

OCCUPATIONAL HAZARDS AND LINKAGES TO INCREASED MORTALITY AND MORBIDITY: THE SOUTHEAST NIGERIAN PERSPECTIVE

Protocols

The Vice Chancellor, Professor Benjamin Chukwuma Ozumba

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Lions and Lionesses

Ladies and Gentlemen

It is indeed a great pleasure and privilege to stand before you and deliver the 138th inaugural lecture of our great university (University of Nigeria Nsukka). I remain most grateful to our visionary Vice Chancellor (Prof Benjamin Chukwuma Ozumba) and all who made this day possible. I also welcome all of you who despite your very busy schedules are able to attend my inaugural lecture. In all “To God be the Glory”.

The journey has been long and interesting: starting with undergraduate medical school, postgraduate training in Public Health, research works in various aspects of public health and eventually concentrating in Occupational Health. Indeed the more research I undertook in occupational health the more I realized the many aspects of the discipline

that are yet to be fully explored. Occupational epidemiology and occupational psychology are just a few of these. I also realized that so many lives are needlessly lost due to workplace exposures. The zeal to contribute to the already existing body of knowledge and possibly save lives led to where I am today.

ABOUT THE INAUGURAL LECTURER

I am the 5th of 6 children: 4 men and 2 women. My father was a civil servant and my mother a school teacher. I went to primary school at Zik Avenue Primary School, Enugu. In those good old days children were asked to pass their right arm over their head and touch the left ear as a way of confirming that they were old enough to start school - I was 6 years old then. My fond memory of primary school days is what my elder sister told me about my first term result in primary one: it read “absent” for many subjects. During those exams I would stay quietly away all by myself. However she observed that in those I sat for, my grades were very good and she subsequently made sure I sat for other exams. I later went to Federal Government College Enugu and was lucky to have classmates who were quite ambitious. I would consider my 1983 class as the most ambitious of the classes – many of us ended up entering the university on our first attempt.

In secondary school, I never set out to be a medical doctor. In fact, I had always wanted to study Aeronautical Engineering. I was very good in mathematics, additional mathematics (now called further mathematics), physics and technical drawing. It was not until my class 4 when I was applying for the JAMB examination that someone convinced me to put in for Medicine. His reason then was that no Nigerian university offered Aeronautical Engineering.

Fortunately I got admitted to what I considered the best university in Nigeria – University of Nigeria Nsukka (UNN). I remember picking my 1st, 2nd and 3rd choices of university as UNN. That was scary considering the very high score one needed in JAMB to be admitted in UNN. Tensions were made worse with the frightening story of the “all mighty second” MBBS and how many who posed as medical students were removed from the medical school by this exam. My elder brother who I felt would console me when I complained of the unnecessary competition told me I should not complain:

“if only one person makes it, why can’t that person be you?” he said.

This statement has been one of my motivating views in life. It made me realize that one is not defeated until he defeats himself. This may have been the genesis of hard work: my classmates later coined the term “*agumbo*” from part of my surname and hard work. After graduating as a medical doctor, choice of postgraduate specialty became the next hurdle. I thought of cardio-thoracic surgery but while preparing for the exams fate had another plan. I visited a senior colleague in Okigwe who told me he was studying Public Administration. I wondered how a doctor could be interested in Public Admin. He eventually convinced me on the need and I eventually obtained a postgraduate diploma in Public Admin from Abia State University Uturu. This further opened my eyes to other disciplines in medicine that could impact more on the lives of millions – Community Medicine. My sojourn in Community Medicine has been very interesting. Despite carrying out several research works on various aspects of Public Health I concentrated on Occupational Health; specifically, occupational epidemiology and psychology.

CHAPTER 1 - BACKGROUND: WHAT WORK DO YOU DO?

This very important question was asked by one of the early occupational health physicians, Bernardino Ramazzini, and is still very relevant today.

Bernardino Ramazzini (1633 – 1714)



He insisted that commoners be asked their occupation as part of their clinical history. His view of workplace hazards was however limited to the “blue collar jobs”. It was other researchers like Charles Turner Thackrah (1795 – 1833), Father of British Industrial Medicine, who broadened the scope of workplace hazards to include the white collar jobs. These remind us of the very important linkages between workplace and

wellbeing and that every occupation has its hazards.

Case Studies

Case 1: On 20th July 2014 Nigerians woke up to the frightening news of the 1st case of Ebola ever recorded in Nigeria when an infected Liberian-American lawyer, Mr Patrick Sawyer, arrived by aeroplane into Lagos Nigeria. The disease quickly spread among health workers because of the contact they had with the index case. Mortality was high and one of those who died was Dr Stella Ameyo Adedevoh a consultant physician.



Dr. Stella Adedavoh

She must have left her house and family like most dedicated workers on that fateful day to work not knowing she would be infected with the Ebola virus. She eventually died on 19th October, 2014. There was a feeling of hopelessness and despair as people were really scared of contracting the disease. To control/prevent this seemingly occupational health disease some resorted to several methods like

drinking and bathing with salt water: leading to more morbidities and mortalities.

Case 2: Earlier, in 1969 Laura Wine, a missionary obstetric nurse from Chicago, USA practicing in a village in North-eastern Nigeria known as Lassa, came in contact with a 'mysterious disease' and an unrelenting fever which eventually resulted in her death.

It was later diagnosed as Lassa fever and she became the first recorded case of Lassa in Nigeria and the world. Since then there have been several outbreaks resulting in death of mostly healthcare workers. As at 20th May 2018 there were 431 confirmed cases out of whom 38 were healthcare workers with total number of death as 108 (NCDC, 2018). Incidentally one of the dead cases, Dr Victor Idowu Ahmed, who graduated from University of Nigeria Nsukka in 2016 died on 21st Jan, 2018. At the time he contracted the disease he was a House Officer at the Federal Medical Center Lokoja Kogi State. Indeed the list of morbidity and mortality linked to occupational health is endless.

Case 3: In 2016 it was reported that a young man who had been working on a Power Holding Company of Nigeria (PHCN) pole to fix electricity fault had been electrocuted at Kogberegbe Street, Isolo Lagos. Later a colleague of his who had climbed up to help bring the dead man down, ended up also getting electrocuted to death.

STATISTICS OF OCCUPATIONAL RELATED HAZARDS

In all the above 3 cases, death resulted from workplace hazards. This gives rise to some very important questions like: must workers be exposed to hazards in their workplaces? Is studying occupational health issues of Public Health concern? Are there efforts to prevent/reduce these hazards? These questions may be better answered by defining the term Occupational Health” and providing a few occupationally related statistics.

“Occupational Health is the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs”.

(ILO / WHO 1950).

In general, the ILO aims to create worldwide awareness of the dimensions and consequences of work-related accidents, injuries and diseases and to place the health and safety of all workers on the international agenda and to stimulate and support practical action at all levels.

According to ILO estimates in 2002;

- Every day, people die as a result of occupational accidents or work-related diseases, more than 2.78 million deaths per year. Additionally, there are some 374 million non-fatal work-related injuries and illnesses each year, many of these resulting in extended absences from work.
- Every year, 250 million accidents occur causing absence from work, the equivalent of over 685,000 accidents every day, 475 every minute, 8 every second;
- Working children suffer 12 million occupational accidents and an estimated 12,000 of them are fatal;
- 5,000 people are killed by work every day, 2 every minute;
- 160 million occupational diseases each year
- The economic costs of occupational and work-related injuries and diseases are rapidly increasing. The ILO expert says that it is ‘impossible to place a value on human life, as compensation figures indicate that approximately 4% of the world’s

gross domestic product disappears with the cost of diseases through absence from work, sickness treatment, disability and survivor benefits’.

Source: ILO. 2002

In addition to above statistics, Dr. Jukka Takala, the then Chief of ILO’s Health and Safety programme warned that work related diseases are expected to double by the year 2020, and selected hazardous jobs can be from 10-100 times riskier. For instance, at construction sites, the risk in developing countries are known to be 10 times more dangerous than in industrialized countries.

The Africa continent continually experiences high incidents of occupational injuries and fatalities. Hence it is not surprising that globally, sub-Saharan Africa alone has one of the highest work-related mortality rates. This is despite the fact that most of the occupational injuries in Africa were never diagnosed or reported. Indeed the ILO estimates that out of the more than 2 million annual global work-related fatalities, 20% occur in sub-Saharan Africa with only about 12% of the global workforce. (Muchiri, 2009). This is a clear case of the tip of the iceberg because data of those permanently incapacitated are not available.

