

# Review of Ergonomics and its impact on Musculoskeletal Disorder among Carpenters, Bricklayers and Automobile mechanics

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**ABSTRACT.** Most fatalities and injuries at workshops and sites can be traced to the work not working in a safe position, using the wrong tool for the job, or using the right tool the wrong way. The aim of this research is to investigate into musculoskeletal injuries and ergonomic impact among carpenters. The objectives are to identify the types of musculoskeletal injuries; find the effect of musculoskeletal injuries among carpenters and to determine the impact of ergonomic interventions. Convenience and purposive sampling techniques were used to select the sample size of 100 respondents. Questionnaires were used to take information from carpenters. Working to low standards, delay of work, lateness to work and loss of contract with respective means of 3.14; 3.01; 3.00 and 3.00 were identified as the effects of musculoskeletal injuries on carpenters. It was found that some of the factors of musculoskeletal injuries among construction workers are awkward posture, repetition, vibration, force and extreme temperature. This was also confirmed that the most and frequent factor that caused musculoskeletal injuries is extreme temperature, followed by awkward posture and vibration with respective means of 3.46, 3.42 and 3.40. This clarifies the fact that carpenters' attitude towards their health in an extreme temperate environment should be given ultimate priority.

**Keywords:** Ergonomics · Interventions, Carpenters, Musculoskeletal · Injuries ·

## I. INTRODUCTION

To work as a carpenter, one can develop several skills to be successful. Some of the most

important carpentry skills include specific technical knowledge in addition to physical strength. Learning how to develop and improve these skills can help to excel in a carpentry career. A carpenter is a construction professional who works with construction crews to build, adjust and repair wood frameworks in various construction projects. They work with their hands, using tools to build and install frameworks that last a lifetime!

### Carpenter responsibilities include:

- Read blueprints, drawings and sketches to fully grasp requirements
- Take measurements and calculate the size and amount of material needed
- Cut, shape and smooth lumber and other material (e.g. fiberglass) according to measurements
- Build window frames, doors, staircases and frame buildings by using raw materials or pre-constructed items
- Lay out floorings, roofings or drywalls ensuring they are leveled and compatible
- Carve and assemble furniture, cabinets, shelves and other items and install them where designated
- Inspect places and conduct repairs or maintenance
- Build scaffolding and other construction structures

### Requirements and skills

- Proven experience as carpenter
- Hands-on experience in working with carpentry materials

- Excellent understanding of carpentry techniques and methods of installation and construction
  - Proficient in using electrical and manual equipment and measurement tools (powered saws, hammers, rulers etc.)
  - Ability to read technical documents and drawings
  - Willingness to follow safety guidelines at all times
  - Good knowledge of English
  - Good understanding of basic math
  - Good physical condition and endurance
  - High school diploma; Successful completion of a carpentry apprenticeship program is required
- Carpentry skills are math skills, physical strength, communication, attention to detail, problem-solving, dexterity and mechanical skill.

The word "Ergonomics" comes from two Greek words "ergon", meaning work, and "nomos" meaning "laws" to denote the science of work [1]. The International Ergonomic Association [2] defines Ergonomics (or human factors) as "the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design or to optimize human well-being and overall system". A precise definition proposed by [4], which leads to its very fundamental nature states that "Ergonomics is the design and engineering of human-machine systems for the purpose of enhancing human performance". Ergonomics considers the physical and mental capabilities and limits of the worker as he or she interacts with tools, equipment, work methods, tasks, and the working environment [5]. [6] also said Ergonomics derives from two Greek words: 'ergon', meaning work, and 'nomos', meaning natural laws. Today, the word is used to describe the science of "designing the job to fit the worker, not forcing the worker to fit the job—thus, it is also the science of adapting work and working conditions to suit the worker". Common examples of ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands or legs; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward posture. Vibration and excessive heat or cold may also add risk to these work conditions. The level of risk depends on the intensity, frequency, and duration of the exposure to these conditions [7].

## II. PROBLEM STATEMENT

Carpentry, by its very nature, is a problem for ergonomists as it requires work above shoulder level and below knee height. Materials may also be heavy and/or inconveniently sized and shaped, thus presenting manual material handling problems [7]. [8], stated that "by any epidemiological criteria, occupational musculoskeletal injuries represent a significant pandemic problem in the United States with gigantic effects on the quality of life of millions of people's lives every year." Numerous carpentry tasks pose significant risks to workers. To eliminate or mitigate these risks, it would be necessary to identify work risks in carpentry and assess their impact on workers, of even minimal ergonomics on the carpentry [7]. Carpenters due to pose in a certain posture in their everyday work and the response from them will be either a waist pain, spinal cord pain or other musculoskeletal disorders. This has made numerous construction workers to depend on drugs and other on prescribed medication. The outcome of this has affected their work output. That is, their ability to work effectively when they have taken drug and when they are not.

### 2.1 Aim of the Study

The aim is to investigate into musculoskeletal injuries and ergonomics impact among carpenters.

### 2.2 Objectives

The objectives of the study are:

1. to identify the types of musculoskeletal injuries
2. to find the effect of musculoskeletal injuries among construction workers
3. to determine the impact of ergonomic interventions

### 2.3 Ergonomics in Perspective

The goal of the science of ergonomics is to find the "best fit" between the carpenters and the job condition. Ergonomics tries to come up with solutions to make sure carpenters stay safe, comfortable, and productive [9]. Carpenters are exposed to a variety of ergonomic hazards, including awkward postures, heavy lifting, forceful exertions, vibrations, and repetitive motions [10]. They also experience an elevated risk of musculoskeletal disorders [11].

### 2.4 Types of Musculoskeletal Injury

The [12] has characterized "work-related" diseases as multifactorial to indicate that a

number of risk factors (e.g., physical, work organizational, psychosocial, individual, and socio-cultural) contribute to causing these diseases. The sum of these challenges affects the working capacity and decreases the satisfaction of the individual. Furthermore, it decreases the profit of the organizations. International Commission on Occupational Health defines MSD as both disorders and diseases of the musculoskeletal system that have a causal determinant that is work related.

[3] defines MSDs

as injuries and disorders of the muscles, nerves, tendons, ligaments, cartilage and spinal discs which are directly and indirectly related to work or the work environment. Work related Musculoskeletal disorders (WMDs) are casually linked to physical loads resulting from occupational activities and believe to occur when mechanical workload is higher than physical capacity of human body. However, these relate to different body regions and occupational work.

The International Labour Organization (ILO) estimates that some 6000 workers die each day worldwide and 337 million people are victims of work related accidents and illness arising from occupational injuries [13]. Injuries to the musculoskeletal system can

be classified according to the body structures that are damaged. Some injuries may involve more than one structure.

[14] suggested that there are four basic types of musculoskeletal injuries, and these are: Fracture; Dislocation; Sprain and Strain.

- **Fracture:** A break or disruption in bone tissue. This may be open or closed.

- **Dislocation:** A displacement or separation of a bone from its normal position at a joint.

- **Sprain:** A partial or complete tearing or stretching of ligaments and other tissues at a joint.

- **Strain:** A stretching and tearing of muscle or tendon fibers. Alireza and Aref, 2013 attribute the effect of these types of musculoskeletal injury as Awkward posture; Repetition; Static posture; Vibration; Force and Extremity temperature.

### **Awkward Posture.**

Awkward posture is the position of the body outside of neutral that is a best location of each joint that can provide the strength and control. In the construction industry prolonged reaching, twisting, bending, kneeling, squatting, working over-

head with your hands or arms, or holding fixed positions are a awkward posture. Work method or workplace dimension can contribute to create awkward posture. Therefore, awkward posture can associate to raising the rate of injury in the wrist, shoulder, neck, and low back and this can cause low output of workers [15].

### **Repetition.**

Performing the similar motion of the work in every few seconds for more than two hours without any rest and break time is mentioned as a repetition work. Repetition work can increase the rate of injury in the local tissue of the body [15].

Repetitive or sustained shoulder elevation during occupational tasks has been identified as a significant risk factor for shoulder tendonitis or non-specific shoulder pain [16].

### **Static Posture.**

Static postures or positions that a worker must hold for long periods of time, can restrict blood flow and damage muscles. Same posture or position of the body is held throughout the exertion (no movement) or lack of movement reduces circulation and causes muscle tension which can contribute to injury [17].

### **Vibration.**

Vibration is defined as any movement of the body in one fixed point while using power tools or equipment while driving which can put stress on the tissues of the fingers, hand and arms [15].

Many jobs in construction involve the use of hand-held power tools such as pneumatic breakers and disc grinders. The vibration from such equipment may cause carpal

tunnel syndrome. The disease affects the fingers and hands. In the long run, permanent damage to the nerves will result in loss of the sense of touch and dexterity [9].

### **Force.**

Forces vary with the equipment type, design, and state of repair. Recognize that when applying force to an object, forces are transferred through your body. Forces transferred to your body are affected by not only the amount of force, but also the distance through which a force is applied. Choosing equipment that requires less force to activate and requires a shorter activation distance can reduce force transferred to your body. Ensuring that equipment is in good working order helps reduce the overall force to the body [18].

The amount of physical effort that is required by the worker to do the task and maintain the equipment and tools in a limited period is introduced as force. Utilizing the muscles much harder than normal by applying extreme pressure causes stress on the muscles, tendons and joints [15].

### Extreme Temperature.

Extreme temperature is of the environmental features that can be divided into extreme heat and extreme cold temperature. Extreme heat can reinforce fatigue and heat stress. On the other hand, extreme cold can narrow the blood vessels and decline sensitivity and harmonization of body part [15].

### 2.5 The Impact of Ergonomic

The carpentry industry is a dangerous place to work as its physical processes entail various ergonomic-related problems [19]. It faces many occupational injuries and fatal risks, making it both unique and challenging to study. Carpentry is always risky because of outdoor operations [20]. Carpentry industry is a complex industry that employs a large number of workers. Comparisons have often been made between the construction industry and other industrial sectors and the chance of being disabled by injury or serious illness is much greater than for workers in most other industrial sectors. As noted by [6], developing countries encounter a number of ergonomic-related problems as far as the carpentry industries are concerned. This can be attributed to the absence of the strong regulations and the weak implementation of the few existing ones owing to the inadequate human and material resources to aid in the enforcement of these regulations [21, 22]. A number of these problems have their source in the nature of the work processes on site which happen to be more suboptimal as they are made worse by the use of manual approach in most developing countries, when a mechanical procedure would be very much suitable [6, 23].

## III. RESEARCH METHODOLOGY

### 3.1 Research Design

The research is primarily quantitative in nature. The research strategy that was used to implement the comprehensive literature review on the above objectives was reviewed to see what other researchers have done, to gather the information on the types of musculoskeletal injuries, effect of musculoskeletal injuries among construction workers and the ergonomic interventions from previous researcher.

- **Research Instruments.** Questionnaires, personal interviews and observation forms were the main data collecting instrument used in the study. A set of questionnaires were designed for this research was for the artisans
- **Sampling Technique.** Convenience and purposive sampling techniques were used to select the sample size.
- **Data Analysis.** The data was analyzed using the descriptive statistics that comprises mean and tables

## IV. FINDINGS AND DISCUSSION

### 4.1 Types of Musculoskeletal Injuries

The research as one of the objectives of the study sought to find out about the types of musculoskeletal injuries at the various carpentry sites. The results after the analysis of the data from the field survey are presented under the headings that follow.

### 4.2 Types of Musculoskeletal Injuries Encountered by Respondents

Table 1 makes it clear that fracture, dislocation, sprain and strain have been the different types of musculoskeletal injuries usually encountered by carpenters. Field survey shows that both sprain and strain had the strongest mean of 3.39 and 3.14 respectively.

**Table 1.** Musculoskeletal injuries encountered by respondents

Type of injury	Strongly agree (5)	Agree (4)	Neither (3)	Disagree (2)	Strongly disagree (1)	Total	Mean
Fracture	18 90	20 80	12 36	35 70	15 15	291	2.91
Dislocation	9 45	21 84	35 105	18 36	17 17	287	2.87
Sprain	35 175	15 60	17 51	20 40	13 13	339	3.39
Strain	28 140	19 76	12 36	21 42	20 20	314	3.14

Source: FieldSurvey,2022

### 4.3 The Factor of Musculoskeletal Injuries on the Activities of Carpenters

In the daily activities of the workers, they are exposed to different factors. Respondents stated in the questionnaire the factor they are usually exposed to. The Table 2 highlights the factors which

they are exposed to; these including awkward posture, repetition, vibration and extreme body temperatures. Table 2 shows a greater number of the tradesmen agree and disagree to extreme temperature with a mean of 3.46 while some agree and strongly agree to awkward posture and forces which have a strong mean of 3.42 and 3.03 respectively.

**Table 2.** Factors of musculoskeletal injuries on the activities of carpenters

Factors	SA(5)	A(4)	N(3)	D(2)	SD(1)	Total	Mean
Awkward posture	32 160	1872	2874	14 28	8 8	342	3.42
Repetition	18 90	20 80	22 66	12 24	2828(7)	282	2.82
Static posture	17 85	15 60	1854	28 56	22 22	277	2.77
Vibration	25 125	32 128	1339	18 36	1212	340	3.40
Force	21105	2080	2987	11 22	9 9	303	3.03
Extreme temperature	29145	16 72	2266	30 60	3 3	346	3.46

Source: FieldSurvey,2022

### 4.4 Nature of Respondents' Work

Table 3 shows that carrying heavy loads, working on your knees and stretching to work overhead were the nature of work that affected most respondent with respect to means of 2.73; 2.97; and 3.08.

It can therefore be deduced from the data in the Table 3 that most of the respondents indicated that they carry heavy loads, working on their knees and stretching to work overhead in their daily working activities.

**Table 3.** Nature of respondents' work

Nature of work	SA(5)	A(4)	N(3)	D(2)	SD(1)	Total	Mean
Carrying heavy loads	1890	15 60	1751	2244	28 28	273	2.73
Working on your knees	15 75	28 112	1854	1734	22 22	297	2.97
Stretching to work overhead	23 115	10 40	27 91	22 44	18 18	308	3.08

Source: FieldSurvey,2022

### 4.5 Effect of the Musculoskeletal Injuries on the Working Conditions of Respondents

As part of the injuries encountered, carpenters are affected in one or more ways. Working to low

standards, delay of work, loss of contract and lateness to work were some of the critical effects as stated in Table 4, they had mean scores of 3.14; 3.01, 3.00 and 3.00 respectively.

**Table 4.** Effects of the musculoskeletal injuries on the working conditions

Effects	Strongly agree(5)	Agree(4)	Neutral (3)	Disagree(2)	Strongly disagree(1)	Total	Mean
Lateness to work	22 110	18 72	18 54	22 44	20 20	300	3.00
Absenting yourself from work	18 90	23 92	17 51	24 48	18 18	299	2.99
Working to low standards	25 125	18 72	22 66	16 32	19 19	314	3.14
Working not to specifications	17 85	27 108	14 42	22 44	20 20	299	2.99
Delay of work	28 140	12 48	15 45	23 46	22 22	301	3.01
Shortage of money	19 95	25 100	16 48	15 30	25 25	298	2.98
Loss of concentration	18 90	17 68	22 66	28 56	15 15	295	2.95
Loss of contract	21 105	19 76	18 54	23 46	19 19	300	3.00

Source: Field Survey, 2022

Sprains and types were first ranked as most injury that occur to the carpenters. Followed by strain but fracture and dislocation were below mean of 3.00.

## V. CONCLUSION

The study depicted that musculoskeletal injuries occur to carpenters. It was also found that injuries including fractures, dislocations, sprains and strains occur at various carpentry sites and this affects the working abilities of the carpenters by making them lose concentration during work, do shoddy work, work not to standard and delay the duration of their work to a great extent. However, some carpenters sites appear to have tools which when used, reduce workers' exposure to these musculoskeletal injuries but a greater number of workers do not have any idea on them. This therefore appears to be increasing the number of carpenters who get exposed to musculoskeletal injuries at their jobsites.

### 5.1 Recommendations

Based on the findings of the study, the researcher recommends the following:

1. There is the need for the offer of extensive education on carpenters' exposure to musculoskeletal injuries and the effects it has on their work performance. This will help reduce the number of injuries that occur at work sites as the carpenters will take much precaution in their operations.

