ASSOCIATION BETWEEN RISK FACTORS AND OCCUPATIONAL HAZARDS AMONG HEALTH WORKERS IN PORT HARCOURT NIGERIA

ABSTRACT

Occupation is a labour routinely engaged in by individuals, often as a result of training, and for the purpose of making or earning a living. A hazard is something that could cause harm. The aim of this study was to study the association between risk factors and occupational hazards.A well-structured questionnaire was used for the collection of details from the respondentsabout their socio-demographic data, risk assessmentdata and hazard occurrence. The risk assessment data (risk factors) studied include: PPE provision, PPE usage, working at multiple facilities, working overtime, sleep adequacy, exercise, waste segregation, processing of biohazard specimen in closed chamber, disposal of biohazard according to set standard, and good work posture. These risk factors were studied based on physical, biological and chemical hazards.The result showed that out of 10 studied risk factors, only 8 had significant associations (p-values<0.5)with occupational hazards;working overtime, sleep adequacy were the two risk factors amongst the 8 that had significant association with all the studied occupational hazard(physical, biological and chemical hazards). PPE provision, working at multiple facilities, and waste segregation had significant association with two occupational hazards. While use of PPE, exercise and processing of specimen in closed chamber had significant associations with physical, biological and chemical hazards respectively. Disposing of biohazard according to set standard and good posture had no relationship (p-values>0.05) with occupational hazard. This study has shown occupational hazards may have varying or shared risk factors, therefore, care must be taken to ensure risk at work place is minimally reduced.

Keywords: *Hazards, occupation, risk, chemicals, biological, physical.*

INTRODUCTION

Occupation, as described by Merriam-Webster Dictionary, is a labour routinely engagedin by individuals, often as a result of training, and for the purpose of making or earning a living [1,2]. An occupation is also a task performed for a profit or profits. It could be for fun or as a result of necessity [3].

A hazard is something that could cause harm. When something has the potential to harm someone's health, life, property, or any other valuable interest even theoretically, it is considered to be a hazardous substance, event, or circumstance [4].The term "risk," which is frequently used synonymously in everyday discourse, refers to the likelihood that the potential harm will actually occur in a particular instance as well as the size of that harm[4,5].In order to categorize a risk, it must be determined whether it is natural, anthropogenic, technical, or a combination of these. For example, a natural phenomenon like wildfire may become more frequent owing to anthropogenic climate change or more dangerous due to changes in building practices. There is a recurring pattern in many different types of risks where there is stored energy that, when released, can cause harm. Chemical, mechanical, thermal, and other risks as well as potential victim populations and the gravity of

the risk can all result from the stored energy. A hazard typically affects a variety of targets while having little to no impact on others [4].The first step in conducting a risk assessment is the definition of hazards, which presupposes that the potential targets are identified.

Hazardous natural (or physical) events are only those that have the potential to endanger life, damage property, or disrupt social or economic order [6].Hazard have the characteristics of either being in the environmental or natural in form. The motion of tectonic plates, the impact of weather systems, the presence of streams and slopes, and other natural phenomena all have a role in determining where natural disasters are most likely to occur (e.g. that might generate landslides). However, factors like urbanization, deterioration of the environment, and climate change can also affect the location, occurrence (frequency), and severity of natural hazards. These actions are referred to as risk drivers [6]. According to Ismail [7], every workplace has some level of risk, and determining which ones pose the greatest threat to employees' safety would require being better equipped to regulate or eliminate workplace hazards and avert accidents, injuries, property damage, and downtime if you can identify them.