The occupational fatality per 100,000 workers in sub-Saharan Africa is 21 and the accident rate is 16,000. This translates to about 54,000 workers die each year and about 42 million work-related accidents take place that leads to at least 3 days absence from work. (African Newsletter on Occupational Health and Safety, 2014). Nigeria has recorded 238 fatalities across different sectors of the economy within the last three years, with the start year being 2014. From available records, the year 2015 recorded the highest number of work-related fatalities. (Nigeria, Country profile, Occupational Safety and Health, 2016).

Table 1 - Occupational Fatality Data (Nigeria)

Year	Total Number of Reported Fatalities
2014	30
2015	117
2016 (January – September)	91
Total	238

Adapted from Occupational Safety and Health, Nigeria, Country profile, 2016

CHAPTER 2 – WORK-RELATED RESEARCH FINDINGS

Over the years, I have done some researches together with my colleagues on occupational hazards, workers' risky habits and related morbidities (some of which might eventually result in increased workplace mortality). These are presented below according to some parts of the work environment: psychosocial, chemical, physical and mechanical.

Psychosocial – (1) Burnout: One of my key research interests is on occupational or workplace stress or burnout. The term 'burnout was first made popular by the psychologist Herbert Freudenberger in 1974; defining it as the loss of motivation, growing sense of emotional depletion, and cynicism he observed among volunteers working at a free clinic in New York City. However, more recently other burnout inventories have been developed like Oldenberg Burnout Inventory (OLBI), Shirom Melamed Burnout Questionnaire (SMBQ), Maslach Burnout Inventory (MBI) and Copenhagen's Burnout Inventory (CBI). Maslach and Leiter, defined burnout as: a psychological syndrome emerging as a prolonged response to chronic interpersonal stressors on the job. The three key dimensions of this response are an overwhelming exhaustion (emotional exhaustion), feelings of cynicism and detachment from the job (depersonalization), and a sense of ineffectiveness and lack of accomplishment

(reduced personal accomplishment). (Maslach and Leiter, 2016). Maslach's burnout inventory (MBI) is the most widely used tool to assess burnout.

Chronic stress can lead to burnout and it is not just a state of mind, but a condition that leaves its mark on the brain as well as the body (Michel, 2018). Socially and in the workplace burnout may lead to loss of employment, pessimism, detachment, isolation, feeling of apathy, hopelessness, increased irritability, lack of productivity and poor performance. Medical signs and symptoms of burnout include chronic fatigue, insomnia, anorexia, anger, anxiety, depression, forgetfulness/impaired concentration and physical symptoms like chest pain, palpitations, shortness of breath, reduced sex drive, gastrointestinal pain, dizziness, fainting, and/or headaches (Cater 2013). Others include increased vulnerability to illnesses and difficulty with managing certain chronic diseases like hypertension and diabetes. Indeed some researchers have opined that chronic stress has been associated with the pathogenesis of many diseases, including cancer (Moreno-Smith et al. 2010). Many occupations are known to have high levels of stress and burnout among workers. Some of these include teachers, healthcare workers (Portoghese, 2014), bankers, police (Russell, 2014).

Using Freudenberger burnout inventory tool and Christian Maslachs burnout inventory tools at different times myself and other researchers have over the years studied prevalence of burnout among teachers, doctors, nurses and bankers. Okwaraji and Aguwa (2015) assessed the prevalence of Burnout, Psychological Distress and Job Satisfaction among Secondary School Teachers in Enugu, South East Nigeria. Teachers at all levels of education are essential in the educational development of any society and their satisfaction will greatly affect the quality of services they render to the educational sector. However, the teaching profession is associated with a lot of stress arising from work overload, feeling of not being appreciated and poor remuneration. Many resort to working extra hours to make enough earnings for their families. This can lead to high prevalence of burnout, psychological distress and low level of job satisfaction among teachers.

The Maslach burnout inventory, the General health questionnaire (GHQ-12) and the Generic job satisfaction scale were used to assess 432 teachers for prevalence of burnout, psychological distress and level of job satisfaction. The prevalence of burnout was 41% (173/432) for emotional exhaustion, 39% (170/432) for depersonalization and 63% (273/432) for reduced personal accomplishment. About 33% (142/432) had psychological distress while 40% had low level of job satisfaction. We concluded that there was high prevalence of burnout, psychological distress and low level of job satisfaction among the teachers. Our finding on psychological distress was however higher than findings by Ofili et al (2009) among teachers in private secondary schools in Edo state Nigeria. More research work will be needed to observe any true difference between the private schools and public schools in terms of burnout.

Table 2 - Socio-demographic variables and burnout measurements among teachers

Variable	Emotional Exhaustion N = 432		Depersonalization N = 432		Reduced Personal Accomplishment N = 432		Psychological Distress Measured using GHQ - 12	
	Present N=173(%)	χ^2 (P value)	Present N=170 (%)	χ^2 (P value)	Present N=273 (%)	χ^2 (P value)	Present N=142 (%)	χ^2 (P value)
Age (years)								
≤ 35	71(33.0)	8.79	76(35.3)	2.87	152(71.0)	11.19	58(40.8)	6.74
> 35	102(47.0)	(<0.01)	94(43.3)	(0.09)	121(55.5)	(<0.01)	84(59.2)	(0.01)
Gender								
Male	46(31.5)	6.70	47(32.2)	4.74	103(70.5)	5.13	33(23.2)	10.54
Female	127(44.4)	(0.01)	123(43.0)	(0.03)	170(59.4)	(0.02)	109(76.8)	(<0.01)
Marital Status								
Single	47(30.0)	11.52	50(31.4)	6.59	117(73.6)	11.68	42(29.6)	4.75
Married	126(46.2)	(<0.01)	120(44.0)	(0.01)	156(57.1)	(<0.01)	100(70.4)	(0.03)
Educational. level								
NCE	61(53.5)	11.69	45(39.5)	<0.01	71(62.3)	0.06	39(27.5)	0.13
HND	112(35.2)	(<0.01)	125(39.3)	(0.98)	202(63.5)	(0.81)	103(72.5)	(0.72)
Religion								
Christianity	163(40.2)	0.11	159(39.3)	0.02	259(64.0)	1.59	133(93.7)	<0.01
Others	10(37.0)	(0.74)	11(40.7)	(0.88)	14(51.9)	(0.21)	9(6.3)	(0.96)
Years of Service								
≤ 5	32(27.8)	9.75	39(33.9)	1.94	88(76.5)	11.97	33(23.2)	1.24
> 5	141(44.5)	(<0.01)	131(41.3)	(0.16)	185(58.4)	(<0.01)	109(76.8)	(0.27)
Level of Job satisfaction								
- Low	106(61.3) 54 (31.2)	75.48 (<0.01)	109(64.1) 46(27.1)	80.44 (<0.01)	64(23.4) 103(37.7)	90.89 (<0.01)	90(63.4) 107(75.4)	27.75 (<0.01)

- Medium	13(7.5)		15(8.8))	106(38.9)		93(65.5)	
- High								

Source: Okwaraji and Aguwa (2015)

From our findings those who had low job satisfaction had higher prevalence of burnout compared to those who had medium to high level of job satisfaction. Other variables associated with high levels of burnout include age, gender, marital status, educational level and years of service. These variables showed different results in the 3 aspects of assessing burnout e.g. emotional exhaustion was significantly higher in teachers who were more than 35 years of age, females, married, with lower educational level, as well as those who had served for more than five years as teachers. For depersonalization, it was higher among females and married workers. Reduced personal accomplishment was significantly higher among the teachers who were less than 35 years of age, males and those who were single. Psychological distress as measured by the GHQ-12, significantly occurred more among the teachers who were more than 35 years of age, females and those who were married. Knowledge of these factors that affect burnout can assist policy makers to look at modalities that can be implemented to reduce the burnout level. Similar high levels of burnout were obtained in studies carried out in developed (Chenevey et al. 2008) and developing country (Ofili, 2009).

Another occupation at risk of high burnout are the health workers: they are often exposed to high levels of stress in their day-to-day work. The nature of their work exposes them to persistent emotional and physical stress including work overload, a need to rescue the patient, a sense of failure and frustration when the patient's illness progresses, fear of becoming ill or dying from hospital acquired diseases, ethical issues in patient management, etc. (Meier et al. 2001).

In 2013 Okwaraji and Aguwa carried out a study on burnout and psychological distress among nurses in a Nigerian tertiary health institution. The role of nurses in the health care delivery system cannot be overemphasized. Nurses are needed at all levels of healthcare and the profession requires a lot of dedication, time and energy with regards to patient management and service delivery. This time investment and dedication to

duty is likely to lead to burnout and psychological distress among the nurses. Using the Maslach Burnout Inventory (MBI) and the General Health Questionnaire (GHQ-12) 210 nurses working in a tertiary health institution were assessed for symptoms of burnout and psychological distress. Findings showed high levels of burnout in 43% of the respondents in the area of emotional exhaustion, 48% in the area of depersonalization and 54% in the area of reduced personal accomplishment, while 44% scored positive in the GHQ-12 indicating presence of psychological distress (Okwaraji and Aguwa, 2014).

