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ERGONOMIC INVESTIGATION AND ASSESSMENT OF MOTORCYCLISTS MUSCULOSKELETAL DISORDERS

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Abstract. Motorcycles have become a mean of transportation in our rural and urban area in Nigeria. This cross sectional study was conducted in Abeokuta Ogun State to assess the work-related musculoskeletal disorders (WRMSDs) among the motorcyclist between October 2021 and January 2022 using snowball techniques. A structured modified Nordic Musculoskeletal disorder questionnaire (SNMQ) was administered to four hundred and fifty (450) motorcyclists. The result shows that 91.6% (412) of the motorcyclist participated. Furthermore, 76.1% of the cyclist experienced daily pains and 81.6% reported major pains in body parts. However, the results also show that major affected body regions were lower back (81.6%), leg (61.2%), upper back (82.0%), shoulder (55.1%), neck (82.5%), knee (73.3%), wrist/hand (98.8%), thigh (91.3%), ankle/feet (78.9%), ears (80.3%), eyes (59.0%), head (63.1%) respectively. The study concluded that high prevalence of WRMSDs existed among the commercial motorcyclists as a result of working hours, sitting posture, smoking and alcoholic drinking. Reduction of these symptoms could be achieved through the reduction of working hours.

Keywords: *WRMSDs, motorcyclist, smoking, alcohol, tiredness, break, shoulder, thigh.*

Rezumat. Motocicletele au devenit un mijloc de transport în zonele rurale și urbane din Nigeria. Acest studiu transversal a fost efectuat în statul Abeokuta Ogun pentru a evalua tulburările musculo-scheletale legate de muncă (WRMSD) în rândul motociclistului între octombrie 2021 și ianuarie 2022, folosind tehnici de bulgăre de zăpadă. Un chestionar modificat structurat pentru tulburări musculo-scheletale nordice (SNMQ) a fost administrat patru sute cincizeci (450) de motocicliști. Rezultatul arată că 91,6% (412) dintre motocicliști au participat. În plus, 76,1% dintre cicliști au avut dureri zilnice și 81,6% au raportat dureri majore în părți ale corpului. Cu toate acestea, rezultatele mai arată că regiunile majore ale corpului afectate au fost partea inferioară a spatelui (81,6%), picior (61,2%), partea superioară a spatelui (82,0%), umărul (55,1%), gâtul (82,5%), genunchi (73,3%), încheietura mâinii/mâna (98,8%), coapsă (91,3%), gleznă/picioare (78,9%), urechi (80,3%), ochi (59,0%), respectiv cap (63,1%). Studiul a concluzionat că există o prevalență ridicată a WRMSD în rândul

motocicliștilor comerciali ca urmare a orelor de lucru, a posturii pe scaun, a fumatului și a consumului de alcool. Reducerea acestor simptome ar putea fi realizată prin reducerea orelor de lucru.

Cuvinte cheie: *WRMSD, motociclist, fumat, alcool, oboseală, pauză, umăr, coapsă.*

Introduction

The application of ergonomics in all facet of our daily life cannot be overemphasized. Reference to this application, ergonomics is defined as the science of designing of workplace conditions, workstation and job demands to the capabilities of the working population, It is also involved the designing of fit-all approach. Ergonomics can be said to covers all facet of job being an aspect of industrial engineering discipline. Cumulative trauma disorders is defined as the excessive wear and tear on tendons, muscles and sensitive nerve tissue caused by continuous use over an extended period of time. The hazards of industries ranging from physical stress on joint, muscles, bone, tendons etc can be attributed to trauma injuries and disorders. This disorder could also be referred to as musculoskeletal disorders (MSDs). Similarly, environmental factors such as vision, hearing, health and comforts of individual cannot be jettison with a kick gloves but assessed as the risk factors.

Motorcycles in the recent days have become a mean of transportation in our rural and urban areas in Nigeria and some other developing countries. Research revealed that majority of individual in developing countries of low and middle level income ride motorcycle as a way of increasing their income couple with the vast unemployment [1].

Onawumi and Oyewale [1] reported further that poor road network with unpaved road linking rural area is glaring encouraged the increase in the use of motorcycle as well as increase unemployed youth venture into riding of motorcycle as a source of leaving. Riding of motorcycle is cheaper comparing to taxi or bus and most of the motorcycle operation area could not encourage taxi bus to ply due to the poor road couple with narrow nature of the road. The passengers of this motorcyclist also could not be spare of this discomfort. Riding motorcycle is risky and exposed the motorcyclist and passenger to hazards, environmental pollutions such as exhaust from other passer vehicle [1].

