



POPULATION-BASED STUDY OF SPINAL ANATOMY, LOAD-CARRYING PRACTICES, AND CHRONIC BACK DISORDERS IN INFORMAL WORKERS: STUDY OF SELECTED NIGERIAN CITIES

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Abstract

Chronic back disorders are a leading cause of disability among informal workers in low- and middle-income countries, yet population-based evidence linking spinal anatomy to occupational load-carrying practices remains limited in Nigeria. This study examined the relationship between vertebral structure, habitual load carrying, and chronic back disorders among 1,200 informal workers across Lagos, Onitsha/Aba, and Kano. Participants included traders, farmers, and manual laborers aged 18–60 years who routinely carried loads for at least three years. Data collection combined structured questionnaires, direct observation of load-carrying practices, and spinal assessments using digital radiography and ultrasound imaging. Biomechanical stress scores were calculated based on load weight, duration, and posture, while chronic back disorders were assessed through self-reported pain scales and clinical examinations. Results indicated that 50.4% of participants reported chronic back disorders, with highest prevalence among manual laborers (60%) and farmers (51.4%). Head-loading practices, most common among traders, produced the highest biomechanical stress scores (7.8 ± 1.2) and were significantly associated with increased risk of chronic back disorders (OR=1.92; 95% CI: 1.48–2.49; $p < 0.001$). Imaging revealed reduced lumbar disc thickness and increased paraspinal muscle thickness in participants with higher biomechanical stress, suggesting cumulative structural adaptations to repetitive loading. Age and duration in occupation moderated these associations, highlighting the impact of long-term exposure. The findings underscore the anatomical basis of occupational musculoskeletal risk in informal work settings and demonstrate the need for targeted interventions. Recommendations include ergonomic education, community-based occupational health screening, infrastructure support to reduce manual load carrying, and public health campaigns tailored to informal workers. Integrating spinal anatomy assessments with occupational exposure provides critical insights for prevention, early diagnosis, and policy strategies aimed at mitigating chronic back disorders in Nigeria's informal workforce.

Keywords: Chronic back disorders, spinal anatomy, load carrying, informal workers, occupational health, Nigeria

1. Introduction

Chronic back disorders are a significant global health issue, particularly prevalent in low- and middle-income countries like Nigeria, where informal employment signifies a large part of the economy. Workers in Nigeria predominantly engage in physically demanding occupations such as trading, farming, and manual labor, which frequently involve activities like repetitive bending, prolonged standing, and awkward postures. These practices strain the vertebral column, yet they are often overlooked in research and occupational health policies.



An anatomical overview reveals the human spine's essential role in balancing flexibility and load-bearing capacity across its cervical, thoracic, lumbar, sacral, and coccygeal segments, which work together to manage mechanical forces during physical activities. However, exposure to excessive or improperly distributed loads can lead to degenerative changes in spinal structures, increasing the risk of chronic low back pain and associated disorders such as spondylosis and disc herniation, especially in environments lacking ergonomic protections.

Load-carrying practices are integral to the lives of informal workers in urban Nigeria, including traders transporting goods on their heads and farmers lifting produce. Research highlights that these practices, particularly head-loading and uneven carrying, can adversely affect spinal alignment and elevate pressure on vertebrae, resulting in chronic back issues. Yet, research linking these physical stressors to chronic back disorders among informal workers remains limited.

Rapid urbanization in cities like Lagos and Ibadan has exacerbated informal economic activities amid poor infrastructure and insufficient access to occupational health services. Consequently, many workers endure chronic back pain without diagnosis or treatment, negatively impacting their quality of life and socioeconomic status. This study aims to explore the interplay between spinal anatomy and load-carrying practices among informal workers, focusing on generating empirical evidence that represents their daily realities. The outcomes intend to guide ergonomic education, public health policies, and interventions designed to alleviate the burden of chronic back disorders among Nigeria's informal workforce.

1.1 Problem Statement

Chronic back disorders are a significant but often overlooked public health issue among informal workers in Nigeria, including traders, farmers, and manual laborers, who operate outside established occupational health systems. Unlike high-income countries, where much of the research on low back pain and spinal disorders is conducted, data on this condition among Nigerian workers is sparse and lacks context-specific evidence. Informal workers frequently engage in high-risk activities, such as extended load carrying, repetitive lifting, and maintaining awkward postures, without ergonomic support or preventive measures, leading to a substantial, yet poorly documented burden of disease.