Table 3 - Socio-demographic variables and burnout measurements among nurses

Variable	Emotional Exhaustion (Yes = 90)		Depersonalization (Yes = 100)		Reduced Personal Accomplishment (Yes = 113)		Psychological Distress measured using GHQ-12	
	Freq. (%)	χ^2 (P Value)	Freq. (%)	χ^2 (P Value)	Freq. (%)	χ^2 (P Value)	Positive N = 87 (%)	χ^2 (P Value)
Age (years)								
≤ 35	90(100.0)	125.19 (<0.01)	100 (100.0)	151.75 (<0.01)	113 (100.0)	194.46 (<0.01)	87 (100.0)	118.07 (< 0.01)*
>35	0 (0.0)		0 (0.0)		0 (0.0)		0 (0.0)	
Gender								
Male	40 (44.4)	65.88 (<0.01)	40 (40.0)	54.35 (<0.01)	40 (35.4)	42.42 (<0.01)	40 (46.0)	69.86 (< 0.01)*
Female	50 (55.6)		60 (60.0)		73 (64.6)		47 (54.0)	
Marital Status								
Single	59 (65.6)	109.40 (<0.01)	59 (59.0)	90.26 (<0.01)	59 (52.2)	70.43 (<0.01)	59 (67.8)	116.01 (< 0.01)*
Married	31 (34.4)		41 (41.0)		54 (47.8)		28 (32.2)	
Years of Service								
≤ 5	13(14.4)	162.11 (<0.01)	13 (13.0)	15.24 (<0.01)	13 (11.5)	11.90 (<0.01)	13 (14.9)	19.59 (< 0.01)*
>5	77(85.6)		87 (87.0)		100(88.5)		74 (85.1)	
Rank								
NO	19 (21.1)	143.02 (<0.01)	29 (29.0)	117.99 (<0.01)	42 (37.2)	92.08 (<0.01)	16 (18.4)	151.65 (< 0.01)*
SNO & above	71 (78.9)		71 (71.0)		71 (68.8)		71 (81.6)	

Source: Okwaraji and Aguwa, 2014

All the nurses studied were ≤ 35 years old. Emotional exhaustion, depersonalization and reduced personal accomplishment were more among the females, single, those who had worked more than 5 years as nurses and those with rank of Senior Nursing

Officers and above. Psychological distress was proportionately more in males, single and those who had worked ≤ 5 years.

Among other findings Aguwa et al. compared level of burnout among two professions that are known to have high burnout – health workers and bankers. A cross-sectional,

descriptive study was carried out in 2013 among health workers and bankers in Aba metropolis. By multistage sampling method, proportionate number of the health workers and bankers were selected. The study instrument was Freudenberger Burnout Scale. A total of 327 health workers and bankers were studied: 253 (77.4%) were health workers while 74 (22.6%) were bankers. The age range was 21 to 59 years, and 229 (70.0%) were females. Most (48.3%) had worked for 5 years or less and had burnout scores within 0-25. There was significant difference between gender ($P = 0.017$), level of education ($P = 0.038$), and type of occupation ($P = 0.002$) to burnout score. Age ($P = 0.956$), marital status ($P = 0.461$) and years of work ($P = 0.247$) did not significantly affect burnout score. Female health workers were significantly more at risk of burning out compared to their male counterparts.

Among bankers, however, though females were more at risk, this was not significant. Sex, level of education and type of work were the greatest contributors to burnout score. Significantly more bankers (37.8%) than health workers (20.6%) were at the risk of burnout ($p = 0.002$). In this study we recommended there should be policies aimed at identifying those most at risk and reducing the prevalence. (Aguwa et al. 2014).

Table 4 - Burnout scores of bankers and health workers by gender

Occupation	Doing well (burnout score - ≤ 25) N = 247	At risk burnout score = > 25) N = 80	Total	Odds ratio/C.I.	χ^2 (P Value)
Occupation					

Health staff	201 (79.4)	52 (20.6)	253(100.0)	2.35	9.26
Banker	46 (62.2)	28 (37.8)	74 (100.0)	(1.29-4.27)	(0.002)*
Health staff					
– Female	131 (74.9)	44 (25.1)	175 (100.0)	0.34	7.32
– Male	70 (89.7)	8 (10.3)	78 (100.0)	(0.14-0.80)	(0.007)*
Banker					
– Female	23 (59.0)	16 (41.0)	39 (100.0)	0.75	0.36 (0.551)
– Male	23 (65.7)	12 (34.3)	35 (100.0)	(0.26-2.14)	

*Significant, C.I=Confidence interval

Source: Aguwa et al. 2014

My findings and those of other researchers raise a very important question: ***Does gender play a significant role in workplace burnout?*** There is indeed no conclusive evidence to any gender being more prone to burnout. In some the females experience significantly higher level of reduced personal accomplishment but no difference in emotional exhaustion and depersonalization (Adekola 2010). A meta-analysis done by Purvanova et al showed more revealing results in the 3 aspects of burnout. In emotional exhaustion women were slightly more affected unlike for depersonalization which was more among men (Purvanova & Muros 2010). The authors opined that the perception that more females had burnout at work than men may be because depersonalization is often unrecognized unlike emotional exhaustion. According to them, many of the measures of burnout tap only on emotional exhaustion and therefore identify burnout among women more than men. Indeed their study also observed that burnout rate was same for males and females even in occupations that are typically male or female dominated (Purvanova & Muros 2010).

Another aspect to burnout is the association to the worker's personality traits. The common classes of personality traits, though not entirely supported by some professionals, are type A and type B. Persons of type A personality are more impatient, short tempered, competitive, ambitious, highly organized and aggressive. They are often referred to as "workaholic". Type B are often easygoing, sociable, calm, emotionally stable, compassionate, procrastinators, with even temperament and have

job satisfaction, and are creative. There is a third type which is a hybrid of types A and B called type C. Studies are of the opinion that persons of “type A” personality are more likely to have work related burnout compared to “type B” personality traits.(Khan 2011;James & Sidin.2017)

Recommendations:

- Both employers and employees should be on the lookout for signs of burnout
- Do not set very high standards for your self
- Do not take work home so you can get enough sleep
- Avoid Caffeine, Alcohol and Nicotine
- Indulge in Physical Activity
- Accept your limits
- Take time out to rest
- Whenever necessary get some support e.g. by talking to someone
- Manage your time: remember the Pareto’s Principle and 6’s to healthy work environment: Daily remember that 20% of your work is really important in any given moment; therefore focus 80% of your time, energy and talents on that important 20%.
- *Don’t just “work smart”, work smart on the “right things”*

(2) Workplace Violence: Workplace violence is a common phenomenon which cuts across all work settings and occupational groups in developed and developing countries. It constitutes a threat to effective and efficient service delivery in all occupational settings. Recently it has gained momentum internationally as a major public health and human right issue prompting the International Labour Organization (ILO), the International Council of Nurses (ICN), the World Health Organization (WHO) and Public Services International (PSI) to launch in the year 2000 a Joint Programme to develop sound policies and practical approaches for the prevention and elimination of

violence in the health sector (International Labour Organization, International Council of Nurses, World Health Organization and Public Services International, 2002). Unfortunately most workplace violence still go unreported and undocumented.

What is workplace violence? Workplace violence has been defined as, “incidents where staff are abused, threatened or assaulted in circumstances related to their work, including commuting to and from work, involving an explicit or implicit challenge to their safety, wellbeing or health” (ILO/ICN/WHO/PSI. 2002) The World Health Organization (WHO 2002) defines it as, “The intentional use of power, threatened or actual, against another person or against a group, in work-related circumstances, that either results in or has a high degree of likelihood of resulting in injury, death, psychological harm, mal-development, or deprivation.” Examples of workplace violence include “rumours, swearing, verbal abuse, pranks, arguments, property damage, vandalism, sabotage, pushing, theft, physical assaults, psychological trauma, anger-related incidents, rape, arson and murder.” (CCOHS 2017)

Four categories/types of workplace violence have been described: (CDC 2018)

- Type I: Criminal Intent or “external” violence, where the perpetrator is neither an employee nor a client and the aim of attack is cash or some other valuable commodity.
- Type II: Customer or Client-initiated violence, which involve some form of assault by a person who is either the recipient or the object of a service provided by the affected workplace or the victim. This is most common in the healthcare setting.
- Type III: Worker-on-worker or “internal” violence, where an assault is perpetrated by a fellow worker. It is also called lateral or horizontal violence.
- Type IV: Personal Relationship: The perpetrator usually has a personal relationship with an employee (e.g., domestic violence that spills over to the workplace).

