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Remote Work Ergonomics and Musculoskeletal Health in Lagos, Nigeria: A Cross-sectional Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Remote workers are at risk of musculoskeletal disorders due to the sedentary nature of their work and ergonomic safety compliance is a necessary control measure. This work evaluated ergonomic compliance and work-related musculoskeletal disorders among fully remote workers in Lagos. Following approval, 371 remote workers were recruited to participate in a cross-sectional study. They responded to a Questionnaire, the main study tool, which biodata, work information, knowledge of ergonomics, workstation compliance, level of support offered by employer to aid ergonomic compliance, behavioral factors, musculoskeletal disorder symptoms and medical Information regarding past and present diagnosis/ treatment. To support data on workspace

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compliance, physical and virtual observations were carried out on 361 workspaces. Collated data were analyzed using descriptive tools. The data analysis showed that a large percentage of remote workers, about 66.31% had high knowledge on ergonomics. However, a relatively lower percentage, about 23.36% had highly compliant workspaces. Only 8% were highly compliant based on behavioral patterns as a larger 48% fell into the low category. The study showed that only 15.36% of employers gave a very high level of support to encourage ergonomic compliance. The Most prevalent musculoskeletal disorder amongst the population studies is the lower back pain, which has been suffered by 90.5% of respondents at varying durations and levels. This was closely followed by the upper back pain at 85.7% then eye pain at 47.1. The study shows a positive correlation between Employer support and: ergonomic compliance based on workspaces, ergonomic compliance based on behavioral patterns as well as knowledge on ergonomics at 0.26828222, 0.151881985 and 0.188086546 respectively. There is an urgent need to educate employees on ergonomic safety, create effective occupational health plans tailored specifically for the remote work model, develop feasible measures for compliance checks, and work with authorities to enact laws to protect the health and safety of remote workers in the long run.

Keywords: Remote work; musculoskeletal disorders; ergonomics; work environment; occupational health; risk factors.

1. INTRODUCTION

Remote work is defined as a flexible work arrangement whereby workers work in locations, remote from their central offices or production facilities, the worker has no personal contact with co-workers there, but is able to communicate with them using technology [1]. It basically means performing work at a location other than one's primary office" [2]. Although remote work gained more popularity after the COVID-19 pandemic [3], it has been present since before the industrial revolution [4]. Messenger and Gschwind [5]. explained that the concept of Work from Home has long been practiced since 1973 as it has been known as "telework" or "telecommuting".

Before the pandemic however, freelance organizations like Upwork and Fiverr as well as remote companies such as SafetyWing, Automattic and Zapier were already in existence and allowed people the freedom to work remotely. Some countries saw the percentage of remote workers triple during the lockdown in April 2020 [6]. Remote work has two models- "work from home" and "work from anywhere" based on geographical flexibility [7]. Eddleston and Mulki [8] further separates remote work (working full time remotely) and telecommuting (working one to three days per week remotely). However, Reshma et.al. [9] define Working from home as people working from their home or from another location of their choice than the working area which is provided by the employer, this means that remote work can also be majorly referred to as "Work From Home". Irrespective of that analogy, it's important to note that remote work could be done from anywhere, but most remote workers work from their homes [7].

Remote work is based on evolving technology as work is done from microcomputers [10]. Computer work-stations pose ergonomic risks which could be magnified by long work durations, poorly designed workstations and unacceptable seating arrangements. [11], It is observed that employees working on computers for long impair their musco-skeletal system; more dominantly when the computer use is in a wrong posture [12]. Prolonged use of computers, especially in an poorly designed workspace can cause injuries or discomfort to the eyes, chest, upper back, shoulders, arm muscles and other body parts [13]. Working in a sedentary position for a long time may also increase the risk of neck and/or low back pain (LBP) [14]. Healthline Identifies sitting in the same position at a computer every day, engaging in repetitive motions and maintaining poor posture are work factors that can cause wear and tear on the musculoskeletal system, leading to Musculoskeletal disorders [15].

The home environment is likely to be faulty in many respects [16]. The home environment could increase ergonomic risks as it does not guarantee appropriate facilities and equipment [17]. This means that Remote work may increase the risks of musculoskeletal injuries associated with the workstation condition [18]. Working from home may not only trigger mental health issues such as stress, anxiety, and isolation that eventually could affect job effectiveness, well-

being, and work life balance [19] but also hinder the adoption of healthy body posture and trigger the onset of musculoskeletal disorders [16].