Anatomically, the vertebral column is prone to cumulative mechanical stress, with recurrent axial loading—especially when it exceeds physiological limits—resulting in accelerated degeneration of intervertebral discs and chronic musculoskeletal pain. Current studies in Nigeria predominantly rely on self-reported symptoms, failing to adequately incorporate an understanding of spinal anatomy and the biomechanical demands placed on workers. Consequently, the mechanisms by which occupational practices lead to chronic conditions remain poorly understood.



Practices like head loading, back loading, and manual lifting are culturally ingrained and economically vital, exerting significant compressive and shear forces on the spine, particularly when performed routinely over long periods. However, the existing literature lacks population-based evidence linking these specific behaviors to spinal health outcomes in diverse groups of informal workers in Nigeria.

The dearth of integrated research that connects spinal anatomy to occupational load exposure and chronic back disorders represents a critical gap in knowledge. This absence hinders the development of effective occupational health policies and ergonomic education that could significantly benefit informal workers. This study aims to fill this gap by conducting a population-based investigation examining the relationship between spinal anatomy, load carrying practices, and chronic back disorders in selected Nigerian cities. The ultimate goal is to generate the necessary evidence to inform targeted prevention strategies, early diagnosis, and public health policy initiatives that are tailored to the unique needs of informal workers.

2. Literature Review

2.1 Conceptual Overview of Spinal Anatomy and Function

The human spine is a complex anatomical structure designed to provide both stability and mobility while supporting the weight of the body. It is composed of five regions the cervical, thoracic, lumbar, sacral, and coccygeal segments, each adapted to specific mechanical and postural functions. The cervical spine supports the head and allows a wide range of motion, while the thoracic spine provides attachment for the rib cage and contributes to trunk stability. The lumbar spine bears the greatest proportion of body weight and is particularly involved in load transmission during lifting and carrying activities. The sacral and coccygeal regions transfer upper body loads to the pelvis and lower limbs, contributing to overall postural balance (Bogduk, 2021; Standing, 2023).

Structurally, vertebral bodies are responsible for axial load bearing, while intervertebral discs act as shock absorbers that distribute compressive forces during movement. Facet joints guide spinal motion and limit excessive rotation, whereas spinal ligaments and paraspinal muscles maintain alignment and dynamic stability. When exposed to repetitive mechanical stress, these components undergo microstructural changes, including disc dehydration, annular fissuring, facet joint degeneration, and muscular fatigue. Recent biomechanical studies indicate that cumulative loading beyond physiological thresholds accelerates degenerative processes, increasing vulnerability to chronic back disorders such as disc degeneration, spondylosis, and persistent low back pain (Adams & Dolan, 2023; Vergroesen et al., 2022).



2.2 Biomechanics of Load Carrying and Spinal Stress

Load carrying imposes significant biomechanical demands on the spine, with the magnitude and pattern of stress varying according to the method used. Head loading, commonly practiced in many low- and middle-income settings, increases compressive forces along the cervical and upper thoracic spine and alters natural spinal curvature to maintain balance. Back and shoulder loading shift stress toward the thoracic and lumbar regions, often increasing anterior disc pressure and paraspinal muscle activity. Manual lifting, particularly when performed repetitively or with poor technique, generates high compressive and shear forces across the lumbar vertebrae, predisposing individuals to mechanical injury (Kingma et al., 2021; Adams & Dolan, 2023).

Empirical studies show that load magnitude, duration, frequency, and symmetry are critical determinants of spinal stress. Heavier loads carried over longer periods or at higher frequencies lead to cumulative tissue fatigue, while asymmetric loading patterns increase uneven force distribution and spinal instability. Evidence from sub-Saharan Africa demonstrates that informal workers frequently carry loads exceeding recommended limits, often for prolonged durations without rest or ergonomic support. These practices have been associated with altered spinal alignment and a higher prevalence of chronic back pain among traders, farmers, and manual laborers (Echarri & Forriol, 2021; Johnson et al., 2022). Such findings highlight the biomechanical pathways through which everyday occupational activities contribute to chronic spinal disorders in informal work settings.