Effects of workplace violence: These can be grouped into: physical consequences [e.g. injuries, disability and death]; emotional consequences [sadness and self-withdrawal]; psychological consequences [depression and anxiety]; consequences related to function in workplace [e.g. sickness absence]; consequences on patient/client

relationship and quality of service provided; social consequences [e.g. disruption of family life, sense of insecurity]; financial consequences [both to the victim and the workplace].

Which occupations are most at risk? Almost one quarter of all violent incidents at work occur in the health sector and more than 50 percent of healthcare workers have been victims of workplace violence. It has been estimated that healthcare workers face 16 times the risk of violence from patients/clients than other service workers face. However, recent reports of workplace violence have come from the entertainment industries, schools (e.g. school shootings in USA and Boko Haram killings of teachers in Northern Nigeria), and farmers (herdsmen attack on farmers in Nigeria). Along with some colleagues I carried out work on: Workplace Violence against health workers in a Nigerian Tertiary Hospital. (Ogbonnaya et al. 2012)

A descriptive cross-sectional study was conducted in a Federal Medical Centre, located in South-East Nigeria. For the purpose of this study, psychological violence included verbal abuse, threats, bullying and sexual harassment. Threat was defined as, “Promised use of physical force or power (i.e. psychological force) resulting in fear of physical, sexual, psychological harm or other negative consequences to the targeted individuals or groups”. Sexual harassment was defined as, “any unwanted, unreciprocated and unwelcome behaviour of a sexual nature that is offensive to the person involved, and causes that person to feel threatened, humiliated or embarrassed.” Bullying meant any repeated and over time offensive behaviour through vindictive, cruel or malicious attempts to humiliate or undermine an individual or groups of employees. Physical assault was defined as the use of physical force including pushing, slapping, beating and kicking a health worker with an intention to cause harm. Patients' relation included persons other than the healthcare worker providing care for patient, who are either family members or friends of the patient. These definitions were provided in the questionnaire to guide respondents.

Figure I: Prevalence of various types of workplace violence

Source: Ogbonnaya et al. 2012

Figure 2: Main perpetrators of workplace violence as reported by victims of violence

Source: Ogbonnaya et al. 2012

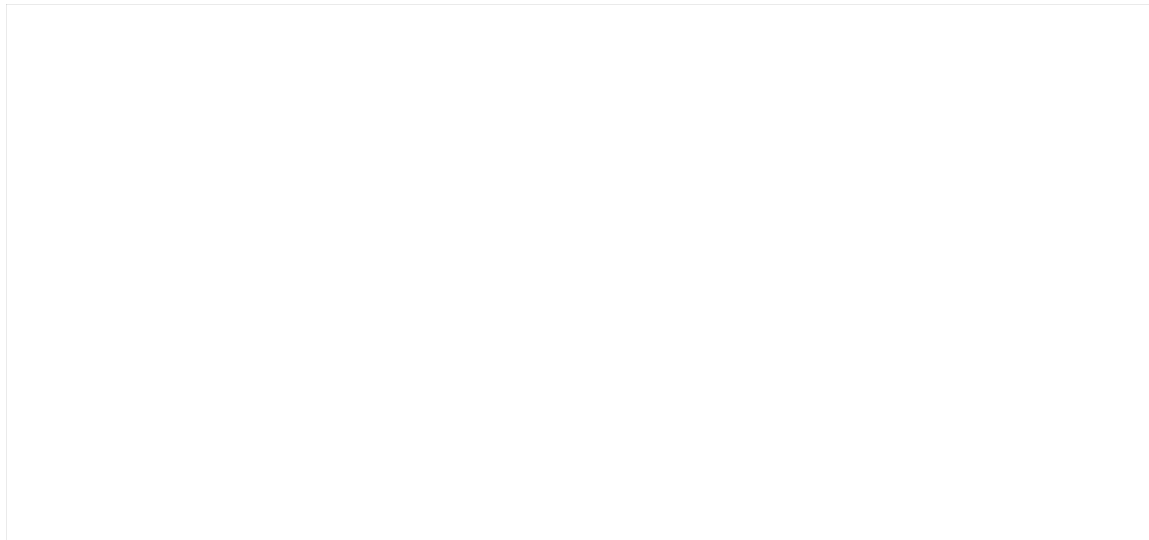


Figure 3: Location of violent events

Source: Ogbonnaya et al. 2012

Though the study did not include all categories of healthcare workers, those included in the sample are the ones who usually make contact with those seeking health care services in a hospital. Both psychological and physical violence were reported in this study. Repeated psychological assault can have a devastating impact on the victim. There are gender variations in patterns of occupational violence. Most studies observed that females in most occupations are at much greater risk of workplace violence (Fisher

and Gunnison 2001; Cruz and Klinger 2011). In our study and many other studies (Abdellah and Salama 2017) verbal abuse was the most commonly occurring form of workplace violence. Also verbal abuse, physical assault, bullying and sexual harassment was higher among females than males. This may be explained by the concentration of female health workers in jobs that involve greater face-to-face contact with clients and confirms their general vulnerability to all forms of assault and abuse. With respect to threats only, the experience was higher among males. However, the observed differences in the experience of all forms of violence between the male and female respondents were not statistically significant.

Verbal abuse in the workplace: are men or women most at risk? Verbal abuse is a form of workplace bullying. It may be in form of intimidation or hurtful language and can occur from boss/employer to subordinate/employee or among co-workers. Several authors have different conclusions which may depend on the occupation studied. Incidentally most studies on workplace violence had been in hospital setting. For instance in a systematic review of literature most of which were in a hospital setting (24/29), fifteen out of twenty-nine (15/29) research works did not report any significant difference in the prevalence of workplace violence between men and women. The reason for this it opined was that men conform to a female dominated environment by adopting certain behaviours than when in male dominated workplace. (Universite de Montreal).

In most occupational settings, clients and/or their relations are the main perpetrators of violence. Our study in a hospital setting showed a similar pattern. We observed that patients' relations perpetrated more violence than the patients. Most of the violence reported in this study occurred in the wards (53.2%) (Figure 3) and during the morning hours (37.1%). This suggests that the wards may be the highest risk area for violence than the accident and emergency room of this hospital. A possible explanation for this could be the presence of security personnel at the Accident and Emergency unit and a hospital policy that ensures patients are promptly admitted to the wards after presenting at the Accident and Emergency unit. Also patients' relations are not usually allowed into the Accident and Emergency facility. This finding may also be due to the fact that

almost half of the respondents in this study spent over 50% of their time in the wards. Most of the violent incidents in this study occurred in the morning hours than at night. The high influx of patients and their relatives in the morning hours, the prolonged waiting hours at the Medical Records department and delays at the outpatient department may be a possible explanation for this finding. By the time the patients get to see the doctor, their potential to become violent is increased.

It has been observed that most health workers have come to view violence as a normal “part of the job”. Studies have also shown that most victims of violence do not do anything after the incidents have occurred and do not report incidents as often as they should. When asked of their response to violence against them, more than half of the victims in this study did nothing. Not many of them reported to a higher authority. We did not investigate whether this health facility had any policy on violence against its employees or whether the employees were aware if such policy existed. For all forms of violence, there was no report of any legal action taken against a perpetrator. These findings suggest that the healthcare workers in this setting appear either uninterested or helpless in dealing with violence in the work place. Some are also afraid of consequences of reporting these incidents.

In view of this, we recommended that a workplace policy which includes prevention and reporting be developed. An effective line of communication should be created and workers should be trained on how to identify such cases and encouraged to report any and all violent incidents. “Zero-tolerance” code of conduct should be established. Managers should put modalities that will reduce occurrence of violence and workers should be constantly reminded of consequences of their actions.

