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Prevalence and risk factors of musculoskeletal disorders (WMSD) in selected medical facilities in Enugu state, Nigeria

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Abstract
This study aimed to assess the prevalence and risk factors of musculoskeletal disorders in medical facilities in Enugu State, Nigeria. The research identified various types and frequencies of musculoskeletal disorders among employees, including mechanical back syndrome, rotator cuff tendonitis, thoracic outlet compression, muscle/tendon strain, trigger finger thumb, tendonitis, epicondylitis, digital neuritis, degenerative disc disease, tension neck syndrome, ligament sprain, carpal tunnel syndrome, and radial tunnel syndrome. The overall percentage mean of musculoskeletal disorders was 20.93%, irrespective of the disorder. Risk factors included crude manual handling, exposure to slippery surfaces, poor health and safety procedures, non-availability of assisting devices and facilities, high intensity of operations, multiple repetition of tasks, heavy pulling of tasks, and awkward postures. The study concluded that providing a safer and more comfortable work environment can result in additional benefits, such as reduced staff turnover, absenteeism, increased productivity, improved employee morale, and increased resident comfort. Management should support clear goals, assign responsibilities, provide resources, and ensure assigned responsibilities are fulfilled.

Keywords: Mechanical back syndrome, tendonitis, epicondylitis, digital neuritis, degenerative disc disease.

Introduction
Ergonomics is the science of adjusting workplace conditions to meet user needs, aiming to increase efficiency, productivity, and reduce discomfort. It involves the interaction between human, technology, and organization to optimize health, well-being, and performance. Workplace ergonomics programs can prevent or control injuries and illnesses by reducing exposure to work-related musculoskeletal disorders (WMSDs) risk factors. These disorders are common causes of absence from work, leading to individual suffering and significant costs for society. A well-planned ergonomic working environment benefits both individuals and companies, leading to increased quality and productivity gains. The International Ergonomics Association (IEA) emphasizes the compatibility of human anatomical, anthropometric, physiological, and biomechanical characteristics with the static and dynamic parameters of physical work.

The Problem Statement
Work-related musculoskeletal disorders (WMSDs) are common among medical professionals, who are exposed to injuries from ergonomic stressors during patient handling and repositioning. The adoption of new technologies in the healthcare sector, such as electronic medical records, may lower costs and reduce errors, but also increase the risk of musculoskeletal injuries. Many hospitals are investing heavily in new technology without considering ergonomic design principles, which could exacerbate the prevalence of WMSDs among medical practitioners. Nurses are found to have the highest risk of developing WMSDs, while physicians are at a lower risk. This study aims to identify risk factors and individual contributions for WMSDs in medical practice environments and determine preventive measures. No comprehensive study has been conducted in health facilities in Enugu State, Nigeria.

Objectives of the Study
The following were the specific objectives of the study:
a. identifying the types of musculoskeletal disorders/ injuries among employees in the study area;
b. identifying the ergonomic risk factors and stressors responsible for the musculoskeletal disorders/ injuries among employees in the study area.

Research Questions
a. What are the types and prevalence of musculoskeletal disorders/ injuries among employees in the study area?
b. What are the ergonomic risk factors and stressors responsible for the musculoskeletal disorders/ injuries among employees in the study area?

Literature Review
1. Types of Medical Practices
There are five types of medical practices. These include the following:

1.1 Private Practice
In private practice, a physician practices alone without any partners and typically with minimal support staff. Therefore, this type of practice ideally works for physicians who wish to own and manage their own practice. Physicians may choose to work in private practice for the benefits of individual freedom, closer relationships with patients, and the ability to set their own practice's growth pattern. However, the drawbacks of working independently in this way include longer work hours. It also includes financial extremes, and a greater amount of business risk.