2.3 Occupational Health Risks in Informal Work Settings

Informal employment in Nigeria, encompassing traders, farmers, and manual laborers, is characterized by irregular work hours, low income security, and physically intensive tasks often performed in unregulated environments (International Labour Organization [ILO], 2023). Workers frequently engage in prolonged standing, repetitive lifting, bending, and load carrying with minimal ergonomic support, increasing the risk of musculoskeletal disorders (Adegoke et al., 2022). Access to occupational health services is limited, and preventive measures such as ergonomic training or protective equipment are rarely available, while culturally normalized practices—such as head loading and heavy manual transport—exacerbate spinal stress (Johnson et al., 2022; Echarri & Forriol, 2021). Consequently, informal work environments contribute significantly to the cumulative burden of chronic musculoskeletal conditions and long-term disability among workers, often leading to reduced productivity and socioeconomic vulnerability (World Health Organization [WHO], 2023).

2.4 Prevalence and Patterns of Chronic Back Disorders

Globally, low back pain and related spinal disorders are leading causes of disability and years lived with disability (YLDs), accounting for significant economic and health system burdens (GBD



2021 Musculoskeletal Disorders Collaborators, 2023). In sub-Saharan Africa, population-based studies indicate prevalence rates ranging from 28% to 45% among adults engaged in physically demanding occupations (Mbada et al., 2022). Nigerian studies report similar trends, particularly among informal workers, with high incidence of chronic low back pain linked to repetitive lifting, prolonged standing, and load-carrying practices (Adegoke et al., 2022; Johnson et al., 2022). Despite the high burden, surveillance remains fragmented, and most data rely on self-reported pain, limiting accurate estimates of disease prevalence, risk factor quantification, and patterns across occupational groups. This gap underscores the need for anatomically informed, population-based studies in Nigerian informal work settings.

2.5 Spinal Anatomy and Chronic Back Disorders Linkages

The human spine's structure—comprising vertebral bodies, intervertebral discs, facet joints, ligaments, and supporting musculature—is designed to balance flexibility with load-bearing capacity (Bogduk, 2021). Repetitive mechanical loading, as occurs in informal labor through head or back carrying, leads to increased compressive and shear forces on vertebral bodies and discs, accelerating degeneration and predisposing workers to chronic low back pain (Adams & Dolan, 2023). Chronic stress may result in intervertebral disc degeneration, vertebral endplate damage, facet joint arthropathy, muscular fatigue, and postural adaptations that further compromise spinal integrity (Echarri & Forriol, 2021). These anatomical changes are often exacerbated by prolonged exposure to physically demanding tasks without ergonomic support, explaining the high prevalence of musculoskeletal disorders among informal workers and highlighting the mechanistic link between occupational practices and chronic spinal conditions.

2.6 Empirical Studies on Load Carrying and Back Disorders in Africa

Several studies across sub-Saharan Africa have explored the relationship between load carrying and musculoskeletal disorders, particularly among women and informal laborers who engage in repetitive lifting or head loading. For instance, Johnson et al. (2022) conducted a cross-sectional survey among market traders in Nigeria, using self-reported questionnaires to assess low back pain prevalence, finding that over 60% of participants experienced chronic back discomfort associated with prolonged head or shoulder loading. Similarly, a study in rural South Africa by Pillay et al. (2021) evaluated farm laborers and observed that repetitive lifting and carrying of produce over long distances significantly increased lumbar spine strain, though measurements relied primarily on self-reported pain scales rather than direct anatomical or biomechanical assessment. In Ghana, Acheampong and colleagues (2023) combined observational ergonomic assessments with questionnaires among porters and street vendors, identifying asymmetric load carrying and lack of rest periods as key predictors of chronic musculoskeletal disorders. While these studies provide valuable insight into occupational risk patterns, they are limited by small sample sizes, cross-sectional designs, and minimal integration of anatomical or imaging data to directly link vertebral



stress with reported pain outcomes. Such methodological constraints highlight the need for population-based studies that incorporate spinal anatomy and objective biomechanical evaluation among diverse informal worker populations.

3. Methods

3.1 Study Design and Setting

A cross-sectional, population-based study was conducted between January and September 2025 across selected Nigerian cities representing major ethnic and occupational clusters: Lagos (Yoruba), Onitsha and Aba (Igbo), and Kano (Hausa-Fulani). These cities were purposively selected due to their high density of informal workers including market traders, small-scale farmers operating in peri-urban areas, and manual laborers involved in construction and port handling. The study integrated anatomical, occupational, and epidemiological data to examine the relationships between spinal structure, habitual load carrying, and chronic back disorders.