WORKPLACE PRECAUTIONS: UTILIZATION AND CHALLENGES

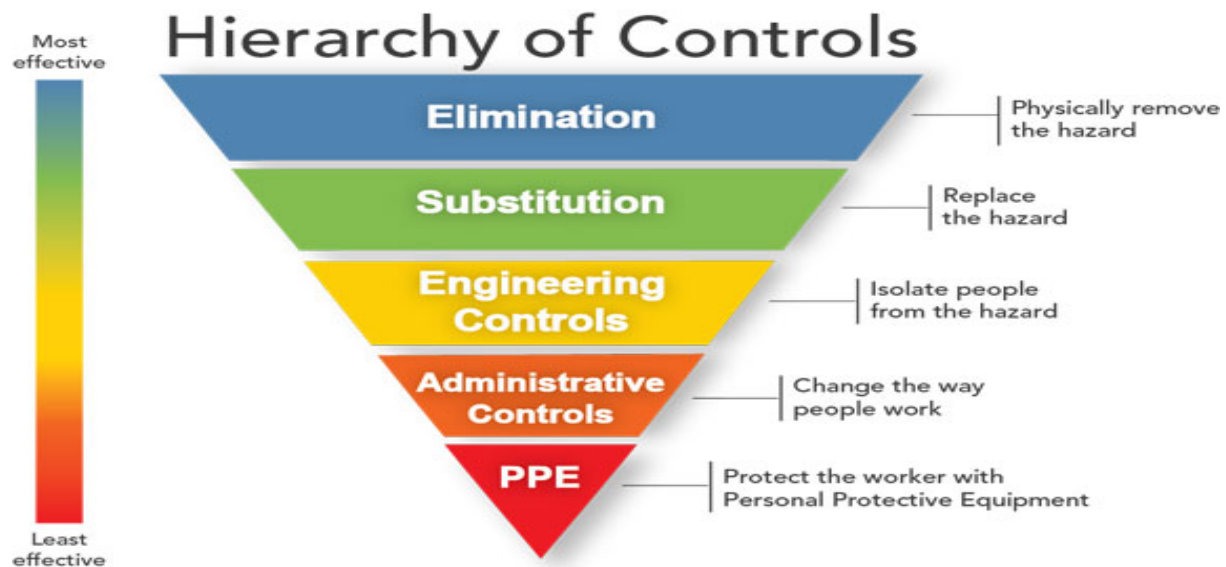
When considering workplace hazard control, the most important approach is to try and eliminate the hazard either by changing the hazardous agent or changing the hazardous process. However it is not always possible to eliminate or substitute the hazard. In such conditions we think of other options. These other recommended control measures are often grouped into Environmental/Engineering control, Administrative control measures, and Personal protective equipment. Engineering controls are physical changes to the work area or process that effectively minimize a worker's exposure to hazards. These could involve any of these – enclosure of hazard e.g. to muffle sound; isolation of hazard e.g. locating the hazard away from people; redesigning the workplace e.g. redesign of workstation to reduce ergonomic injuries.

In administrative control there are no physical changes. An example includes limiting daily exposure to hazards by adjusting work tasks or schedules; written operating procedures, work practices, and safety and health rules that employees must follow to complete the job safely, such as a company policy on the safe lifting of loads. Other administrative examples are training, buddy system, setting up alarms, signs and warning systems, having stretching exercises and break policies. According to OSHA, PPE is acceptable as a control method in the following situations:

- When engineering controls are not feasible or available like during emergencies or do not completely eliminate the hazard
- While engineering controls are being developed
- When administrative controls and safe work practices do not provide sufficient protection

Examples of PPEs include helmet, face masks, respirators, gloves, overalls and safety boots.

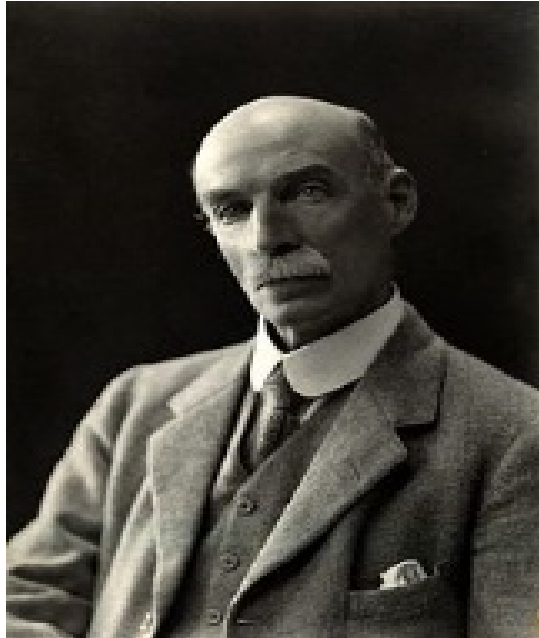
Out of the above control measures, the least effective is personal protective equipment (PPEs).



Adapted from National Institute for Occupational Safety and Health (NIOSH)

This fact was long identified by Sir Thomas Legge.

THOMAS MORISON LEGGE (1863-1932)



Sir Legge was the first doctor to be appointed as the first British Medical Factory inspector in 1898. He introduced the idea of notifying occupational diseases especially lead poisoning. He stressed preventive aspects of occupational health practice known as Legge's Aphorisms which deal with the general methods of prevention of diseases and ailments in industries. Sir Thomas Legge and other researchers have long established the need to protect workers from workplace hazards which is crucial to reduce mortality and morbidity in

the workplace. Indeed 2 of his 5 aphorisms stated: First aphorism - "Unless and until the employer has done everything and everything means a good deal - the workman can do next to nothing to protect himself; although he is naturally willing enough to do

his share” The Fifth aphorism – “Examples of influence - useful to a point, but not completely effective - which are not external, but depend on the will or the whim of the workers to use them, are respirators, gloves...”

This led me in 2013 to conduct *A Review of Sir Thomas Legge’s Aphorisms and Workplace Personal Protective Equipment – Is There Gap in Knowledge, Attitude and Utilization?* (Aguwa 2013). The need for these PPEs has increased over the years with increasing awareness of workplace hazards, and the difficulties associated with overdependence on other control measures which for some agents cannot be totally eliminated or even monitored. The aim of this literature review was therefore to obtain from previous works, the knowledge, attitude and utilization of PPEs by various occupations.

Table 5: Reasons given by workers for not wearing PPE

Occupation	Reason for not using PPE	Percent (%)
Construction Worker (Occupational Health and Safety Council, 2000)	Reduced work Efficiency	27
Printing workers (Yu, 2005)	Interference with work	58.3
	Believe that chemicals were not harmful	20.0
	Discomfort	13.9
Emergency medical technicians during SARS (Visentin, 2009)	Emergency nature of work	23.9
	Not necessary	21.7
	Not required	6.5
	Impaired movement	2.2
Surgical Nurses (Ganczak, 2007)	Non-availability	37.0
	Interfered with patient care	32.0
	Lack of time	19.0
	Feeling that the PPE is inefficient	9.8
Quarry (Aigbokhaode, 2011)	Lack of knowledge	70.8
	PPE uncomfortable	16.1
	Not important	13.1

Source: Aguwa 2013

The Findings suggest that knowledge of PPEs is poor in most occupations, there is negative attitude towards wearing some of the PPEs and the utilization is less than 50% in most cases. Education on hazards and PPEs has not always equated to improved

use of PPEs. Responsibilities of the employers of labour like provision of PPEs, education of workers and enforcement of utilization of PPEs have been lacking. Even in some situations where the employer has done well in providing these PPEs some employees have defaulted in using them. Unfortunately the consequences of not wearing relevant PPEs and hence exposure to the occupational hazards are often of long latency. By the time they occur the worker might have long left the work. Some of these include silicosis (in quarry industry and construction workers); formaldehyde poisoning which has been associated with nasopharyngeal cancer (laboratory staff, furniture workers, textile manufacturers, medical, dental, and other health and veterinary services). Indeed some hazards may appear harmless and users become careless on safe use of these agents. Among teachers chalk used on blackboards though made of naturally occurring substance [calcium carbonate] can cause or trigger-off asthmatic attacks.

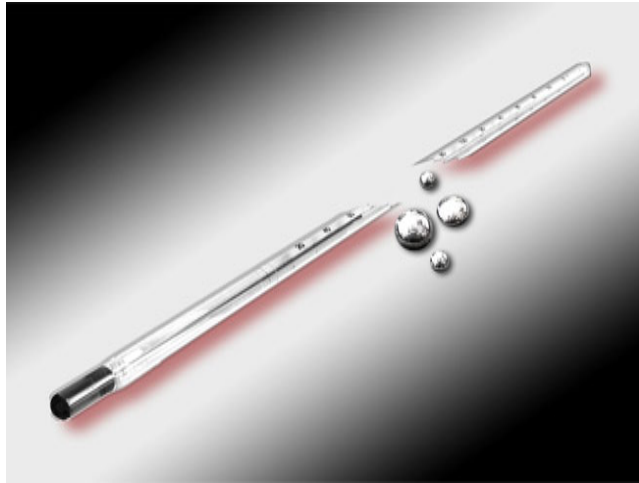
Plate 2: Whiteboard marker



Also the now modern use of whiteboard maker also appears so safe that we occasionally touch the ink. Unfortunately they are made of toxic mixture of chemicals; the most dangerous of which is methyl isobutyl ketone [also called 2-Butanone]. Exposure to this chemical can cause irritation of the nose, throat and eyes and

may also lead to neurological, liver, kidney and respiratory problems.