1.2 Group Practice
A group practice involves two or more physicians who all provide medical care within the same facility. They utilize the same personnel and divide the income in a manner

previously agreed upon by the group. Group practices may consist of providers from a single specialty or multiple specialties. Physicians working in a group practice experience the benefits of shorter work hours, built-in on-call coverage, and access to more working capital. All of these factors can lead to less stress. The drawbacks include less individual freedom, limits on the ability to rapidly grow income, and the need for a consensus on business decisions.

1.3 Large HMOs

A health maintenance organization, or HMO, employs providers to care for their members and beneficiaries. The goal of HMOS is to decrease medical costs for those consumers. There are a variety of types of HMO scenarios, including staff-model HMOs and group-model HMOs. The benefits for providers working for an HMO include a more stable work life with regular hours. Other benefits include less paperwork and regulatory responsibilities and a regular salary along with bonus opportunities. These bonuses are based on productivity or patient satisfaction. In reality, the main drawback for physicians working for an HMO is the lack of autonomy. HMO's required physicians to follow their guidelines in providing care.

1.4 Hospital Based Medical Practice

In hospital based medical practice, physicians earn a predictable income. They have a regular patient base, and a solid referral network. Physicians who are employed by a hospital will either work in a hospital-owned practice or in a department of the hospital itself. The benefits of working for a hospital include a regular work schedule, low to no business and legal risk, and a steady flow of income. On the other hand, there are drawbacks, such as a relative lack of physician autonomy. Also, employee constraints and the expectation that physicians become involved in hospital committee work can be drawbacks.

1.5 Locum Tenens

Locum tenens is derived from the Latin phrase for "to hold the place of. " In locum tenens, physicians relocate to areas hurting for healthcare professionals. This type of practice has been around since the last 1970s. These types of positions offer temporary employment and may offer higher pay than more permanent employment situations. Physicians working in locum tenens scenarios enjoy the benefits of variety and the ability to experience numerous types of practices and geographic locations. Also, they enjoy schedule flexibility and lower living costs. The drawbacks of locum tenens work include the possibility that benefits are not included, uses equipment on ground, whether it is convenient or not and a potential lack of steady work. Also, locum tenens physicians need to regularly uproot their families.

2. Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) are injuries affecting the human body's movement, including muscles, tendons, ligaments, nerves, discs, and blood vessels. Common MSDs include Carpal Tunnel Syndrome, Tendonitis, Ligament Sprain, Tension Neck Syndrome, Rotator Cuff Tendonitis, Epicondylitis, Radical Tunnel Syndrome, Digital Neuritis, Trigger Finger/Thumb, Mechanical Back Syndrome, Degenerative Disc Disease, and more.

Existing Ergonomic Work Methods, Health and Safety Procedures

Okafor *et al*. (2019) [21] found that Nigerians have low awareness of ergonomics in the medical practice environment, possibly due to lack of understanding of its benefits. Ergonomics should be emphasized in designing tasks to fit workers' capabilities, as problems associated with major activities like extreme temperatures, noise, slippery surfaces, manual handling, and exposure to forceful pushing and heavy pulling can lead to occupational diseases. Poor ergonomics is a major problem in developing countries like Nigeria, with musculoskeletal disorders being more frequent. Ergonomics aims to reduce work-related injuries, improve employee efficiency, and contribute to organizational goals.

Ergonomic Risk Factors and Stressors

Musculoskeletal disorders (MSDs) are caused by both work-related and individual-related risk factors. In nursing, repositioning tasks, such as turning patients in bed, moving patients side to side, and scooting patients up, are a significant proportion of patient handling tasks among nursing staff. These tasks are well-documented and can reduce complications associated with bed rest. However, repositioning tasks are considered the most physically demanding, and they remain a high-risk activity for worker injury due to high physical demands and awkward postures. Workplace design plays a crucial role in the development of MSDs. When a worker is asked to perform work outside their body's capabilities, they put their musculoskeletal system at risk. An objective evaluation of the workstation design indicates that the worker's recovery system will not be able to keep up with the fatigue caused by the job, indicating the presence of ergonomic risk factors, a risk of developing a musculoskeletal imbalance, and an imminent reality of a musculoskeletal disorder.

