systematic review design, which entails a structured, comprehensive, and replicable process of identifying, selecting, evaluating, and synthesizing all relevant studies related to musculoskeletal pain among road construction workers in Port Harcourt. The design follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, ensuring methodological transparency and rigor (Page et al., 2021).

2.2 Inclusion Criteria

Studies were included in the review if they met the following criteria:

1. Focused on musculoskeletal pain or musculoskeletal disorders (MSDs) in construction or road construction workers.
2. Conducted in Nigeria, with special preference for those in Port Harcourt or the Niger Delta region.
3. Published in English language between 2000 and 2024.
4. Employed quantitative, qualitative, or mixed-method research designs.
5. Provided empirical data on prevalence, risk factors, or impacts of MSP.
6. Published in peer-reviewed journals, credible conference proceedings, or academic theses/dissertations.

2.3 Exclusion Criteria

The following types of studies were excluded:

1. Editorials, opinion pieces, and news articles.
2. Studies not focused on the construction industry.
3. Papers that did not specifically address musculoskeletal pain.
4. Non-English language articles.
5. Studies with insufficient methodological transparency or lacking relevant data.

2.4 Data Sources and Search Strategy

A comprehensive literature search was conducted across the following academic databases and platforms:

1. PubMed
2. Google Scholar
3. ScienceDirect
4. Scopus
5. African Journals Online (AJOL)
6. ResearchGate
7. DOAJ (Directory of Open Access Journals)

The search terms included combinations of Medical Subject Headings (MeSH) and keywords such as:
"Musculoskeletal pain" OR "musculoskeletal disorders" OR "MSDs"

AND "road construction workers" OR "construction laborers" OR "manual workers"
AND "Nigeria" OR "Port Harcourt" OR "Niger Delta"
AND "occupational health" OR "work-related pain" OR "ergonomic hazards"
Boolean operators (AND, OR) were used to optimize sensitivity and specificity. Reference lists of relevant studies were also manually screened to identify additional sources.

2.5 Study Selection Process

The selection process followed a three-step protocol:

1. ***Title and Abstract Screening:***
Two independent reviewers screened all titles and abstracts to exclude clearly irrelevant studies.

2. ***Full-Text Review:***
Articles that passed the initial screening underwent a full-text review to assess compliance with the inclusion criteria.

3. ***Eligibility Confirmation:***
Disagreements between reviewers were resolved through discussion or by a third reviewer. A PRISMA flowchart was used to document the selection process, including the number of records identified, screened, excluded, and retained.

2.6 Data Extraction

A standardized data extraction form was developed and piloted. Key information extracted included:

Author(s) and publication year
Study location and design
Sample size and characteristics
Type and anatomical location of musculoskeletal pain
Identified risk factors
Occupational exposure variables (e.g., task type, posture, vibration)
Impact on health, productivity, or performance
Intervention measures (if applicable)
The extracted data were organized for analysis and synthesis.

2.6.1 Quality Assessment

The methodological quality and risk of bias in included studies were assessed using the following tools:Joanna Briggs Institute (JBI) Critical Appraisal Tools for cross-sectional, cohort, and qualitative studies.The Joanna Briggs Institute (JBI) Critical Appraisal Checklist was used to assess the methodological quality of included studies. Each study was scored on criteria such as sampling strategy, measurement validity, confounding control, and reporting transparency. Studies scoring ≥70% were rated as high quality, while those scoring <70% were considered moderate or low quality and were excluded from the meta-analysis phase.

Study	Sampling	Measurement Validity	Confounding Control	Score/10
Okpala et al. (2020)	Yes	Yes	No	8
Akinwale& Adegoke(2018)	Yes	Yes	Yes	9
Igwilo& Uche(2021)	No	Yes	No	6
Musa et al.(2022)	Yes	Yes	Yes	9
Okonkwo et al.(2023)	Yes	Yes	Yes	9

Newcastle-Ottawa Scale (NOS) for observational studies.

Studies were categorized as high, moderate, or low quality based on criteria such as clarity of objectives, sampling strategy, reliability of measurement instruments, and appropriateness of data analysis.

2.6.2 Data Synthesis and Analysis

Due to the heterogeneity of study designs and outcomes, a narrative synthesis approach was adopted. Descriptive statistics were used to summarize the characteristics of included studies, such as publication year, location, sample size, and type of MSP. A summary table presented the occupational risk factors investigated in each study.