Plate 3: A broken Mercury thermometer



What about the shiny, well-shaped and harmless looking mercury that spills from the sphygmomanometer and thermometers? If the mercury is not cleaned up properly it will evaporate and contaminate the surrounding air and become toxic to both humans and wildlife. Inhaled mercury vapour can be toxic to the nervous system, kidney,

lungs and immune system.

There should be Standard Operating Procedures (SOPs) that include enforcement of PPEs. These SOPs should be pasted at conspicuous areas in the workplaces to serve as constant reminders to both employers and employees. Monitoring of compliance to the use of PPEs should be reinforced and rewards should be given to those who comply. Though education is important it should be targeted towards attitudinal change. Attitudinal change of both the employer and employee will improve utilization. Employers and employee should have the attitude of “safety first”.

Isolation methods in hospital setting for infection prevention and control

UNIVERSAL PRECAUTIONS: Universal precautions refer to the practice, in medicine, of avoiding contact with patients' body fluids. It involves a set of precautions designed to prevent transmission of blood borne pathogens like human immunodeficiency virus (HIV), hepatitis B virus (HBV) and others, when providing first aid or health care. Indeed it was introduced by Center for Disease Control (CDC) in 1985 in response to HIV/AIDS epidemic. The recommendations of universal precautions include; wearing gloves, gowns and aprons when collecting or handling blood and body fluids contaminated with

blood; wearing face shields when there is danger of blood splashing on mucous membrane. Compliance with universal precautions among healthcare workers was found to be inversely related to years of experience in the USA (Helfgott et al, 1998). Healthcare workers and medical students in hospitals were found not to have good perceptions of universal precautions. Knowledge about mode of transmission of blood borne pathogens was very low in mixed populations of healthcare workers and caregivers in Pakistan (Janjua et al, 2007). This compelled me and other researchers in 2008 to study; *Universal Precautions: Awareness and Practice of Patent Medicines Vendors in Enugu Metropolis, South East Nigeria* (Aniebue et al 2010), so as to determine patent medicine vendor's awareness and practice of universal precautions.

Table 6: Practices by PMV following a needle prick injury

Actions taken soon after needle prick	N=337 freq (%)
Nothing	16 (4.7)
Wash the site	60 (17.8)
Inform a doctor	41 (12.2)
Go for HIV screening after 6 weeks	60 (17.8)
Inform a doctor and go for screening	98 (29.1)
Wash the site/inform the doctor	9 (2.7)
Wash the site/go for screening	12 (3.6)
Wash the site/inform a doctor/go for screening	3 (0.9)
Others	38 (11.3)

Source: Aniebue et al 2010

There is an observed role of the patent medicine vendor in Nigeria as an informal health care provider. This role, however uncomfortable to the formal health sector, cannot be ignored. They present a real risk of exposure and perpetuation of blood borne pathogens in the population. Stricter regulation of their practices are necessary to reduce this risk and efforts need be made to enhance their knowledge of and adherence to universal precautions. Training and mandatory continuing health

education on universal precautions as a prerequisite to renewal of their licenses, were recommended.

STANDARD PRECAUTIONS: Just a few weeks ago, I had the privilege of presenting a pre-conference paper to the Association of Public Health Physicians of Nigeria (APHPN). I titled it “Standard Precautions: A Panacea to Infection Control in Hospital Setting? Case Study of Viral Hemorrhagic Fevers”. My concern then was the rampaging effect of Lassa fever despite the increased knowledge of Standard Precautions (SP). Indeed standard precaution was introduced in 1996 as an improvement of Universal precaution and Body Substance Isolation (1987). It is defined as minimum infection prevention measures that apply at all times to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. It is based on the principle that transmissible infectious agents may be present in all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes. SP has the following components: hand hygiene, appropriate personal protective equipment, safe use and disposal of sharps, safe handling of potentially contaminated equipment or surfaces in the patient environment (waste management; patient care equipment; linen management; environmental cleaning; aseptic technique); respiratory hygiene and cough etiquette. Despite this nosocomial infections still abound in hospital settings especially in developing countries. This raises the questions: Is it that the SP is not effective in disease control or are we not practicing it appropriately? What could be the constraints to compliance? In 2014, along with other researchers, I carried out a study on “Knowledge and Practice of Standard Precautions by Health-Care Workers in a Tertiary Health Institution in Enugu Nigeria (Arinze-Onyia et al, 2018)”. Though the knowledge of health workers studied was high, most of the staff had exposure to patient’s body fluid. In fact doctors had more prevalence of exposure than nurses. The commonest reason for not fully complying with PPEs is non-availability of the product. Challenges with practice of SP had also been recorded by other researchers. The observations were the following:

- Proper handling and disposal of sharp materials, hand washing and use of PPEs were unsatisfactory

- Although, a small proportion (6.6%) showed that these professionals had poor knowledge on SP, knowledge on SP was shown to have little impact on adherence to these measures
- Level of awareness does not affect SP (*Osungbemi et al, 2016; Oli et al, 2016*)
- Health education did not have lasting effect on compliance (*Gammon et al, 2008*).
- Compliance to specific aspects of SP differ

The reasons for non-compliance with SP include:

- Risk Perception: adherence to SP differs according to the patient's disease (*Kagan et al, 2009*).
Adherence was better with higher risk of being infected
- Compared to physicians, nurses had greater risk perception and took more adequate measures of infection control (*Parmeggiani et al, 2010*)
- Type of disease: Fatality/Stigmatizing/Curable
- Lack of appropriate materials: Often commonest reason (*Amoran, 2013*).
- Emergency nature of healthcare

A study in Cyprus (*Efstathiou et al, 2011*) among nurses:

"... the emergency, something unexpected may happen, an emergency situation may occur [...] you do not have the time to use protective equipment."

- Patients' discomfort while wearing PPE
- Standard precaution is time consuming
- Concern about appearing to stigmatize a patient
- Interference with some clinical procedures
- Perception that some patients e.g. children are at low risk of transmitting infection (*Efstathiou et al, 2011*).
- Lack of training on how to use some PPEs

Recommendations include:

- Engineering and Environmental e.g. Provide adequate isolation locations and barrier nursing; Provide sufficient hand hygiene stations, soap, running water,

alcohol-based hand rubs, chlorine/bleach/cleaning supplies, electricity, working waste disposal system

- Administrative: These include Promote institutional safety climate; Triage/Sorting; Develop IPC policies and staff: SOPs (National Guidelines on IPC); Provide social protection for illness. Others are Improve laboratory diagnosis; Training on IPC (staff/patient/visitors) and PPEs; Provide adequate staff to carry out work activities.
- Ensure compliance with personal protective equipment by providing sufficient and appropriate PPEs; PPEs should be stored in easy-to-reach locations; Training on use of PPEs and enforcing compliance.

CARDIAC RISK AMONG LECTURERS: Non-communicable diseases (NCD) are a major health burden in many industrialized countries and they are also increasing rapidly in developing countries owing to demographic transitions and changing lifestyles (Aulikki et al. 2001). Generally certain occupations are regarded as sedentary jobs. A sedentary job is defined as one that involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required occasionally and other sedentary criteria are met. "Occasionally" means occurring from very little up to one- third of the time, and would generally total no more than about 2 hours of an 8-hour workday. Sitting would generally total about 6 hours of an 8-hour workday (Donati Law, PLLC). Some sedentary jobs include secretarial work, banking, creative work, driving, computer operators, medical profession, legal profession and teaching. Indeed the number of jobs requiring moderate physical activity has reduced over the years. Most teaching revolve around a rigid schedule that limits movement to a small area.

Sedentary life style is associated with high blood pressure, heart disease, diabetes, anxiety, depression, cancer (esp. breast and colon cancers}, obesity and increased risk of early death. (Furlan 2015). Cardiovascular diseases (CVD) are now a great cause of morbidity and mortality worldwide which led some authors and I to conduct a study on Cardiac risk indices of Junior staff (Grade level 01 – 06) and Senior staff (07 – 16) of one of the universities in Imo State, Nigeria (Emerole et al 2007). A cardiac risk indices record sheet (Corbin, 2000) was used to record cardiac risk indices like age, sex, family history of hypertension, body mass index (BMI), tobacco smoking, exercise, serum cholesterol level and systolic blood pressure.