Akrouf et al., [20] stated that assessing the exposure of workers to known risk factors for work related musculoskeletal injuries, is essential for the introduction of primary interventions as well as the application of ergonomic knowledge and understanding of ergonomic principles amongst these workers.

Safety Compliance is an issue in underdeveloped countries due to weak laws and enforcement. While most corporate offices have incorporated ergonomic friendly workspaces, there is a possibility that companies make little provisions in this regard when employees work remotely since remote employees may provide or purchase their tools themselves. Their jobs require the use of computers daily for long hours.

Without the proper ergonomically designed spaces, working becomes a real problem and the risk of Musculoskeletal injuries could increase greatly but proper workplace setting alone might not be entirely helpful if the workers themselves do not implement the essential ergonomic principles with regards to their behavior and work patterns. This includes a number of touchpoints such as proper postures, sitting/ body positions, periodic walks, actually using the workspace, and proper equipment positioning.

Occupational health is concerned with the total well-being of workers and this work will be useful for managers and employees to learn how to manage ergonomic issues as more and more people continue to join the remote workforce. There is a need to investigate their knowledge and perception of ergonomics, their working conditions, the kind of musculoskeletal symptoms they experience, the risk factors they're exposed to and other factors that contribute to these injuries. This study will meet this need and also provide empirical evidence on the subject as there seems to be scarce publication in this regard.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out within Lagos, Nigeria. It is the epicenter of commercial activities in Nigeria with a population of about 16-21 million people [21], it is the most densely populated city in Nigeria [22]. Although the major religions are Christianity and Islam, there are still a lot of traditional worshippers in Lagos [23]. Lagos State lies on longitude 20 42'E and 32 2'E respectively, and between latitude 60 22'N and 60 2'N with a small land mass of about 356,861 hectares of which 75,755 hectares are wetlands [24]. According to the Lagos state government official website, the city consists of mazes of Islands or Main lands which include about 20 Local government areas. Poverty levels in Lagos remain at a record high of about 48–50% although this hasn't stopped the high level of migration from other Southern, Eastern, and Northern parts of Nigeria [24]. Due to this migration, the indigenously Yoruba area still stands as a socio-political center with popularly spoken languages being English, Yoruba and Pidgin English.

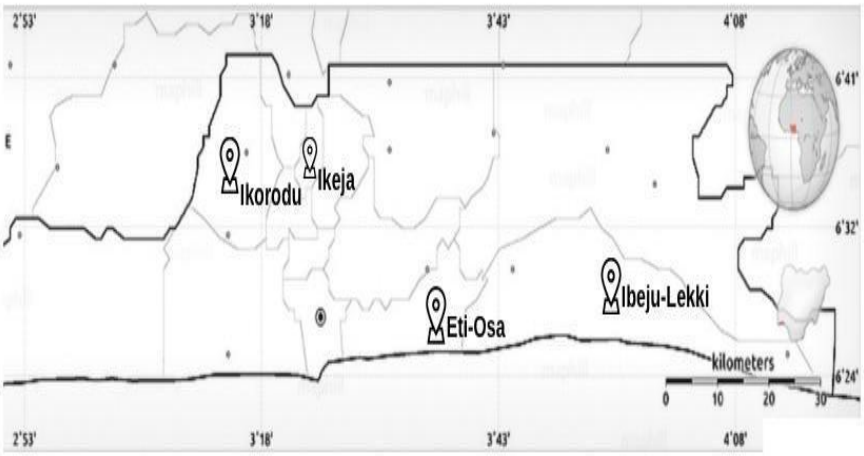

Fig. 1. Map of study area

2.2 Data Collection

To gather this data, a multistage sampling technique was employed, dividing the city into quadrants and randomly selecting four local government areas as clusters for sample selection. The sample size was calculated using Yemane's formula considering a 10% non-response rate. The inclusion criteria encompassed remote workers aged 18 or above with at least 6 months of remote work experience, working a minimum of 30 hours weekly with a globally distributed team. Exclusions involved individuals with specific health conditions, digital nomads, freelancers, and certain professions like social media influencers or network marketers.

Data collection methods included a self-administered questionnaire focusing on various aspects such as ergonomics knowledge, workstation assessment, employer support, behavioral factors, musculoskeletal symptoms, and medical information. Additionally, physical and virtual visits were conducted to observe and evaluate home workstations using a checklist based on ergonomic standards. The questionnaire and checklist underwent validation by subject matter experts. To ensure the reliability and validity of the instruments used for data collection, face and content validity checks were performed on the questionnaire. Reliability was assessed through a pilot study involving 20 remote workers. Once data was collected, statistical software like SPSS 25 and Microsoft Excel were employed for analysis, with results presented in a Word format using Microsoft Office 2016.