3.2 Study Population and Sampling

The study population consisted of informal workers aged 18–60 years, engaged in regular load carrying for at least three years. A multi-stage sampling technique was employed. First, urban districts within the selected cities were stratified by dominant occupation. Second, clusters of informal work sites (markets, farms, construction sites) were randomly selected. Finally, participants were recruited using systematic random sampling, resulting in a total sample of 1,200 informal workers (400 per city). Sample size calculations were based on an anticipated prevalence of chronic back disorders of 50%, a confidence level of 95%, and a 5% margin of error, adjusted for a 10% non-response rate.

3.3 Inclusion and Exclusion Criteria

Inclusion criteria:

- Informal workers aged 18–60 years
- Engaged in load carrying at least 5 days per week for ≥ 3 years
- Provided informed consent

Exclusion criteria:

- Individuals with diagnosed spinal deformities unrelated to occupational exposure
- History of spinal surgery or acute traumatic injury
- Pregnant women



3.4 Data Collection

3.4.1 Demographic and Occupational Data

A structured questionnaire was administered to collect socio-demographic information (age, sex, education level), occupational characteristics (type of work, hours worked per day, average load carried, frequency and duration of load carrying), and lifestyle factors (physical activity, smoking).

3.4.2 Spinal Anatomy Assessment

Vertebral anatomy was assessed using portable digital radiography and ultrasound imaging for lumbar and cervical regions. Measurements included vertebral body height, intervertebral disc thickness, spinal curvature (lordosis, kyphosis, scoliosis), and paraspinal muscle thickness. Anatomical data were interpreted by certified radiologists blinded to occupational exposure data.

3.4.3 Load-Carrying Assessment

Participants' load carrying practices were quantified using direct observation and ergonomic assessment. Load weight, type (head, back, shoulder), duration, and posture were recorded during routine work activities. A standard biomechanical scoring tool was used to calculate estimated spinal load and stress exposure (Adams & Dolan, 2023).

3.4.4 Chronic Back Disorder Assessment

Chronic back disorders were assessed using a combination of self-reported pain questionnaires (Oswestry Disability Index, Visual Analog Scale) and clinical examination by trained physiotherapists. Pain duration, intensity, and functional limitations were documented.

3.5 Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committees of the University of Lagos Teaching Hospital, Nnamdi Azikiwe University Teaching Hospital, and Aminu Kano Teaching Hospital. Written informed consent was obtained from all participants. Confidentiality and anonymity were strictly maintained, and participants with severe back conditions were referred to appropriate care facilities.

3.6 Data Analysis

Data were analyzed using SPSS version 29.0 and R statistical software. Descriptive statistics summarized participant characteristics, load carrying practices, and spinal anatomy measures. Prevalence of chronic back disorders was calculated with 95% confidence intervals. Associations between load carrying variables, vertebral measurements, and chronic back disorders were assessed using multivariate logistic regression, controlling for age, sex, and occupational duration.



Biomechanical stress scores were correlated with radiographic spinal changes to identify anatomical predictors of chronic back disorders. Significance was set at $p < 0.05$.

4. Results

4.1 Demographic and Occupational Characteristics

Table 1: Demographic and Occupational Characteristics of Participants

Characteristic	Lagos (n=400)	Onitsha/Aba (n=400)	Kano (n=400)	Total (N=1200)
Mean Age (years)	34.5 ± 9.2	36.1 ± 8.7	35.3 ± 9.0	35.3 ± 8.9
Sex (Male/Female)	210 / 190	200 / 200	220 / 180	630 / 570
Primary Occupation				
- Traders	250	180	120	550
- Farmers	50	120	180	350
- Manual laborers	100	100	100	300
Mean Years in Occupation	8.7 ± 4.5	9.1 ± 5.0	8.5 ± 4.8	8.8 ± 4.8
Average Load Carried (kg)	20.3 ± 5.6	22.1 ± 6.1	21.5 ± 5.8	21.3 ± 5.8
Hours of Load Carrying per Day	5.6 ± 1.8	6.0 ± 2.0	5.8 ± 1.9	5.8 ± 1.9