High task repetition

Many work tasks and cycles are repetitive in nature, and are frequently controlled by hourly or daily production targets and work processes. High task repetition, when combined with other risks factors such high force and/or awkward postures, can contribute to the formation of MSD. A job is considered highly repetitive if the cycle time is 30 seconds or less.

a. Forceful exertions

Many work tasks require high force loads on the human body. Muscle effort increases in response to high force requirements, increasing associated fatigue which can lead to MSD.

b. Repetitive or sustained awkward postures

Work-related musculoskeletal disorders (WMSDs) are a significant health issue among healthcare workers (HCWs), affecting their quality of life, productivity, and the cost of treatment. Awkward postures place excessive force on joints, overloading muscles and tendons around the affected joint. High task repetition, forceful exertions, and repetitive/sustained awkward postures increase the risk of MSDs.

WCWs, who carry, transfer, or relocate patients, are exposed to a high risk of WMSDs in the neck, lower back, and knee region. A cross-sectional study in Nigeria found that 84.4% of respondents experienced work-related

musculoskeletal pain or discomfort at some time in their occupational lives. Personal factors, such as female HCWs being more prone to develop WMSDs than male HCWs, and the body mass index of HCWs also contribute to WMSDs.

Physicians and dentists are also exposed to WMSDs due to repetitive work, awkward positions, and bending or twisting the back. Bad working habits and uncomfortable physical postures are the causes of MSDs, discomfort, and fatigue among these professionals. An ergonomic dentist chair with an arm rest and thoracic support was designed to reduce EMG activity in the trapezius muscle. Physical therapists, particularly nurses, have the highest prevalence of WMSDs compared to dentists and physical therapists. WMSDs are mostly found in the shoulders, hand and back, neck, arm, hip, and knee, with lower back pain being a major cause.

Global Prevalence of Musculoskeletal Disorders (WMSDs)

The Ministry of Labor in Thailand has classified work-related musculoskeletal disorders (WMSDs) as occupational diseases, with an increase in morbidity rates from 121.93 per 100,000 persons per year in 2015 to 135.26 per 100,000 persons per year in 2016. This has led to a need for innovative ergonomic interventions to prevent health problems among the workforce. A study found that Thai physical therapists had the highest prevalence of WMSDs, with the lowest rate among Thai nurses. The highest prevalence of WMSDs among Thai physical therapy students was in the lower back, shoulder, neck, upper back, and wrist/hand.

Conceptual Framework

Musculoskeletal injuries are common among workers due to various factors, including existing work methods, health and safety procedures, and repetitive motions. These conditions can lead to muscle-tendon strain and fatigue, and the recovery period depends on the specific act and body area. Job tasks that require the same motions or muscles for long periods increase the probability of general and local fatigue. Psychosocial factors, such as incongruous pain and depression, are the main reasons for the development of a disability and transition from acute to chronic pain. Work scheduling, job design, and interpersonal facets of work can also result in musculoskeletal disorders if not well planned. Work methods or procedures that require manual handling, lifting, and assisting devices are usually provided, but non-provision of such devices may lead to injuries. Stress, which can be physiological, psychological, social, environmental, developmental, spiritual, or cultural, is the general causative agent of musculoskeletal disorders. Stressors can be physiological, psychological, social, environmental, developmental, spiritual, or cultural and represent unmet needs.

The human body's internal environment is constantly changing, and the body's adaptive mechanisms continually function to adjustments in heart rate, respiratory rate, blood pressure, temperature, fluid and electrolyte balances, hormone secretions, and level of consciousness. However, cases of musculoskeletal disorders are also observed in medical practice environments among health workers such as doctors, nurses, and physiotherapists.