3. RESULTS AND DISCUSSION

The study collected data from 396 respondents via a questionnaire and physical observation of 361 home workspaces, aiming to understand ergonomic issues among Lagos workers. Demographics as shown in Table 1, revealed an almost equal split between Island and mainland residents, with a majority in the 20-39 age range, predominantly male, and mostly single with a Bachelor's degree. Remote work experience varied, with a significant portion using laptops for work. Likert scale responses indicated consensus on several points: acknowledging the role of ergonomic design in reducing stress and injuries, the importance of neutral postures, breaks for stretching, and the 20-20-20 rule for eye strain prevention. However, opinions were divided regarding whether ergonomic workspaces should be mandatory, their cost, and the necessity of medical checks tied to employer-provided health insurance.

Table 1. Demographics (n=396)

Description	Percentage	Description	Percentage
Location: Island	49.90%	Remote Work Experience: 6-11 months	20.50%
Location: Mainland	50.10%	Remote Work Experience: 12-17 months	28.30%
Age Group: 20-29	42.90%	Remote Work Experience: 18-24 months	27.20%
Age Group: 30-39	37.20%	Remote Work Experience: More than 24 months	24.00%
Age Group: 40-49	16.20%	Highest Education: Bachelor's degree	42.60%
Age Group: 50-59	3.80%	Highest Education: Master's degree	24.00%
Marital Status: Married	41.00%	Highest Education: Ordinary National diploma	12.90%
Marital Status: Single	59.00%	Highest Education: Post-Graduate diploma	8.10%
Gender: Female	46.40%	Highest Education: Higher National diploma	6.20%
Gender: Male	53.60%	Highest Education: Other qualifications	6.20%
Device Used: Laptop	94.10%		
Device Used: Desktop computer	5.70%		
Device Used: Other micro-computers	0.30%		

The initial findings, as presented in Table 2 and Fig. 2, offer a detailed look into how respondents perceive ergonomic principles. A considerable proportion expressed agreement or strong agreement regarding the effectiveness of customized workplaces in reducing physical strain and discomfort. However, some were uncertain or disagreed regarding the necessity of ergonomic investments unless mandated by employers, viewing ergonomic workspaces as merely cosmetic enhancements. Interestingly, many recognized the role of behavioral patterns in ergonomic injuries, emphasized the benefits of regular breaks and maintaining proper posture, and acknowledged the influence of environmental factors such as lighting and space.

Transitioning to Tables 3 and 4 as well as Fig. 3 and 4, these tables and figures elaborate on the level of ergonomic compliance among respondents based on their workspaces, gathered from both questionnaires and direct observations (checklist). Table 3 and Fig. 3 primarily captures questionnaires responses, revealing that while a significant percentage have designated workspaces, the use of ergonomic chairs, appropriate chair adjustments, and support for lower back positioning varies widely. Positive compliance is noted in elements like screen readability, lighting, and accessibility of frequently used items.

Table 4 and Fig. 4 provides insights from physical observations of workspaces. It becomes apparent that aspects like adjustable tables and suitable workstation space are limited, but there are commendable statistics for certain ergonomic features, a notable percentage of workers have their monitors correctly positioned, use ergonomic keyboard setups, and maintain favorable lighting conditions. However, there are also areas lacking in compliance, such as the absence of easily adjustable chairs and limited availability of ergonomic accessories like wrist rests or specialized mice.

Table 5 and Fig. 5 provides insights into respondents' ergonomic compliance based on their behavioral patterns. It showcases varying percentages concerning habits related to ergonomic well-being. Substantial number of respondents sometimes or often took breaks for stretching and movement during work hours, while a small percentage consistently did so. Similarly, application of the 20-20-20 optometric rule, stopping for meals and hydration, regulating work hours for adequate breaks, maintaining good sitting positions, and positioning screens at a distance showed mixed levels of adherence among respondents. Also, a significant portion reported never working in awkward positions or on their beds, but there were instances where respondents occasionally or consistently engaged in these non-ergonomic practices.