2. Also, the introduction of musculoskeletal injuries reducing tools such as locally made pulleys to aid in lifting heavy loads to heights at the various construction sites and that will go a long way to cut down the number of injuries at the sites. Carpenters must endeavor to make use of these tools in order to prevent injuries at the sites.
3. Moreover, there is the need to ensure that carpenters at the various carpentry sites, both masons and steel benders should have adequate knowledge and training on the tools they use.
4. In addition, the government and other NGOs in the country can offer their help through the provision of funds to provide good and required tools and equipment for carpenters and also offer support for carpenters displaced through musculoskeletal injuries.
5. Efforts must be made by the manager's or leaders of carpenters at the various carpentry sites to ensure strict adherence to safety measures at the sites.
6. There should be a requirement by law for all involving in any carpentry work before the onset, to obtain the service of a qualified and licensed safety and health practitioner to be in charge of health and safety practice on the building site.
7. Lastly, carpenters must make it a habit to visit the hospital from time to time to enable them know their health standard and also try to treat any level of musculoskeletal injuries at the hospital.

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## Ergonomics and its impact on Musculoskeletal Disorder among Bricklayers

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**Abstract.** Most fatalities and injuries at construction sites can be traced to the workernot working in a safe position, using the wrong tool for the job, or using the right tool the wrong way. The aim of this research is to investigate into musculoskeletal injuries and ergonomic impact among bricklayers. The objectives are to identify the types of musculoskeletal injuries; find the effect of musculoskeletal injuries among bricklayers and to determine the impact of ergonomic interventions. Convenience and purposive sampling techniques were used to select the sample size of 50 respondents. Questionnaires were used to take information from bricklayers. The results revealed that fracture and strain were the major injuries recorded with means of 3.18 and 3.06 respectively. Shortage of money, Loss of concentration, and working not to specification with respective means of 3.16; 3.06; and 3.04 were identified as the effects of musculoskeletal injuries on bricklayers. It was found that some of the factors of musculoskeletal injuries among bricklayers are awkward posture, repetition, vibration, force and extreme temperature. This clarifies the fact that bricklayers attend to their health needs.

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### I. INTRODUCTION

The word "Ergonomics" comes from two Greek words "ergon", meaning work, and "nomos" meaning "laws" to denote the science of work [1]. The word ergonomics was created in 1857 by Wojciech Jastrzebowski in a philosophical narrative, "based upon the truths drawn from the Science of Nature" [1]. Ergonomics is a systems-oriented discipline, which now applies to all aspects of human activity. The International Ergonomic Association [2] defines Ergonomics (or human factors) as "the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design or to optimize human well-being and overall system "Ergonomics removes barrier to quality, productivity, and safe human performance

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- **Strain:** A stretching and tearing of muscle or tendon fibers. Alireza and Aref, 2013 attribute the effect of these types of musculoskeletal injury as Awkward posture; Repetition; Static posture; Vibration; Force and Extremity temperature.

**Awkward Posture:** Awkward posture is the position of the body outside of neutral that is a best location of each joint that can provide the strength and control. In the construction industry, prolonged reaching, twisting, bending, kneeling, squatting, working overhead with your hands or arms, or holding fixed positions are areas of awkward posture. Work method or workplace dimension can contribute to create awkward posture. Therefore, awkward posture can be associated with raising the rate of injury in the wrist, shoulder, neck, and low back and this can cause low output of workers [15].

**Repetition:** Performing the same motion of the work in every few seconds for more than two hours without any rest and break time is mentioned as repetition work. Repetition work can increase the rate of injury in the local tissue of the body [15]. Repetitive or sustained shoulder elevation during occupational tasks has been identified as a significant risk factor for shoulder tendonitis or non-specific shoulder pain [16].

**Static Posture:** Static postures or positions that a worker must hold for long periods of time, can restrict blood flow and damage muscles. Same posture or position of the body is held throughout the exertion (no movement) or lack of movement reduces circulation and causes muscle tension which can contribute to injury [17].

**Vibration:** Vibration is defined as any movement of the body in one or more directions while using power tools or equipment while driving which can put stress on the tissues of the fingers, hand and arms [15]. Many jobs in construction involve the use of hand-held power tools such as pneumatic breakers and disc grinders. The vibration from such equipment may cause carpal tunnel syndrome. The disease affects the fingers and hands. In the long run, permanent damage to the nerves will result in a loss of the sense of touch and dexterity [9].

**Force:** Forces vary with the equipment type, design, and state of repair. Recognize that when applying

force to an object, forces are transferred through your body. Forces transferred to your body are affected by not only the amount of force, but also the distance through which a force is applied. Choosing equipment that requires less force to activate and requires a shorter activation distance can reduce force transferred to your body. Ensuring that the equipment is in good working order helps reduce the overall force to the body [18]. The amount of physical effort that is required by the worker to do the task and maintain the equipment and tools in a limited period is introduced as force. Utilizing them much harder than normal by applying extreme pressure causes stress on the muscles, tendons and joints [15].

### Extreme Temperature.

Extreme temperature is of the environmental feature that can be divided into extreme heat and extreme cold temperature. Extreme heat can reinforce fatigue and heat stress. On the other hand, extreme cold can narrow the blood vessels and decline sensitivity and harmonization of body part [15].

### 2.5 The Impact of Ergonomic

The construction industry is a dangerous place to work as its physical processes entail various ergonomic-related problems [19]. The construction industry faces many occupational injuries and fatality risks, making it both unique and challenging to study. Construction is always risky because of outdoor operations [20]. Construction industry is a complex industry that employs a large manpower. Comparisons have often been made between the construction industry and other industrial sectors and the chance of being disabled by injury or serious illness is much greater than for workers in most other industrial sectors. As noted by [6], developing countries encounter a number of ergonomic-related problems as far as the construction industries are concerned. This can be attributed to the absence of the strong regulations and the weak implementation of the few existing ones owing to the inadequate human and material resources to aid in the enforcement of these regulations [21, 22]. A number of these problems have their source in the nature of the work processes on site which happen to be more suboptimal at

they are made worse by the use of manual approach in most developing countries, when a mechanical procedure would be very much suitable [6, 23].

## III.

### RESEARCH METHODOLOGY

#### 3.1 Research Design

The research is primarily quantitative in nature. The research strategy that was used to implement the comprehensive literature review on the above objectives was reviewed to see what other researchers have done, to gather the information on the types of musculoskeletal injuries, effect of musculoskeletal injuries among construction workers and the ergonomic interventions from previous researcher.

- **Research Instruments.** Questionnaires, personal interviews and observation forms were the main data collecting instrument used in the study. Two sets of questionnaires were designed for this research, one set was for the artisans and another set for doctors.
- **Sampling Technique.** Convenience and purposive sampling techniques were used to select the sample size.
- **Data Analysis.** The data was analyzed using the descriptive statistics that comprises mean, tables and graphs.

## IV. FINDINGS AND DISCUSSION

#### 4.1 Types of Musculoskeletal Injuries

The researcher as one of the objectives of the study sought to find out about the types of musculoskeletal injuries at the various construction sites. The results after the analysis of the data from the field survey are presented under the headings that follow.

#### 4.2 Types of Musculoskeletal Injuries Encountered by Respondents

Table 1 makes it clear that fracture, dislocation, sprain and strain have been the different types of musculoskeletal injuries usually encountered by bricklayers. Field survey shows that both fracture and strain had the strongest mean of 3.18 and 3.06 respectively.

**Table 1** Musculoskeletal injuries encountered by respondents

Type of injury	Strongly agree(5)	Agree(4)	Neither(3)	Disagree(2)	Strongly disagree(1)	Total	Mean
Fracture	12 60	11 44	6 18	16 32	05 05	159	3.18
Dislocation	8 40	15 60	7 12	9 18	11 11	150	3.00
Sprain	7 35	9 36	11 33	15 30	8 8	142	2.84
Strain	15 15	6 24	9 27	7 14	13 13	153	3.06

Source: Field Survey, 2022

### 4.3 The Factor of Musculoskeletal Injuries on the Activities of Bricklayers

In the daily activities of the bricklayers, they are exposed to different factors. Respondents stated in the questionnaire the factors they are usually exposed. The Ta

ble 2 highlights the factors which they are exposed to; these include awkward posture, repetition, vibration and extreme body temperatures. Table 2 shows a greater number of the tradesmen strongly agree and agree to repetition and static posture which were having a strong mean of 3.56 and 3.02 respectively.

**Table 2** Factors of musculoskeletal injuries on the activities of carpenters

Factors	SA(5)	A(4)	N(3)	D(2)	SD(1)	Total	Mean
Awkward posture	11 55	6 24	12 36	5 10	16 16	141	2.82
Repetition	16 80	12 48	9 27	10 20	3 3	178	3.56
Static posture	9 45	10 40	16 48	3 6	12 12	151	3.02
Vibration	3 15	16 64	12 36	9 18	10 10	143	2.86
Force	10 50	8 32	12 36	6 12	14 14	144	2.88
Extreme temperature	4 20	8 32	17 51	12 24	9 9	136	2.72

Source: Field Survey, 2022

### 4.4 Nature of Respondents' Work

Table 3 shows that carrying heavy loads; working on your knees and stretching to work overhead were the nature of work that affected most respondent with respective means of 3.26; 3.22; and 2.74.

It can therefore be deduced from the data in the Table 3 most of the respondents indicated that they carry heavy loads; working on their knees and stretching to work overhead in their daily working activities.

**Table 3** Nature of respondents' work

Nature of work	SA(5)	A(4)	N(3)	D(2)	SD(1)	Total	Mean
Carrying heavy loads	17 85	8 32	6 18	9 18	10 10	163	3.26
Working on your knees	9 45	16 64	10 30	7 14	8 8	161	3.22
Stretching to work overhead	10 50	8 32	7 21	9 18	16 16	137	2.74

Source: Field Survey, 2022

#### 4.5 Effect of the Musculoskeletal Injuries on the Working Conditions of Respondents

As part of the injuries encountered, bricklayers are affected in one or more ways: shortage of money, loss of concentration, and working not to specifications were some of the critical effects as stated in Table 4, they had mean scores of 3.16; 3.06 and 3.04 respectively.

Table 4 Effect of the musculoskeletal injuries on the working conditions

Effects	Strongly agree(5)	Agree(4)	Neutral (3)	Disagree(2)	Strongly disagree(1)	Total	Mean
Lateness to work	5 25	6 24	20 60	8 16	11 11	136	2.72
Absenting yourself from work	2 10	8 32	15 45	7 14	18 18	119	2.38
Working to low standards	3 15	5 20	20 60	16 32	6 6	133	2.66
Working not to specifications	4 20	7 28	30 90	5 10	4 4	152	3.04
Delay of work	5 25	10 40	6 18	13 26	16 16	125	2.50
Shortage of money	10 50	15 60	8 24	7 14	10 10	158	3.16
Loss of concentration	8 40	6 24	19 57	15 30	2 2	153	3.06
Loss of contract	5 25	3 12	20 69	6 12	16 16	125	2.50

Source: Field Survey, 2022

### V. CONCLUSION

The study depicted that musculoskeletal injuries occur to construction workers. It was also found that injuries including fractures, dislocations, sprains, and strains occur at various construction sites and this affects the working abilities of the workers by making them lose concentration during work, do shoddy work, work not to standard and delay the duration of their work to a great extent. However, some construction sites appear to have tools which when used, reduce workers' exposure to these musculoskeletal injuries but a greater number of workers do not have any idea on them. This therefore appears to be increasing the number of workers who get exposed to musculoskeletal injuries at their jobsites.

#### 5.1 Recommendations

Based on the findings of the study, the researcher recommends the following:

1. There is the need for the offer of extensive education on bricklayers' exposure to musculoskeletal injuries and the effects it has on their work performance. This will

help reduce the number of injuries that occur at worksites as the bricklayers will take much precaution in their operations.

2. Also, the introduction of musculoskeletal injuries reducing tools such as locally made pulleys to aid in lifting heavy loads to heights at the various construction sites and that will go a long way to cut down the number of injuries at the sites. Workers must endeavor to make use of these tools in order to prevent injuries at the sites.

3. Moreover, there is the need to ensure that bricklayers at the various construction sites, should have adequate knowledge and training on the tools they use.

4. In addition, the government and other NGOs in the country can offer their help through the provision of funds to provide good and required tools and equipment for construction workers and also offer support for workers displaced through musculoskeletal injuries.

5. Efforts must be made by the manager's or leaders of bricklayers at the various construction sites to ensure strict adherence to safety measures at the sites.

6. There should be a requirement by law for all involving in any construction work before the onset, to obtain the service of a qualified and licensed safety and health practitioner to be in charge of health and safety practice on the building site.

7. Lastly, construction bricklayers must make it a habit to visit the hospital from time to time to enable them to know their health status and also try to treat any level of musculoskeletal injuries at the hospital.

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### **Ergonomics and its impact on Musculoskeletal Disorder among Automobile Mechanics**

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**Abstract.** Most fatalities and injuries at repair workshops or sites can be traced to the workers not working in a safe position, using the wrong tool for the job, or using the right tool the wrong way. The aim of this research is to investigate into musculoskeletal injuries and ergonomic impact among automobile mechanics. The objectives are to identify the types of musculoskeletal injuries; find the effect of musculoskeletal injuries among them and to determine the impact of ergonomic interventions. Convenience and purposive sampling techniques were used to select the sample size of 30 respondents. Questionnaires were used to take information from the automobile mechanics. The result revealed that strains and sprain were the major injuries recorded with means of 3.70 and 3.57 respectively. Delay of work, loss of concentration, and working not to specification with respective means of 3.00; 2.37; and 2.13 were identified as the effects of musculoskeletal injuries on automobile mechanics workers. It was found that some of the factors of musculoskeletal injuries among automobile mechanics are awkward posture, repetition, vibration, force, and extreme temperature. Result shows that the most and frequent factor that caused musculoskeletal injuries is repetition followed by force with respective means of 4.13 and 3.83. This clarifies the fact that automobile mechanics' attitude towards their health needs to be taken seriously to avoid their well-being being compromised.

**Keywords:** Ergonomics Interventions, automobile mechanics, Musculoskeletal Injuries.

### **I. INTRODUCTION**

The word "Ergonomics" comes from two Greek words "ergon", meaning work, and

"nomos" meaning "laws" to denote the science of work [1]. The word ergonomics was created in 1857 by Wojciech Jastrzebowski in a philosophical narrative, "based upon the truths drawn from the Science of Nature" [1]. Ergonomics is a systems-oriented discipline, which now applies to all aspects of human activity. The International Ergonomic Association [2] defines Ergonomics (or human factors) as "the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data, and methods to design in order to optimize human well-being and overall system". ErgoWeb Inc. defines ergonomics in a proactive sense: "Ergonomics removes barriers to quality, productivity, and safe human performance in human-machine systems by fitting products, equipment, tools, systems, tasks, jobs, and an environment to people" [3]. A precise definition proposed by [4]. Which leads to its very fundamental nature states that "Ergonomics is the design and engineering of human-machine systems for the purpose of enhancing human performance". Ergonomics considers the physical and mental capabilities and limits of the worker as he or she interacts with tools, equipment, work methods, tasks, and the working environment [5]. [6] also said Ergonomics derives from two Greek words: 'ergon', meaning work, and 'nomos', meaning natural laws. Today, the word is used to describe the science of "designing the job to fit the worker, not forcing the worker to fit the job—thus, it is also the science of adapting work and working conditions to suit the worker". Common examples of ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands or legs; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward postures. Vibration and excessive heat or cold may also add risk to these work conditions. The level of risk depends on the intensity, frequency, and duration of the exposure to these conditions [7].

### **II. PROBLEM STATEMENT**

Automobile mechanics, by its very nature, is a problem for ergonomists as it requires work above shoulder level and below knee height. Materials may also be heavy and/or inconveniently sized and difficult to fix in, thus presenting manual material handling problems [7], [8], stated that "by any epidemiological criteria, occupational musculoskeletal injuries represent a pandemic problem in the United States with gigantic effects on the quality of life of millions of people's lives every year."

Numerous Automobile mechanic tasks pose significant risks to workers. To eliminate or mitigate the risks, it would be necessary to identify work risks in construction and assess

the impact on workers, of even minimal ergonomics on the construction process [7].

Automobile

mechanics due to pose in a certain posture in their everyday work and the response from them will be either back pain, spinal cord pain or other musculoskeletal disorders. This has made numerous Automobile mechanic to depend on drugs and other on prescribed medication.

The outcome of this has affected their work output. That is; their ability to work effectively when they have taken drug and when they are not.

## 2.1 Aim of the Study

The aim is to investigate into musculoskeletal injuries and ergonomics impact among Automobile mechanics.

## 2.2 Objectives

The objectives of the study are:

1. to identify the types of musculoskeletal injuries
2. to find the effect of musculoskeletal injuries among Automobile mechanics
3. to determine the impact of ergonomic interventions

## 2.3 Ergonomics in Perspective

The goal of the science of ergonomics is to find the "best fit" between the worker and the job condition. Ergonomics try to come up with solution to make sure workers stay safe, comfortable, and productive [9].