Based on the article published by Ismail [7], hazards can be categorized into: biological, physical, physiological, chemical, and ergonomic. Bacteria, viruses, parasites, and molds or fungi are examples of biologicalhealth hazards. When they come into touch with skin, are eaten, or are inhaled, they can be harmful to human health. They have the potential to spread diseases such parasite infections, tetanus, lung infections, and food poisoning. In order to monitor and manage biological dangers that are spread through water, food, or the air, we offer our expertise and resources [7,8]. Personal protective equipment (PPEs) and thorough washing of the hands and exposed parts of the body, plays a role in mitigating the exposure of workers to biological pathogens [7]. Physicalhazards are substances, elements, or situations that can be harmful upon contact. They can be divided into two categories: environmental hazards and occupational hazards [9]. Noise, vibration, heat, radiation, body stressing, and ergonomics consists some of the examples of physical hazards [9,10].This hazard can arise from manual handling and computer usage [10]. According to WorkSafe.qld.gov.au[11], aspects of the workplace and how work is structured that are linked to mental problems and/or physical harm or disease are known as psychological hazards. Psychosocial risks can have a detrimental effect on organizational metrics like productivity, absenteeism, and turnover if they are not properly managed.Any material, regardless of form, that has the potential to endanger people's physical and mental health or result to environmental harm is considered a chemical hazard. It can also be described as the real danger posed by a particular chemical, such as the potential for skin burns, long-term health effects, long-lasting environmental harm, fires, or even explosions [12]. One of the leading causes of chemical hazard as well as other forms of hazard is the neglect of Good Manufacturing Practices (GMPs) either by an institution, or workers [13]Ergonomic hazards are environmental conditions that can lead to musculoskeletal injury [14].Some examples include static posture, cold temperature, contact stress, vibrations, and repetition [15]. In this study, the attempt was to determine the association between risk factors and various kinds of occupational hazards among healthcare workers.

MATERIALS AND METHOD

Study Area

This study was conducted in PAMO University of Medical Sciences (PUMS) and Rivers State University Teaching Hospital. PAMO University of Medical Sciences is the first private medical university in Nigeria, located at Elelenwo, Port Harcourt, Rivers State, Nigeria. Rivers State University Teaching Hospital, is a state own hospital which services most of the people in Port Harcourt. Both institutions are located in Port Harcourt, Rivers State, Nigeria.

Study Population

The study was carried out among various cadre of health workers within PAMO University of Medical Sciences and Rivers State University Teaching Hospital. The study was conducted among 212 respondents which were randomly selected in PAMO University of Medical Sciences and Rivers State University Teaching Hospital, with respect to various socio-demographic variables.

Data Collection

A well-structured questionnaire was developed for the collection of details from the respondents which captured theiroccupation and the compliance to risk assessmentparameters. The risk assessment parameters include: as age group, gender, marital status, head of household, care of health worker, responsibility of cadre, specialty, work zone, and type of facility. The risk factors considered are: provision of necessary PPEs, regular putting on of provided PPEs, working in multiple facilities, working overtime, getting regular and required sleep (8hrs), getting regular exercise, proper waste segregation, following due process for handling biohazard specimen in enclosed chamber, disposing of biohazard waste according to set standard, and good working posture.

Data Analysis

Data collected were analyzed using IBM® SPSS(Statistical Package for the Social Science) version 25.0. The association between occupation and risk factors were analyzed using Chi-square and the level of significance was set at p-value<0.05.

RESULTS

The socio-demographic variables such as age group, gender, marital status, head of household, care of health worker, responsibility of cadre, specialty, work zone, and type of facility of the respondents are captured and represented in the table below with respect to frequency. Results werepresented in percentage (%).

Table 1: socio-demographics variables of respondents.

Socio-demographic characteristics	Frequency	Percentage (%)
Age group		

< 20 years	16	7.5
21 – 30 years	87	41.0
31 – 40 years	74	34.9
41 – 50 years	25	11.8
>50 years	10	4.7
Total	212	100.0
Gender		
Male	72	34.0
Female	140	66.0
Total	212	100.0
Marital Status		
Single	121	57.1
Married	89	42.0
Divorcee	1	0.5
Widow	1	0.5
Widower	-	-
Total	212	100.0
Head of Household		
Yes	66	31.1
No	146	68.9
Total	212	100.0
Cadre of Health worker		
Senior	85	40.1
Junior	127	59.9
Total	212	100.0
Responsibility of Cadre		
Very Tasking	90	42.5
Tasking	99	46.7
Not Tasking	23	10.8
Total	212	100.0
Specialty		
Med Lab Science	117	55.2
Nursing	41	19.3
Radiographer	20	9.4
Medical Doctor	7	3.3
Pharmacist	2	0.9
Others	25	11.8
Total	212	100.0
Work Zone		
Laboratory	119	56.1
A & E	7	3.3
Theatre	9	4.2
Consulting Room	13	6.1
X ray	23	10.8
Dispensary	11	5.2
Office	25	11.8
Others	5	2.4
Total	212	100.0