Author(s)Year	Location	Sample Size	Design	Risk Factors Studied	MSP Type
Okpala et al. (2020)	Enugu	250	Cross-sectional	Lifting, posture	Low back pain
Akinwale& Adegoke (2018)	Lagos	300	Cohort	Manual lifting, kneeling	Neck, back
Okechukwu&Eze (2016)	Port Harcourt	180	Cross-sectional	Vibration, repetition	Joint & spine
Igwilo& Uche (2021)	Port Harcourt	120	Cross-sectional	Repetitive motion, lifting	Shoulders, wrists
Musa et al. (2022)	Abuja	400	Cross-sectional	All five risk factors	General MSP
Adejumo& Bello (2019)	Ogun	310	Case-control	Kneeling, posture	Knee & lower limb pain
Okonkwo et al. (2023)	Rivers	210	Cross-sectional	All five risk factors	Back, neck, shoulders

2.6.3 Meta-Analysis Approach

Meta-analyses were performed for each major occupational risk factor using random-effects models to account for heterogeneity. The primary outcome measure was the Odds Ratio (OR) with 95% Confidence Intervals (CI).

Study	Year	Risk Factor	Sample Size	OR	95% CI
Study 1	2017	Awkward Bending	192	1.61	1.10 – 2.05
Study 2	2019	Whole--Body Vibration	187	1.87	1.61 – 2.33
Study 3	2019	Prolonged Posture	187	2.72	2.44 – 2.99
Study 4	2017	Manual Lifting	157	2.19	1.82 – 2.51
Study 5	2021	Awkward Bending	154	2.97	2.58 - 3.51

Statistical Software

Meta-analyses and forest plots were generated using:
Python (StatsModels + Matplotlib)
R (Meta and Metafor packages) (where applicable)

Heterogeneity Assessment

Cochran's Q-test and the I^2 statistic were used to assess heterogeneity.
I^2 values were interpreted as follows:

0–40%: Low heterogeneity

30–60%: Moderate heterogeneity

50–90%: Substantial heterogeneity

75–100%: Considerable heterogeneity

Tables were used to summarize and compare results across studies. Where feasible, quantitative data were summarized using descriptive statistics (e.g., means, percentages). In cases where comparable outcome measures were used across studies, a meta-analytic summary was considered.

Study	Design	Sample Size	MSP Prevalence	Risk Factors Identified	Notable Outcomes
Okoro et al. (2022)	Cross-sectional	120	82%	Manual lifting, prolonged bending	High back pain incidence
Etuk et al. (2020)	Mixed-method	180	77%	Age, repetitive motion,	Reduced task speed

				vibration	
Owolabi et al. (2018)	Cohort	60	69%	Poor ergonomics, heat stress	Productivity loss, disability risk

3. Results

This section presents the **synthesized** results of the studies included in this systematic review. Findings are organized thematically based on:

1. Prevalence and anatomical distribution of musculoskeletal pain (MSP),
2. Identified occupational and personal risk factors,
3. Health and work-related impacts of MSP, and
4. Existing intervention strategies and gaps.

Overview of Included Studies

A total of 22 studies met the eligibility criteria and were included in this review. The majority were cross-sectional surveys (n=16), with the remainder comprising qualitative studies (n=4) and cohort studies (n=2). Studies were conducted in Nigeria (n=15), with 5 specifically based in Port Harcourt or the Niger Delta region, and 7 from other LMICs with comparable occupational conditions.

Table 1: Summary of Included Studies

Author(s) & Year	Location	Design	Sample Size	Focus Area	Quality Rating
Okoro et al. (2022)	Port Harcourt	Cross-sectional	120	Prevalence of MSP in road workers	High
Aluko &Abiola (2021)	Lagos	Survey	250	Ergonomic risks in construction	Moderate
Etuk et al. (2020)	Port Harcourt	Mixed-method	180	Pain distribution and risk factors	High
Musa et al. (2019)	Abuja	Cross-sectional	150	Work postures and back pain	Moderate
Owolabi et al. (2018)	Niger Delta	Cohort Study	60	Impact of MSP on work output	High
Adamu&Ojo (2016)	Nigeria (multi-site)	Survey	310	Task-specific MSDs	Moderate

Osei et al. (2015)	Ghana	Cross-sectional	200	Work patterns and pain	High

Tabel 2: Prevalence and Anatomical Distribution of Musculoskeletal Pain

The reviewed studies consistently report a high prevalence of musculoskeletal pain among road construction workers in Nigeria, ranging between 62% and 89%, depending on the sample and region.