Table 7: Cardiac risk indices of staff of federal University of Technology, Owerri

VARIABLE	JUNIOR N=141 n(%)	SENIOR N=100 n(%)	χ^2	P-VALUE
Age (>40yrs)	41 (29.1)	66 (66.0)	32.31	0.00*
Positive family history	7 (5.0)	8 (8.0)	0.92	0.34
Sex (male)	72 (51.8)	49 (49.0)	0.14	0.71
BMI (>25kg/m ²)	35 (24.8)	49 (49.0)	15.06	0.00*
Smokes tobacco	5 (3.5)	4 (4.0)	0.03	0.85
No moderate occupational/recreational exercise	15 (10.6)	53 (53.0)	51.84	0.00*
Serum cholesterol >180mg	129 (91.5)	91 (91.0)	0.02	0.89
Systolic hypertension (>140mmhg)	36 (25.5)	34 (34.0)	2.04	0.15
Average to extremely dangerous cardiac risk	33 (23.4)	42 (42.0)	9.44	0.00*

*Significant

Source: Emerole et al 2007

Table 8: Cardiac risk index (CRI) score of junior and senior workers by age group

Score	<40yrs		>40yrs	
	Junior staff	Senior staff	Junior staff	Senior staff
<18	64 (97.0)	35 (85.4)	44 (58.7)	23 (39.0)
>18	2 (3.0)	6 (14.6)	31 (41.3)	36 (61.0)
	66 (100.0)	41 (100.0)	75 (100.0)	59 (100.0)

Source: Emerole et al 2007

The study showed that junior staffs are significantly more involved in moderate occupational and recreational exertion than the senior staff. By moderate activity is implied any activity that is similar in intensity to brisk walking at a rate of about 3 to 4 miles per hour e.g. cycling, gardening and swimming. It has also been shown that repeated intermittent or shorter bouts of activity (such as 10 minutes) that include occupational and recreational activity e.g. walking to work and carrying out errands or the tasks of daily living like fetching water, sweeping, climbing long stairs, etc. have similar cardiovascular and other health benefits if performed at the moderate intensity level with an accumulated duration of at least 30 minutes per day for at least 5 days a week.

Our findings suggest that exercise and BMI may be the main factors responsible for the senior staff having higher CVD risk index score than junior workers. The risk of cardiovascular disease among staff studied is high especially among the senior staff. This may be because of high cholesterol, overweight and sedentary lifestyle among these workers. Health education campaign targeted at improving healthy dietary habit and exercise is strongly advised. Fortunately many people, including teachers are involved in non-occupational physical activities like household chores and exercise. This observation is similar to another study in India (Vaz & Bharathi 2004).

Recommendations to improving workplace physical activity include:

- Change work systems e.g. conducting standing meetings (people are known to burn more calories while standing than sitting)
- Redesign work tasks to enable greater variability in movement or posture
- Provide workers with regular breaks that involve physical activity, such as walking
- Encourage workers to ride their bikes to work
- Provide workers with corporate gym memberships
- Encourage workers to stand up and stretch every 30 minutes
- Organize physical activities for workers, such as a friendly football match

- Set up a pedometer challenge for workers to walk 10,000 steps a day.
- Whenever possible take stairs instead of lifts; Park at the end of parking lot; walk and talk on the phone (Furtan 2015)

MECHANICAL ENVIRONMENT

Poor ergonomics has been a major problem in most workplaces especially in developing countries. Ergonomics is defined as the science of designing the job to fit the worker. It applies information on human behaviours, abilities and limitations and other characteristics to the design of tools, machines, jobs, tasks and work environments for productive, safe, comfortable and effective human use (Health and Safety Authority. Ergonomics in the Workplace). Unfortunately in most jobs the worker is often forced to adapt to the workstation instead the other way round. For example, the chair he sits on is often either too low or too high and he has to lean forward in awkward position to carry out his work. This often results in musculoskeletal symptoms like muscle pain, carpal tunnel syndrome, tendonitis and bursitis. Other health effects include range of motion loss, clumsiness or loss of coordination, increased risk of work injuries, irreversible damage, back injuries, headache, migraines, stiff neck, ganglion cysts, trigger finger and advanced spinal degeneration. Musculoskeletal disorder is known to affect workers in almost every occupation. However occupations often associated with poor ergonomics are ones that require manual handling, manufacturing and production, heavy lifting, twisting movements and long hours of working in awkward positions. Examples include subsistent farmers, dentists and surgeons, etc. Udoeye and I worked on “*Musculoskeletal Symptoms: A survey amongst selected Nigerian dentists*” (Udoeye & Aguwa 2007). In this study, musculoskeletal symptom (MSS) was defined as pain commonly experienced by dentists in the course of their work. The musculoskeletal health of dentists has been a subject of many studies world over, with pain experience as the main focus. It is often the commonest symptom reported by dentists (Chowanadisai et al. 2000). Work related musculoskeletal pain has been attributed to be of multifactorial origin which was also thought to be posture related.



Plate 4: Dentist operating on a patient

However studies have shown that being seated or standing made little difference on how frequently dentists experience pain but rather affected is the pattern of pain distribution among the body part. The importance of MSS lies in its cumulative physiological damage which can lead to an injury or a career-ending disability. It is a common cause of work related disability among dentists, with substantial financial consequences. Dentists who suffer MSS

are also prone to neuro-circulatory disease, including varicose vein, postural defeats and flat foot.

Literature on the current subject in Nigeria, is scarce despite MSS's role as one of the major causes of work related morbidity. Furthermore, availability of data on Nigerian dentists will not only enrich relevant global data bank, but also will be very useful in epidemiological research. The purpose of the study was to investigate the occurrence of MSS in selected Nigerian dentists, and to evaluate its pattern of distribution.

Table 9: Prevalence of Musculo-skeletal symptoms by Body Sites and Gender

SITE	TOTAL N=70(%)	GENDER		P-VALUE
		MALE N=46(%)	FEMALE N=24(%)	
Neck	52 (74.3)	34(73.9)	18(75.0)	0.01 [*]
Lower Back	54(77.1)	37(80.4)	17(70.8)	0.82
Shoulder	57(81.4)	36(78.3)	21(87.5)	0.89
Elbow	51(79.9)	28(60.9)	13(54.2)	0.29
Hand Wrist	52(74.3)	35(76.1)	17(70.8)	0.23
Knee	49(70.0)	26(56.5)	13(54.2)	0.04 [*]
Ankle/Feet	49(70.0)	26(56.5)	13(54.2)	0.04 [*]

Upper Back	49(70.0)	26(56.5)	13(54.2)	0.04*
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Source: Udoeye & Aguwa 2007

Higher neck, lower back and hand/wrist pains seen more amongst the generalists than specialists may be because general dentists very often assume static postures than the specialist. It may also be that the specialists with musculoskeletal symptoms under reference were not captured in the survey. In Nigeria, as well as in most developing nations, specialist dentists with their better employment opportunities, travel for greener pastures abroad.

In conclusion, given the limitations of the study, it was found that musculoskeletal symptom is a significant occupational health problem in the studied population and the symptoms occurred more in males (66.5%) than in females (33.5%). Furthermore, general practitioners had more symptoms than specialists. It is hence recommended that occupational health campaigns be mounted routinely by the professional body, especially for the population at risk on issues of proper clinical postures, mechanisms of musculoskeletal disorder production, etc. Furthermore, the principle of ergonomic should always be considered in workstations.

CHEMICAL ENVIRONMENT

(A) BAKER'S ASTHMA AND OTHER HEALTH PROBLEMS OF BAKERS

The baking industry involves the use of certain ingredients to bake bread, cake, biscuits, cookies etc. Some of these ingredients like flour, yeast, egg can result in allergic responses. Inhalation of flour can produce what is commonly known as baker's asthma. Other respiratory problems include rhinitis and chronic obstructive pulmonary diseases like emphysema (Rushton, 2007). Rhinitis often precedes asthma. The mechanism of asthma could be allergy to the contents of the flour or it could be non - allergic since the flour dust is a known respiratory irritant (Fishwick et al, 2011). The asthma usually resolves with withdrawal from further exposure to the allergen.

Other health problems in baking industry include conjunctivitis, contact dermatitis and injuries resulting from accidents. These could arise from slips and falls on wet or uneven floor surfaces. Cuts from sharp or moving machinery, falls from heights as well

as burns and scalds from hot ingredients are also frequent causes of accidents (Health and Safety executive, 2011). Among bakers' musculoskeletal disorders like muscle pains and arthritis arise from manual handling and moving of heavy loads for example while loading or off-loading a vehicle may occur. Other causes of musculoskeletal disorders include work requiring repetitive movements and poor work posture (Ghamari et al, 2009). Most of these are due to poor consideration of ergonomic factors in the workplace.