Auto

mechanics are exposed to a variety of ergonomic hazards, including awkward postures, heavy lifting, forceful exertions, vibrations, and repetitive motions

[10]. They also experience an elevated risk of musculoskeletal disorders [11].

Below are some of the common work related injuries for car mechanics, with auto shop safety tips that can reduce the risk.

- Sprains and Tears. Automotive technicians do a lot of heavy lifting. ...
- Repetitive Motion Disorders. ...
- Chemical and Particle Exposure. ...
- Slips, Trips, and Falls. ...
- Mechanical Injuries.

Common injuries for mechanics include sprains, strains, tears, chemical burns, eye injuries, loss of limbs/digits, and falls. According to the Bureau of Labor Statistics, over 620,000 were employed in the automotive service industry as of May 2020. That year, nearly 10,000 suffered nonfatal occupational injuries and illnesses that required days off work.<sup>1</sup> However, most incidents can be

prevented. Below we will cover some of the common work related injuries for car mechanics, with auto shop safety tips that can reduce the risk.

1. Sprains and Tears: Automotive technicians do a lot of heavy lifting. This puts them at risk of back injuries and various other types of sprains and strains. Some of the most severe automotive shop accidents can happen while operating heavy-duty tools, moving machinery, or working under the hood of a car. The resulting injuries can have long-term, life-changing consequences.

It is possible to mitigate the risk by encouraging employees to perform warm-up exercises in the morning. Just 10 minutes of stretching and flexing can reduce the chances of workers suffering strains, sprains, and tears. Also, one can use safer techniques for lifting heavy objects and mechanical lifting devices for the heaviest items.

2. Repetitive Motion Disorders : Repetitive motions, such as turning manual screwdrivers, using wrenches, and frequent lifting can put constant stress on one part of the body. Muscles and ligaments can be seriously strained by working in an awkward position for long periods of time. Long-term and even permanent injuries can result, but their effects may develop gradually. Repetitive motion injuries like carpal tunnel syndrome can be prevented by having another worker assist in a job, using the proper tools and machinery, and ensuring employees get adequate breaks and rest time. More frequent, shorter rest periods help relieve strain and fatigue. Encourage workers to maintain good posture and rotate them to different tasks so they're not always relying on the same movement.

## III. CHEMICAL AND PARTICLE EXPOSURE

Paints, primers, fillers, and polishes are used throughout the day in auto body repair shops. Hazardous chemicals can cause respiratory harm when inhaled or burn the skin or eyes. Many chemicals are also flammable. A lot of tools and machinery can release particles into the air, such as cutters, grinders, and buffers. Some automotive components, such as older clutch and brake systems, contain asbestos, which puts workers at risk of exposure.

Proper labeling is the first line of defense against chemical exposure. Potentially hazardous products should come with information on safe handling and how to handle a case of exposure. Containers should be checked for leaks, expiration dates, and for tight closure. When handling

chemicals, workers should wear protective gloves and goggles with side shields. Wearing long-sleeved shirts and pants protects workers from chemicals and particles that can cut or puncture the skin.

#### . Slips, Trips, and Falls



Grease, paint, and a variety of liquids used in an auto shop can be quite slippery. It's not uncommon for these to spill onto the floor. If an unsuspecting worker walks over a slick area, they can fall and suffer bruises, bone fractures, or concussions. An accidental fall can even result in death.

Fortunately, these common injuries for mechanics can be easily prevented by quickly cleaning up spills when they occur. Put up warning signs or cones to alert workers of slick areas. Also encourage them to wear closed-toed, anti-skid shoes that are more resistant to slipping.

#### IV. MECHANICAL INJURIES

Chains, winches, sprayers, compressors, shears, grinders, and other equipment can easily cause cuts and lacerations if misused. One wrong move can cause a burn or crush a worker's hand. Many have suffered severed fingers and limbs in this manner as well.

To reduce the risk of injury, make the operating instructions of power tools and equipment accessible, and train employees how to use each tool appropriately. Where necessary, install tool/machine guards. There should also be a designated cabinet or space to store tools after a job is complete. Also, be sure to properly inspect and maintain these items. Another preventative measure is to supply protective gear and proper clothing and uniforms to your staff.



#### Prudential Uniforms for Mechanic Safety

Source: <https://www.bls.gov/iif/oshwc/case/osn-automotive-service-technicians-and-mechanics-2016-20.htm>.

#### Safety Rules for Automotive Repair Shops

Working on vehicles can be a fun, exciting, and rewarding career. However, repair shop owners and their staff need to ensure the proper safety precautions and rules are implemented and followed at all times. Safety measures help protect employees from accidental injuries to themselves, their co-workers, customers, and the vehicles they are repairing. The following is a list of general safety tips every repair shop should use to keep everyone safe.

- Never smoke in or near repair bays or garages. Vehicles contain flammable and combustible fluids that can easily be set on fire if hot ash from a cigar or cigarette were to come into contact with such materials.
- Keep work areas clean and organized. Pick up tools and use tool cabinets to keep walkways clear and free from clutter. Whether it's a workbench, the workshop floor, toolboxes, or the office, keeping your workspace free from clutter and organizing tools and equipment correctly can prevent a number of dangerous workplace risks and help maintain overall shop safety. Falling over discarded tools, being unable to find the necessary safety equipment in an emergency, or having to stretch or abandon a vehicle or car part in a precarious position to find the right tools are all instances that could potentially be dangerous to workers and other staff.
- Never wear loose clothing or clothing that is ripped or torn. To prevent employees from wearing unacceptable attire, it is recommended to obtain customized uniforms and work apparel from a qualified uniform service company.
- Wear protective gear at all times, as appropriate for the repair. Goggles, gloves, and



ear protection should be worn when making certain types of repairs.

- Make sure fire extinguishers are easily acceptable and appropriate for all potential fire types. In the event of a fire, extinguishers need to be accessed quickly and be charged with the right materials to put out the type of fire: i.e., gas, oil, electrical, and so on.
- Always disconnect the battery when working on electrical systems and near/around electrical wiring. Even when the vehicle is off, there is still the potential for current to pass through electrical wiring.
- Never place hands, tools, or other objects near the engine while it is running. The moving parts and components could cause injury to a person or the vehicle itself.
- Never work underneath a vehicle unless it has been properly supported. Raising the vehicle off the ground to access the underside requires verifying it is stable, and that there is no risk of the vehicle falling on top of the mechanic.
- Always remove the keys from the ignition switch. Never leave the key in the ignition switch, as the key can draw an electrical charge from the battery. Also, avoid unplugging fuses and wiring harnesses while the key is in the “on” position. Otherwise, there is a risk of electrical shock, and/or electrical spikes that may damage electronic parts and wiring.
- Be aware of the vehicle’s temperature before beginning any work. The engine, manifold, exhaust system, and radiator could be hot and cause skin burns. Plus, the radiator coolant is still pressurized.
- In addition to wearing chemical and fire resistant clothing, workers should be educated on the right procedures to follow in case of common auto shop safety risks. These include fires, electrical issues, and chemical spills. Regularly retrain new and existing employees in the right steps to take in case of such safety risks to minimize the damage they cause when they happen.
- As part of workplace organization and cleanliness, all eating and drinking should be confined to the kitchen or designated break rooms. Contaminating food with chemicals used in the workshop or eating while working on cars or car parts are two significant risks of choosing to eat in a work area. It also looks unprofessional should customers notice a mechanic or technician eating at his or her workstation.

### Automotive Repair Safety Apparel



A major part of staying safe in an auto repair shop is to wear the right protective clothing. In addition to choosing a protective uniform that consists of fire and chemical resistant clothing, the following uniform elements shouldn’t be left out:

- **Gloves** – Handling engines and car parts that become extremely hot is a safety hazard for automotive technicians. Engines and car parts are also very dirty and even small cuts could easily become infected if not kept clear of dirt and debris.
- **Goggles** – As mechanics or auto technicians, your employees are up close and personal with many dangerous car parts and liquids that could cause serious damage to their eyes in the case of an accident. Wearing industry-specific safety goggles is crucial to keeping them safe.
- **Overalls** – Lightweight, durable overalls are the ideal choice for automotive workers’ uniforms, as they will keep dirt, hot liquids, and other debris away from their bodies while still being cool and comfortable to wear.
- **Sturdy shoes** – Tools and car parts will inevitably fall or be dropped during the work day. Protecting your workers’ feet by providing sturdy work shoes is essential to complete a quality protective uniform.

In addition to the above safety tips, there are government requirements for specific types of repairs, which are the responsibility of shop owners to review and educate their employees about on a regular basis.

#### Key Risks and Concerns Facing Auto Repair Shop Security

The life of a mechanic is complex, filled with expensive cars, strict procedures, and various hazards. As an auto repair shop owner, you are also responsible for protecting your equipment, customers, and staff. In order to keep up with these demands, it’s crucial to understand the key layers and risks of auto repair shop security.

#### Employee Safety

While theft and property damage are important, safety is the most critical aspect of your shop’s security. From mechanical procedures to your emergency equipment, safety is ingrained in nearly every layer of the auto repair process.

### Training and Safety Equipment

Mandatory safety training helps all mechanics stay on the same page, even if they've had previous safety training with another employer. As you implement a comprehensive training strategy, consider posting your safety procedures around the garage and hosting semi-annual safety refreshers. In doing so, you can ensure everyone understands their responsibilities and best practices.

Additionally, every employee should know the location of personal protective equipment (PPE) and how to use it. These safety essentials protect mechanics during specific operations and help them respond to emergencies. Types of auto repair PPE include:

- Gloves
- Foot protection
- Goggles and safety glasses
- Face shields
- Hard hats
- Masks
- Respirators
- Ear protection
- First-aid kits
- Electrical equipment

### Operational Safety

While every team member must know how to respond to emergencies, the most significant safety concerns often lie in your shop's day-to-day. The equipment, tools, and vehicles that mechanics work with can be dangerous and require focus and frequent maintenance. Even your garage's windows and countless other factors can negatively affect your employees' health.

As such, it's crucial to understand the most significant factors in your auto repair safety, including:

- **Maintenance:** Frequent maintenance of your garage's auto repair equipment will help you identify defective gear and tools that need to be replaced. Regularly test your larger equipment, especially hydraulic lifts, and keep records after each inspection. Additionally, you should check your operation's smaller components, such as electrical cords, power tools, and inventories.
- **Ventilation:** Gasoline, exhaust, and other hazardous fumes can cause long-term and immediate health concerns for anyone on your property. It's critical to install thorough ventilation in the repair garage and anywhere hazardous substances are stored. Additionally, for maximized airflow, you should encourage

your team to use fans and windows whenever operating equipment.

- **Fall protection:** It's essential to have safety measures to protect staff from harm caused by equipment that can fall, such as auto lifts. Examples include guard rails, safety netting, inspection pits, extra supports, and hard hats.

### Criminal Activity

Theft, vandalism, and break-ins are just a few criminal concerns facing small and medium-sized businesses, especially those with valuable inventories. Unfortunately, auto garages are often top targets because of their vehicles, parts, and cash boxes. It's crucial to form a thorough security plan to help you reduce criminal activity and defend your business.

A significant aspect of auto repair security is establishing a perimeter. Install multiple surveillance cameras at various spots around your garage's entry points and your storage lot, regardless of its size. Take extra time to consider your cameras' ranges of view, blind spots, and limitations to ensure no activity can go unnoticed. This way, with 24/7 monitoring, you and your security team can catch all suspicious activity and respond immediately.

### Internal vs. External Theft

External theft includes anything stolen by customers, trespassers, and everyone else not within your company. For auto repair shops, this type of theft ranges from people stealing individual parts to driving off without paying. Additionally, some criminals may target the belongings in customers' cars, which can cause a serious legal headache for your business.

On the other hand, internal theft comprises criminal activity performed by your shop's staff, including leadership. These incidents can include stolen equipment, wage theft, negligent repairs, and even grand theft auto. Furthermore, depending on your state laws, you may be required to return removed parts to their owners. Even if customers don't care about their broken parts, not following these laws could be considered theft and lead to legal issues.

Installing thorough loss control strategies inside and outside your auto garage will help limit security concerns and keep your team accountable. So, if a trespasser attempts to steal their engine part or an employee uses improper equipment, you can record the incident and respond as needed. Security footage is especially crucial for tracking identities and lost equipment.

### Cash and Equipment Storage

Valuable parts and tools are often the top targets in auto repair shop break-ins. It's crucial to have a secure storage process for your inventory and cash. By using stronger locks, door contacts, and glass break sensors, you can detect criminals, scare them off, or at least slow them down while you call the police. Furthermore, by checking your inventory regularly, you can track missing equipment faster by narrowing down the timeline of their last use.

Depending on the size of your facility, you may also consider access control locks with key cards and pin codes. These security measures restrict access to specific entry points with varying levels of access based on employees' roles. For instance, while every staff member can open the shop in the morning, only managers and senior mechanics can unlock storage rooms.

### Property Damage Prevention

From upset clients to vehicle fires, countless factors can contribute to property damage and other safety concerns. Because you can't plan for just one incident, the best safety solution is often to invest in comprehensive security and fire prevention measures.

Surveillance cameras in particular can reduce break-ins by capturing identities and scaring criminals away. Furthermore, comprehensive alarm systems let you immediately respond to trespassers, fires, and other emergencies to reduce their impacts.

Some of the most common types of property damage in auto repair shops include:

- **Vehicular-related damage** from customers, clients, and staff
- **Accident-related damage** from operations and equipment malfunctions
- **Criminal-related damage**, including vandalism and break-ins
- **Fire damage** from faulty vehicles and equipment

### Premises and Operations Liability

Auto repair shops face numerous liability concerns, from the safety of customers to their cars, that demand security measures to be enacted.

Additionally, some state laws and insurance policies may mandate specific safety and operational protocols, depending on your location.

Thorough auto repair shop alarm systems will help your operations and premises liability across the board. First, your setup will fill your legal checklists and improve your trust with customers just by having security devices visible. Plus, cameras in your repair garage will keep your staff accountable and validate your safe operations to insurance providers.

Second, surveillance footage can benefit you in responding to criminal incidents, such as identifying thieves or pressing charges. Stored videos are also crucial after accidents or injuries, letting you precisely observe the incident to take action or defend your business accordingly.

Finally, your garage's surveillance footage benefits your completed operations liability by verifying the work performed. This way, if a customer complains that their vehicle wasn't repaired properly, you can use your recorded footage to defend your employees.

Consider implementing the following safety and liability practices:

- Post signage around your facility, including safety instructions and "employees only" signs.
- Place hazard tape and floor markings around hydraulic lifts and other machinery.
- Maintain comprehensive records of all transactions, operations, and accidents.
- Train all staff on safety operations and procedures.
- Practice pausing operations when someone enters the workspace.
- Implement professional monitoring and push notifications for around-the-clock security of customers' vehicles.

### Upgrading Auto Repair Shop Security

Auto repair shop's security is important for employees' health, customers' vehicles, and business's longevity. Investing in 24/7 monitoring and security will protect in long term and even give peace of mind by ensuring someone always has eyes on the garage.

**Table1.** Musculoskeletal injuries encountered by respondents

Type of injury	Strongly agree(5)	Agree(4)	Neither(3)	Disagree(2)	Strongly disagree(1)	Total	Mean
Fracture	3	5	6	8	8	77	2.57
	15	20	18	16	8		
Dislocation	8	3	8	6	5	93	3.10
	40	12	24	12	5		
Sprain	10	8	4	5	3	107	3.57
	50	32	12	10	3		
Strain	11	10	2	3	4	111	3.70
	55	40	6	6	4		

Source: FieldSurvey,2022

#### 4.4 The Factor of Musculoskeletal Injuries on the Activities of Auto mechanics

In the daily activities of the workers, they are exposed to different factors. Respondents stated in the questionnaire the factors they are usually exposed. The Ta

ble 2 highlights the factors which they are exposed to; these including awkward posture, repetition, vibration and extreme body temperatures. Table 2 shows a greater number of the tradesmen strongly agree and agree to repetition and force which were having a strong mean of 4.13 and 3.83 respectively.

**Table2.** Factors of musculoskeletal injuries on the activities of carpenters

Factors	SA(5)	A(4)	N(3)	D(2)	SD(1)	Total	Mean
Awkward posture	6	8	3	7	6	91	3.03
	30	32	9	14	6		
Repetition	15	10	1	2	2	124	4.13
	75	40	3	4	2 (7)		
Static posture	2	3	6	9	10	68	2.27
	10	12	18	8	10		
Vibration	8	10	4	6	2	106	3.53
	40	40	12	12	2		
Force	15	5	3	4	3	115	3.83
	75	20	9	8	3		
Extreme temperature	8	12	2	5	3	107	3.57
	40	48	6	10	3		

Source: FieldSurvey,2022

#### 4.5 Nature of Respondents' Work

Table 3 shows that carrying heavy loads; working on your knees and stretching to work overhead were the nature of work that affected most respondent with respect to means of 3.97; 2.17; and 2.73.