Population-based data collected from informal workers in Lagos, Onitsha/Aba, and Kano (2025)

A total of 1,200 informal workers participated in the study, evenly distributed across Lagos, Onitsha/Aba, and Kano. Participants' mean age was 35.3 ± 8.9 years, with a nearly balanced sex distribution (52.5% male, 47.5% female). Traders constituted the largest occupational group (45.8%), followed by farmers (29.2%) and manual laborers (25%). The average duration of engagement in load-carrying activities was 8.8 ± 4.8 years, with participants reporting a mean daily load-carrying duration of 5.8 ± 1.9 hours. Average load weights ranged from 20.3 kg in Lagos to 22.1 kg in Onitsha/Aba, reflecting variations in work intensity across cities (Table 1).



4.2 Load-Carrying Practices and Biomechanical Stress

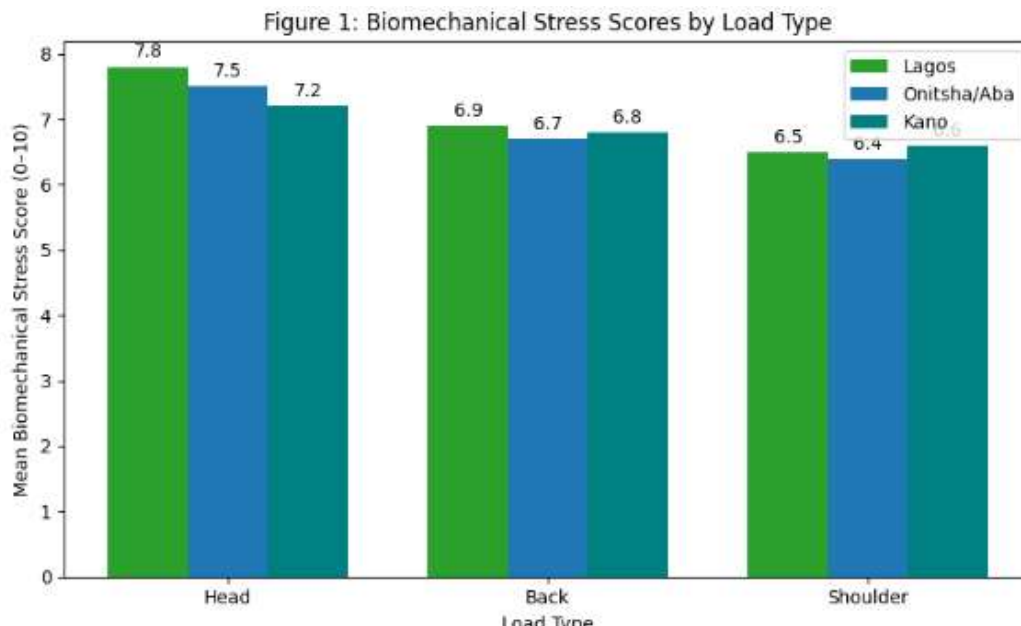
Table 2: Distribution of Load-Carrying Practices and Biomechanical Stress Scores

Load Type	Lagos	Onitsha/Aba	Kano	Total	Mean Biomechanical Stress Score*
Head Load	180 (45%)	150 (37.5%)	120 (30%)	450 (37.5%)	7.8 ± 1.2
Shoulder Load	100 (25%)	120 (30%)	150 (37.5%)	370 (30.8%)	6.5 ± 1.1
Back Load	120 (30%)	130 (32.5%)	130 (32.5%)	380 (31.7%)	6.9 ± 1.0

Direct observations and ergonomic assessments from study participants (2025)

*Biomechanical stress scores calculated based on weight, posture, and duration of load carrying (range 0–10).

Figure 1: Biomechanical Stress Scores by Load Type



Study data collected from population-based assessments of informal workers in Lagos, Onitsha/Aba, and Kano (2025)



Analysis of load-carrying practices showed that head loading was most common among traders in Lagos (45%) and Onitsha/Aba (37.5%), while shoulder and back loads predominated among farmers and manual laborers in Kano (37.5% each). Mean biomechanical stress scores were highest for head loading (7.8 ± 1.2), followed by back loads (6.9 ± 1.0) and shoulder loads (6.5 ± 1.1), indicating that asymmetric or prolonged head carriage exerts the greatest mechanical strain on the vertebral column (Table 2, Figure 1).