Table 6 and Fig. 6 shows the results focus on ergonomic compliance linked to employer support. These figures detail the distribution among respondents concerning various aspects of ergonomic aid provided by their employers. Notably, a relatively small percentage had received ergonomic training as part of their onboarding process or during their tenure. Similarly, the provision of ergonomic budgets, including those specifically designated for office ergonomics, was limited. Instances where ergonomic safety was mentioned in safety meetings or the provision of health insurance for employees varied among respondents, indicating differing levels of support from employers regarding ergonomic well-being.

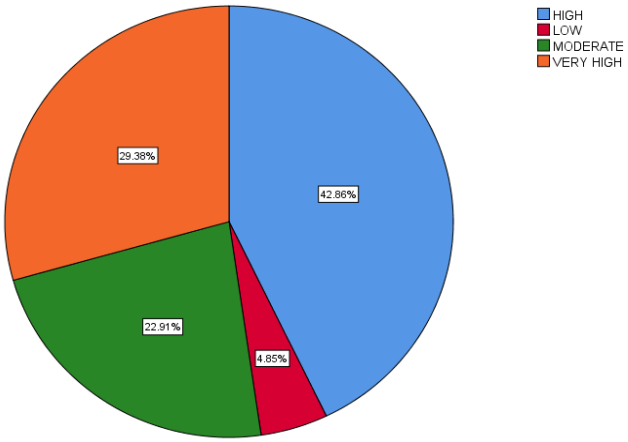

Fig. 2. Level of workers' knowledge on ergonomic principles (percentage pie chart)

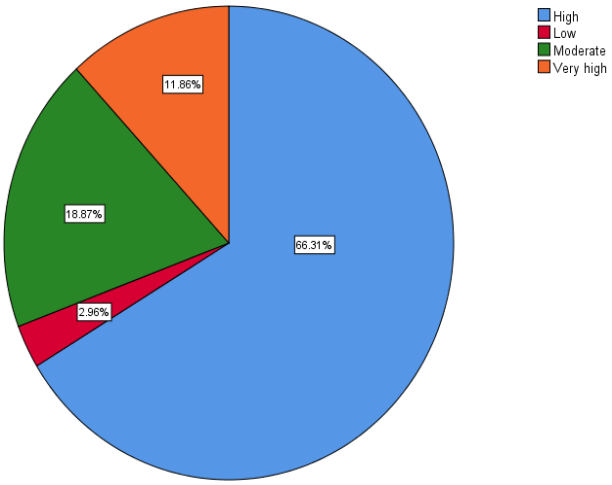

Fig. 3. Level of ergonomic compliance based on workspaces of respondent (questionnaire, percentage)

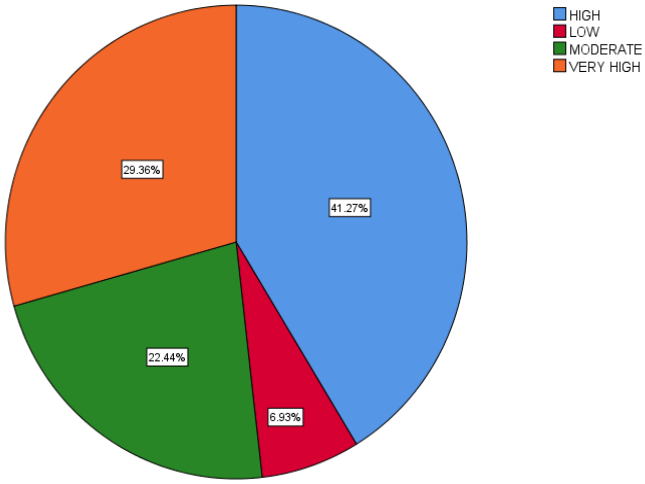

Fig. 4. Level of ergonomic compliance based on workspaces of respondent (checklist, percentage)

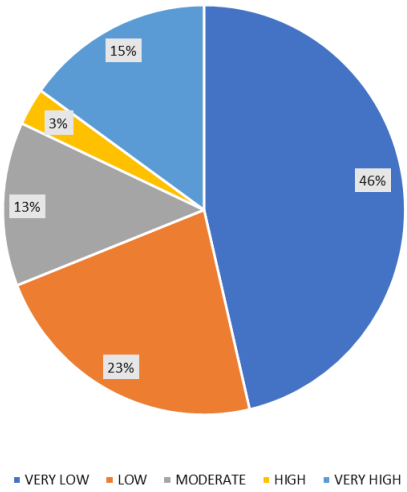

Fig. 5. Level of ergonomic compliance based on behavioral patterns (percentage)

