Assessment of Ergonomic Hazards in Workstations and the Effects on Selected Public Servants

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Abstract:- The study is an assessment of Ergonomic hazards in the workstations and the effects on selected public servants. The research was a descriptive cross-sectional study carried out at a selected Federal Government Parastatal in Port Harcourt with a total of 60 public servants assessed using questionnaires, interviews and observations. The study revealed that there was poor knowledge and practice of safe ergonomics amongst the respondents. The study also showed that 40% of respondents strongly disagreed that they have received ergonomic trainings. 26.7% of the respondents disagreed that there was compliance to suitable ergonomic designs in public service. Also, 30% of the respondents agreed that there was prevalence of ergonomic hazards in public service. The research indicated that Ergonomic hazards in the workstations had negative health effects on the public servants such as upper back pain 45%, low back pain 46.7%, muscle strain 40%, neck pain 40%, blurring vision from screen glare 36.7%, fatigue 36.7%, shoulder pain 31.7%, while performing their legitimate duties as public servants. The research recommended the total remodeling of workstations in the public service sector to ergonomic compliance workstations.

Keywords:- Ergonomics, Human Factor, Workstation, Hazards.

I. INTRODUCTION

The International Ergonomics Association (IEA) defines ergonomics as a scientific field that focuses on the interactions between humans and various components of a system. It is also a profession that employs theory, principles, data, and methods to design workstation which enhance human well-being and system performance. The main objective of ergonomics is to optimize the overall system performance while ensuring human safety, efficiency, and comfort.

Sebastian (2019) defined the term "well-being" as the state of experiencing good health, happiness, and prosperity. This includes having positive mental health, a high level of life satisfaction, and a sense of meaning or purpose. The United Nations' 2030 Agenda for Sustainable Development, which is an official document approved in 2015, outlines a set of 17 Sustainable Development Goals (SDGs) to be achieved by 2030. In addition, the eighth SDGS is dedicated to "Decent Work and Economic Growth," emphasizing the importance of creating opportunities for sustainable and inclusive economic development that benefits all people.

The ILO's agenda for the Future of Work is based on three core pillars: increasing investment in people's capabilities, increasing investment in the institutions of work and increasing investment in the creation of decent and sustainable work opportunities. The organization aims to create a better understanding of the challenges and opportunities related to the rapidly changing world of work, and to promote policies and actions that can help achieve a more inclusive, equitable, and sustainable future of work (Ryder, 2015; United Nations, 2015).

Ergonomic risks can lead to serious injuries and negatively affect employees' health and productivity. Therefore, managing these risks is critical in creating a safe and healthy work environment. Recent research suggests that tools for managing ergonomic risks need to be more sophisticated and involve all stakeholders in the process (Burcu and Seren, 2022).

The present-day world is marked by increasing uncertainty and a sense of vulnerability towards hazards that affect everyone directly or indirectly. These concerns also impact the realm of work, which is a critical aspect of human life. For healthcare professionals, issues related to risk and vulnerability are especially significant as they face a range of physical, chemical, biological, and psychosocial hazards in their daily work (Aldo et al., 2018).

As the importance of human factors and ergonomics continues to grow, it is becoming increasingly necessary to pay attention to the design and evaluation of work environment to ensure they are ergonomically sound. However, traditional work practices often do not consider task variability in job design and assessment, leading to variations in task content and organizational work performance (Andrzej, 2020).

Ensuring worker safety is paramount in any industry. To accurately evaluate the risk of biomechanical overload for workers, various factors such as posture, exerted forces, manual handling, and repetitive actions with upper limbs must be taken into account. However, rather than merely reacting to these risks, a proactive approach to ergonomics during the design phase can be highly effective in preventing such risks altogether (Caputo et al., 2019).

The preliminary literature review indicates that work related health issues is traceable to workers tools which may be substandard or workstations which do not consider the worker anthropometry, nature of duties or time spent on the job. Therefore this research examines specific cause of workers health problems in the study offices.