Karmegam et al., [2] reported that riding of motorcycle involves complex and risky maneuvers and processes. Though it could be cheap to procure, maintain and consume less fuel compare to taxi and buses but the risk of the man-machine, exposure to environmental dust etc still makes it very risky. The safety of motorcyclist has remained concern with the level of unprotected man-machine system and exposure, lack of body support, personal protective wears such as helmets, boots, jacket and gloves are required to serve as safety equipment for the motorcyclist [1].

Several model of motorcycle were imported to the country without recourse to the motorcyclist anthropometric dimensions or measurements. The consequence of this is the discomfort among the motorcyclist leading to musculoskeletal injuries and disorders. The work related cumulative trauma disorders of the motorcyclist may result in physiological illness. Due to prolong stress in a fixed position for long distance riding could lead to accident, body injury or death. Physical risk factors such as awkward posture, exertion repetition and work duration could also contributed to high level of musculoskeletal disorder in the shoulders, neck, arm etc [3].

Jaiyesimi et al., [4] investigated the work related musculoskeletal disorders and predisposing factors among 200 commercial motorcyclists in Ibadan north local government

area of Oyo State but could not cover large geographical area. Onawumi and Oyewale [1] studied on the survey of the motorcyclist and work related musculoskeletal disorders among 300 commercial motorcyclists but did not report or investigated the prevalence of musculoskeletal disorders or the risk factors. The research only focuses on the associated problem with respect to ergonomic design of different imported motorcycles.

Several studies of high prevalence in musculoskeletal disorders among different professionals in Abeokuta metropolis have been researched and reported by the author [3], [5, 6]. Due to incessant accident and complain of absence from work couple with pains by the commercial motorcyclist, this present research was aimed and designed to investigate the cumulative trauma disorders among the commercial motorcyclist leading to discomforts and related hazards and survey the model of motorcycle used in Abeokuta, Ogun State.

Methodology

The cross-sectional study was carried out between October 2021 and January 2022 to investigate the prevalence of musculoskeletal disorders (MSDs) among the motorcyclist leading to discomforts in Abeokuta areas, such as Fajol hotel junction, Gbonogun junction, Oloke junction, Olokuta junction, Panseke, Olomore area all in Ogun State. Snowball technique was used to reach out to the motorcyclist, because most of the cyclist decline interview with acclaimed stranger due to the security situation in the areas.

A self–administered questionnaire divided into three sections was used to conduct the interview base on the survey needed. The first section relates to socio-demographic information of the respondents, second section is the work-related characteristics of the motorcycle while the third section is the standardized Nordic musculoskeletal questionnaire (SMNQ) The question was developed for subjective approach correlating to twelve anatomical area of the body such as neck, shoulder, elbow, hands/wrists, upper back, low back, hip/thigh, knee, ankle/feet, eyes, ears and head based upon the areas where symptoms accumulated.

Statistical Data Analysis

Statistical Package for Social Sciences (SPSS) 23.0 version and Microsoft word excel (2010) was used for data analysis to estimate the descriptive statistic (frequencies and percentile), and elucidate the prevalence of work related musculoskeletal symptoms relating to demographic characteristics. Chi square test was also employed to assess the relationship between the prevalence of musculoskeletal disorders and demographic characteristic. Level of significance was set at $P<0.05$

Result

Study characteristics

Four hundred and fifty (450) self administered questionnaire were distributed to the motorcyclist. Four hundred and twelve were return with response rate of 91.6% with all male riders.

Table 1

Socio-demographic characteristics of the motorcyclist (n = 412)

	Variables	Frequency (n)	Percent (%)	p-value (p<0.05)
A	**Gender**			
	Male	412	100	0.000
	Age (years)			
B	21 – 25	189	45.9	
	26 – 30	68	16.5	

Continuation Table 1

	31 – 35	**85**	**20.6**	
	36 – 40	**57**	**13.8**	
	41 – 45	**13**	**3.2**	**0.000**
	Marital status			
C	Married	330	80/1	
	Single	82	19.9	0.000
	Education Level			
D	Primary School	36	8.7	
	Secondary School	266	64.6	
	* ND / **NCE	110	26.7	0.000

*ND – National Diploma

**NCE – National Certificate of Education

The motorcyclists in Abeokuta, Ogun State Nigeria peak through the age of 21 – 25 years (45.9%) as revealed in the Table 1 above.