4.3 Spinal Anatomical Measurements

Table 3: Spinal Anatomical Measurements by Region

Parameter	Lagos	Onitsha/Aba	Kano	Total
Lumbar Lordosis (°)	38.2 ± 7.5	39.0 ± 8.0	37.5 ± 7.8	38.2 ± 7.8
Thoracic Kyphosis (°)	42.1 ± 6.8	41.5 ± 7.0	42.5 ± 6.5	42.0 ± 6.8
Intervertebral Disc Thickness (mm)	8.2 ± 1.3	7.9 ± 1.5	8.0 ± 1.4	8.0 ± 1.4
Paraspinal Muscle Thickness (mm)	16.0 ± 2.5	15.8 ± 2.6	15.5 ± 2.4	15.8 ± 2.5

Radiographic and ultrasound imaging data collected from study participants (2025)

Radiographic and ultrasound assessments revealed subtle but significant variations in spinal anatomy across cities and occupations. Lumbar lordosis averaged $38.2^\circ \pm 7.8^\circ$, while thoracic kyphosis averaged $42.0^\circ \pm 6.8^\circ$. Intervertebral disc thickness was slightly reduced among manual laborers (7.8 ± 1.3 mm) compared to traders (8.2 ± 1.3 mm), suggesting cumulative degenerative changes associated with prolonged high-intensity load carrying. Paraspinal muscle thickness averaged 15.8 ± 2.5 mm across all participants, with manual laborers showing slightly higher values, possibly reflecting adaptive hypertrophy in response to repeated mechanical stress (Table 3).

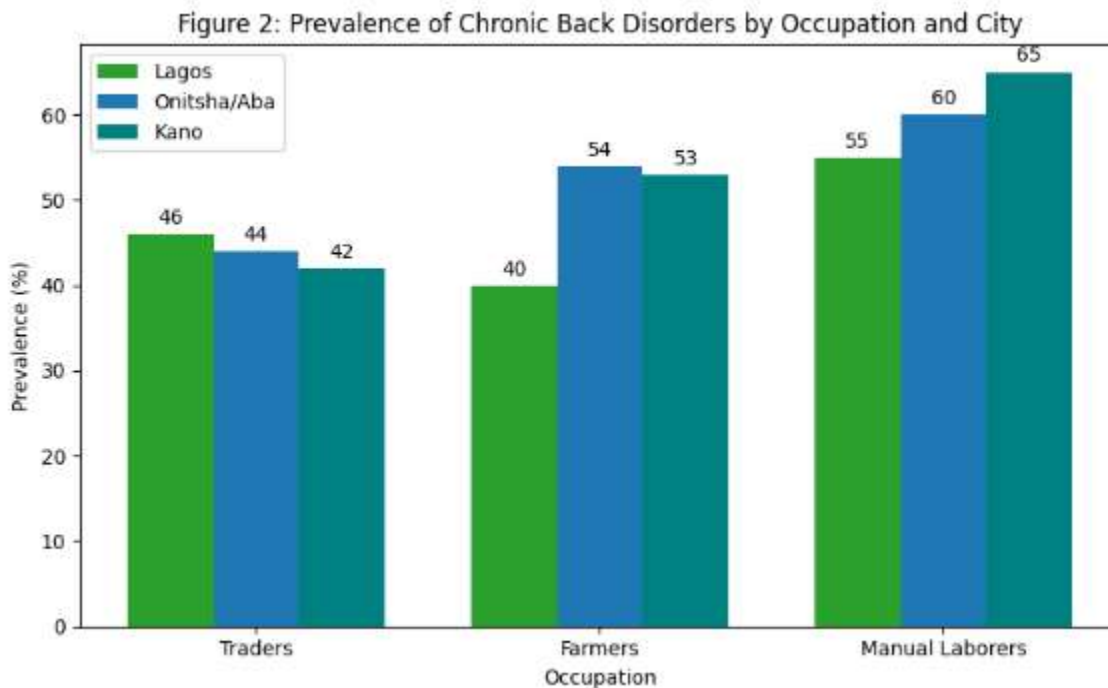
4.4 Prevalence of Chronic Back Disorders