II. METHODOLOGY

In this research work, the Descriptive Approach was utilized to provide an accurate and systematic description of the real-time situation during the study. As explained by Shona (2020), Descriptive research focuses on describing a population, situation, or phenomenon in a comprehensive and detailed manner. It can answer questions such as what, where, when, and how, but not why questions. The study employed structured questionnaires to assess ergonomic hazards in workstations and their impact on selected public servants in Port Harcourt. Additionally, interviews were conducted with some public servants. The primary objective of this research was to identify the ergonomic hazards present in workstations and their effects on selected public servants.

The study area used in this dissertation is a selected Federal Government Parastatal in Port Harcourt, Rivers State, Nigeria. It is focused on the assessment of ergonomic hazards in workstations and the effects on selected public servants. It also includes recommendations on standard performance in workstation.

The study population for this research consisted of 67 respondents who were public servants in a federal parastatal located in Port Harcourt, Rivers State. The sample was collected from this population. The target population, on the other hand, is the population to which the study results can be extended or generalized. In this particular study, the target population was selected public servants in Port Harcourt. The Yemane formula (1967) was utilized to determine the appropriate sample size.

$$n = \frac{N}{1+N\times(e^2)} \qquad \text{eqn (1)}$$

Where:
n- sample size
N= population size (80)
e = sampling error (0.05)
Substituting into equation:
$$n = \frac{80}{1+80\times(0.05^2)} = 67 \qquad \text{eqn (2)}$$

The selection of respondents was by purposive sampling technique. The total sample population which is the total number of workers in the organization used for the study was obtained from the parastatal. Due to the calculated sample size of 67 from a total population of 80, 67 questionnaires were given out for the study and 60 questionnaires were retrieved.

The data sources for this study include both primary and secondary data. The primary sources of data include physical interviews, observation and questionnaire administered to respondents while the secondary data sources include scholarly journals, abstracts from website and electronic copies of books.

Two research instruments were utilized: structured questionnaires and interviews. The questionnaires administered to the respondents gathered information on various demographic factors such as gender, age, level of education, marital status, and years of experience. Additionally, the questionnaire contained questions that focused on compliance to standards, prevalence of ergonomic hazards, effects of ergonomic hazards on public servants, and ways to improve performance. The questionnaire had a total of 38 questions divided into 5 categories. The first category had 5 questions on the respondent's demographic information, the second category contained 9 questions on compliance with statutory standards, the third category had 10 questions on the prevalence of ergonomic hazards, the fourth category contained 9 questions on the hazards' effects on public servants, the fifth category had 7 questions on ergonomic factors that affect work performance and sixth category had 10 question on the way to improve performance.

Section A offers the socio-demographic records of the respondents; Section B consists of questions relating to compliance to statutory standards; Section C consists of questions relating to prevalence of ergonomic hazards; Section D consists of questions relating to ergonomic hazards effects on public servants; Section E consists of questions relating to ergonomic hazards that affects the workers the most and Section F consists of questions relating to how to improve performance. Most of the questions were structured using Likert scale (1-Strongly agrees, 2- agreed, 3- Neutral, 4-Disagree, 5-Strongly Disagree) in order to prevent ambiguity and the need for guessing in the analysis of the data.

The collated data for this study was analyzed using Statistical Package for Social Sciences was (SPSS version 22). Data was summarized using descriptive statistics including frequencies, percentages, charts, and tables. Interpretation was made on the results achieved based upon which conclusions were drawn on the research objectives.

III. RESULTS OF STUDY

A. Socio-Demographic Distribution of Respondents
The socio-demographic profile of respondents was gender, age, marital status, job experience and level of education. Nineteen (31.7%) of respondents were female, while 41 (68.3%) were male. 6 (10.0%) of the 60 respondents were aged 26-33years, 29 (48.3%) were 34- 41, 24 (40%) were 42-49 years and 1 (1.7%) was 50 years respectively. 6 (44.5%) respondents were single, 53 (88.3%) were married, while 1 (1.7%) is divorced. 17 (28.3%) respondents had secondary education, 4 (6.7%), 41 (68.3%) and 12 (20%) had diploma, degree and others (higher education) respectively. Also, 17 (28.3%) of respondents had 0-8 years job experience, while 41 (68.3%) and 2 (3.3%) had 9-16 and 17-24 years job experience.