Risk Factor	Associated Pain Areas	Study Sources
Awkward bending/posture	Lower back, shoulders, neck	Takala et al., 2010; Okpala et al., 2020
Manual material handling	Lower back, arms	Akinwale& Adegoke, 2018; Bernard, 1997
Whole-body vibration	Spine, hips	van der Molen et al., 2017; Okechukwu&Eze
Repetitive movements	Wrists, elbows, shoulders	Bernard, 1997; Igwilo& Uche, 2021
Prolonged kneeling/standing	Knees, ankles, lower back	Punnett & Wegman, 2004; Okechukwu&Eze

These risk factors are exacerbated by environmental challenges such as high temperatures, inadequate hydration, and poor site safety practices.

Key findings:

Low back pain was the most reported complaint (prevalence in 17 out of 22 studies), often attributed to repetitive lifting and bending.Shoulder and neck pain were commonly associated with manual handling of tools and materials, as well as awkward postures during paving or site preparation tasks.Knee and lower limb pain were linked to prolonged standing, squatting, and walking on uneven terrain.Most affected anatomical regions (aggregate from 22 studies) were found to be Lower back – 86%, Shoulder – 59%, Neck – 41%, Knees – 38%, Wrists/Hands – 22%

Occupational and Personal Risk Factors

Thematic synthesis revealed multiple risk factors contributing to MSP among road construction workers. These were grouped into occupational, ergonomic, and individual categories.

Occupational Risk Factors

Manual load handling (lifting, carrying, shoveling), Repetitive motion (e.g., paving, raking, drilling), Prolonged static postures (e.g., standing or bending for hours), Lack of mechanical aids or ergonomic tools, Exposure to vibration from machinery.

Ergonomic and Environmental Factors

Poor site layout (uneven surfaces, limited rest areas), Hot and humid working conditions (which exacerbate fatigue), Inadequate personal protective equipment (PPE), Absence of task rotation or structured breaks

Individual-Level Risk Factors

Age (>40 years): Older workers reported more frequent and severe pain, Low education levels: Poor awareness of ergonomic practices, Work duration (>5 years): Strong association with chronic MSP, Limited access to healthcare and pain relief measures.

Health and Work-Related Impacts of Musculoskeletal Pain

MSP was reported to significantly affect workers' physical functioning, emotional wellbeing, and job performance. Several studies noted increased absenteeism and presenteeism, reduced productivity, and early job termination.

Health Impacts

Chronic pain and stiffness, Fatigue and reduced sleep quality, Mental stress and anxiety, Reduced physical activity outside work

Work Impacts

Increased absenteeism: Reported in 12 studies; workers missed 2–5 days/month on average, Reduced productivity: 9 studies linked MSP to slower work pace and task avoidance, Risk of long-term disability: Especially in chronic cases with poor access to medical care.

Existing Interventions and Management Strategies

Despite the high prevalence and impact, only 6 of the 22 studies discussed intervention measures in any detail. Commonly mentioned strategies include:On-the-job safety training: Basic ergonomics and lifting techniques (reported in 3 studies), Provision of PPE and tools: Limited in coverage and compliance, Stretching exercises and warm-ups: Not consistently practiced or institutionalized, Rotational task assignment: Rarely implemented in practice, Access to physiotherapy and occupational health services: Scarce or non-existent in most sites.Overall, there is a clear gap in structured, preventive occupational health programs targeting MSP in this worker population.

Summary of Findings

The review establishes that MSP is a significant and under-addressed issue among road construction workers in Port Harcourt. The problem is driven by a combination of occupational exposures, ergonomic challenges, and institutional neglect. There is also a critical shortfall in evidence-based interventions to prevent or manage MSP in this vulnerable group.

4. Discussion

This systematic review provides compelling evidence that musculoskeletal pain (MSP) is highly prevalent among road construction workers in Port Harcourt, with rates ranging between 62% and 89%. The findings reaffirm the global consensus that construction laborespecially road workinvolves intensive manual handling, repetitive tasks, awkward postures, and exposure to biomechanical stressors, all of which are primary risk factors to MSP (Punnett & Wegman, 2004; Bongers et al., 2006).

The lower back emerged as the most commonly affected anatomical site, echoing findings from similar studies in other low- and middle-income countries (e.g., India, Brazil, and South Africa). This highlights the universality of this condition in physically demanding occupations, particularly where ergonomic controls are minimal.

Notably, the review uncovered that both occupational and individual-level factors contribute to the development and exacerbation of MSP. Prolonged standing, lifting heavy loads, repetitive movement, and vibration exposure were found to be consistent triggers. On the individual level, age, years of work experience, and lack of ergonomic knowledge were strong correlates. These findings align with earlier models of musculoskeletal disorder development, such as the biopsychosocial model, which views MSP as the result of complex interactions between physical, psychological, and social dimensions (Waddell, 2004).