Type of Facility		
Primary	50	23.6
Secondary	52	24.5
Tertiary	110	51.9
Total	212	100.0

Table 2 below shows hazard types and the frequency of their occurrence

Table 2: Frequency Distributions of hazard occurrence

VARIABLES	FREQUENCY(F)	PERCENTAGE(%)
PHYSICAL HAZARDS		
Regularly	48	22.6
Irregularly	161	76.0
Not at all	3	1.4
Total	212	100.0
BIOLOGICAL HAZARDS		
Regularly	92	43.4
Irregularly	105	5.0
Not at all	14	6.6
Total	212	100.0
CHEMICAL HAZARDS		
Regularly	76	35.8
Irregularly	84	39.6
Not at all	52	24.5
Total	212	100.0

Table 3 shows the frequency distribution or level of compliance to risk management indices among the respondents.

Table 3: Frequency Distribution of risk factors amongst respondents

Variables	Frequency (F)	Percentage (%)
Are all necessary PPEs Provided?		
Regularly	90	42.5
Irregularly	97	45.8
Not at all	25	11.8
Total	212	100.0
Do you wear all the necessary PPEs during work?		
Regularly	115	54.2
Irregularly	88	41.5
Not at all	9	4.2
Total	212	100.0
Do you work in multiple facilities?		
Regularly	51	24.1
Irregularly	79	37.3
Not at all	82	38.7
Total	212	100.0
Do you work overtime?		

Regularly	52	24.5
Irregularly	123	58.0
Not at all	37	17.5
Total	212	100.0
Do you sleep well? (up to 8 hours daily)		
Regularly	83	39.2
Irregularly	105	49.5
Not at all	24	11.3
Total	212	100.0
How often do you exercise?		
Regularly	48	22.6
Irregularly	140	66.0
Not at all	24	11.3
Total	212	100.0
Do you segregate your waste?		
Regularly	111	52.4
Irregularly	75	35.4
Not at all	26	12.3
Total	212	100.0
Do you process biohazard specimen in enclosed chamber?		
Regularly	85	40.1
Irregularly	90	42.5
Not at all	37	17.5
Total	212	100.0
Do you dispose off biohazard wastes according to set standards?		
Regularly	122	57.5
Irregularly	66	31.1
Not at all	24	11.3
Total	212	100.0
Do you work in a good posture?		
Regularly	101	47.6
Irregularly	104	49.1
Not at all	7	3.3
Total	212	100.0

Table 4 shows the frequency of exposure of respondents to the different types of studied hazards (physical, biological and chemical) based on age group classifications.

Table 4: Frequency of exposure of health workers to occupational hazards based age group

VARIABLES	FREQUENCY(F)	PERCENTAGE(%)
PHYSICAL HAZARDS		
<20 years		

Regularly	1	6.3
Irregularly	13	81.3
Not at all	2	12.5
Total	16	100.0
21 – 30 years		
Regularly	24	27.5
Irregularly	63	72.3
Not at all	-	
Total	87	100.0
31 – 40 years		
Regularly	15	20.3
Irregularly	58	78.4
Not at all	1	1.4
Total	74	100.0
41 – 50 years		
Regularly	8	32
Irregularly	17	68
Not at all	-	-
Total	25	100.0
>50 years		
Regularly	-	-
Irregularly	10	100.0
Not at all	-	-
Total	10	100.0
BIOLOGICAL HAZARDS		
< 20 years		
Regularly	3	18.8
Irregularly	8	50.0
Not at all	5	31.3
Total	16	100.0
21 – 30 years		
Regularly	38	43.7
Irregularly	46	52.9
Not at all	3	3.4
Total	87	100.0
31 – 40 years		
Regularly	32	43.2
Irregularly	39	52.7
Not at all	3	4.1
Total	74	100.0
41 – 50 years		
Regularly	13	52.0
Irregularly	9	36.0
Not at all	3	12.0
Total	25	100.0
>50 years		
Regularly	6	60.0
Irregularly	4	40.0
Not at all	-	
Total	10	100.0
CHEMICAL HAZARDS		
<20 years		

Regularly	2	12.5
Irregularly	7	43.8
Not at all	7	43.8
Total	16	100.0
21 – 30 years		
Regularly	39	44.8
Irregularly	28	32.2
Not at all	20	23.0
Total	87	100.0
31 – 40 years		
Regularly	24	32.4
Irregularly	33	44.6
Not at all	17	23.0
Total	74	100.0
41 – 50 years		
Regularly	8	32.0
Irregularly	13	52.0
Not at all	4	16.0
Total	25	100.0
>50 years		
Regularly	3	30.0
Irregularly	3	30.0
Not at all	4	40.0
Total	10	100.0

Table 5 shows the frequency of exposure of respondents to the different types of studied hazards (physical, biological and chemical) based on gender classifications.