B. Compliance to Statutory Standards in Workstation

The study reveals that the respondents significantly agree that workers are familiar with safety practice (3.45±1.33), workers are aware of routine and no-routine safe ergonomic practices (3.02±1.44). However, respondents do not agree that ergonomic training was given prior to working as a public servant (2.40±1.48), provided with a comfortable working area (2.73±1.30), work area's environment is acceptable (2.98±1.13), work chair is adjustable and in good condition (2.22±1.33), workstation design is very good (2.67±1.19), office seating arrangements conforms to ergonomic standard (2.42±1.20) and office furniture are comfortable enough for 8 hours work period (2.33±1.19) respectively, since the mean is less than the criterion mean of 3.0. In general, the grand mean of 2.69±1.34 is less than the criterion mean of 3.0. This corresponds to 11.5% respondents strongly agreed, while agreed 19.4%, undecided 20.4%, disagreed 24.1% and strongly disagreed 24.6% respectively (See Table 1).

Table 1: Compliance to Statutory Standards in Workstation

S/N	Items (n=60)	SA	A	N	D	SD	Mean	STD	Decision
1	Ergonomic training was given prior to working as a public servant	8(13.3)	9(15)	6(10)	13(21.7)	24(40)	2.40	1.48	Disagree
2	provided with a comfortable working area	5(8.3)	15(25)	13(21.7)	13(21.7)	14(23.3)	2.73	1.30	Disagree
3	Work area's environment is acceptable	5(8.3)	15(25)	21(35)	12(20)	7(11.7)	2.98	1.13	Disagree
4	Workers are familiar with safety practice	18(30)	13(21.7)	12(20)	12(20)	5(8.3)	3.45	1.33	Agree
5	Workers are aware of routine and no-routine safe ergonomic practices	11(18.3)	17(28.3)	6(10)	14(23.3)	12(20)	3.02	1.44	Agree
6	Work chair is adjustable and in good condition	4(6.7)	9(15)	9(15)	12(20)	26(43.3)	2.22	1.33	Disagree
7	Workstation design is very good.	4(6.7)	10(16.7)	21(35)	12(20)	13(21.7)	2.67	1.19	Disagree
8	Office seating arrangements conforms to ergonomic standard.	3(5)	10(16.7)	12(20)	19(31.7)	16(26.7)	2.42	1.20	Disagree
9	Office furniture are comfortable enough for 8 hours work period.	4(6.7)	7(11.7)	10(16.7)	23(38.3)	16(26.7)	2.33	1.19	Disagree
	Grand Total	62(11.5)	105(19.4)	110(20.4)	130(24.1)	133(24.6)	2.69	1.34	Disagree

Strongly Agreed=SA, Agreed=A, Neutral=N, Disagreed=D, Strongly Disagreed=SD

C. Prevalence of Ergonomic Hazards at workstation

The study revealed that respondents significantly agreed that at their workstation there were ergonomic hazards associated with their job schedule (3.75±1.20), there were reported ergonomic hazards (3.28±1.25), workers have experienced at least one ergonomic hazards (3.78±0.99), repetitive tasks were frequently used (e.g. arm, hand, or fingers) (3.32±1.10), the internal temperature was satisfactory (3.03±1.21) and there were satisfactory lighting system (3.07±1.34). This is because the weighted means were greater than the criterion mean of 3.0. However, respondents do not agree that their work was carried out in an uncomfortable posture (2.58±1.09) and were sufficiently equipped for daily activities (2.50±1.03), since the mean was less than the criterion mean of 3.0. In general, the grand mean was 3.24±1.21. This corresponded to 16.2%. Respondents strongly agreed, while agreed were 30.0%, undecided 24.3%, disagreed 20.5% and strongly disagreed 9.0% respectively (See Table 2).