It can therefore be deduced from the data in the Table 3 most of the respondents indicated that they carry heavy loads; working on their knees and stretching to work overhead in their daily working activities.

**Table3.** Nature of respondents' work

Nature of work	SA(5)	A(4)	N(3)	D(2)	SD(1)	Total	Mean
Carrying heavy loads	10	15	1	2	2	119	3.97
	50	60	3	4	2		
Working on your knees	2	2	3	15	8	65	2.17
	10	8	9	30	8		
Stretching to work overhead	5	6	3	8	8	82	2.73
	25	24	9	16	8		

Source: FieldSurvey,2022

#### 4.6 Effects of the Musculoskeletal Injuries on the Working Conditions of Respondents

As part of the injuries encountered, Automobile mechanics are affected in one or more ways. Delay of work,

Loss of concentration; and working not to specifications were some of the critical effects as stated in Table 4, they had mean scores of 3.002, 3.37 and 2.13 respectively.

**Table 4.** Effects of the musculoskeletal injuries on the working conditions

Effects	Strongly agree(5)	Agree(4)	Neutral (3)	Disagree(2)	Strongly disagree(1)	Total	Mean
Lateness to work	2 10	3 12	1 3	10 20	14 14	59	1.97
Absenting yourself from work	1 5	5 10	2 6	10 20	12 12	63	2.10
Working to low standards	1 5	2 8	1 3	15 30	11 11	57	1.90
Working not to specifications	2 10	3 12	2 6	13 26	10 10	64	2.13
Delay of work	5 25	10 40	1 3	8 16	6 6	90	3.00
Shortage of money	2 10 95	3 12	0 0	10 20	15 15	57	1.90
Loss of concentration	3 15	6 24	1 3	6 18	11 11	71	2.37
Loss of contract	2 10	6 24	0 0	7 14	15 15	63	2.10

Source: Field Survey, 2022

### V. CONCLUSION

The study depicted that musculoskeletal injuries occur to Automobile mechanics. It was also found that injuries including fractures, dislocations, sprain and strains occur at various workshops or sites and this affects the working abilities of the Automobile mechanics by making them loose concentration during work, do shoddy work, work not to standard and delay the duration of their work to a great extent. However, some construction sites appear to have tools which when used, reduce Automobile mechanics' exposure to these musculoskeletal injuries but greater number of workers do not have any idea on them. This therefore appears to be increasing the number of Automobile mechanics who get exposed to musculoskeletal injuries at their workshops or jobsites.

#### 5.1 Recommendations

Based on the findings of the study, the researcher recommends the following:

1. There is the need for the offer of extensive education on Automobile mechanics' exposure to musculoskeletal injuries and the effects it has on their work performance. This will help reduce the number of injuries that occur at worksites as the worker will take much precaution in their operations.

2. Also, the introduction of musculoskeletal injuries reducing tools such as locally made pulleys to aid in lifting heavy loads to heights at the various construction sites and that will go along way to cut down the number of injuries at the sites. Automobile mechanics must endeavor to make use of these tools in order to prevent injuries at the sites.

3. Moreover, there is the need to ensure that workers at the various workshops or sites, they should have adequate knowledge and training on the tools they use.

4. In addition, the government and other NGOs in the country can offer their help through the provision of funds to provide good and required tools and equipment for Automobile mechanics and also offer support for Automobile mechanics displaced through musculoskeletal injuries.

5. Efforts must be made by the manager's or leaders of Automobile mechanics at the various construction sites to ensure strict adherence to safety measures at the sites.

6. There should be a requirement by law for all involving in any Automobile mechanics before the onset, to obtain the service of a qualified and licensed safety and health practitioner to be in charge of health and safety practice on the building site.

7. Lastly, Automobile mechanics must make it a habit to visit the hospital from time to time to enable them to know their health standard and also try to treat any level of musculoskeletal injuries at the hospital.

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### **An Investigation into the Prevalence of Errors in the Written English of Junior Secondary School 3 Students in Abeokuta North Local Government Area of Ogun State**

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#### **ABSTRACT**

This study investigates the errors in a collection of 30 letter writings in the written English Junior secondary school students written by 10 JSS3 students from each of 3 private secondary schools in Abeokuta North Local Government Area, Ogun State. Errors were found and classified into different categorizations. These errors are: capitalization, articles, subject/verb agreement, pronoun, noun, omission, repetition, degree/adjective, verb, spellings, and prepositions. The findings and the result of this study showed that the errors committed by

the subjects were due to mother tongue interference and the carelessness of the students. Finally, the study shed the light on the manner in which students internalize rules of target language and the findings are vital in designing curricula for the better fulfillment of the objectives of Second Language teaching and learning while providing guiding light to create effective teaching methodology.

Keywords: errors, letter writings, JSS3 students, private secondary schools, Abeokuta North local government

#### **INTRODUCTION**

##### **1.1 Background of the study**

The use of the English language in Nigeria dates back to the late sixteenth and early seventeenth century when British merchants and Christian Missionaries settled in the coastal towns called Badagry, near Lagos in the present-day south-western Nigeria and Calabar, a town in the present-day South-Eastern Nigeria. The merchants initially traded in slaves until the slave trade was abolished in 1807, after which freed slaves of Nigerian origin returned to the country. Many of

them, who had been exposed to western education and Christianity, later served as translators or interpreters for the Christian missionaries, the language then were limited to interactions between the white colonial masters, the coastal towns who had business with them such as teachers, catechists, christian converts, traders and clerks working with the colonial government.

Hence English language during this period was purely an instrumental language whose function was limited to communication between the indigenes and the British.

Nigerians adopted English language after the independence till date. After the independence, the English language became Nigeria's official language and lingua Franca. This was attributed to the fact that Nigeria has about four hundred languages even when the numerous codes were technically subjugated by three major ones, that is Hausa, Igbo, Yoruba, there was still the difficulty of selecting a particular one to replace the English language and serve as the official language in Nigeria and the language is of wider communication. English language is accepted as the language of government, education, commerce, and national development. Functions of English in Nigerian society with the obtainment of independence gradually grew to become the major medium for interethnic communication, like most Africa nations, had to grapple with multiethnicity and acute multi lingualism.

In education, English during the post - colonial period was not merely a school subject; it became core subject at every level of education from the primary school to the tertiary level, a credit pass in English is now mandatory for candidates to get admission into higher institutions. It is also mandatory for all first-year students in higher institutions to undertake course in the use of English and pass the course before they can graduate. Most universities also teach English for specific purpose.

English also became the lingua Franca for students of tertiary institutions from different parts of the country. The National Policy on Education (NPE) released in 1981 and 2004, clearly spelt out the role of English as a school subject in the first three years of primary education, as the language in structure from the fourth year in the primary school. It also stipulates that every child should be made to study English and any two Nigerian languages other than that of the environment in the junior secondary school while in the senior secondary school; a child is expected to study English and one Nigerian language other than that of the environment.

In relation to education, it is the function of English as the major language for creative writing in Nigeria. English is the major language used by creative writers for expressing their protest against all forms of injustices and promoting the indigenous cultures of the people to the outside world. English in Nigerian educational process is read all over the world and many of them have been translated into other languages.

English is also being used in expression in oral and written literature. It is also extended to those who are with limited competence like Amos Tutuola managed to write literary words, which have received enough attention from readers and critics "The theme of the earliest fictionalized Nigerian literary works, such as Chinua Achebe's *Things Fall Apart*, *No Longer at Ease*, *Arrow of God*, T.M. Aluko's *One Man, One Wife*, and *One Man, One Matchet* was protest and conflict. Other works that came later focused on post - colonial experiences, such as the disappointments experienced by the people after Nigerian leaders took over power from British colonial masters. Examples are Chinua Achebe's *A Man of The People*, Wole Soyinka's *Opera Wonyosi*, and so forth. These writers ( according to Walter 2007) use English as a language of mutual communication between Nigeria's and the reading populace at large.

Chinua Achebe himself reacting to his critic on his use of English as his medium asserts that English undoubtedly must serve as a unifying, national inception in Nigeria and should not lose its value as a medium of international exchange (Achebe, 1965).

Several Nigerian writers have won laurels for their literary works. They include Wole Soyinka, who won the Nobel prize for literature in 1985; Chinua Achebe who was announced as the winner of the Man Booker international prize in honour of his literary career in June 2007. There is also emerging a new group of literary writers whose works have won international prizes. They include: Niyi Osundare, a poet, whose poem *The Eye of The Earth* won the Commonwealth Poetry Prize, Hellon Habila, who won the Caine Prize for African literature (short stories) in 2001, Chimamanda Ngozi Adichie, whose novel *Half a Yellow Sun* won the Orange Prize for Fiction.

However, there has been a growth in the Nigerian film industry, which has been reeling out what are popularly referred to as home videos produced in English 'Nollywood', as the film industry, is sometimes described, produced film that portray Nigerian socio-cultural like scoops are also produced and featured regularly on the local

televisions and radios. The function of English as the tool for disseminating news has assumed a new dimension in the post-independence Nigeria. In the electronic media. English remains the most daily used language for new cast, advertisement, news reporting, documentary, discussion programmes, talk shows, phone in programmes and so forth. The Nigerian pidgin, a debased form of Nigerian English, is particularly employed in the media to bridge the communication gap among Nigerians. It is used across different domains in the country for advertisements, etc. English has also gained acceptance as the tool in the music industry, in Post-Colonial Nigeria, several Nigerian musicians presented their messages in the different varieties of the language that exist in the country - ranging from pidgin to standard Nigerian English.

Western-oriented musics such as pop, buses and soul are becoming phenomenon among those who sing purely African oriented brands of music such as juju, apala, and fuji, such musicians hence taken their brand of music beyond the shores of Nigeria to the western world, hence the need for them to sing in English to reach a wider audience.

English in the post - colonial Nigeria performs a major role in religion, particularly in the Christian religion, with the advent of Pentecostalism in the 1970s, there was an up surge of English speaking churches in the country, from the 1980s, to the new millennium, the number of such churches has grown tremendously, even though there are still churches that use predominantly the local languages most churches internet their messages in English to enable them to reach a larger congregation as most young Nigerian Christians feel more comfortable worshipping in predominantly English speaking church.

The benefits of education (acquired in a English language) are numerous, they include:

- i. improved social relations
- ii. better job opportunities
- iii. higher family income
- iv. higher productivity
- v. access to better health facility
- vi. improved standard of living
- vii. ability to participate in the life of community

English in the Nigerian educational process, through language people interact, share ideas and express their feelings. Education is unarguably an essential instrument for change and human development at different levels of schooling. In formal education, students are equipped with life-long knowledge and skills that



would enable them realize their full potentials as human beings, in the Nigerian policy. English language plays the role of a second language, considering the multi lingual nature of the content; it is also a compulsory language of instruction in the Nigeria education system. It is also a subject and a yard stick for evaluating a learner's school performance. The normal teaching learning process dwells on effective communication between the teacher and the student.

### 1.2 Statement of the problem

It is observed that students or learners lack the ability when it comes to writing. Students are still found making some common errors in English language such grammatical errors. The various findings of the researchers show that errors in English language are common among students in secondary schools. Thus informs the focus on this work on manifestation of grammatical errors in the writing skills of junior secondary schools students in secondary schools in Abeokuta. Those errors are thus believed to be caused by several factors in crudely how to construct grammatical sentences the extent to which students observe appropriate punctuations in the their written letter writing and use appropriate connectives.

### 1.3 Aims and objectives

#### 1.3.1 Aims

The sole aim of this research work is to have knowledge of the students writing activities and ability in English language. The errors and how to overcome such problems will improve their writing skills to establish the level of their proficiency attained by junior secondary school in public and private schools

Specific objectives are therefore;

- i. Confirm the extent to which the JSS 3 students are able to construct grammatical sentences.
- ii. Check the extent to which the JSS 3 students are able to observe appropriate punctuations in their written letter writing
- iii. To establish the extent to which the students are able to use appropriate Connectives in their letter writing
- iv. To find out the extent to which the students are able to apply proper tenses in a king in their letter writing

### 1.4 Research Questions

In order to achieve the objectives stated above, the following research questions shall be addressed

- i. To what extent are the JSS3 students able to construct grammatical sentences in letter writing?
- ii. To what extent are the JSS3 students able to observe appropriate punctuation marks in letter writing?
- iii. To what extent are the JSS3 students able to use connective in letter writing?

### 1.5 Scope of the study

The study focused on the ability and performance of student's writing skill in English language in jss3 selected private schools in Abeokuta North Local Government, Ogun state, Nigeria with the concept to examine their proficiency in written English.

### 1.6 Significant of the study

This research work will help in determining the ability and performance of the students in English languages as regards their writing skills and help them to correct their errors. Also, the students will be enlightened on the clearly of writing and grammatical accuracy in their English language. Thus, research work will be useful in the teaching and learning of English languages in schools. It will enhance future performance of students in writing English. This study will be a valuable material in English for teachers, parents and government.

### 1.7 Definitions of terms

EA - Error Analysis

EFL - English as a Foreign Language

ESL - English as a Second Language

JSS3 - Junior Secondary School 3

L1 - interlingual errors arising from first language

L2 - intralingual errors resulting from students' misinterpretation of grammatical rules

NPE - National Policy on Education

## 2.0 LITERATURE REVIEW

Hendrickson(1978)

bordered the query of 'how errors should be corrected?' According to Corder (1967), errors play vital roles in three special ways. First, errors let teachers identify what remains for students to learn. Second, errors present teacher evidence on how language is learnt or acquired.

Thirdly, errors are crucial to students as errors can be regarded as an appliance learner's exercise to discover. The making of errors is a strategy employed both by the students of first and

second language. Errors can be granted a kind of learning action in students.

Brown (1980) affirms that error is an obvious variation of grammar. It reflects the interlanguage skill of the students. This shows that error occurs due to the lack of knowledge or consciousness. According to Littlewood (1998), language students' errors derive from systematic and non-systematic sources. Systematic sources include interlingual errors deriving from the native language and intralingual errors related with the target language. Non-systematic sources cover the sociolinguistic context of communication, cognitive strategies and innumerable affective variables.

There are two types of errors in language learning: i. interlingual errors (L1) and intralingual errors (L2) (Bryant, 1984). Interlingual errors are errors resulted from first language; while intralingual errors are from student's misinterpretation of grammar rules. According to James (1998), errors are classified into five patterns as follows: omission, inclusion, misselection, and misordering.

Al-Mohanna (2014) analyzed Saudi university EFL students' essays using contrastive analysis and error analysis in identifying and explaining students' errors. This study identified several types of errors regarding omission, articles, nouns, adjectives etc. Alhaysony (2012) conducted the kinds of errors committed by 100 first-year Saudi Female EFL students in their written compositions. It was found by the researcher that omission of 'the' article outside more commonly error than substitution errors.

Ying (1987) explored the alliance between students' first language and target language. He scrutinized 120 Taiwanese EFL students' writing to sort errors on the basis of several criterion such as overgeneralization, simplification, and language transfer. Around 1250 errors were noted in the 120 compositions. It was found that 78.9% of the errors were a consequence of language transfer, 13.6% of the errors were due to overgeneralization of the target language, and 7.5% were types of oversimplification.

## 2.1. Preamble

Over the years after independence in Nigeria, the English language functions in various societal situations: it functions as a language of official communication, language of official

business, mass communication, a medium of transmitting knowledge in the field of technology, medicine, law and other professions. It is essentially the language of education and instruction in Nigeria. These functions are aptly corroborated by Adeyanju (2002) who states that the English language in Nigeria has, for long, championed the course of human cooperation by performing effectively all the above-mentioned roles.

This study aims at examining English as a Second Language (ESL) learners' communicative competence in English at the junior secondary school level. However, the primary objective of conducting this research is to explore the common errors Junior Secondary School Three (JSS3) students make in their written letters. Error analysis (EA) became a preferred tool of studying second language analysis.

## 2.2 Error Analysis (EA)

Corder (1967) who is considered the father of EA contended that errors are "important in and of themselves". Thus, it can be said that errors made by language students make it possible to determine areas that need reinforcement in teaching. He added that EA has two objects: one theoretical and another applied. The theoretical object is to understand what and how a student learns when he studies a second language (L2). The applied object is to enable the student to learn more efficiently by using the knowledge of his dialect for pedagogical purposes. At the same time, the investigation of errors can serve two purposes, diagnostic (to in-point the problem) and prognostic (to make plan to solve a problem). In addition, he said that it is diagnostic because it can tell the student's grasp of a language at any given point during the learning process. It is also prognostic because it can tell the teacher to modify learning material to meet the students' problems.