Table 2

Characteristics of Work-Related

	Variable	Frequency (n)	Percent (%)	p-value (p<0.005)
	Year of Experience (years)			
A	0 – 5	327	79.4	
	6 – 10	85	20.6	0.000
	Working days per week			
B	4days	168	40.8	
	6days	85	20.6	
	7days	159	38.6	0.000
	Working hour per day			
C	>8hours	85	20.6	
	8hours	72	17.5	
	<12hours	255	61.9	0.000
	Tiredness			
D	Yes	412	100	
	No	0	0	0.000
	Frequency of tiredness			
E	Often	163	39.6	
	Sometimes	249	50.4	0.000
	Observe break			
F	Yes	252	61.2	
	No	160	38.8	0.000
	Length of break			
G	>1hour	163	39.6	
	<1hour	249	60.4	0.000
	Action taken when tired			
H	Self Medication	247	60.0	
	Taken herbs	165	40.0	0.000
	Smoking			
I	Yes	336	81.6	
	No	75	18.4	0.000
	Drinking Alcohol			
J	Yes	252	61.2	
	No	160	38.8	0.000

Majority of this group are youth who either dropout of secondary school or school certificate holders. The highest educational level of the motorcyclist was a secondary school certificate (64.6%) and most of them were married (80.1%).

Table 2 above shows the work-related characteristics of the motorcyclists. Majority (79.4%) of the motorcyclists had 0 – 5 yers of experiences in the riding and operation of the motorcycle. The results also revealed that 40.8% spent 4 days out 7days in a week to ride the motorcycle for commercial purposes working for more than 12 hours (61.9%) in a day respectively. Similarly, majority of the motorcyclist get tired while riding through the various environmental conditions such as dust, wind, noise, sooth etc on the road and 60.4% claimed sometimes feel tired while 39.6% often get tired. In view of this, tiredness, 61.2% reported observing rest of more than one hour (60.4%) every operational day.

Similarly, 81.6% and 61.2% of the motorcyclists smoke cigarette or like and engaged in the drinking of alcohol respectively during the break period. However, Table 2 above also shows the action taken when the motorcyclist get tired. Majority (60.0%) engaged in self medication while 40.0% uses herbs/concoctions to re-energize the lost strength.

Characteristic and prevalence of Musculoskeletal Disorders

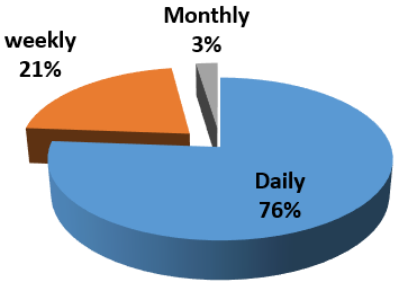

Figure 1. frequency of musculoskeletal Pains.

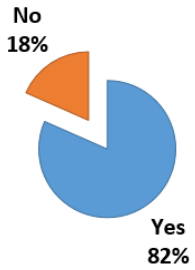

Figure 2. Prevalence of Musculoskeletal Disorders.