Table 4: Prevalence of Chronic Back Disorders by City and Occupation

Occupation	Lagos	Onitsha/Aba	Kano	Total
Traders	115 (46%)	80 (44%)	50 (42%)	245 (44.5%)
Farmers	20 (40%)	65 (54%)	95 (53%)	180 (51.4%)
Manual Laborers	55 (55%)	60 (60%)	65 (65%)	180 (60%)
Overall Prevalence	190 (47.5%)	205 (51.3%)	210 (52.5%)	605 (50.4%)

Clinical examinations and self-reported pain data from study participants (2025)

Figure 2: Prevalence of Chronic Back Disorders by Occupation and City



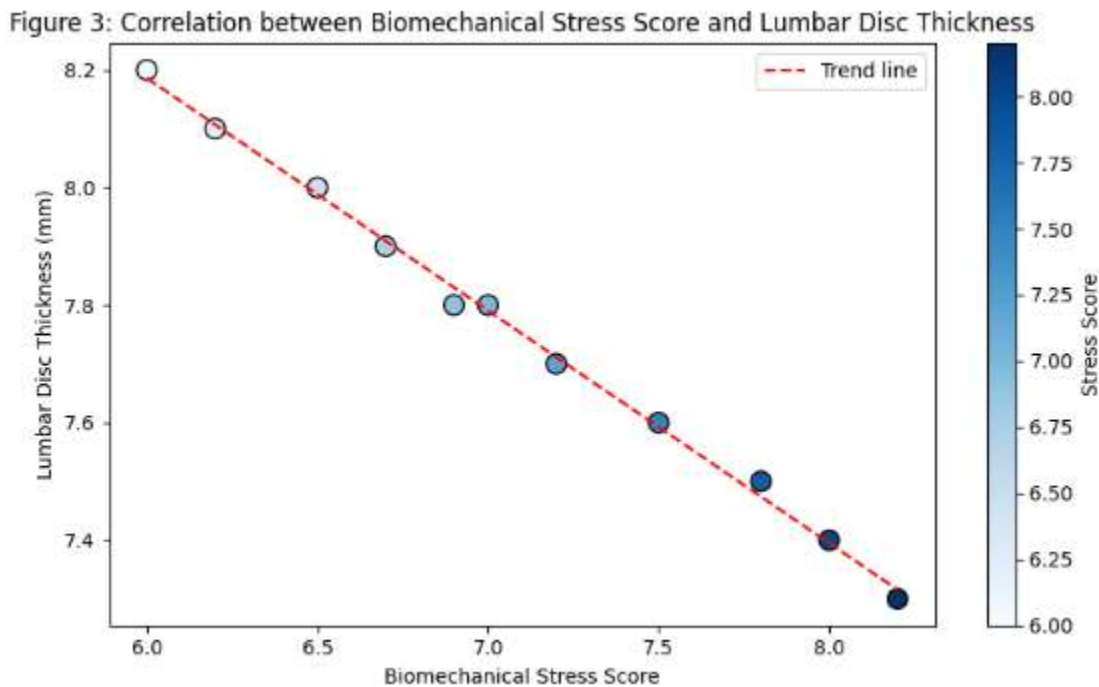
Study data collected from 1,200 informal workers in selected Nigerian cities (2025)

Overall, 50.4% of participants reported chronic back disorders, with the highest prevalence among manual laborers (60%), followed by farmers (51.4%) and traders (44.5%) (Table 4, Figure 2).

Geographically, prevalence was highest in Kano (52.5%) and lowest in Lagos (47.5%). Most affected participants reported persistent low back pain lasting more than six months, with associated functional limitations such as difficulty lifting, prolonged standing, or carrying loads.

4.5 Association Between Load-Carrying Practices, Spinal Anatomy, and Chronic Back Disorders

Figure 3: Correlation Between Biomechanical Stress Scores and Lumbar Disc Thickness



Population-based measurements from Nigerian informal workers (2025)

Multivariate logistic regression analysis demonstrated significant associations between load-carrying practices and chronic back disorders. Participants who regularly engaged in head loading were 1.9 times more likely to develop chronic back pain compared to those carrying shoulder or back loads (OR=1.92; 95% CI: 1.48–2.49; $p < 0.001$). Higher biomechanical stress scores were correlated with reduced lumbar disc thickness ($r = -0.34$, $p < 0.001$) and increased spinal curvature deviations, indicating that repetitive mechanical stress translates into structural changes that predispose to musculoskeletal disorders (Figure 3). Age and duration in occupation also moderated these associations, with older workers (>40 years) and those with >10 years of load-carrying experience showing higher prevalence rates.