Error analysis is one of the most influential theories of second language acquisition. According to James (as cited in Zawahreh, 2012), it is concerned with the analysis of the errors committed by L2 students by comparing the students' acquired norms with the target language norms and explaining the identified errors. For Crystal (1999), error analysis in language teaching and learning is the study of the unacceptable forms produced by someone learning a language, especially a foreign language. According to Brown (as cited in Ridha, 2012), error analysis, "is the process to observe, analyze and classify the deviations of the rules of the second

languages and then to reveal the systems operated by student".

### 2.2.1 Sources of Errors

Brown (2000) states that there are two main sources of errors, namely, interlingual errors and intralingual errors. Interlingual (interference) errors are those errors that are traceable to first language interference. These errors are attributable to negative interlingual transfer. The term interlingual "was first introduced by Selinker (1972). He used this term to refer to the systematic knowledge of an L2 which is independent of both student's L1 and the target language (Abi Samra, 2003). According to Kavaliauskienė (2009), transfer of errors may occur because the students lack the necessary information in the second language or the attentional capacity to activate the appropriate second language routine.

Transfer is of two kinds: positive and negative. The transfer may prove to be justified because the structures of the two languages are similar - this case is called, "positive transfer" or, "facilitation", or it may prove unjustified because the structures of the two languages are different - that case is called, "negative transfer" or, "interference" (Wilkin, 1972). As far as the intralingual errors are concerned, they result from faulty or partial learning of the target language rather than language transfer (Keshavarz, 2003; Fang and Jiang, 2007). Richards (1972) cites four main types of intralingual errors, namely: (1) overgeneralization, (2) ignorance of rules restrictions, (3) incomplete application of rules, and (4) false concept hypothesized. Later he identifies six sources of errors: (1) interference, (2) overgeneralization, (3) performance errors, (4) markers of transitional competence, (5) strategies of communication and assimilation, and (6) teacher-induced errors.

Hazaymeh (1996) made a study that aimed at investigating the second secondary students' errors in learning English verb tenses. The sample was of 587 students from public schools and 172 students from private schools. These errors were attributed to the student's group of reasons such as (a) mother tongue interference (b) overgeneralization (c) the complexity of the structures of the English verb tense, (d) a strategy of parallel structure and (e) the ignorance of grammatical rules.

Sarfraz (2011) examined the errors made by 50 undergraduate Pakistani students in written essays; he found that the majority of errors the students made resulted from students'

interlanguage process and mother tongue interference.

Darus and Subramaniam (2009), examined errors in a corpus of 72 essays written by 72 Malay students. They found that students' errors were of six types, viz; in singular/plural form, verb tense, word choice, preposition, subject-verb agreement and word order.

Abi Samra (2003), in his article entitled, "An analysis of errors in Arabic speakers' English writing", collected samples of written work from 10 students in 9th grade. He classified the errors into five categories, namely, grammatical (prepositions, articles, adjectives, etc.); syntactic (coordination, sentence structure, word order, etc.); lexical (word choice); semantic and substance (punctuation, capitalization, and spelling); and discourse errors. The results revealed that one third of the students' errors were transfer errors from the native language, and the highest numbers of errors were in the categories of semantics and vocabulary. The rest of the errors (64.1%) were errors of over-application of the target language, the highest numbers of errors being found in substance (mainly spelling), syntax and grammar.

In addition, Ridha (2012) examined English writing samples of 80 English as Foreign Language (EFL) college students and then categorized the errors according to the following taxonomy: grammatical, lexical/semantic, mechanics, and word order types of errors. The results showed that most of the students' errors can be due to L1 transfer. Furthermore, she found that most of the learners rely on their mother tongue in expressing their idea. She added that although the rating process showed that the participants' essays included different types of errors, the grammatical errors and the mechanical errors were the most serious and frequent ones.

### 2.2.2. Stages/ steps involved in the Analysis of Errors

Corder (as cited in Oyedokun-Alli, 2014) identifies three stages involved in error analysis and they are logically dependent upon one another. These are: recognition, description, and explanation. The process of recognizing and identifying errors is one of comparing original utterances with their plausible reconstruction and authoritative reconstruction (that is an interpretation/reconstruction of the utterance derived from the learner himself) and identifying the difference.

Recognition of errors is thus crucially dependent upon correct interpretation of the student's intention. Description only begins when recognition has taken place. In the same vein, explanation of error can be regarded as a linguistic activity, concerned with accounting for why and how errors come about (Uboh, 2004). It is thus from the explanation of errors that theories such as transfer, facilitation, interference, overgeneralization, conflict, ambiguity, equivocation, vagueness and misdirection emerge (Oyedokun-Alli, 2014).

Corder (1973) provides a model for identifying erroneous utterances/expressions in a second language. According to Corder's model, any sentence uttered and subsequently transcribed can be analysed for error. He makes a major distinction between „overt“ and „covert“ errors. Overt erroneous expressions are unquestionably ungrammatical at the sentence level. Covert erroneous utterances/expressions are grammatically well-formed at the sentence level but are not interpretable within the context of communication. Covert errors, in other words, are not really covert at all if the surrounding discourse before and after the utterance is attended to. For example, I have been around since morning is grammatically correct at the sentence level but as a response to: When did you come? It is obviously an error.

A simpler and straighter forward set of items than would be sentence level and discourse level errors rather than overt and covert errors. On a local level, errors can be described as errors of addition, omission, substitution and ordering. Jibowo, Iteogu, Odizua and Abayomi (2005) suggest that the teachers should conduct diagnostic error analysis during the initial contact of a given semester/term in order to find out which items of the language have not been fully learnt and remedy them first.

Brown (2000) states that cognitive feedback in error correction must be minimal in order to be effective. Too much of cognitive feedback e.g. barrage of interruptions, errors underlined/over corrections and overt attention to information, often lead to students' shutting off their attempt at communication. Choon (1993) submitting to this view, says:

Teachers also should not mark every error just because it is expected of them or because they believe it is an indication of dedication. This is because over-correction can be a very tedious

experience for the teacher (resulting in a demoralizing experience for the student).

It should however be noted that too much positive cognitive feedback (willingness of the teacher to let error go uncorrected) serves to reinforce the errors of the learner. The result is persistence and perhaps, the eventual fossilization of such errors. The task of the teachers of English could, therefore be to ensure that learners are given enough encouragement for continued communication but not so many that crucial errors go unnoticed and they should not be discouraged for attempting to use the language. It is, from this point of view, that the present study sees errors.

>

### 3.0 METHODOLOGY

The data for this study consisted of 30 letter writings in the written English Junior secondary school students written by 10 JSS3 students from each of selected 3 private secondary schools in Abeokuta North Local Government Area, Ogun State using a simple random sampling method. The students were chosen because they are still at the primary stage of the second language learning. Analyzing the errors made by these students will help their English language teacher(s) know the areas to pay more attention to while teaching them.

#### 3.1 Data Collection

##### 3.1.1 Data Collection Instrument

The students were asked to write a letter on one of the following topics to:

1. The Commissioner of Education in Ogun State telling him or her the need for upgrading the social amenities in secondary schools in Ogun State,
2. Your school Principal stating what you observed as the strengths and weaknesses of your school and the challenges you will like to take place.
3. Your senior brother staying in Anambra State giving him at least 3 reasons why he should come (or invite a friend to come) and celebrate Ileya festival with you.

Each school picked one topic different from others.

##### 3.1.2 Data Collection Procedure

The students were asked to write their letters within a period of thirty minutes without knowing that their letter writings are going to be under investigation.

#### 4.0 Data Analysis

The analysis of written letters was derived from Corder's (1967) method on error analysis. This method has three steps:

- (1) Collection of sample errors,
- (2) Identification of errors and
- (3) Description of errors.

The identified errors were counted based on their frequencies. In the classification level, the errors were tabulated and classified into the following categories: capitalization, articles, subject/verb agreement, pronoun, noun, omission, repetition, degree/adjective, verb, spellings, and prepositions

In this section, the findings of the study are presented. The errors made by the students are identified, classified and finally, these errors made by the students are corrected. Tables are used for easy interpretation of results.

Now the eleven types of error the students made in their written letters are described below:

**Capitalization** refers to the act of writing of any word with its first letter in uppercase and the rest of the letters in lowercase. Writing with an initial capital or writing in capital letters is called capitalization.

Error classification	Error Identification	Error Correction
Capitalization	a) ...that the secondary schools <u>In</u> <u>ogun</u> state need social amenities. b) Some people cannot write note <u>Again</u> . c) The purpose of <u>This Letter</u> is to <u>In</u> form you what I observed as the <u>Strengths</u> and weakness of our school. d) He is <u>Serving</u> the people who are always suffering. e) I am writing <u>This Letter</u> ... f) The <u>com</u> missioner of <u>edu</u> cation...	a)... that the secondary schools <u>in</u> <u>Ogun</u> State need social amenities. b) Some people cannot write note <u>again</u> . c) The purpose of <u>this letter</u> is to <u>in</u> form you what I observed as the <u>strengths</u> and weakness of our school. d) He is <u>serv</u> ing the people who are always suffering. e) I am writing <u>this letter</u> ... f) The <u>Com</u> missioner of Education...

**Articles:** These are demonstrative adjectives such as Aor An and The. The definite article (The) is used before singular countable nouns, plural countable nouns

and uncountable nouns. We use the indefinite articles (a, an) before singular countable nouns

Error Classification	Error Identification	Error Correction
Article	a) We saw <u>an</u> snake. b) I saw snake. c) She had a baby on 27 <sup>th</sup> May, 2021 in General hospital.	a) We saw <u>a</u> snake. b) I saw <u>a</u> snake. c) She had a baby on the 27 <sup>th</sup> May, 2021 in General hospital.

**Subject verb Agreement: (Agreement of verbs with subject):**

Verb of a sentence is used according to the number and person of subject; if the subject is singular, verb must be singular, if the subject is plural, verb must be plural.

Error classification	Error Identification	Error Correction
Subject/verb Agreement	a) My school <u>have</u> science laboratory. b) My school <u>have</u> playing ground. c) Goals and ambition <u>gives</u> us a sense of life. d) How <u>is</u> brother and sister Alimot ? e) Many <u>student</u> have suffered many losses in the past. f) Many <u>student</u> did not understand... g) Most of the <u>parent</u> took loan from the banks.	a) My school <u>has</u> a science laboratory. b) My school <u>has</u> a playing ground. c) Goals and ambition <u>give</u> us a sense of life. d) How <u>are</u> brother and sister Alimot ? e) Many <u>students</u> have suffered many losses in the past. f) Many <u>students</u> did not understand... g) Most of the <u>parents</u> took loan from the banks. h) Some students <u>do</u> ... i) We <u>do</u> not have much working tools...

**Repetition** is an act of repeating or doubling a word in a sentence or phrase.

Error Classification	Error Identification	Error Correction
<b>Repetition</b>	a) It is <u>veryvery</u> important... b) Our father will be <u>veryvery</u> happy.	a) It is <u>very</u> important... b) Our father will be <u>very</u> happy.

**Pronoun** is a word which is used instead of a noun. A pronoun always agrees with its Antecedent.

Error Classification	Error Identification	Error Correction
<b>Pronoun</b>	a) All students are to clear <u>his</u> portions. b) Every student must read <u>their</u> books.	a) All students are to clear <u>their</u> portions. b) Every student must read <u>his</u> books.

**Noun** is the name of anything. Words like pen, chair, fan, flower are countable nouns and rice, milk, water, gold are uncountable nouns.

Error Classification	Error Identification	Error Correction
<b>Noun</b>	a) Ileya festival is full of the <u>sceneries</u> . b) Students hate <u>works</u> .	a) Ileya festival is full of the <u>scenery</u> . b) Students hate a <u>piece of work</u> .

**Degree or Adjective:**

Generally the words - superior, inferior, senior, junior, prefer, preferable, prior are Latin comparatives. Before these words comparative degree are not used. They

have not positive and superlative degree. After these 'to' is used instead of than and the objective form of a person is used. After prefer if there is a verb gerund (verb+ing) is used.

Error Classification	Error Identification	Error Correction
<b>Degree or Adjective</b>	a) The students prefer <u>to</u> get handouts than <u>to</u> copy notes.	a) The students prefer handouts than copying notes.

**Omission** is an act of forgetting to insert a word in a sentence or phrase.

Error classification	Error Identification	Error Correction
<b>Omission</b>	a) His father very happy. b) Example the moral lesson. c) All students are to clear <u>his</u> portions. d) Every student must read <u>their</u> books. e) The junior school are made to sweep and clean the floor always f) The senior school are always bullying the junior school.	a) His father <u>is</u> very happy. b) Example <u>is</u> the moral lesson. c) All students are to clear <u>their</u> portions. d) Every student must read <u>his</u> books. e) The junior school <u>students</u> are made to sweep and clean the floor always f) The senior school <u>students</u> are always bullying the junior school.

**Preposition**

is the word which places before a noun or a pronoun to show the relation of the noun or pronoun with the other words of the sentence. Before date 'on' is used; before

on hand year 'in' is used and before fixed time 'at' is used. The errors of preposition are mostly from the confusion of the selection of appropriate

preposition and their irregularity of uses. This category comprised the omission, insertion and the wrong choice of preposition. The errors are dominated by

the wrong selection of preposition. These errors are attributed to mother tongue interference and wrong analogy of the target language rules.

Error Classification	Error Identification	Error Correction
<b>Preposition</b>	<p>a) Myschool comprises <u>of</u> junior and senior secondary.</p> <p>b) The school garden needs to be renovated into a very beautiful garden.</p> <p>c) Ileya festival will begin <u>at</u> 8' o'clock.</p> <p>d) We will stay there for <u>three</u> days....</p>	<p>a) Myschool comprises junior and senior secondary.</p> <p>b) The school garden needs to be renovated to a very beautiful garden.</p> <p>c) Ileya festival will begin <u>at</u> 8' o'clock.</p> <p>d) We will stay there for <u>three</u> days....</p>

**Verb:**

The verbs - die, arrive, depend, belong, consist, appeal, ensure, arrive, awake etc. are

Intransitive verb and these verbs are not used in the passive form.

Error Classification	Error Identification	Error Correction
<b>Verb</b>	<p>a) Some students <u>arrived</u> late to the school.</p> <p>b) Our classroom <u>is belonged</u> to us.</p>	<p>a) Some students <u>came</u> late to the school.</p> <p>b) Our classroom <u>belongs</u> to us.</p>

**Spelling:** means the act or process of writing words by using the letters conventionally accepted for their formations.

Error Classification	Error Identification	Error Correction
<b>Spelling</b>	<p>a) ... <u>aroun</u> the school.</p> <p>b) ... because <u>the</u> couldn't find a chair.</p> <p>c) ... because <u>the</u> is no chalk and <u>maker</u> for the teachers.</p> <p>d) <u>Sinior</u> Waec.</p> <p>e) ... when he got <u>their</u>.</p> <p>f) The principal was <u>coofuse</u>.</p> <p>g) The hoe that we bought <u>buy</u> ourself.</p> <p>h) The sewing machines are no more <u>walking</u>.</p> <p>i) <u>Admition</u></p> <p>j) ... as if they were in <u>there</u> house.</p> <p>k) ... but now we <u>know</u> longer go to the school farm again.</p> <p>l) ... before are <u>know</u> longer done again.</p> <p>m) Library is not <u>function</u> in the secondary school.</p> <p>n) Some senior <u>stundents</u>...</p> <p>o) She is <u>encourages</u> others to follow her steps.</p>	<p>a) ... <u>around</u> the school.</p> <p>b) ... because <u>they</u> couldn't find a chair.</p> <p>c) ... because <u>there</u> is no chalk and <u>marker</u> for the teachers.</p> <p>d) <u>Senior</u> WAEC.</p> <p>e) ... when he got <u>there</u>.</p> <p>f) The principal was <u>confused</u>.</p> <p>g) The hoe that we bought <u>by</u> ourself.</p> <p>h) The sewing machines are no more <u>working</u>.</p> <p>i) <u>admission</u></p> <p>j) ... as if they were in <u>their</u> house.</p> <p>k) ... but now we <u>no</u> longer go to the school farm again.</p> <p>l) ... before are <u>no</u> longer done again.</p> <p>m) Library is not <u>functioning</u> in the secondary school.</p> <p>n) Some senior <u>students</u>...</p> <p>o) She is <u>encouraging</u> others to follow her steps.</p>

Table 1 shows the error classification, frequency and percentage of errors committed by the students in their written work.