Table 5: Frequency of exposure of health workers to occupational hazards based gender

VARIABLES	FREQUENCY(F)	PERCENTAGE(%)
PHYSICAL HAZARDS		
Male		
Regularly	15	20.9
Irregularly	55	76.4
Not at all	2	2.8
Total	72	100.0
Female		
Regularly	33	23.5
Irregularly	106	75.7
Not at all	1	0.7
Total	140	100.0
BIOLOGICAL HAZARDS		
Male		
Regularly	25	34.7
Irregularly	42	58.3
Not at all	5	6.9
Total	72	100.0
Female		
Regularly	67	47.8
Irregularly	64	45.7

Not at all	9	6.4
Total	140	100.0
CHEMICAL HAZARDS		
Male		
Regularly	23	31.9
Irregularly	31	43.1
Not at all	18	25.0
Total	72	100.0
Female		
Regularly	53	37.9
Irregularly	53	37.9
Not at all	34	24.3
Total	72	100.0

Table 6 shows the frequency of exposure of respondents to the different types of studied hazards (physical, biological and chemical) based on age occupational or specialty classifications.

TABLE 6: Frequency of exposure of health workers to occupational hazards based specialty

VARIABLES	FREQUENCY(F)	PERCENTAGE(%)
PHYSICAL HAZARDS		
Medical Laboratory Science		
Regularly	20	17.2
Irregularly	96	82.1
Not at all	1	0.9
Total	117	100
Nursing		
Regularly	13	31.6
Irregularly	28	68.3
Not at all	-	-
Total	41	100
Radiography		
Regularly	3	15.0
Irregularly	17	85.0
Not at all	-	-
Total	20	100
Medical Doctor		
Regularly	6	85.8
Irregularly	1	14.3
Not at all	-	-
Total	7	100
Pharmacist		
Regularly	-	-
Irregularly	2	100.0
Not at all	-	-
Total	2	100.0
Others		
Regularly	6	24.0
Irregularly	17	68.0
Not at all	2	8.0

Total	25	100.0
BIOLOGICAL HAZARDS		
Medical Laboratory Science		
Regularly	49	41.9
Irregularly	66	56.4
Not at all	2	1.7
Total	117	100
Nursing		
Regularly	22	53.7
Irregularly	17	41.4
Not at all	2	4.9
Total	41	100
Radiography		
Regularly	11	55.0
Irregularly	5	25.0
Not at all	4	20.0
Total	20	100.0
Medical Doctor		
Regularly	2	28.6
Irregularly	4	57.2
Not at all	1	14.3
Total	7	100.0
Pharmacist		
Regularly	-	-
Irregularly	2	100.0
Not at all	-	-
Total	2	100.0
Others		
Regularly	8	32.0
Irregularly	12	48.0
Not at all	5	20.0
Total	25	100.0
CHEMICAL HAZARDS		
Medical Laboratory Science		
Regularly	43	36.8
Irregularly	47	40.2
Not at all	27	23.1
Total	117	100.0
Nursing		
Regularly	14	34.1
Irregularly	18	43.9
Not at all	9	22.0
Total	41	100.0
Radiography		
Regularly	3	15.0
Irregularly	11	55.0
Not at all	6	30.0
Total	20	100.0
Medical Doctor		
Regularly	4	57.1
Irregularly	2	28.6

Not at all	1	14.3
Total	7	100.0
Pharmacist		
Regularly	-	-
Irregularly	-	-
Not at all	2	100.0
Total	2	100.0
Others		
Regularly	12	48.0
Irregularly	6	24.0
Not at all	7	28.0
Total	25	100.0

Table 7 showed the association between physical hazard occurrence and risk factors. The results showed that there was a significant association (p-value<0.05) between physical hazard occurrence andthe following risk factors; "Are all PPEs provided?""Do you wear all necessary PPEs?""Do you work in multiple facilities?""Do you work overtime?""Do you sleep well?" and "Do you segregate your wastes?" On the other hand, there was no association (p-value>0.05) between physical hazard occurrence and the following risk factors;"How often do you exercise?","Do you process biohazard specimen in closed chamber?","Do you dispose off biohazard wastes according to set standards?" and "Do you work in a good posture?"