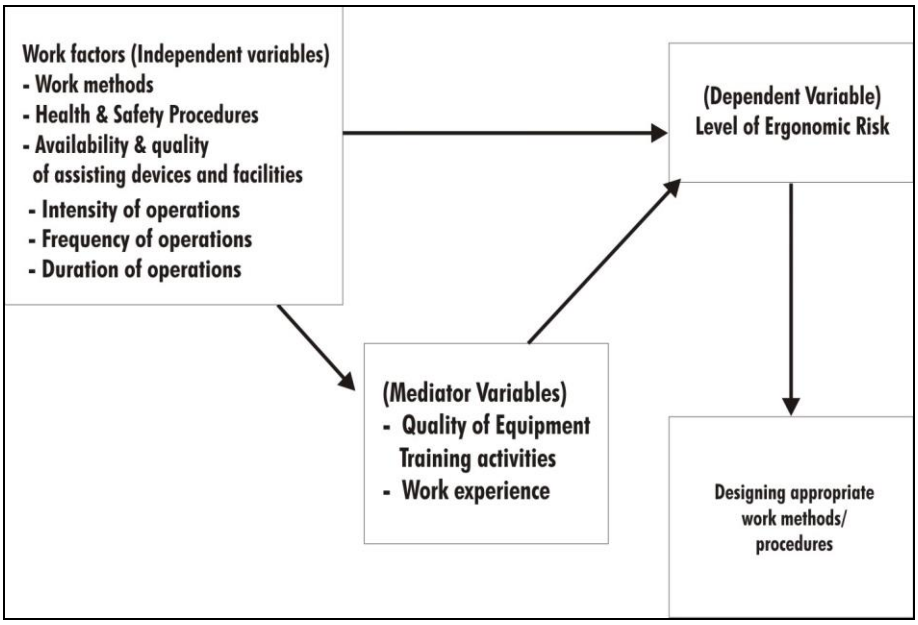

Fig 1: Relationship between dependent, mediator and independent variables in assessment of ergonomic risks of musculoskeletal disorders (McCauley & Isabel, 2012).

Methodology

1. The Study Area

Enugu State in south-east Nigeria has seventeen officially recognized Local Government Areas (LGAs), with an estimated population of 3,100,000. The state has 1036 medical facilities, including 9 district hospitals, 51 health cottage hospitals, 478 private hospitals, and 498 primary health centers. Primary health centers are staffed by community health officers, extension workers, registered nurses, and midwives. The state is divided into seven health districts, each consisting of at least three LGAs.

2. Study Design

The study used a cross-sectional design to collect data on ergonomic risks and musculoskeletal disorders in medical practice environment in Enugu State.

3. Study population
The population of this study included all the registered medical practice facilities in Enugu State. There are 1036 medical practice facilities in the study area.

4. Sample size determination
Applying Cochran formula for sample size determination:

n0 = z2pq/e2 = (1.96)2[0.80(1-0.80)]/(0.05) (Middlesworth, 2016; Glen, nd) = 246.

Adjusting this Cochran sample size:

n=n0/1+[no-1)/N] = 246/1.24 = 198.

This study adopted 198 medical practice facilities for effective investigation.

In the formulae, above,
n = sample size of medical practice facilities for the study;
n_0= Cochran sample size of medical practice facilities; p= prevalence of musculoskeletal disorder[5], estimated to be 0.80 from relevant literature;
q = 1-p; e= margin of error, assumed to be +/- 0.05;
N = total number of medical practice facilities;
Z= a value, determined from z-tables, corresponding to the confidence level of the study, with a value of 1.96 at a confidence level of 95%.

5. Sampling technique
The study used random sampling techniques to select medical practitioners in Enugu State. The distribution of the facilities used in this study was as follows:

- District Hospitals = (9/1036)198 = 2;
- Cottage Hospitals = (51/1036)198 = 10;
- Private Hospitals = (478/1036)198 = 91;
- Primary Health Centers = (498/1036)198 = 95

This gave a total of 198 medical practice facilities. For the questionnaire administration, since the population of workers in the 198 medical facilities was well above 10,000, a 10% value (1000 respondents) was chosen as the sample size.