**TABLE 1**

Analysis of Errors	Freq of Errors	Percentage of Errors
Capitalization	13	21.31147541
Article	3	4.918032787
Subject/Verb Agreement	9	14.75409836
Pronoun	2	3.278688525
Noun	2	3.278688525
Omission	7	11.47540984
Repetition	2	3.278688525
Degree/Adjective	1	1.639344262
Verb	2	3.278688525
Spelling	16	26.2295082
Preposition	4	6.557377049
Total	61	100

#### 4.1 Discussion of findings

The table

above shows that the most committed errors are spelling errors which have the frequency of 16 (26.23%). Next to spelling errors, wrong use of capitalization has the frequency of 13 (21.31%), subject/verb agreement errors have the frequency of 9 (14.75%) omission errors have the frequency of 7 (11.48%), preposition errors have the frequency of 4 (6.56%), article errors have the frequency of 3 (4.92%), each of pronoun, noun, repetition and verb errors has the frequency of 2 (3.28%) while degree/adjective error has the least the frequency of 1 (1.64%). Spelling error having the highest frequency could be attributed to carelessness of the students for not reviewing or reading through their written letters before submission. Following the spelling errors is the capitalization errors whose frequency or percentage error is the second highest due to the fact that these errors came from the same set of students having lack of concentration and consistency on rules and guidelines for using capital letters in written English letter writing. Apart from subject/verb agreement and omission errors taking 3<sup>rd</sup> and 4<sup>th</sup> positions in the percentage of errors as in Table 1, other error classifications could be regarded as errors occurring sparingly or uncommon errors as a result of their low error percentages and could be attributed to few students not adhering to appropriate use of parts of speech in English language they were taught in classes.

#### CONCLUSION

This study has given an account of the errors made by a group of English students at the junior secondary school level in their letters. Based on the discussion of the findings and the examples given, it could be concluded that the students committed eleven common errors, viz., capitalization, articles, subject/verb agreement, pronoun, noun, omission, repetition, degree/adjective, verb, spellings and preposition. It goes without saying that most of the students' errors are due to L1 transfer, intralingual factors and the carelessness of the students. The findings of this study have gone some way towards enhancing the understanding of categorizing and diagnosing of errors in English essays of the junior secondary school students. The present study, like all studies, has a number of limitations that need to be considered. First, the participants of this study were junior secondary school students (JSS3) of 3 private Secondary Schools in Abeokuta North local government area of Ogun State. Thus, the results in this investigation may not be generalized to other groups of students. Last, a limitation of this study is that the number of subjects involved was relatively small. The overt influences of Yoruba on the students' written English indicate that language teachers need to take careful stock of the transfer and interference of the students' mother tongue in



their spoken or written letters. Therefore, one way to highlight the influences of the mother tongue on the students' learning of English is to collect these errors and ask the students to analyze them and if they could correct them (Ridha 2012). Mistake is also a common phenomenon in the writing of the students. This research study may work as a guideline for the ELT practitioners. This study may help policymakers build up a better curriculum in the context of Nigerians.

### 5.2 Recommendations

Given the results of this study, a number of recommendations for further research are suggested namely:

- 1) It is recommended that further research be undertaken to investigate the errors made by English written Senior Secondary School (SS3) students to compare with the results of this current study and find out if there are reduction in number of errors committed as the students get to higher classes before writing their West Africa Senior Secondary Certificate Examination.
- 2) Further investigation into interlingual and intralingual errors of writers of other language is strongly recommended that is, Igbo speaking students.
- 3) Teachers should pay attention to the occurrence of those errors in order to provide relevant remedies as an attempt to prevent the students from fossilizing the wrong concepts of language usage.
- 4) To enable students to write more accurately, they need more practice on reading and thinking in English.
- 5) The curriculum planners should work hand in hand with the teachers who teach English Language to review the curriculum for junior secondary students and parts of speech should be given its rightful place in the scheme.
- 6) English Language should be taught by specialists in English who are capable of doing the job effectively. Apart from having a minimum of first degree in English or in a related discipline, they should always be made, with the assistance of the government, to attend seminars or conferences on the teaching of English Language. It is through this that they can improve their teaching.
- 7) Teachers should be equipped with discovering new ways of creative teaching and designing interesting grammar games to

make students familiar with the rules subconsciously in the primary stage of second language learning.

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### Adoption of use of Electronic Medical Record (EMR) System in Healthcare Facilities of Abeokuta City, Ogun State, Nigeria

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Background. Globally, electronic information and communication technology has been applied and much expanded in the healthcare industry. However, in developing countries including Ethiopia, EMR system adoption and utilization for medical practice are still inconsistent, and healthcare institutions which started utilization currently have also failed to sustain. A desirable readiness of healthcare experts is mandatory to expand digital health service delivery. Thus, this study is aimed at estimating the proportion of the willingness of profes-

nals in Abeokuta city to use EMR and identifying factors associated with this proportion.

Methods. An institution-based cross-sectional study was conducted from May 15, 2021, to August 15, 2023, among 2600 health professionals. Respondents were selected using a simple random sampling method. Data were reentered into

EpiData version 3.1 and exported to SPSS version 23 for further analysis. Descriptive statistics were computed to describe study variables

and presented using tables. Willingness to use the EMR system was computed. Bivariable and multivariable binary

logistic regression models were fitted to identify the associated factors. The odds ratio with 95% confidence interval was used to measure the strength of association.

Results. A total of 2500 health professionals participated in the study with a response rate of 96%. The proportion of willingness to use the EMR system was 85.9%. Among health professionals who were not willing to use EMR, lack of access to EMR training (73.4%) was a major barrier to the willingness

to use EMR. A multivariable logistic regression analysis showed that those health professionals who had good computer skill (AOR = 2.5; 95% CI: 1.3-4.6), good

knowledge on EMR (AOR = 2.1; 95% CI: 1.4-4.4), gotten EMR training (AOR = 3.8; 95% CI: 1.7-8.1), EMR guideline access (AOR = 2.8; 95% CI: 1.4-5.6), and management support (AOR = 2.6; 95% CI: 1.4-4.8) were more likely willing to use the EMR system. Conclusions. Majority of

the professionals were willing to use the EMR system. EMR programs should involve computer illiterate, less knowledgeable, those unable to access EMR guidelines, and managerially unsupported professionals. Enhancing

health professionals' attitude and contextualizing EMR training in the healthcare curricula are highly recommended to scale up EMR use.

## 1. Background

To date, the application of electronic information and communication technology

(ICT) in the healthcare system has increased worldwide. These include telehealth, mobile health applications, electronic medical records, and health information management systems [1]. A survey conducted by the World Health Organization (WHO) in 2012 indicated 45%

of countries used electronics systems for patients' data management. Besides, 30% of countries have been collecting and communicating patient information via electronic

systems [2,3]. In Nigeria, the ten-year perspective strategic

plan known as health sector transformation plan, which

had been implemented from 2010 to 2020, envisioned utilization of electronic

health management information system and strengthening the electronic medical record (EMR) system in the healthcare industry.

EMR, which is a patient's health and health-related information

record data set system, is operating based on an application of computer software. In other words, it is a

software program developed for the storage, processing, and exchange of medical and medical-related information, and the patients' data can

be created, gathered, managed, and consulted by authorized clinicians or staff within healthcare organizations [4,5].

EMR systems in the medical sectors do have numerous advantages where they simplify service delivery and decision-

making process [6]. Research conducted in hospitals in the US revealed that EMR system adoption decreased patient length of stay, patient mortality rate, and hospitalization by 0.11%, 0.18%, and 0.46%, respectively, out of 30 days [7]. Another study in Australia showed that 5% more patient consultations per hour had

been seen by medical practitioners in the EMR system compared to the paper-based medical recording system [8]. Similarly, results from India specified that the duration of patient treatment was significantly shorter for the electronic records system [6]. This has paved the way for the

increased acceptance and implementation of EMR by healthcare systems in the world including resource-limited countries Nigeria, where the EMR system has been launched by the Ministry of Health and included in the strategic plan [2,3,9].

The EMR system ensures high-quality documentation and easier to retrieve data system than the paper-based medical records system [8]. According to the research finding, retrieving evidence through

EMR system was 40% more complete and 20% faster than a paper records [6]. A study in Malawi in 2017 also indicated that 76%

of health workers preferred to work in healthcare facilities which had installed the EMR system, justifying that the system is fast and easy to

use. Additionally, 77.8% of respondents supported that the electronic health care data management system was more accurate, and as a result, the patients were served more quickly [10]. On the contrary,

paper-based prescriptions had 18.5% of reading error for the actual medication and also had lack of patient confidentiality and privacy due to unauthorized users who can easily access information [4,6,11]. A significant amount of medical errors around the globe are accustomed to weak EMR program and data system functioning and willingness to use EMR by health experts. Findings from North Carolina indicated that one in seven Medicare patients suffered harm and 63% of the harms were attributed to hospital medical care although 44% of the medical care errors were preventable if the installed EMR system was used by healthcare professionals enthusiastically. EMR systems are alarmingly being utilized and automated in healthcare system to improve effectiveness, timeliness, efficiency, quality of healthcare, data management, and decision-making. Nevertheless, a practice of EMR system implementation has faced confrontations from users even in the technically equipped healthcare working setups [12]. A survey by the WHO in 2016 indicated financial, technical, and infrastructural barriers were the commonest which is directly related to healthcare professionals' unwillingness to use EMR [13]. Similarly, other literatures found that different factors would also potentially affect the willingness to use EMR systems by healthcare experts. These include system users, facility setups, availability of skilled human capital, information and resource availability, training, computer literacy, English language proficiency, educational status, and knowledge for EMR [6,14-19]. Literature found around the world indicated that healthcare professionals' resistance and dissatisfaction in using new technology like EMR was a major barrier to escalate the electronic health data system [13,20,21]. Given the high burden of disease and the increased number of skilled personnel in Nigeria, information quality and user remain weak, particularly at primary healthcare facilities. This is because of deprived EMR infrastructure aggravated by the unwillingness to use the already available technology [14]. This makes surveillance systems and health communication among different healthcare organizations and professionals' very difficult [22]. A survey conducted between 2008-

2009 on health professionals' willingness to use EMR discovered that 42.3% of physician had willingness to use patients' electronic health records during clinical practices [23]. Whereas, another study carried out in Saudi Arabia revealed that 83% of healthcare professional preferably use EMR system than paper-based system [19].

## 2. Methods

2.1. Study Setting and Participants. Abeokuta city, where the study was conducted, is the capital city of Ogun State, Nigeria.

2.2. Study Design and Period. A cross-sectional study was conducted between May 15, to August 15, 2023,

2.3. Sample Size Determination and Sampling Procedures.

The sample size was calculated based on a single population

proportion formula using Epi Info version 3.5 with the following assumptions: 95% confidence interval ( $\alpha=0:05$ ), 5% margin of error

in the estimate of willingness to use the EMR system, and taking

the proportion ( $p$ ) of willingness to use EMR by healthcare professionals, which was 50%. The final

sample size estimated, after taking a 10% non-responder rate and a design effect of 1.5, was 636. Based on the number of

professionals found in each healthcare facility, the proportion to size allocation was made to achieve the desired sample size of healthcare professionals in each selected healthcare

facility. Multistage sampling was employed to recruit study participants. In the first stage, four out of six health institutions, which started to use EMR, were

selected using a simple random sampling method, while the second stage was the selection of the final respondents from the healthcare expert

sampling frame available in the human resource department.

During the data collection period, the numbers of allocated

sample size in the selected facility were further proportional

to the number of experts in each healthcare profession. Then,

healthcare professionals that participated in the study were

identified from each profession by using a computer-generated, simple random sampling method.

2.4. Data Collection Tools, Techniques, Procedures, and Quality Management.

A structured questionnaire adapted by reviewing the literature was used to collect data through self-administered interviews. Socio-demographic, skill, technical, and organizational variables were included in the questionnaire. Appropriate training was given for data collectors (health informaticians) and supervisors on the objectives of the study, data collection tools, data collection procedures, respondents' approach, and respondents' rights prior to the data collection period. Before the actual data collection, the tool was pretested among 5% of the sample size outside the study area with similar characteristics to the respondents, and necessary corrections were done accordingly. The investigators and supervisors closely checked the data collection procedures on the spot. Any questionnaire with a defect was rejected and counted as a non-response.

### 2.5. Data Processing and Analysis.

Data were coded and entered into EpiData version 3.1 software and then exported to SPSS version 23 for analysis. Frequencies, proportions, and summary statistics were used to summarize the data. Both bivariable and multivariable logistic regression analyses were carried out to identify the association between the dependent and independent variables. The degree of association between outcome and exposure variables was described by the adjusted odds ratio with a 95% confidence interval (CI).

Willingness to use the EMR system is the preparedness of healthcare professionals to use the EMR system. Willingness to use the EMR system by healthcare experts was graded into "yes" and "no" using composite scores obtained from all the five willing to use EMR questions tested and adopted from Khoja et al. [26]. Five of these questions were scored, and the maximum score obtainable was 5 marks. A score of 3 marks and above out of 5 marks suggested willingness while a score of less than 3 marks suggested unwillingness to use the EMR system.

2.6. Ethical Considerations. Verbal consent was obtained from each respondent. Each study participant was informed about the purpose and anticipated benefits of the research project. Privacy and confidentiality were guaranteed throughout the study.

### 3. Results

3.1. Socio-demographic Characteristics. A total of 2500 health professionals participated in the study with a response rate of 96%. The mean age of respondents was  $30.9 \pm 5.5$  years. The majority of respondents (92.6%) were in the age range of 20-39 years. About three-quarter (74.6%) were female respondents, and about 1758 (70.3%) were married. About 1802 (72.1%) of the participants were first-degree holders, and 65.3% of them were with working experience of less than 10 years. The majority of the respondents (1350 (54.0%)) were nurses by profession (Table 1).

3.2. Technical Factors for Readiness to Use the EMR System. More than half (54.7%) of health professionals had good knowledge towards EMR system use. This is because of lack of planned training packages in healthcare facilities. However, more than half (59.2%) of the respondents had sufficient skill to use computer systems which in turn enable them to use the EMR system. The computer skill was the result of a short-term training taken by each expert sponsoring themselves. Thus, the more professionals were computer literate, the more likely skillful they are in using the EMR system. However, more than half (51.8%) of the respondents did not receive EMR system training because of lack of access and plan for training (70.3%), absence of interest for training (9.1%), lack of time to be self-trained (7.5%), etc. More than two-thirds (70.3%) of health professionals had no English language barrier to use a computer and EMR system. This is because of the fact that most of the experts were bachelor or above by profession. Nearly two-thirds of the respondents used a computer device in the EMR system for the following obvious purposes: writing reports (11.3%), keeping patient files and profiles (55.5%), and reading (28.2%) (Table 2).

3.3. Organizational and Resource-Related Factors. Of the total respondents, 2008 (80.3%), 2170 (86.8%), and 1680 (67.2%) were able to access computers, the EMR

guideline, and the Internet for the purpose of running an EMR system, respectively. More than two-thirds (68.2%) of healthcare professionals had been supported by trained IT technical personnel recruited for EMR system maintenance. Nearly two-thirds (66.3%) of respondents got managerial support to use EMR system, however, only 39.2% of the respondents replied that adequate budget was allocated for EMR system (Table 3).

3.4. Readiness to Use the EMR System. The proportion of those who were willing to use the EMR system in healthcare facilities was 85.2% (95% CI: 82.3-89.5). About 71.4% and 82.0% of professionals were ready to avail even a personal computer and undergo a computer training in order to enable EMR usage, respectively (Table 4).

3.5. Factors Associated with Readiness to Use the EMR System. After adjustment for possible confounders, some

variables remained in the multivariable model: healthcare professionals who had trained for EMR system software were 3.75 times more likely to be willing to use the EMR system than those who had never trained for EMR system software (AOR=3.75; 95% CI: 1.73, 8.12); study subjects who have gotten EMR guideline around the clinical working area were 2.76-fold more likely to have willingness to use the EMR system compared to those with no EMR guideline (AOR=2.76; 95% CI: 1.36, 5.60); respondents working in the presence of higher management support were 2.59 times more likely to use the EMR system than their counterparts (AOR=2.59; 95% CI: 1.40, 4.77); the odds of readiness to use the EMR system was 2.46 and 2.11 times higher in those with good computer skill (AOR=2.46; 95% CI: 1.31, 4.61) and good knowledge on the EMR system (AOR=2.11; 95% CI: 1.02, 4.37), respectively (Table 5).