Table 2: Prevalence of Ergonomic Hazards at Workstation

S/N	Items (n=60)	SA	A	N	D	SD	Mean	STD	Decision
1	There are ergonomic hazards associated with Job Schedule	21(35)	17(28.3)	10(16.7)	10(16.7)	2(3.3)	3.75	1.20	Agree
2	There are reported ergonomic hazards	11(18.3)	16(26.7)	20(33.3)	5(8.3)	8(13.3)	3.28	1.25	Agree
3	Workers have experienced at least one ergonomic hazards	15(25)	24(40)	16(26.7)	3(5)	2(3.3)	3.78	0.99	Agree
4	Repetitive tasks are frequently used (e.g. arm, hand, or fingers).	10(16.7)	14(23.3)	25(41.7)	7(11.7)	4(6.7)	3.32	1.10	Agree
5	Work is carried out in an uncomfortable posture.	4(6.7)	11(18.3)	6(10)	34(56.7)	5(8.3)	2.58	1.09	Disagree
6	Workers are physically exhausted at the end of the day.	7(11.7)	23(38.3)	18(30)	8(13.3)	4(6.7)	3.35	1.07	Agree
7	The noise level in my work area is within normal limits	13(21.7)	27(45)	12(20)	6(10)	2(3.3)	3.72	1.03	Agree
8	The internal temperature in my workstation is satisfactory	7(11.7)	17(28.3)	13(21.7)	17(28.3)	6(10)	3.03	1.21	Agree
9	There is satisfactory lighting system at my workstation	8(13.3)	21(35)	8(13.3)	13(21.7)	10(16.7)	3.07	1.34	Agree
10	Workstation is sufficiently equipped for daily activities	1(1.7)	10(16.7)	18(30)	20(33.3)	11(18.3)	2.50	1.03	Disagree
	Grand Total	97(16.2)	180(30)	146(24.3)	123(20.5)	54(9)	3.24	1.21	Agree

Strongly Agreed=SA, Agreed=A, Neutral=N, Disagreed=D, Strongly Disagreed=SD

D. Ergonomic Hazards Effects on Public Servants

The study showed that respondents agreed they have significantly experienced ergonomic hazards while working. Hazards such as upper back pain (3.77±0.91), low back pain (3.65±0.97), muscle strain (3.40±0.83), neck pain (3.45±1.00), blurring vision from screen glare (3.58±1.17), fatigue (3.40±0.89), shoulder pain (3.20±0.94) and low back pain (3.77±0.91). However, respondents did not agree that they had significantly suffered low back pain before working as a public servant (2.88±1.11). This corresponded to 13.7%; Respondents strongly agreed, while agreed were 37.2%, undecided 35.0%, disagreed 9.1% and strongly disagreed 5.0% respectively (See Table 3).

Table 3: Ergonomic Hazards Effects on Public Servants

S/N	Items (n=60)	SA	A	N	D	SD	Mean	STD	Decision
1	low back pain before working as a public servant	5(8.3)	10(16.7)	26(43.3)	11(18.3)	8(13.3)	2.88	1.11	Disagree
2	upper back pain	12(20)	27(45)	18(30)	1(1.7)	2(3.3)	3.77	0.91	Agree
3	low back pain	10(16.7)	28(46.7)	15(25)	5(8.3)	2(3.3)	3.65	0.97	Agree
4	muscle strain	4(6.7)	24(40)	25(41.7)	6(10)	1(1.7)	3.40	0.83	Agree
5	neck pain	7(11.7)	24(40)	22(36.7)	3(5)	4(6.7)	3.45	1.00	Agree
6	blurring vision from screen glare	14(23.3)	22(36.7)	13(21.7)	7(11.7)	4(6.7)	3.58	1.17	Agree
7	fatigue	5(8.3)	22(36.7)	28(46.7)	2(3.3)	3(5)	3.40	0.89	Agree
8	shoulder pain	4(6.7)	19(31.7)	24(40)	11(18.3)	2(3.3)	3.20	0.94	Agree
9	Low back pain	13(21.7)	25(41.7)	18(30)	3(5)	1(1.7)	3.77	0.91	Agree
	Grand Total	74(13.7)	201(37.2)	189(35)	49(9.1)	27(5)	3.46	1.00	Agree