6. Data Collection
Data was collected through self-administered questionnaires, structured interviews, and observations.

7. Instruments for Data collection
7.1 Questionnaire
Pre-tested interviewer administered questionnaire was be used, which consisted of three major sections A, B and C. Section A was concerned with personal information of the respondent while sections B and C were concerned with technical details/descriptions of work procedures, challenges and suggestions by the respondents.

7.2 Digital Cameras
Digital cameras were employed in the determination of the various postures and angles of the workers. The researcher concentrated on taking photos of awkward postures that were repeated multiple times. This ensured accurate work studies in the departments and activities that were observed.

7.3 Ergoplus
8. Data Analyses
The collected data was analyzed using descriptive statistics such as frequency distributions, means, and percentages. Inferential statistics such as chi-square tests was used to test for associations between ergonomic risks and musculoskeletal disorders.

9. Ethical Consideration and Permission to Proceed
The research received ethical clearance from the University of Nigeria Teaching Hospital Ethical Clearance Committee and permission from registered medical practice facilities in Enugu State. Participants provided written and verbal consent for periodic ergonomic assessment and interviews, and data confidentiality was ensured. Participants were allowed to withdraw at any time.

10. Limitations of the Study
The study faced challenges in obtaining medical professionals to participate due to their busy schedules and job demands. The researcher collaborated with authorities and organizations to raise awareness about the study. Additionally, some medical professionals were unaware of the risks associated with musculoskeletal disorders in the medical practice environment, highlighting the importance of the study.

Results and Discussions

Table 1: Demographic Characteristics of Respondents in the Study Area

Variable	Frequency	Percentage
Sex		
Female	462	46.20
Male	538	53.80
Total	1000	100
Age		
20 - 30yrs	196	19.60
31 - 40yrs	355	35.50
41 - 50yrs	307	30.70
More than 51yrs	142	14.20
Total	1000	100
Job Specification		
Doctor	184	18.40
Nurse	317	31.70
Pharmacist	46	4.60
Pathologist	25	2.50
Physiotherapist	122	12.20
Radiologist	65	6.50
Dietician/Caterer	28	2.80
Housekeeper/cleaner/ Messenger/ward maids	92	9.20
Medical Records keeper	25	2.50
Security	20	2.0
Administrative Staff/ Personnel	35	3.50
Mortuary attendant	41	4.10
Total	1000	100
Place of practice		
Public	593	59.30
Private	407	40.70
Total	1000	100
Length of practice		
< 5 years	126	12.60
5-10 years	380	38
10 years and above	494	49.40
Total	1000	100

Out of 1,000 respondents, 46.20% were females and 53.80% were males. The majority were aged 20-30, with 19.60% aged between 20-30 and 31-40. The majority were doctors,

with 18.40% being doctors, and the remaining 1.40% were nurses, pharmacists, pathologists, physiotherapists, radiologists, dieticians, housekeepers, medical records keepers, security officers, administrative staff, and mortuary attendants. The majority were employed in the public sector, with 59.30% working in the private sector.

Table 2: Types and Prevalence of MSD in the Study Area

S/N	MSD	Frequency	Percentage/ Prevalence	Rank
1	Mechanical Back Syndrome;	746	74.60	1
2	Rotator Cuff Tendonitis;	325	32.50	8
3	Thoracic Outlet Compression;	49	4.9	12
4	Muscle /Tendon strain;	531	5.31	11
5	Ruptured / Herniated Disc;	642	64.20	2
6	Trigger Finger / Thumb;	32	3.20	14
7	Tendonitis;	134	13.40	9
8	Epicondylitis;	98	9.80	10
9	Digital Neuritis;	42	4.2	13
10	Degenerative Disc Disease;	564	56.40	4
11	Tension Neck Syndrome;	520	52.0	5
12	Ligament Sprain;	639	63.90	3
13	Carpal Tunnel Syndrome;	512	51.20	6
14	Radial Tunnel Syndrome;	420	42.0	7
Mean			20.93	