TABLE 7: The association between risk factors and physical hazard

Physical Hazard	X^2	df	p-value	remark

Are all necessary PPEs provided?	37.929	16	0.00	Sig	
Do you wear all necessary PPEs during work?	27.303	16	0.04	Sig	
Do you work in multiple facilities?	38.285	16	0.00	Sig	
Do you work overtime?	40.497	16	0.00	Sig	
Do you sleep well?	31.601	16	0.01	Sig	
How often do you exercise?	25.591	16	0.06	N/S	
Do you segregate your wastes?	52.615	16	0.00	Sig	
Do you process biohazard specimen in closed chamber?	21.472	16	0.16	N/S	
Do you dispose off biohazard wastes according to set standards?	16.024	16	0.45	N/S	
Do you work in a good posture?	24.873	16	0.07	N/S	

Table 8 showed the association between biological hazard occurrence and risk factors. The results showed that there was a significant association (p-value<0.05) between biological hazard occurrence and the following risk factors; "Are all PPEs provided?" "Do you work overtime?" "Do you sleep well?" and "How often do you exercise?" On the other hand, there was no association (p-value>0.05) between bioloical hazard occurrence and the following risk factors; "Do you wear all necessary PPEs?", "Do you work in multiple facilities?", "Do you segregate your wastes?" "Do you process biohazard specimen in closed chamber?", "Do you dispose off biohazard wastes according to set standards?" and "Do you work in a good posture?"

TABLE 8: The association between risk factors and biological hazard

Biological Hazards	**X^2**	**df**	**p-value**	**remark**
Are all necessary PPEs provided?	24.943	8	0.00	Sig
Do you wear all necessary PPEs during work?	15.165	8	0.06	N/S
Do you work in multiple facilities?	6.355	8	0.60	N/S
Do you work overtime?	18.824	8	0.02	Sig
Do you sleep well?	23.974	8	0.00	Sig
How often do you exercise?	22.304	8	0.00	Sig
Do you segregate your wastes?	6.823	8	0.56	N/S
Do you process biohazard specimen in closed chamber?	10.839	8	0.21	N/S
Do you dispose offbiohazard wastes according to set standards?	10.840	8	0.21	N/S
Do you work in a good posture?	7.624	8	0.47	N/S

Table 9 showed the association between chemical hazard occurrence and risk factors. The results showed that there was a significant association (p-value<0.05) between chemical hazard occurrence and the following risk factors; "Do you work in multiple facilities?" "Do you work overtime?" "Do you sleep well?" and "Do you segregate your wastes?" "Do you process biohazard specimen in closed chamber?". On the other hand, there was no association (p-

value>0.05) between chemical hazard occurrence and the following risk factors; "Are all PPEs provided?", "Do you wear all necessary PPEs?", "How often do you exercise?", "Do you dispose off biohazard wastes according to set standards?" and "Do you work in a good posture?"

TABLE 9: The association between risk factors and chemical hazard

Chemical Hazards	X^2	df	p-value	remark
Are all necessary PPEs provided?	7.058	4	0.13	N/S
Do you wear all necessary PPEs during work?	4.956	4	0.29	N/S
Do you work in multiple facilities?	13.279	4	0.01	Sig
Do you work overtime?	15.072	4	0.00	Sig
Do you sleep well?	14.996	4	0.00	Sig
How often do you exercise?	5.240	4	0.26	N/S
Do you segregate your wastes?	2.047	4	0.72	Sig
Do you process biohazard specimen in closed chamber?	10.056	4	0.04	Sig
Do you dispose off biohazard wastes according to set standards?	5.159	4	0.27	N/S
Do you work in a good posture?	6.848	4	0.14	N/S

DISCUSSION

The research was conducted to determine the occupational hazards and the associated risk factors arising from some respondents in PAMO University of medical Sciences and Rivers State University Teaching Hospitalwithin the framework of some selected risk parameters which includes; "Are all necessary PPEs provided?","Do you wear all necessary PPEs during work?","Do you work in multiple facilities?","Do you work overtime?","Do you sleep well?","How often do you exercise?","Do you segregate your wastes?","Do you process biohazard specimen in closed chamber?","Do you dispose off biohazard wastes according to set standards?"and "Do you work in a good posture?" The risk factorsassessment parameters were examined with respect to three categories of hazard namely; physical, biological, and chemical hazards.