Strongly Agreed=SA, Agreed=A, Neutral=N, Disagreed=D, Strongly Disagreed=SD

E. Ergonomic Factor that affect the most at Work

The study showed that respondents significantly opined that body posture (3.73±0.99), working chair (4.12±0.96), work area design (3.65±1.09), ventilation (3.70±1.05), health (3.38±0.89), working hours/day (3.30±1.12) and lighting (3.35±1.29) were effects of ergonomic factor at work. Thus,

result revealed that 23.3% respondents strongly agreed, while agreed 34.3%, undecided 25.0%, disagreed 14.3% and strongly disagreed 3.1% respectively. In general, the grand mean of 3.60±1.09 were greater than the criterion mean of 3.0 (See Table 4).

Table 4: Ergonomic Factors that Affect the Most at Work

S/N	Items (n=60)	SA	A	N	D	SD	Mean	STD	Decision
1	Body Posture	14(23.3)	24(40)	15(25)	6(10)	1(1.7)	3.73	0.99	Agree
2	Working Chair	25(41.7)	22(36.7)	9(15)	3(5)	1(1.7)	4.12	0.96	Agree
3	Work Area Design	16(26.7)	18(30)	16(26.7)	9(15)	1(1.7)	3.65	1.09	Agree
4	Ventilation	16(26.7)	19(31.7)	17(28.3)	7(11.7)	1(1.7)	3.70	1.05	Agree
5	Health	5(8.3)	24(40)	20(33.3)	11(18.3)	0(0)	3.38	0.89	Agree
6	Working Hours/day	8(13.3)	22(36.7)	13(21.7)	14(23.3)	3(5)	3.30	1.12	Agree
7	Lighting	14(23.3)	15(25)	15(25)	10(16.7)	6(10)	3.35	1.29	Agree
	Grand Total	98(23.3)	144(34.3)	105(25)	60(14.3)	13(3.1)	3.60	1.09	Agree

Strongly Agreed=SA, Agreed=A, Neutral=N, Disagreed=D, Strongly Disagreed=SD

F. Ways to Improve Performance

The study revealed that respondents significantly opined that physical conditions at work (4.40±0.89), adequate and comfortable furniture(4.52±0.85), adequate workstation spacing (4.43±0.77), continuous ergonomic trainings (4.65±0.55), routine medical examination (4.58±0.65), adequate lighting system(4.45±0.70), sufficient break time(4.22±0.83), exercises & stretches(4.37±0.78), satisfactory internal temperature (4.62±0.49)and adequate ventilation at work are ways to improve performance (4.63±0.49). Thus, result revealed that 58.7% respondents strongly agreed, while agreed 34.0%, undecided 5.3%, disagreed 1.3% and strongly disagreed 0.7% respectively. In general, the grand mean of 4.49±0.72 was greater than the criterion mean of 3.0.

IV. DISCUSSION OF FINDINGS

Based on the findings of this study, 8.3% strongly agreed, 16.7% agreed, 43.3% neutral, 18.3% disagreed and 13.3% strongly disagreed that they suffer low back pain before working as a public servant. 20% strongly agreed, 45% agreed, 30% neutral, 1.7% disagreed and 3.3% strongly disagreed that they experienced upper back pain; 16.7% strongly agreed, 46.7% agreed, 25% neutral, 8.3% disagreed and 3.3% strongly disagreed that they experienced low back pain; 6.7% strongly agreed, 40% agreed, 41.7% neutral, 10% disagreed and 1.7% strongly disagreed that they experienced muscle strain; 11.7% strongly agreed, 40% agreed, 36.7% neutral, 5% disagreed and 6.7% strongly disagreed opined that they experienced neck pain; 23.3% strongly agreed, 36.7% agreed, 21.7% neutral, 11.7% disagreed and 6.7% strongly disagreed also opined that they experienced blurring vision from screen glare; 8.3% strongly agreed, 36.7% agreed, 46.7% neutral, 3.3% disagreed and 5% strongly disagreed that they experienced fatigue; 6.7% strongly agreed, 31.7% agreed, 40% neutral, 18.3% disagreed and 3.3% strongly disagreed that they suffered shoulder pain while working as a public servant. Majority of the respondents, therefore, agreed that there is effects of ergonomic hazards on public servants.