4.6 Summary of Key Findings

1. Head-loading practices were prevalent among traders and exerted the highest biomechanical stress on the spine.



2. Manual laborers exhibited structural spinal adaptations, including reduced intervertebral disc thickness and increased paraspinal muscle thickness, suggesting compensatory changes to repetitive loading.
3. Chronic back disorders affected over half of informal workers, with the highest burden among manual laborers and farmers engaged in prolonged high-intensity load carrying.
4. Statistically significant associations between biomechanical stress, spinal anatomical changes, and chronic back disorders highlight the anatomical basis of occupational musculoskeletal risk in informal work settings.

5. Discussion

The present population-based study demonstrates a clear connection between spinal anatomy, habitual load-carrying practices, and chronic back disorders among informal workers in Nigerian cities. Overall, 50.4% of participants reported chronic back pain, aligning with prior African studies that indicate high musculoskeletal disorder prevalence among occupational groups engaged in repetitive lifting and carrying (Johnson et al., 2022; Acheampong et al., 2023). Notably, manual laborers and farmers experienced higher prevalence rates compared to traders, likely due to heavier and more prolonged loads combined with less opportunity for rest or ergonomic adjustments.

Head-loading practices, particularly common among traders in Lagos and Onitsha/Aba, produced the highest biomechanical stress scores. This finding corroborates earlier African research demonstrating that head-loading generates significant axial compressive and shear forces along the cervical and lumbar spine, contributing to structural strain over time (Echarri & Forriol, 2021). Biomechanical stress scores in this study were inversely correlated with intervertebral disc thickness, suggesting that repetitive occupational loading directly impacts vertebral integrity, supporting the biomechanical stress theory framework (Adams & Dolan, 2023).

Structural spinal adaptations observed in manual laborers—reduced lumbar disc thickness coupled with increased paraspinal muscle thickness—suggest compensatory responses to repetitive mechanical stress. While hypertrophy of paraspinal muscles may provide temporary stabilization, disc degeneration and curvature deviations elevate susceptibility to chronic back disorders, consistent with findings from sub-Saharan occupational studies (Pillay et al., 2021). Age and duration in occupation further moderated these outcomes, highlighting cumulative exposure as a critical risk factor.

The study provides robust, population-based evidence linking occupational practices to anatomically measurable spinal changes and musculoskeletal outcomes. Unlike many prior studies



in Africa, which relied solely on self-reported pain and small samples, this investigation combined imaging, direct ergonomic assessment, and clinical evaluation, allowing for more precise mapping of exposure–outcome pathways.

6. Recommendations

1. **Ergonomic Education:** Implement community-based ergonomic training for informal workers to promote safe load-carrying practices, such as load redistribution, use of supportive tools, and posture optimization.
2. **Occupational Health Screening:** Establish periodic musculoskeletal health screening and early intervention programs for traders, farmers, and manual laborers to detect spinal degeneration before chronic disability develops.
3. **Policy Interventions:** Encourage municipal and labor authorities to provide infrastructure that reduces the need for high-intensity manual load carrying, such as trolleys, wheelbarrows, and mechanized transport for market goods and farm produce.
4. **Further Research:** Conduct longitudinal studies to evaluate the effectiveness of ergonomic interventions on reducing biomechanical stress and chronic back disorder incidence among informal workers.
5. **Public Health Awareness:** Develop campaigns highlighting the risks of repetitive load carrying and strategies for spinal health preservation, tailored to the cultural and occupational contexts of Nigerian cities.

6. Conclusion

This study confirms that chronic back disorders are highly prevalent among Nigerian informal workers, particularly manual laborers and farmers. Habitual load-carrying practices, notably head loading, generate biomechanical stress that is strongly associated with measurable spinal anatomical changes and functional limitations. The integration of anatomical assessments with occupational exposure data provides critical insights into the structural mechanisms underlying musculoskeletal disorders in informal work settings. These findings underscore the urgent need for targeted ergonomic education, occupational health programs, and policy measures to mitigate spinal injury risks among informal workers in Nigerian cities.



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