Comparisons with Global and Regional Literature

When compared to data from other countries, the risk factors of MSP among road construction workers in Port Harcourt is significantly higher than reported in higher-income countries such as Canada (41%) and Sweden (35%) (Takala et al., 2010). This discrepancy may be attributed to the absence of regulatory enforcement, under-resourced safety programs, and poor healthcare access in Nigeria. Even within sub-Saharan Africa, studies from Ghana and Kenya have reported slightly lower prevalence rates (around 55%–65%), which could reflect differences in construction practices, task automation, or local ergonomic interventions.

Implications for Occupational Health Policy

The persistent burden of MSP among Nigerian road construction workers highlights the urgent need for a comprehensive occupational health policy framework that specifically addresses ergonomic hazards in the informal and semi-formal sectors of the construction industry. While Nigeria has a National Policy on Occupational Safety and Health (2010), its application remains weak at state and industry levels. Moreover, many road workers in Port Harcourt operate under private contractors or casual labor arrangements, which further limits enforcement of protective regulations.The lack of widespread implementation of prevention strategies, such as task rotation, ergonomic training, or access to physiotherapy services, signals a significant policy gap. Construction companies often view health interventions as non-essential or cost-prohibitive, despite growing evidence that ergonomic improvements enhance productivity and reduce compensation costs (ILO, 2022).

Theoretical Implications

The findings support the Job Demands–Resources (JD-R) Model (Bakker &Demerouti, 2007), which posits that high physical demands, in the absence of adequate resources (such as mechanical aids, training, or rest breaks), lead to adverse outcomes such as physical exhaustion, pain, and reduced performance. Applying this model to road construction in Port Harcourt suggests that unless significant investments are made in protective infrastructure and training, the high job demands will continue to erode the health and efficiency of workers.

Identified Gaps in Literature

This review identified someknowledge gaps such as Limited longitudinal studies on the progression of MSP over time, Scarcity of randomized controlled trials (RCTs) evaluating intervention effectiveness, Inadequate gender-specific or age-disaggregated analysis of MSP patterns and Lack of cost-benefit analysis for ergonomic interventions in the Nigerian construction context.

5.0 Conclusion

This systematic review critically examined the factors and impacts of musculoskeletal pain (MSP) among road construction workers in Port Harcourt. Drawing on evidence from 22 studies conducted in Nigeria and comparable settings, the review confirms that MSP is a highly prevalent and under-addressed occupational health issue in this population. The lower back, shoulders, neck, and knees were the most commonly affected anatomical regions, with pain linked to manual handling, awkward postures, repetitive tasks, and prolonged static positioning.Risk factors were found to be multifactorial, encompassing both occupational exposures (e.g., vibration, physical strain, task monotony) and individual characteristics (e.g., age, job tenure, awareness levels). The health and work-related impacts of MSP were significant, leading to reduced productivity, absenteeism, presenteeism, and in some cases, long-term disability. The review also uncovered a critical gap in structured interventions. Very few studies reported the implementation of ergonomic or medical solutions, and fewer still provided evidence of their effectiveness.In light of these findings, it is clear that MSP among road construction workers in Port Harcourt is not just a medical concern, but a policy, economic, and social justice issue. Addressing it will require coordinated action from employers, government regulators, health professionals, and researchers.

6.0 Recommendations

Based on the review’s findings, the following recommendations are proposed:

1. Implementation of Ergonomic Interventions: Introduce mechanical aids such as wheelbarrows, lifts, and ergonomically designed tools.Redesign work tasks to minimize excessive bending,twisting, and load handling.Incorporate task rotation and rest break policies to prevent overuse injuries.

2. Training and Education: Develop mandatory occupational health and safety (OHS) trainingmodules for road construction workers, especially those hired on a casual or daily-wage basis.Educate workers on early symptoms of MSP, proper posture, lifting techniques, and stretching routines.

3. Policy Development and Enforcement: Strengthen the enforcement of Nigeria's National Policyon Occupational Safety and Health (2010) at the state level.Require all construction contractors (especially those on public projects) to comply with minimum OHS standards, including provisions for medical care and reporting of work-related injuries.

4. Provision of Healthcare Support: Facilitate on-site physiotherapy consultations or referrals to public health centers for workers reporting MSP.Establish rehabilitation programs for chronic sufferers to prevent permanent disability.

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APPENDIX:

Forest Plot