Table 1: Socio-demographic characteristics of healthcare professionals in healthcare facilities of Abeokuta city, Ogun State, Nigeria, 2023 (N= 2500).

Variables	Category	Frequency(f)	Percent(%)
Sex	Female	1865	74.6
	Male	635	25.4
Age in years	20-30	1202	48.0
	30-40	1114	44.6
	>40	1847	74.4
Religion	Orthodox	2110	84.4
	Muslim	302	12.1
	Others	88	3.5
Marital status	Married	1758	70.3
	Single	128	29.1
	Divorced(widow)	14	0.6
Educational level	Diploma	372	14.9
	Degree	1802	72.1
	Masters and above	326	13.0
Profession	Nurse	1350	54.0
	Physician	335	13.4
	Laboratory personnel	270	10.8
	Pharmacy personnel	210	8.4
	Midwives	136	5.4
Monthly income in Naira	Others*	199	8.0
	50000-64000	70	2.8
	65000-79000	575	23.0
	80000-99000	1188	47.5
	100000-149000	602	24.1
Working experience in years	≥150000	65	2.6
	≤10	1632	65.3
	>3808	34.7	

\*Optometrists, public health officers, anesthesiologists, and radiologists.

4. Discussion

The study is mainly dedicated to assess the willingness to use an EMR system among health care experts operating in health care facilities of Abeokuta city, Ogun State Nigeria.

Hence, the study proved that 85.2% of the experts were ready to use the EMR system in their assigned clinic and committed to advance patient data management systems even by being willing to avail one's own computer in the working

Table 2: Technical factors of health professionals in willingness to use the EMR system in facilities of Abeokuta city, Ogun State, Nigeria, 2023 (N= 2500).

Variables	Category	Frequency(f)	Percent(%)
Knowledge about EMR system	Good	1368	54.7
	Poor	1132	45.3
Possessing Computerskill	Sufficient	1480	59.2
	Not sufficient	1020	40.8
Having EMR training	Yes	1205	48.2
	No	1295	51.8
Reason for not taking EMR system training	Not interested in training	186	7.5
	No access to take training	1758	70.3
	Having no interest in training	2289	91.1
	My work does not need training	328	13.1
Using computer for EMR	Yes	1758	70.3
	No	742	29.7
Reasons for using computer and EMR system	Report writing	282	11.3
	Watching videos and listening to music	124	5.0
	Reading	705	28.2
	Keeping patient file and profiles	1389	55.5
Language barrier	Yes	795	31.8
	No	1705	68.2

Table 3: Organization- and resource-related factors of respondents in health care facilities of Abeokuta city, Ogun State, Nigeria, 2023 (N= 2500).

Variables	Category	Frequency (f)	Percent (%)
Computer access	Yes	2008	80.3
	No	492	19.7
Presence of trained IT technical personnel	Yes	1705	68.2
	No	795	31.8
Internet access for EMR system use	Yes	1680	67.2
	No	820	32.8
EMR guideline access	Yes	2170	86.8
	No	330	13.2
	Idonotknow	252	10.1
Adequate budget allocation	Yes	1658	66.3
	No	842	33.7
Management support for EMR system	Yes	1602	64.1
	No	898	35.9

setup (71.3%) and taking computer training sponsoring themselves (83.8%) in the absence of public support. In the current study, respondents' readiness to use the EMR system was comparable with previous studies [11, 16, 27]. The probable explanation for this similarity in the high proportions of people who were ready

to use the EMR system might be due to the global contextual technological advancement (automation of medical systems for advancement in healthcare practice [28, 29], an increase in computer literacy, and an increase in supporting infrastructure), and the government takes high priority provided

Table 4: Healthcare professionals readiness to use the EMR system in healthcare facilities of Abeokuta city, Ogun State, Nigeria, 2023 (N= 2500).

Variables	Category	Frequency(f)	Percent(%)
Readiness to own a personal computer to use EMR system	Yes	1785	71.4
	No	715	28.6
Readiness to undergo computer training to be able to use EMR system	Yes	2050	82.0
	No	450	18.0
Readiness to implement EMR system after taking EMR training	Yes	1842	73.7
	No	658	26.3
Readiness to use EMR system for patient service and if properly trained	Yes	1838	73.5
	No	662	26.5
Readiness to use EMR system if full infrastructure is being available	Yes	1948	77.9
	No	552	22.1
Readiness to use EMR system, overall	Yes	2130	85.2
	No	370	14.8

Table 5: Factors associated with readiness to use the EMR system among healthcare professionals in healthcare facilities of Abeokuta city, Ogun State, Nigeria, 2023 (N= 2500).

Variables	Readiness to use	No	OR( COR 5%)	AOR	Pvalue
Got EMR training					
Yes	2670	50	7.04(3.65-13.55)	3.75(1.73-8.12)	0.001**
No	1058	322	1	1	
EMR guideline access					
Yes	1932	244	5.67(3.34-9.66)	2.76(1.36-5.60)	0.005**
No	192	132	1	1	
Management support to use EMR					
Yes	1485	122	4.61(2.85-7.48)	2.59(1.40-4.77)	0.002**
No	652	241	1	1	
Computer skill					
Sufficient	1362	92	5.56(3.30-9.38)	2.46(1.31-4.61)	0.005**
Not sufficient	778	268	1	1	
Knowledge on EMR system					
Good	1090	72	4.17(2.39-7.39)	2.11(1.02-4.37)	0.044*
Poor	1050	288	1	1	

\*Statistically significant at  $P < 0.05$ . \*\*Significant at  $P < 0.01$ .

that the EMR system was included in the strategic plan of the Ministry of Health Tertiary Hospital [31]. The possible

variation existing between the two studies would be exhibited to the age difference among respondents. In the recent study, nearly



half of the study subjects were found in the age group below 30 years with a mean age of 30.9 years (Table 1), whereas in the previous study, nearly three-fourths of them were in the age group above 30 years with a mean age of 35.2 years [31]. This implies the fact that the more people are younger, the more they naturally tend to have motive, interest, and commitment to accept new technology developments [19, 25, 30]. Studies found that the deficit of basic and refreshment training on computers and e-Health among health professionals is the possible hindrance factor for the utilization of EMR systems in health care facilities that might lead to undesirable patient health outcomes [19]. This is actually reported in the same fashion by the current study in that the health professionals who had ever trained for the EMR system were more likely to be willing to use the EMR system than their counterparts, as supported by previous studies [10, 17, 20, 24, 25, 32]. This is also actually in line with the existing fact that training can change the knowledge, attitude, and skills of health professionals on computer systems and as a result increase commitment to use the EMR system. Thus, before the actual launching of such kind of program, it is mandatory to assess the existing level of knowledge, acceptance, and utilization habits of those subjects being studied. Successful implementation and sustainability of an EMR system utilization in health care industries depend on the computer skills of all health care professionals who were exposed in using it [28]. Additionally, computer skill or literacy is the pillar of information communication and EMR utilization in the health care system; for this reason, more than half (58.3%) of the respondents in the current study were with sufficient skill of computer application, and respondents whose computer skill was sufficient were more likely willing to use the EMR system than their counterparts. This finding was in line with the study findings from Ethiopia, Adama Hospital [24] and North Gondar zone [19], Nigeria [30], Kenya [33], and Egypt [34]. This is due to the fact that those health professionals with sufficient computer

skills and application could be confident enough in using EMR which indirectly influenced their view to use the EMR system. Availability of adequate computers, other resources, training center and support from non-governmental organization were also the likely explanations for the similarity of being sufficient skill. Several studies have indicated that there is a positive relationship between the level of knowledge on EMR and willingness to use electronic medical records, and the present study, as a result, identified that the health professionals who had good knowledge on EMR system were more likely willing to use the EMR system as compared to those with poor knowledge. This might be due to the fact that the health professionals with good knowledge do have the tendency to accept the advance of technology and are more likely able to willingly use the EMR system. This is supported by the study in the North Gondar zone [19], the Harer region [32], and Iran [35] and the study conducted in East Yangon General Hospital [36] whereas significant relationship between the importance of EMR and use of it was pronounced. Thus, interested groups and program owners of the EMR system should strengthen continual capacity building among less knowledgeable experts in order to narrow the awareness gaps found in the health system. Reliable and timely health information is the foundation of health systems action where information and communication technology initiatives such as EMR enhance the decision-making process. However, it is sometimes not available when required because of poor managerial priority, budget allocation, and support. This was truly explained by the current study by the fact that managerial support and access to EMR guidelines were an independent determinant for willingness to use the EMR system. This result is similar to that of the study conducted in Ethiopia, Ayder Referral Hospital [25], and Saudi Arabia Hospital [17]. This might be explained by the fact that when managerial support is in place, more resources including working manuals would be allocated to the EMR implementation provided that professionals are motivated and eager to use the EMR pac

kage. Additionally, managerial actions would increase supportive supervision, and therefore, more staff accepted to join in utilizing the EMR system. This study could not be realized without any limitations. Among them, recall bias was the commonest one and lead to a poor estimate of results. Moreover, social desirability bias was not minimized. The study assessment relied on self-report and thus did not provide an objective measure of the healthcare experts' skill in using the EMR system.

### 5. Conclusion

Majority of the healthcare professionals showed a better willingness to use the EMR system in parallel to existing literature and national plan. Since health professionals were not the main actors of the EMR system adoption and utilization, decision personnel should take the lion's share in order to automate the health system in particular in the study area and in general in Nigeria healthcare facilities. EMR program, which was recommended for expansion by the Ministry of Health nationwide, should involve and prioritize those who are computer illiterate and less knowledgeable and those who are unable to access the EMR guideline and managerially unsupported professionals. Enhancing and contextualizing EMR training in the healthcare curricula among universities in Nigeria are also a beneficial step to scale up EMR system use. In addition to this, awareness creation, cultivating skills, expanding infrastructures, allocating enough resources, and changing the eye view of policy-makers towards health are the milestone interventions in improving the landscape of Ethiopia's health ICT. A further assessment of the effective means of increasing EMR system use in the study area is a research agenda in countries with limited resources. Future studies should be emphasized on mixed approaches of both quantitative and qualitative methods so as to have an in-depth investigation based on qualitative methods.

Abbreviations  
EMR: Electromedical records  
SPSS: Statistical Package for Social Science  
AOR: Adjusted odds ratio  
CI: Confidence interval  
COR: Crude odds ratio  
ICT: Information and communication technology  
WHO: World Health Organization  
US: United States

M&E: Monitoring and evaluation.

### Data Availability

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

### Ethical Approval

Written and verbal informed consent from the study participants was also obtained before conducting this study.

### Conflicts of Interest

The author has declared that no competing interests exist.

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**Electronic medical record use and associated factors among clinical**

**healthcare professionals at public health facilities in Abeokuta South Local government of Ogun State, Nigeria**

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**Background:** Developing countries are lagging behind their developed counterparts in the adoption of electronic medical records (EMRs) in a clinical healthcare setting despite the significant benefits of digital health technologies (ITs). To improve the quality of clinical healthcare, EMRs have long been considered essential elements. In developing countries particularly, the rate of utilization of EMRs among clinical healthcare providers still remains slow.

**Objective:** Using EMR and its determinants among clinical healthcare providers at public health facilities in Abeokuta South Local government of Ogun State, this study aimed at exploring their potentials.

**Methods:** A quantitative cross-sectional study was conducted among 600 clinical health professionals working at public health facilities supplemented with a qualitative study in Abeokuta South Local government of Ogun State, Nigeria. The determinant factors of EMR use were explored using descriptive summary statistics and binary and multivariable logistic regression analysis, while analyzing qualitative data.

**Results:** Overall, about one-quarter (26.7%) of clinical health professionals were using electronic medical records. A work experience of 10 years or less [adjusted odds ratio (AOR)=2.23; 95% confidence interval (CI): [1.15–4.31]], a discussion on EMR (AOR=14.47; 95% CI: [5.58–7.57]), the presence of an EMR manual (AOR=3.10; 95% CI: [1.28–7.38]), and a positive attitude toward the EMR system (AOR=11.15; 95% CI: [4.90–25.36]) and service quality (AOR=8.02; 95% CI: [4.09–15.72]) were independent determinants of EMR use. Poor collaboration among stakeholders and dependence on the software programs of NGOs were the main challenges cited by key informants.

**Conclusion:** Many organizational, technical, and behavioral factors were

identified for low utilization of EMR use by clinical health professionals in the study area is very low calling for leveraging EMRs through continuous technical support and commitment for enhancement of its use, which has the potential to improve health service performance while giving consideration to development of locally applicable EMR software.

**Abbreviations:** HIT, health information technicians; HMIS, Health Management Information System; HSTP, Health Sector Transformation Plan; IT, information technology; NGO, non-governmental organizations; SD, standard deviation AOR, adjusted odds ratio; ART, antiretroviral treatment; CDC, communicable disease control; CI, confidence interval; COR, crude odds ratio; EMR, electronic medical record;

#### KEYWORDS

electronic medical record use, clinical healthcare, Abeokuta South local government, perceived EMR system quality, public health facilities, perceived service quality

#### Introduction

The ever-increasing integration of highly diversified technologies in the clinical healthcare field has resulted in the need for gathering organized and accurate data for informed decision-making in the clinical health sector (1–4). Evidence shows that health facilities with electronic notes, records, test results, and clinical decision support lead to an effective overall healthcare delivery system (5–9). One of the record number of automations being implemented in a healthcare setting is the electronic medical record (EMR), which is the “legal record created in hospitals and ambulatory environments that enables health facilities to capture, store, analyze and communicate patient health information in an electronic format” (10, 11).

Despite large investments to support the adoption of EMRs, the adoption rate of such systems is still low, and little progress has been made to harness the benefits of EMRs, particularly in developing countries (12). The implementation of the EMR is not consistent across healthcare facilities and its use is met with an alarming rate of failure in resource-poor settings (13–15). Due to limited resources, most electronic systems are still being used side by side with paper documentation,

which is creating a burden on health service providers (16–18). In developed countries such as the USA, more than three

quarters of health professionals (81.7%) are using EMRs, while in developing countries like Nigeria, the use of EMR by health professionals is very low (19, 20). A study in sub-Saharan countries showed “the complexity and impact of social considerations, outweighing product and EMR system limitations” (21). Similarly, the utilization of digital health investments for planning and decision-making in Nigeria has not been a priority so far and generally inadequately supported and poorly managed (3).

The current health sector transformation plan (HSTP) of Nigeria envisioned “all of its citizens enjoying equitable and affordable access to all types of health services” through the transformation agenda of the Information Revolution (3). In this regard, the use of the electronic medical record represents one of the key instruments in improving healthcare delivery (6, 7, 22). The Federal Ministry of Health in Nigeria started the development and implementation of a comprehensive EMR system for hospitals called SmartCare in 2000. The system was deployed in 25 hospitals in Abeokuta South local government other hospitals in regional cities within the 36 States of the federation. The Federal Ministry of Health adapted the system as a national EMR for all hospitals, and planned to scale it up to further hospitals and regions” (23, 24). All urban health facilities in the Abeokuta local government Administration were selected for the initial phase of implementation and chosen as a pilot site (23).

However, the current rate of utilization since EMR implementation in facilities in the Abeokuta south local government is unknown (24). Moreover, no study has been conducted on the utilization status of EMRs and individual and organization determinants in the study area. Therefore, this study is aimed to fill the knowledge gaps related to EMR utilization and its determinants among healthcare providers in facilities in the Abeokuta local government administration in Nigeria

#### Methods

##### Study design

An institution-based quantitative cross-sectional study supplemented with a qualitative approach was conducted at public health facilities in Abeokuta

South local government of Ogun State, Nigeria administration from July 15-Sept. 15, 2022. Abeokuta South Local govt., an industrial hub and home to several market centers, is located in Southern part of Abeokuta city, the state capital of Ogun State and has 34 health centers, 12 hospitals, and 62 health posts with a total of 1250 clinical health professionals including health extension workers.

### Study participants

The participants for this study were all healthcare providers selected randomly across twelve hospitals and seven health centers. A sample size of 600 was estimated with an assumption of a 95% confidence level, 80% power, and 10% non-responder rate. However, as the numbers of clinical healthcare providers were manageable (650), all healthcare providers were included in the data collection process. To better understand what factors influence EMR use, we also conducted in-depth interviews with nine key informants who had better knowledge and experience of the EMR in their organizations. The key informants were purposefully selected on the basis of their role in Health Management Information System (HMIS) and clinical healthcare data quality issues. All healthcare providers who were selected randomly across health facilities and who served for at least 6 months were approached to fill up the questionnaire.