Table 2. Worker's knowledge on ergonomics

Statement	Strongly Agree (SA)	Agree (A)	Undecided (U)	Disagree (D)	Strongly Disagree (SD)
Designing the workplace to fit workers can reduce overstressing of body parts and minimize discomfort/injuries.	29.10%	35.60%	6.70%		
Use of Ergonomically designed computer workspaces and equipment reduces the risk of ergonomic injuries.	30.70%	27.00%	8.10%	3.50%	
Ergonomic workspaces are only important because they are aesthetically pleasing and look good in video meetings.	8.90%	21.00%	21.60%	38.50%	
Ergonomically designed workspaces should only be invested in if made mandatory by employers.	7.80%	35.00%	23.70%	28.30%	5.10%
Ergonomic workspaces are expensive and require financial support from employers.	29.10%	48.00%	16.40%	6.50%	
Behavioral patterns of workers can greatly increase the risk of ergonomic injuries.	33.70%	56.90%	35.00%		
Neutral postures help to keep the natural "S-curve" of the back intact during work.		67.90%	9.40%	0.50%	22.10%
Taking frequent breaks for body stretching and movement helps to reduce musculoskeletal injuries.	29.60%	62.80%	7.50%		
The 20-20-20 optometric rule can help to prevent eye strain.	24.30%	58.50%	13.20%	4.00%	
Appropriate lighting, temperature, noise, and vibration can ease discomfort.	30.70%	24.20%	3.80%	0.30%	
Allowing a lot of space free from obstacles can ease body movement and reduce the risk of injuries.	34.50%	64.20%	1.30%	0.30%	0.30%
Periodic medical checks are very important for early detection of ergonomic health issues.	30.50%	63.80%	5.10%		0.30%
Periodic medical checks should only be done if employers provide health insurance.	5.10%	8.60%	33.20%	46.10%	7.00%

Table 3. Ergonomic compliance based on Workspaces of respondents (questionnaire)

Statement	Yes (Y)	No (N)
Do you have a dedicated Indoor or outdoor office space?	96.70%	3.30%
Do you use an ergonomic chair?	50.40%	49.60%
Is your chair in good condition and adjusted to the appropriate height (thighs parallel or knees slightly lower than the hip so you can achieve the neutral posture?	89.80%	10.20%
Are your feet fully supported by the floor or a footrest?	90.60%	9.40%
Does your chair support your lower back?	89.50%	10.50%
Does your chair have armrests?	65.20%	34.80%
If yes, do your armrests allow you to get close to your work station?	65.00%	0.30%
Is it easy to read the text on your screen?	99.70%	0.30%
Is the computer screen free from noticeable glare at all times of the day?	76.30%	23.70%
Do you have appropriate lighting for reading and writing documents?	94.90%	5.10%
Is there space to rest your arms when not keyboarding?	86.00%	14.00%
Are frequently used items within a 2.5-3m reach?	86.30%	13.70%
When keyboarding, do your elbows stay close to the body with upper arms relaxed?	72.20%	27.80%
When you use your phone app or have video meetings, do you use headsets to avoid shoulder deviation?	86.00%	14.00%
Do you use a full-sized external keyboard or mouse when using your laptop/desktop?	51.80%	48.20%
Is your computer positioned at an appropriate height such that the screen is directly in front of you to promote upright neck posture?	51.20%	48.80%
Do you use photochromic glasses or anti-glare screen protectors?	50.10%	49.90%
Does your chair have a neck rest?	50.10%	49.90%

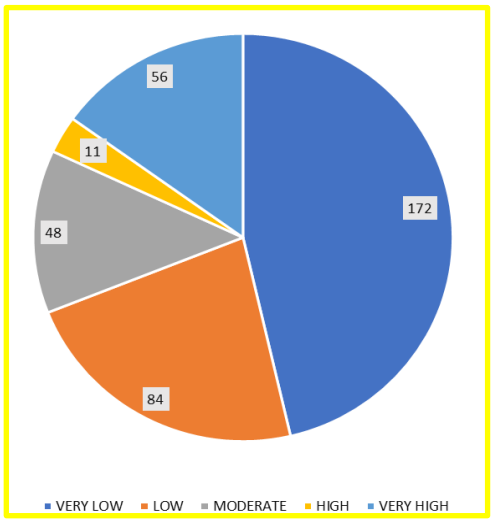

Fig. 6. Level of support provided by employers (percentage)

Table 7 and Fig. 7 presents the musculoskeletal symptoms experienced by respondents. It outlines the prevalence and nature of discomfort among participants across various body parts. The findings suggest that a significant portion of respondents experienced discomfort in areas like the neck, shoulders, arms, back, knees, and legs at varying frequencies. The intensity of pain, its interference with work, and the duration of symptoms also varied among respondents, illustrating a diverse range of experiences related to musculoskeletal health. Also, discomfort in the eyes was reported by a considerable percentage, highlighting the prevalence of eye strain or related issues among the surveyed individuals.