There was a significant association between provision of PPEs for health workers and the vulnerability of both physical and biological hazards. This goes to show that tendency of physical and biological hazards exposure on workers athealth facilities and work places is linked to the availability of all necessary personal protective equipment. This is in agreement with the study by Ismail [7] who asserted that protective clothing play a role necessary for reducing occupational hazard especially among health workers.

Also, the finding from this study revealed that there was an association between usage of PPEs by health workers and exposure to physical hazard. This supports the earlier discussion on provision of PPE and occupational hazard occurrence since provision of PPE has an association with certain occupational hazard, it will be no doubt that usage of PPE will also have an impact on occupational hazard because without provision there will be no usage. This goes to reveal that the occurrence of physical hazards or it's avoidance could be related to the workers' attitude

towards the use of all necessary PPEs made available to them. This outcome corresponds with the research of Susan [9] and Comcare [10] where the manual handling of tools or machines and improper usage of computer exposes workers to physical hazards.

This study also revealed an associatedrisk between working in multiple facilities,and physical and chemical hazards. The outcome obtained could be attributed to the fact that working in multiple facilities increases exposure to the hazards which may be true because every work and facility may have its peculiarity and as well as hazards. Therefore, the tendency of co-existing hazard exposure on workers who work in multiple facilities is possible. It can be established that this outcome is the same with the research conducted by Susan [9], Comcare [10], and Safety Culture [12], when we consider the examples of physical and chemical hazards illustrated in their work. Constant interaction with environments laced with noise, vibrations, radiations, and chemicals which are examples of physical and chemical hazards respectively, increases the incidence of this hazards in places of work.

Working overtime andsleep adequacy wereereported to have significant relationship with the three occupational hazards (physical, biological, and chemical) considered in this work. This implies that working overtime and not sleeping well may be related to the occurrence of physical, biological, and chemical hazards. The reason for this outcome could be attributed to the fact that putting in extra time at work may reduce the chance of workers getting sufficient sleep, which in turn could increase error occurrence at work places, and hazards consequently. Although there are limited studies in this regard, the work of Ismail [7] reported instances of constant noise, exposure to chemicals, and biological materials as examples of physical, chemical, and biological hazards. Based on this report, it can be established that working overtime, and not sleeping well increases the risk of these three hazards at work places.

Exercise as a risk factor considered in this study was found to be associated with biological hazard. This association between exercise and biological hazard is not fully understood and there are no references or sufficient studies concerning this risk factor and biological risk hazard. However, exercise promotes agility and activity. So the more people are smart and physically active, it may impact on their alertness to and sensitivity to their respond to their environment.

Attitude to waste segregation was reported to have associated physical and chemical hazard exposures amongst health workers. This result suggests that there is a link between the response of workers towards waste segregation in institutions and the occurrence of physical and chemical hazards. This connection can be attributed to neglect of GMPs either by institutions or workers according to Food and Safety Program [13].

Processing biohazard specimen in closed chamber, a risk factor considered in this work was found to have a significant relationship with chemical hazard. This suggests that the occurrence of chemical hazards at work places could be attributed to the attitude of workers towards the processing of biohazard specimen in closed chamber. This is in agreement with the work of Ismail [7] where it was stated thatproper equipping of work places plays a role in eliminating or preventing hazards in work places. However, where they are provided but are not used by workers, hazards would occur, and such an instance can be said to be a worker-attitude situation which leads to hazard.

According to the result obtained from this study, there was no relationship between the risk factors;"Do you dispose off biohazard wastes according to set standards?" and "Do you work in a good posture?" and the three occupational hazards researched.

CONCLUSION

In the forgoing discussion, the risk factors associated with occupational hazards have been studied and this study has shown a significant association between occupational hazards and risk factors. The following risk factors were found to be associated with occupational hazards; provision of PPE, usage of PPE, working at multiple facilities, working overtime, sleep adequacy, exercise, attitude to waste segregation and processing of biohazard specimen in closed chamber.

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