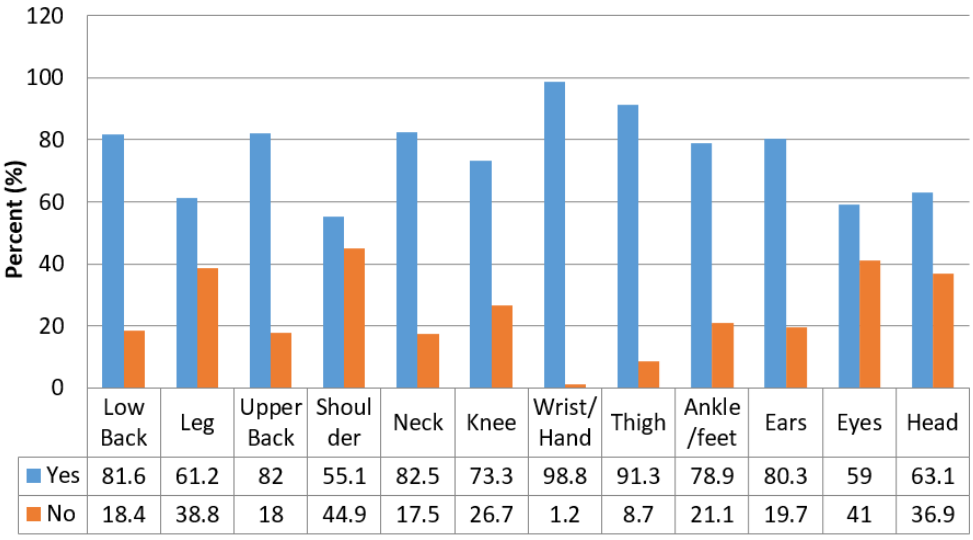

Figure 3. Prevalence of Musculoskeletal pains.

The result of the study as shown in Figure 1 shows that most (76.2%) of the cyclist experiences pain everyday and 82% equally reportedly experienced pain in major body region (figure 2). Similarly, figure 3 also revealed the most commonly affected body regions among the motorcyclists were lower back (81.6%), leg (61.2%), upper back (82.0%), shoulder (55.1%),

neck (82.5%), knee (73.3%), wrist/hand (98.8%), thigh (91.3%), ankle/feet (78.9%), ears (80.3%), eyes (59.0%), and head (63.1%) respectively.

Discussion

The study demonstrated that more than 80% of the motorcyclists reported work-related musculoskeletal disorders (WRMSDs). This is about 255 higher than that 60% MSDs prevalence rate of commercial motorcyclist in Lagos Nigeria [7] and 10% lower compared with similar study of Jaiyesinmi et al., [4]. High level of WRMSDs among commercial motorcyclist may be attributed to the riding requiring excessive use of body regions. Consistent uses of all body parts are very important to maintain stability which involves maneuvering [8].

Most of the motorcyclist experience significant stress during and after riding for a long period of over 12hours. This stress was assessed on twelve body parts as shown in figure 3. The high prevalence of wrist/hand (98.8%) and thigh (91.3%) could be observed from the study. The other body regions, most affected was lower back, upper back, neck and knee. This study was comparable with [1, 4, 8].

Authors discovered that most of the studies in Nigeria found lower back to be most affected body region among cars, buses and trucks drivers [9, 10] and this is due to the long static and awkward position while driving and this is also very applicable to motorcyclist. Onawumi and Oyewale [1] reported that neck and head of the riders were upset which forced the rider to adjust to awkward position. Majority of the motorcyclist complained of lower back, wrist/hand and thigh while considerable number (55.1%) complained of shoulder related pains as against Onawumi and Oyewale [1] study. Prolong sitting and fixed posture could lead to muscular fatigue [11].

Ergonomic design of the motorcycle may also be attributed to discomfort of the rider. Majority of the motorcycle used in operation lack back support. Similarly, vibration exposure from the handbar could also lead to symptoms in the wrist/hand and shoulder [12]. The occurrence of WRMSDs among motorcyclists could lead to work inefficiency and low productivity. This is a major characteristics of RMSDs as highlighted by Centre for Disease Control (CDC) that “MSDs are associated with high cost to employers such as absenteeism, lost productivity and high increase health care, disability and workers compensation cost” [13].

Conclusion

The study shows that high prevalence of WRMSDs existed among the commercial motorcyclist in Abeokuta Nigeria. Socio-demographic and characteristics of work-related were identified as work related risk factors. Riding hours, posture, smoking and alcoholic drinking also played major factor associated with higher low back pains among the motorcyclists.

The stress and discomforts are seriously associated with the design failure of the motorcycle which is as a result of non-used of anthropometric dimension of the Nigerian motorcyclists. This stress and discomfort posed hazard to the rider due to the importation of the motorcycle to Nigeria without recourse to the adult population anthropometric dimension.

This study recommends that reduction in the hours spent in riding (working hours) could reduce the WRMSDs. Similarly, the anthropometric dimension of the adult Nigerians could also improve the ergonomic design of the motorcycle.

Limitation of the study

Most of the motorcyclist hinged on the security of the area and are not ready to attend to stranger whom they thought may use the data collected for rituals or other things. In view of this, authors resulted in the use of snowball techniques to reach out to their parks. Some of the motorcyclist (8.44%) claimed to be busy or in hasten and did not return the collected questionnaire with them.

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