Table 4. Ergonomic compliance based on workspaces of respondents (checklist)

Statement	No (N)	Yes (Y)	Statement	No (N)	Yes (Y)
Workstation table height is adjustable if needed	93.60%	6.40%	Keyboard is horizontal or negatively sloped at about 0-15 degrees	69.80%	30.20%
Table surface is deep enough to allow adequate room for workstation components	9.40%	90.60%	Keyboard is prevented from slipping	31.90%	68.10%
Adequate space to adjust height/ location of monitor	8.30%	91.70%	Wrists are relaxed and straight (neutral)	16.10%	83.90%
Materials used most often are arranged within 2.5ft-3ft	44.90%	55.10%	Wrist rest or parallel support armrests are padded and free of sharp edge	31.90%	68.10%
Storage drawers located under the desk/table do not restrict knee clearance.	54.00%	46.00%	Arms are close to body with elbows at 90-degree angle	16.10%	83.90%
Chair height and backrest tension/angle are easily adjustable	67.30%	32.70%	Wrist/ forearms are straight, parallel to the floor and do not rest on sharp edges.	31.90%	68.10%
Chair is equipped with a padded seat and back cushion.	60.70%	39.30%	Mouse is at same level as keyboard and within easy reach	13.00%	87.00%
Front edge of the seat pan is rounded and seamless.	15.80%	84.20%	Keyboard is ergonomic	85.30%	14.70%
Seat width and depth accommodate worker		100%	Mouse fits the hand of the worker	51.50%	48,50%
Seat front does not press against the back of knees and legs.	15.80%	84.20%	Monitor is directly in front of employee		100%
Chair has non-slippery upholstery with porous “breathable” fabric	22.70%	77.30%	Display screen is at an arm’s length away from your eyes	6.10%	93.90%
Backrest provides support for the worker's lower back (lumbar support).	6.40%	93.60%	Top line of display (print) is slightly below eye level	8.90%	98.10%
Backrest is at least 18” tall x 14” wide	22.70%	77.30%	Display is tilted slightly to reduce reflections and glare	7.20%	92.80%
Seat tilts back only slightly as the backrest tilts back	22.70%	77.30%	Display screen is clean and free of flickering	14.40%	85.60%
Chair swivels easily on casters	60.70%	39.30%	Brightness and contrast controls are adjusted for viewing comfort	0.80%	99.20%
Chair is supported with a five-leg pedestal base for stability	60.70%	39.30%	Window blinds or drapes are adjustable and can be closed when	6.90%	93.10%

Statement	No (N)	Yes (Y)	Statement	No (N)	Yes (Y)
			needed		
Pedestal base of chair is at least 24”around	60.70%	39.30%	Lighting levels are adjustable throughout the day	23.3%	76.7%
Neck rest provides support for neck	70.40%	29.60%	Face of display screen is at right (90 degree) angles to windows	16.10%	83.90%
Sit-up straight	29.60%	70.40%	Anti-glare screen/ filter is available	18.30%	81.70%
Sit back in the chair with feet flat on the floor or footrest		100%	Task lighting or desk lamp is adjusted to avoid glare and reflections	14,40%	85.60%
Feet are flat on the floor or on a footrest		100%	Shadows eliminated	14,40%	85.60%
3” – 6” of leg room between legs and workstation	6.90%	93.10%	Bright shiny objects out of view	19.70%	80.30%
Thighs are parallel to floor	2.50%	97.50%	Lights do not flicker	8.00%	92.00%
Worker uses a laptop and an external keyboard is used (tick if employee uses desktop)	69.80%	30.20%	Keyboard height is adjustable.;Keyboard is horizontal or negatively sloped at about 0-15 degrees	69.80%	30.20%
Worker uses a laptop and an external mouse is used (tick if employee uses desktop)	69.80%	30.20%		69.80%	30.20%