The study found that a significant number of musculoskeletal disorders/injuries were found in the study area, including mechanical back syndrome, rotator cuff tendonitis, thoracic outlet compression, muscle/tendom strain, trigger finger thumb, tendonitis, epicondylitis, digital neuritis, degenerative disc disease, tension neck syndrome, ligament sprain, carpal tunnel syndrome, and radial tunnel syndrome. However, the overall percentage mean was 20.93%.

Table 3: Types of MSD Risk Factors in the Study Area

S/N	Risk factor	Frequency	Percentage	Rank
1	Crude manual handling (I)	603	60.30	7
2	Exposures of carrying	561	56.10	8
3	Lifting	749	74.90	1
4	Lowering	720	72.00	2
5	Forceful pushing	654	65.40	4
6	slippery surfaces	423	42.30	12
7	Poor health and safety procedures	250	25.00	13
8	Non-availability of assisting devices and facilities	612	61.20	6
9	High intensity of operations	501	50.10	11
10	High frequency and duration of operations	525	52.50	10
11	Multiple repetition of tasks (F)	546	54.60	9
12	Heavy pulling of tasks	680	68.00	3
13	Awkward postures (I/D)	632	63.20	5

The study area's risk factors for musculoskeletal disorder include crude manual handling, carrying, lifting, lowering, forceful pushing, slippery surfaces, poor health and safety procedures, non-availability of assisting devices and facilities, high intensity of operations, high frequency and duration, multiple repetition of tasks, heavy pulling, and awkward postures.

Conclusion

Medical facilities that implement injury prevention efforts, such as resident lifting and repositioning methods, have significantly reduced work-related injuries and associated costs. This has led to reduced staff turnover, absenteeism, increased productivity, improved employee morale, and increased resident comfort. Ergonomic furniture, equipment, and environments have been proven to reduce musculoskeletal disorders or injuries.

Providing care to medical facilities residents is physically demanding, and manual lifting and repositioning tasks can increase the risk of pain and injury to caregivers, particularly to the back. Risk factors for workers in medical facilities include force, repetition, and awkward postures. Excessive exposure to these risk factors can result in various disorders in affected workers, which may develop gradually over time or result from instantaneous events. Factors such as genetics, gender, age, and psychosocial factors may also contribute to the development of MSDs.

Recommendations

The study recommends that management should develop clear goals, assign responsibilities, provide resources, and ensure these are fulfilled. Employees should provide vital information about workplace hazards to enhance motivation and job satisfaction. Employees should submit suggestions, discuss workplace methods, participate in ergonomics design, and develop the nursing home's ergonomics process. Resident assessment should consider factors such as assistance required, resident size and weight, ability to understand and cooperate, and medical conditions. Devices like shower chairs should fit over the toilet to eliminate multiple transfers, and shower stalls, bath cabinets, and adjustable tubs should equalize the height of wheelchairs

and toilet seats. Mechanical lift equipment should be installed to help lift patients who cannot support their own weight without manual pumping. Lateral transfer systems should be installed to prevent staff back injuries. Slick boards should be used under patients to reduce lifting during transfers. Repositioning devices should be installed to mechanically pull patients up in bed, and height adjustable electric beds should be used for easy transfers. Wheelchairs with removable arms with height adjustable beds should be provided for easier lateral transfers. Sitting-standing wheelchairs and back belts should be provided to reduce the risk of back injury among healthy workers. Manual lifting of residents should be minimized and eliminated when feasible.

Employers should implement an effective ergonomics process that provides management support, involves employees, identifies problems, implements solutions, addresses injuries, provides training, and evaluates ergonomics efforts.

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