### Data collection and quality control methods

A pretested semi-structured questionnaire was used, which was supplemented with in-depth interview guides. These tools were adapted and constructed from PRISM tools (25) and from previously conducted studies (24, 26, 27). Data were divided into two types, namely, quantitative data and qualitative data; five clinical nurses and five health officers were employed for collecting quantitative data, whereas two data collectors experienced with qualitative data collection carried out the in-depth interviews. Healthcare providers who were unavailable at the time of study were repeatedly visited to minimize the rate of high non-responses. Three item questions within-depth probing were adopted and contextualized from other studies (28, 29). The key informant interviews were sound-recorded using the Sony ICDPX470 sound recorder. To avoid desirability bias, none of the study participants were made

to know about the data collectors in person. Upon completion of each in-depth interview, a trained biostatistician produced a complete transcript and translation. Strict supervision and double data entry were made for data quality control.

### Measurements

The dependent variable: EMR use was measured if a participant used the EMR for one or more of the following functions: (1) finding patients with certain characteristics, (2) making notes (history and physical exam), (3) entering orders (lab, radiology), (4) reviewing/obtaining lab and radiology results, (5) updating diagnosis, (6) reviewing currently received medications, (7) writing prescriptions, (8) admitting a patient, (9) referring a patient, (10) viewing/scheduling appointment for a patient, (11) communicating using Smart Care's communication/report sending, and (12) producing patient summary reports/report generating. The respondent's computer skills were assessed using a 10-question score as follows: Internet browsing, calculations, email communication, database management, ability to check data accuracy, plot data by months or years, compute trends from bar charts, explain findings and their implications, use data for identifying gaps and setting targets, and use data for making various types of decisions and providing feedback. A mean score >95 denoted excellent, 80–95, very good, 65–80 good, 50–64 fair, and <50 poor. Perceived EMR system quality was assessed using five-item questions (please check the Questionnaire in Supplementary Materials), and a two-scale score was used to classify it as good or poor. Perceived service quality was assessed using nine-item questions (please check the Questionnaire in supplementary materials), and a two-scale score was used to classify it as good or poor. Similarly, perceived information quality was assessed using seven-item questions (please check the Questionnaire in Supplementary Materials), and a two-scale score was used to classify it as good or poor.

### Data analysis

All analyses were performed using SPSS 23 version. Descriptive summary statistics were used to describe the characteristics of study participants with EMR use. Bivariate and multivariable logistic regression was employed to identify factors affecting EMR use. All statistics with a  $p$ -value < 0.05 were declared significant. The collected qualitative data were transcribed, coded, and thematically analyzed. Coding

was made inductively during data analysis. The inductive approach was used by semantically analyzing the explicit content of the data to determine our themes.

**Ethical considerations**

Permission for data collection was obtained from Ministry of health facilities. Written and signed informed consent was obtained from the study participants in a form provided with the Questionnaire.

**Results**

**Socio-demographic characteristics of study participants**

Out of the 650 study participants, 600 (92.3%) responded to the questionnaires. The majority (64%) of the respondents were females (Table 1). The mean age of the respondents was 31.30 ( $\pm 6.61$ SD) years. More than one-third of the

participants (38.3%) had more than 10 years of experience, whereas about three-quarter (68%) of the respondents were degree holders.

For the qualitative in-depth interviews, seven HMIS/health informatics technicians (HIT) staff members and two health facility heads were involved. Five of the key informants were females. All of them were married; six of them were degree holders.

**Accessibility, functional status, and computer skills of health professionals**

A majority of the study participants 343 (57.2%) had access to at least one computer in their working desk (excluding the personal computer), of which about 57% were functional at the time of the study. (Table 2) More than two-third of the current users (338 (57%)) are using this

TABLE 1 Socio-demographic characteristics of the study participants, Abeokuta south local govt, Ogun state, Nigeria, 2021 (n=600).

Variable	Category	Freq.	Percent
Sex	Female	385	64.17
	Male	215	35.83
Age (years)	20–24	86	14.33
	25–29	201	33.50
	30–34	173	28.83
	35 and above	140	23.33
Residence	Urban	462	77.00
	Rural	138	23.00
Marital status	Single	220	36.67
	Married	331	55.17
	Others	49	8.16
Education	Diploma	137	22.83
	Degree	408	68.00
	Masters and above	55	9.17
Work experience	≤10 years	370	61.67
	>10 years	230	38.33
Profession	All Nurses	356	59.33
	Laboratory technicians	80	13.33
	Physicians	63	10.50
	Health Officers	52	8.67
Average monthly Income in ETB	Pharmacist	49	8.17
	601–1,650	18	3.00
	1,651–3,200	100	16.67
	3,201–5,250	246	41.00
	5,251–7,800	142	23.67
7,801–10,900	68	11.33	
Over 10,900		264	44.00

TABLE2 Accessibility, functional status, and computer skills of clinical healthcare professionals, Abeokuta south local govt, Ogun state, Nigeria, 2021 (n=600).

Variable	Categories	Frequency	Percent
Have access to computer(s)	Yes	343	57.17
	No	257	42.83
Number of accessible computer(s)	1	278	66.45
	2	110	20.25
	3	26	7.35
	≥4	27	6.95
Computer's functionality	Yes	338	57.00
	No	84	43.00
Share the available computer(s) with others	Yes	320	79.84
	No	49	20.16
Number of health professional(s) with whom they share their Computers	0	77	15.00
	1	52	9.36
	2	78	15.64
	3	86	20.00
	4 and above	148	40.00
Computer skill	Fair	302	50.33
	Poor	298	49.67

computer(s) for data recording, and an additional 141 (41.1%) and 74 (21.6%) of them use the available computer (s) for report generating and reading, respectively use. However, only 424 (70.7%) of the participants use EMRs after training, and only 141 (23.5%) of the participants own the EMR manual. Furthermore, only 145 (24.2%) participants hold regular discussions on the EMR during performance monitoring team meetings.

#### EMR use and related characteristics

Overall, 438 (73%) of the participants are aware of the EMR and more than half (24.2%) of them have used it before. Just over a quarter of health professionals (187 (31.2%)) are currently using EMRs. The EMR is most commonly used for sending reports (37.2%), followed by finding patients with certain characteristics (42.01%). Furthermore, about two-thirds of the current users (356 (59.3%)) are nurses, followed by laboratory technicians (80 (13.3%)), health officers (52 (8.7%)), physicians (63 (10.5%)), and pharmacists (49 (8.17)). Moreover, the main reported reasons for the current non-use of the EMR are the unavailability of the functional installed EMR software program.

The majority (360 (64.68%)) of the participants have received HMIS training, while 181 (30.1%) have been trained on EMR. Health professionals' acceptance and attitude toward the EMR

In general, when respondents were asked about EMRs, 287 (71.39%), 256 (63.68%), 255 (63.43%), and 266 (66.17%) of them agreed that they fully accepted them, believed that they improved their productivity, preferred them over paper-based record, and agreed that electronic recording of patient data had an impact on data quality, respectively. Moreover, there were significant differences in EMR use among healthcare providers with respect to their views on EMR service quality, EMR system quality, and perceived EMR information quality.

#### Factors associated with EMR use

In the final multivariable logistic regression analysis, the following variables were found to independently predict EMR use: work experience, access to the EMR manual, discussions on the EMR in meetings, positive



perceived EMR system quality, perceived service quality, and perceived benefit of the EMR (Table 3). Respondents with work experience of 6 years or less were about two times more likely to use EMRs than those with a work experience of greater than 6 years [adjusted odds ratio (AOR)=2.13; 95% confidence interval (CI)=[1.08–4.20]]. Study participants who had access to the EMR manual were three times more likely to use the EMR system than those who had no EMR manual (AOR=3.01; 95% CI=[1.23–7.40]). Those health professionals who reported having a discussion on EMRs in any meeting were about 15 times more likely to

use them compared with those who did not have any discussion on them (AOR=15.23; 95% CI=[5.70–40.74]). Respondents with good perceived EMR service equality were eight times more likely to use EMRs than those with a poor perception of EMR service quality (AOR=8.31; 95% CI=[4.11–16.80]). Similarly, respondents with good EMR system quality were about seven times more likely to use EMRs than those with poor perceived EMR system quality (AOR=7.38; 95% CI=[2.97–18.34]).

TABLE 3 Factors associated with EMR use by health professionals working in urban public health facilities, Abeokuta south local govt, Ogun state, Nigeria, 2021 (n=600)

Variables	Response	EMR use (%)		COR(95%CI)	AOR(95%CI)	p-Value
		Use	Donot use			
Work experience	>10years	231(38.5)	369(61.5)	1	1	0.03
	≤10years	176(29.3)	424(70.7)	1.70(1.06–2.75)	2.13(1.08–4.20)	
Computerskill	Poor	140(23.3)	460(76.7)	1	1	0.41
	Fair	167(27.7)	433(72.3)	1.98(1.26–3.12)	1.32(0.68–2.56)	
Smartcaretraining	No	126(21.0)	474(79.0)	1	1	0.06
	Yes	181(30.3)	419(69.7)	1.82(1.10–3.01)	0.45(0.20–1.01)	
PresenceofEMRmanual	No	166(27.6)	434(72.4)	1	1	0.02
	Yes	141(23.5)	459(76.5)	7.71(4.30–13.82)	3.01(1.23–7.40)	
Havingdiscussions onEMRs in any meeting	No	162(27.0)	438(73.0)	1	1	0.001
	Yes	145(24.2)	465(75.8)	18.74(9.2–38.3)	15.23(5.70–40.74)	
Perceivedservicequality	Poor	123(20.5)	477(79.5)	1	1	0.001
	Good	184(30.7)	422(69.3)	8.88(5.25–15.00)	8.31(4.11–16.80)	
Perceivedinformationquality	Poor	125(20.8)	475(79.2)	1	1	0.12
	Good	182(30.3)	418(69.7)	3.35(2.02–5.53)	1.87(0.85–4.08)	
Perceivedsystemquality	Poor	113(18.8)	487(71.2)	1	1	0.001
	Good	194(32.3)	406(67.7)	11.00(5.9–20.55)	7.38(2.97–18.34)	
PerceivedEMRbenefitstofacilities	Donotbenefit	167(27.7)	433(72.3)	1	1	0.18
	Benefit	140(23.3)	460(76.7)	1.72(1.07–2.75)	0.33(0.06–1.65)	
PerceivedEMRbenefitstopatients	Donotbenefit	165(27.5)	435(72.5)	1	1	0.04
	Benefit	142(23.6)	458(76.4)	2.33(1.45–3.76)	5.51(1.10–27.67)	

EMR, electronic medical record; AOR, adjusted odds ratio; CI, confidence intervals; COR, crude odds ratio. Health professionals who thought EMRs will benefit patients were about 5.5 times more likely to use them than those who said they will not benefit patients [AOR: 5.51; 95% CI (1.10–27.67)] (Table 3).

#### Challenges of EMR use (qualitative finding)

Multiple factors that influence EMR use were cited by key informants during their in-depth

interviews. Common themes were organized as organizational, technical, and behavioral factors during analysis (Table 4). The most common significant barrier cited by key informants for not using EMRs was the lack of EMR software installed on computers as well as a lack of management commitment to integrate EMRs into patient data recording.

TABLE 4 Common themes identified during in-depth interviews on factors affecting health professionals' EMR use organization (NGO) and after the project

was phased out, the EMR service was also stopped due to the

Organizational factors

Good governance problems, (ii) lack of budget for training and maintenance, (iii) dual documentation system, (iv) poor supervision and support, (v) work overload/shortage of time, (vi) inadequate HIT professionals, (vii) lack of incentives for good performance, (viii) poor coordination and mentoring process, (ix) ownership problems from health institutions, (x) lack of necessary infrastructure for integrating the EMR with other existing information systems. Other studies indicated that the dependence of developing countries on third-party vendors systems for EMRs, which usually involve unsustainable IT infrastructure and software management, were identified as

Technical

factors (i) lack of locally designed EMR software program, (ii) old and non-functional computers, (iii) electricity interruption, (iv) inadequate EMR training, (v) lack of timely maintenance and repair of computers, (vi) expired EMR software program.

Behavioral factors

(i) lack of computer skills and knowledge, (ii) poor commitment from users and management, (iii) lack of interest in adapting to a computerized system, (iv) challenges in motivating staff, (v) carelessness from staff and management, (vi) intentional resistance to use EMRs significant barriers in EMR implementation (23, 32–34).

However, this study finding is in line with those of other studies conducted in Ethiopia's Amhara Region (30) and in Addis Ababa (24). The lack of administrative and policy support and lack of available funding are cited by key informants as major barriers to EMR use. More than two-third of the respondents are in favor of EMR implementation and its positive effect on quality of care, which is supported by studies conducted in the Tigray region (27) and USA (35).

Environmental factors

(i) Poor collaboration from stakeholders, (ii) dependence on NGOs' software program, (iii) hot weather conditions.

The literature indicates that most health professionals have accepted the role of automated notes and records in improving healthcare quality (5, 36), though the lack of finding

where despite receiving training on EMR use, most health professionals were not using it.

Another point raised by key informants is health professionals'

attitude toward the EMR (Table 4). Some respondents cite that

some health professionals

get agitated with filling data in

computers and rather prefer to use paper-based record.

### Discussion

This study revealed that only a quarter of health professionals were using EMRs. This finding indicated low use compared with a finding in the USA (13), Hyder hospital in Tigray, and Amhar states in Ethiopia (24, 30, 31). None of the urban health facilities had a fully functional EMR system.

A few service delivery units such as antiretroviral treatment (ART) clinics and patient registration offices were using the EMR system in conjunction with paper-based records. This resulted from technical challenges related to EMRs, non-functional computers, electricity interruption, and the lack of timely maintenance and repair of computers. Moreover, healthcare providers' behavioral factors such as poor computer literacy, poor commitment, and lack of interest in

adapting to electronic recording were mentioned.

This study also found that poor collaboration from stakeholders and dependence on NGOs for the EMR program were cited as major factors. The respondents indicated that the software was designed by a non-governmental infrastructure and has hindered the full implementation of the system. In general, barriers associated with hardware and software resources are the most commonly cited barrier to EMR use by health professionals in this study.

Health professionals with a work experience of 6 years or less are twice more likely to use EMRs compared with those with work experience greater than 6 years. This finding is similar to that of a study conducted in northern Ethiopia (27). Studies have shown that the gap in the knowledge and skills of health

workers significantly influences data management processes (3,

37). Variations in terms of computer literacy, educational level, and personal commitment in this study could be an explanation for low EMR use among health professionals.

Having discussions on EMRs in any meeting and the presence of the EMR

manual are predictors of EMR use in this study. These findings are in line with those of other studies elsewhere in Ethiopia (20, 24, 27) and the USA (38). In contrast to studies conducted in different regions of Ethiopia (24, 27, 37), Iran (39), the USA (38), and Cyprus (40), training in the EMR system had no influence on EMR use in our study. From the logical point of view, training can improve the knowledge, attitude, and skills of health professionals. However, having adequate training by itself cannot be a driving factor unless the EMR system is continuously maintained and the staff are motivated to use EMR. In addition, key informants stated that the benefits of training have not reached those who actively engage in EMR use, including card room and ART units. Inadequate IT professionals have also been cited by key informants as a reason for low EMR utilization. Further, this study revealed that the attitude toward EMR system quality influences the utilization of the EMR system. Health professionals with good opinion on EMR service quality and EMR system quality are more likely to use EMRs than their counterparts are. This finding is consistent with that of a study conducted in Addis Ababa (24). This study identified users' acceptance as the primary determinant of effective utilization of any program (41, 42). The qualitative findings identified major organizational, technical, and behavioral factors as the major obstacles to EMR use by health professionals. These determinants have also been cited by other studies from the USA (43), Saudi Arabia (28), and the UK (29). Organizational (13, 35, 39, 44), technical, and most importantly behavioral (38, 39) factors were identified to be important determinants hindering effective and efficient utilization of EMRs. This cross-sectional study included only urban public health facilities. An extensive overview of overall EMR utilization status requires an inclusion of health posts and rural and private health facilities. The generalizability of the finding of this study may not apply to these facilities. Further, use was not assessed from a multilevel perspective across individual and organizational levels.

## Conclusions

The immense benefits offered by EMRs were very poorly utilized in this study area. Only a quarter of the respondents surveyed said that they used EMRs in their day-to-day activities. Organizational determinants (EMR manual presence, absence of EMR software program, smart care training, and attending regular discussions on the EMR) and individual factors (views on the benefits of the EMR to patients, perceived system quality, and service quality) had a significant influence on the utilization of the EMR. Successful utilization of the EMR requires the support and commitment of all stakeholders. Interventions should focus on improving users support, stabilizing power fluctuations, improving computer infrastructure, and providing continuous training.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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