Table 5. Ergonomic compliance based on behavioral patterns

Statement	Sometimes (S)	Always (A)	Never (N)	Often (O)
Do you take breaks every 30 minutes to stretch and move around?	69.80%	0.50%	14.00%	15.60%
Do you apply the “20-20-20 optometric rule” when using your computer (take breaks from looking at your monitor every 20 minutes by looking 20 feet away for 20 seconds) to prevent eye strain?	43.70%	4.90%	23.20%	28.30%
Do you stop at appropriate times to eat and hydrate during the workday?	52.60%	13.70%		33.70%
Do you regulate the hours you work to allow adequate time offs for family and or personal recreation daily?	38.30%	22.10%	1.30%	38.30%
Do you try to maintain a good sitting position, maintaining the s-curve of the back during your work day?	59.60%	2.40%	2.70%	35.30%
Do you position your screen at a considerable distance away from your face, tilted slightly to reduce glare?	42.60%	27.20%	6.20%	24.00%
You do not work on your bed, leaning on either arm?	38.80%	0.50%	46.60%	14.00%
You do not work in other awkward positions (for example- under your work table, on the sofa, etc)?	239.60%	0.50%	52.00%	7.80%

Table 6. Employer support

Statement	Yes (Y)	No (N)	I Don't Know (I)
Is ergonomic training part of the onboarding process at your company?	19.70%	63.30%	17.00%
Have you ever been given ergonomic training by your employer?	19.40%	74.10%	6.50%
Does your employer provide a yearly "ergonomic" budget?	14.30%	46.60%	39.10%
Does your employer provide a yearly "office" budget, not necessarily for ergonomics?	66.80%	10.20%	33.00%
Is there any mention of ergonomic safety during your company meetings?	32.10%	65.00%	3.00%
Are you provided with health insurance?	55.30%	44.70%	

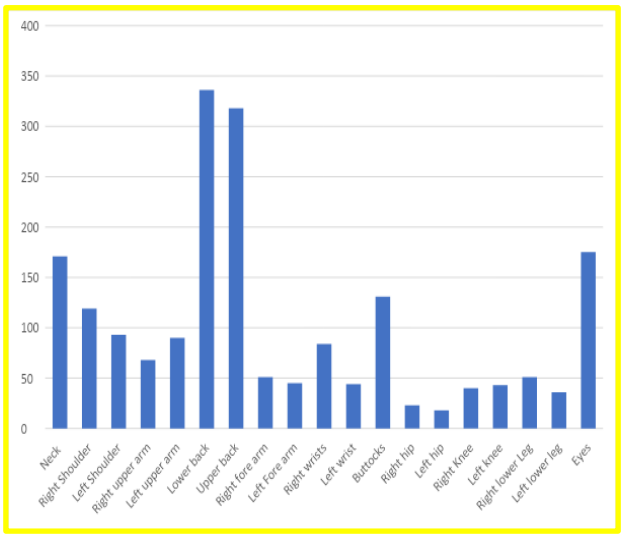

Fig. 7. Number of respondents experiencing symptoms for each body part

Table 8 compiles medical information related to respondents' experiences with musculoskeletal disorders. A substantial portion of respondents have never received a diagnosis or treatment for such disorders, while a significant percentage has sought medical attention. A considerable number do not regularly undergo medical checks, with a notable percentage engaging in self-medication using pain relief drugs. Also, a significant percentage is undergoing treatment for musculoskeletal issues and has sought alternative therapies like massage services for pain relief. Interestingly, a majority report experiencing discomfort or pain during activities unrelated to their job, signifying the pervasiveness of these issues beyond the workplace.

In assessing the workers' grasp of ergonomic principles, responses were rate based on a scoring system for each statement, gauging the level of agreement or disagreement. This method revealed that a substantial majority, approximately 66.31%, of remote workers exhibited a high understanding of ergonomics. Notably, 11.86% demonstrated very high knowledge, while 18.87% and 2.96% showcased moderate and low knowledge, respectively. These findings diverged from previous studies such as Nwokedi et al. [25] and Sirajudden and Siddi [26] which suggested a lower awareness of ergonomic principles among different occupational groups.

Regarding the ergonomic compliance of workspaces, the researcher utilized yes-or-no questions and a checklist, assigning scores to responses to ascertain the level of compliance. The analysis reflected a significantly high degree of ergonomic adherence in workspaces. About

29.36%, 42.86%, 22.91%, and 4.85% of workspaces were rated as having very high, high, moderate, and low compliance, respectively. This concurred with Skelly's findings [27] which also noted a substantial level of ergonomic compliance from a sample of reviewed workstations.