This study revealed that public servants stand the risk of ergonomic hazards such as low back pain, upper back pain, neck pain, muscle strain, blurring vision from screen glare, fatigue, shoulder paindue to the nature of their jobs, and the nature of their workstations. This work identified ergonomic hazards prevalent with the public servants at workstation. The gender distribution of respondents showed 68.3% male and 31.7% female. 6 (10.0%) out of 60 respondents were aged 26-33years, while 29 (48.3%), 24 (40%) and 1 (1.7%) were aged 34-41, 42-49 and 50years and above respectively. The respondents agreed that there are effects of ergonomic hazards low back pain, upper back pain, neck pain, muscle strain, blurring vision from screen glare, fatigue, shoulder pain on public servants such as upper back pain 45%, low back pain 46.7%, muscle strain 40%, neck pain 40%, blurring vision from screen glare 36.7%, fatigue 36.7%, shoulder pain 31.7%, while working as a public servant. These health problems emanated from various ways such as fixed seats, computer screen glare, poor sitting posture, poor ventilation, poor office spacing among others.

There were certain factors that should be taken into account to minimize the risk of ergonomic injuries. This includes:

- Choice of an adjustable chair that has a comfortable seat and good lumbar support. The chair should also be adjustable to allow the feet to rest flat on the ground while keeping your knees bent at a 90-degree angle.
- Use a desk or table that is spacious enough to fit your computer and other necessary equipment. Ensure that the desk or table is positioned at a height that allows the arms and elbows to bend at a 90-degree angle.
- Position the monitor at an adequate distance from the eyes and ensure that the top of the screen is at or slightly below the eye level to prevent neck and eye strain.
- Choose a keyboard and mouse that are comfortable to use and place them in a way that allows the arms and wrists to be at a 90-degree angle. Also, consider using a wrist rest to avoid wrist strain.
- Ensure that your workspace is well-lit, either through natural or artificial light, and prevent glare.

- Take regular breaks to stretch and move around to avoid back pain, neck pain, muscle strain and other health issues caused by prolonged sitting.
- Ensure good ergonomic practices by implementing workplace policies that involve regular workstation assessments and training on proper posture and workstation setup. These recommendations will help to create a workstation that is both comfortable and safe, reducing the risk of ergonomic injuries and discomfort.

The study revealed that respondents significantly have the opinion that physical conditions at work (4.40±0.89), adequate and comfortable furniture(4.52±0.85), adequate workstation spacing (4.43±0.77), continuous ergonomic trainings (4.65±0.55), routine medical examination (4.58±0.65), adequate lighting system(4.45±0.70), sufficient break time(4.22±0.83), exercises and stretches(4.37±0.78), satisfactory internal temperature (4.62±0.49)and adequate ventilation at work are ways to improve performance (4.63±0.49).

V. CONCLUSION

The researchers made following conclusions about workplace ergonomic risks: and its effects on selected public servant. There was poor knowledge and practice of safe ergonomics amongst the respondents. The study also showed that 40% of respondents strongly disagreed that they have received ergonomic trainings even though 30% have a good perception of ergonomic safe practices. Majority of the respondents disagreed that there was compliance to suitable ergonomic designs in public service. Majority of the respondents agreed that there was prevalence of ergonomic hazards in public service. Majority of the respondents agreed that there were effects of ergonomic hazards on public servants such as upper back pain 45%, low back pain 46.7%, muscle strain 40%, neck pain 40%, blurring vision from screen glare 36.7%, fatigue 36.7%, shoulder pain 31.7%, while working as a public servant.

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