Examining the implementation of ergonomic principles based on workers' behavioral patterns, responses were scored to determine the level of compliance. Surprisingly, a significant portion of workers, around 48%, exhibited a low level of implementation. Only 8% demonstrated high compliance, while 44% fell into the moderate category. This contrasted notably with the evaluation of workspaces, where over 60% of respondents were categorized as having high or very high compliance. Regarding employer support to promote ergonomic safety compliance, responses indicated a generally low level of support from remote employers. Approximately 46% of responses fell within the very low category, with an additional 23% in the low category. Merely 15.36% exhibited very high support, while 3% showed high support, and 13% displayed moderate support. Analyzing prevalent musculoskeletal disorders among remote workers in Lagos, lower back pain emerged as the most widespread issue, affecting 90.5% of respondents. This aligns with previous studies by Tinubu et al. [28] and Gairola and Pant [29] which highlighted lower back pain as a prevalent musculoskeletal disorder among different occupational groups. Other areas of discomfort reported included the upper back, eyes, neck, buttocks, shoulders, and various limbs, albeit at varying frequencies.

Table 7. Musculoskeletal symptoms experienced by respondents

Body Part	Frequency (1-2 times weekly)	Frequency (3-4 times weekly)	Never Experienced	Frequency (Once every day)	Frequency (Several times daily)
Neck	14.30%	18.90%	53.90%	6.20%	6.70%
Right Shoulder	15.60%	15.10%	67.90%	0.30%	1.10%
Left Shoulder	8.40%	13.50%	74.90%	2.40%	0.80%
Left Upper Arm	18.10%	6.20%	75.70%		
Right Upper Arm	8.60%	3.50%	87.10%	0.50%	0.30%
Lower Back	6.20%	26.40%	9.40%	14.60%	43.40%
Upper Back	24.50%	20.20%	14.30%	14.80%	26.10%
Right Forearm	4.00%	4.90%	86.30%	4.90%	
Left Forearm	10.80%	0.80%	87.90%	1.90%	-
Right Wrist	4.60%	14.60%	77.40%	1.30%	2.20%
Left Wrist	9.40%	1.90%	88.10%	0.50%	-
Buttocks	10.20%	17.50%	64.70%	6.20%	1.30%
Right Hip	2.70%	1.90%	93.80%	1.60%	-
Left Hip	2.20%	0.50%	95.10%	1.90%	0.30%
Right Knee	3.80%	6.70%	89.20%	0.30%	-
Left Knee	5.90%	5.40%	88.40%	0.30%	0.30%
Right Lower Leg	10.20%	2.40%	86.30%	0.80%	0.30%
Left Lower Leg	6.50%	3.00%	90.00%	0.30%	-
Eyes	19.10%	14.30%	52.80%	11.30%	2.40%

Table 8. Medical information

Description	Percentage
Never diagnosed/treated for musculoskeletal disorder	77.90%
Diagnosed/treated for musculoskeletal disorder	22.10%
Visited hospital for diagnosis due to pain	46.40%
Did not visit hospital for diagnosis	46.40%
Undergo regular medical checks	40.40%
Do not undergo regular medical checks	59.60%
Tried self-medication with pain relief drugs	61.70%
Haven't tried self-medication	38.30%
Currently undergoing treatment for musculoskeletal disorder	58.00%
Not undergoing treatment for musculoskeletal disorder	42.00%
Used services of a masseuse for pain relief	63.30%
Haven't used services of a masseuse	36.70%
Experiences discomfort/pain in non-job-related activities	75.00%
Does not experience discomfort/pain in non-job-related activities	25.00%

Considering correlations between variables, the study rejected hypotheses suggesting no relationships between specific factors. It found positive correlations between employer support and ergonomic compliance, ergonomic compliance in workplaces and behavioral compliance, and worker knowledge of ergonomics and employer support. These findings emphasized the pivotal role of organizational support, in line with the PEO model Law et al., [30] and its influence on overall ergonomic compliance and self-efficacy.

4. CONCLUSION

In conclusion, ergonomic safety has not received the deserved attention with regards to remote work. Although most of the remote workers are knowledgeable about ergonomics, a lot more attention has been paid to workplace design and less on behavioral patterns. Also, the level of support from employers is really low. With the most prevalently affected body parts being lower back, upper back, neck, right shoulder, and eyes, more feasible control measures can be implemented once the workers get more attention from their employers regarding ergonomic safety. There is an urgent need to educate remote workers and employees on ergonomic safety, develop feasible measures for compliance checks, and work with authorities to enact laws to protect the health and safety of remote workers in the long run. Employers need to do more.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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