Some chemicals such as sodium hydroxide and bleach used in cleaning bakeries could cause contact dermatitis and could also be hazardous to the eyes and the respiratory system. Reports have also indicated a higher prevalence of occupational skin diseases among bakery workers than in the general population (Bolaji, 2005; Arrandale et al, 2013). In addition, bakeries are known to have processes which emit high noise levels exceeding the threshold limit levels (McCullagh et al, 2011). Exposure to noise can cause irreversible hearing damage. In fact, hearing defect is one of the commonest health problems among bakers and may sometimes be difficult to detect since the effects can build up slowly over time.

Use of appropriate personal protective equipment would have prevented some of the injuries. Indeed in order to protect workers and ensure that employers provide a healthy working environment the International Labour Organization developed a workplace safety act (Kalejaiye, 2013). Unfortunately, a report from Nigeria showed that the attitude of bakers was negative or indifferent on issues of occupational health and safety (Bolaji, 2005). This is significantly different from British bakers' workplace risk perception which observed that both the management and workers had positive attitude towards safety of the workplace (Alexopoulos et al, 2009).

The questions that often come to mind include: 'Are there policies or practices in bakeries aimed at protecting the workers from these workplace hazards?' If there are, 'are the workers aware and do they adhere to these policies and practices?' Providing answers to these questions will help in programme design targeted at reducing workplace hazards among this group of workers. Unfortunately few studies have been done on occupational health problems of bakers in South-east part of Nigeria. In 2013,

along with some authors we carried out a descriptive cross-sectional study in Aba metropolis on “*Assessment of Baking industries in a Developing Country: The common Hazards, Health challenges, control measures and Association to Asthma (Aguwa & Arinze-Onyia, 2014)*”. A total number of 135 bakers were studied. One hundred and nineteen (88.1%) were aware that working in a bakery could result in ill health but were able to identify only one or two hazards. The most prevalent complaints were respiratory symptoms. Musculoskeletal disorders were reported by 21 (15.6%) while rashes and skin irritation occurred in 16 (11.9%) of the respondents some of whom used personal protective equipment (PPEs). Accidents such as burns, cuts, falls, electrical shocks and fire explosions were reported by about 22% of the respondents while hearing loss was found among 21 respondents (Table 10).

Table 10: Symptoms often encountered in bakers in workplace

Symptoms	Present (%)	Absent (%)
Respiratory complaints		
• Sneezing	44 (32.6)	91 (67.4)
• Catarrh	40 (29.6)	95 (70.4)
• Cough	31 (23.0)	104 (77)
• Chest tightness	25 (18.5)	110 (81.5)
• Prevalence of Asthma	20 (14.8)	115 (85.2)
Other Complaints		
• Musculoskeletal disorders	21 (15.6)	114 (84.4)
• Hearing loss	21 (15.6)	114 (84.4)
• Skin irritation/Rashes	16 (11.9)	119 (88.1)
Accidents :		
• Burns	7 (5.2)	128 (94.8)
• Cuts	6 (4.4)	129 (95.6)
• Falls/Slips	6 (4.4)	129 (95.6)
• Fire/Explosions	5 (3.7)	130 (96.3)
• Electric shocks	5 (3.7)	130 (96.3)

Source: Aguwa & Arinze-Onyia, 2014

Table 11: Variables and their relationship to Asthma

Variables	Presence of Asthma		χ^2 (p – value)
	Yes (%)	No (%)	
Years worked in bakery:			

• 5 years or less	13 (13.3)	85 (86.7)	0.680 (0.409)
• More than 5 years	7 (18.9)	30 (81.1)	
Sex distribution:			
• Male	11 (12.9)	74 (87.1)	0.638 (0.424)
• Female	9 (18.0)	41 (82.0)	
Awareness of hazards in bakery:			
• Yes	20 (17.1)	97 (82.9)	3.612 (0.057)
• No	0 (0.0)	18 (100.0)	
Wear face mask regularly:			
• Yes	5 (7.5)	62 (92.5)	5.697 (0.017)*
• No	15 (22.1)	53 (77.9)	

*Significant

Source: Aguwa & Arinze-Onyia, 2014

The study revealed the prevalence of occupational hazards such as musculoskeletal disorders, skin irritation, hearing loss, accidents and respiratory problems and that the prevalence of occupational asthma can be reduced by wearing facemask at work. It was therefore recommended that bakery owners should provide and enforce the use of personal protective equipment.

(B) FUEL PUMP OPERATORS



The Occupational Hazards related to the chemical environment was also studied in the *Assessment of Workplace Accidents and Risk Reduction Mechanisms among Filling Station Pump Operators in Aba, Southeast Nigeria* (Aguwa et al, 2014). Filling/petrol/gas station pump operators dispense fuel which may be in form of Petrol (Premium Motor Spirit), Diesel (Automated Gas Oil – AGO) or Kerosene (Dual Purpose Kerosene – DPK). Petrol pump operators face several hazards

e.g. fire outbreak and chemical poisoning like benzene (may be up to 3 times acceptable level) which may lead to cancer, aplastic anaemia and death. Globally increased urbanization has resulted in increased use of automobiles, more demand for fuel and consequently proliferation of filling stations. In developing countries some of these filling stations are erected without following government regulations and standard safety practices (fire standards, layout, location, waste management, etc.) for obtaining operational license from the regulatory body (Afolabi et al 2011). This is because living within 100m of fuel station is dangerous to health because of these volatile gases released from the petrol product. According to Department of Petroleum Resources Guidelines for approval to construct and operate petroleum products filling station the following are some of the conditions that must be in place before license is issued: The distance from the edge of the road to the nearest pump will not be less than 15 meters; Total number of petrol stations within 2km stretch of the site on both sides of the road will not be more than four including the one under consideration; and the distance between an existing station and the proposed one will not be less than 400 (four hundred) meters. Others are: The distance between one petrol station to the nearest residential building should be 50m. The distance between one petrol station and the nearest place of public assembly should be 90m (Mshelia 2015).

Studies have shown that filling station operators that store and sell flammable materials are chronically exposed to petroleum derivatives through inhalation of petrol during vehicle refueling and some of these hazards include benzene, toluene, ethylbenzene xylene and Lead poisoning (Karakitsios, 2007; Pandey, 2008; Bindhya 2010). Lead in blood increased with increasing years of exposure (Al-Rudainy, 2010). Most petrol products used in Nigeria contains lead as an anti-knock agent. Other health problems of fuel pump operators include contact dermatitis from petrol products, fire outbreaks, violence and work stress especially during scarcity of product.

Warning signs on gas pump stations: We often encounter warnings signs while attempting to refuel our cars. Our study revealed that only 4 (2.4%) of the gas stations studied had ever had fire incident but cause of these were unknown. We also observed that most of the gas pumps have warning signs. Common ones include: no smoking,

switch off car engine and switch off your cell phone. Most of these are easily understood processes of igniting fire/explosion when used in close proximity with fuel.

Petrol gives off highly flammable vapour even at low temperature of -40°C . This can be ignited by flame, spark or heat source, e.g., naked light, smoking, heaters, hot engines e.g. when engine is still on, etc. However process of cell phone igniting fire when near fuel has not been established beyond reasonable doubt. No study reviewed has conclusively proven the linkage between cell phone and fire outbreak. Questions being asked include: at what stage does the cell phone potentially ignite fire when close to fuel – is it when answering call or when there is an incoming call or both? Also at what distance from the fuel is it safe to use the cell phone? Indeed most opine that the rare cases of fire when refueling may be due to static electricity. Static electricity is an imbalance of electric charges within or on the surface of a material. The charge remains until it is able to move away by means of an electric current or electrical discharge. A static electric charge can be created whenever two surfaces contact and separate, and at least one of the surfaces has a high resistance to electric current e.g. when you scuff your feet on the carpet or move in and out of your car. The cell phone signals are too weak to ignite gasoline fumes while some static electricity can get build up to 30,000 – 60,000 volts. Hence while fire from cell phone may be theoretically possible it is not probable. Since there is a probability caution demands that these cell phones are switched off when at gas stations.

Simple ways of avoiding fires from static electricity include:

- Do not get back in your car until you are finished pumping gas.
- When you get out to pump gas, get rid of any static charge before you reach for the pump. That could be as simple as tapping the metal top of your car with your bare hand.
- Never fill portable containers in or on a vehicle. Instead, Place container on ground before filling.

Table 12 - Administrative and Personal Protective control measures to reduce hazards risks

Administrative and Personal Protective control measures	Frequency (N=170)	Percent
Program/policy established by management to prevent accidents	119	70.0
Source of information about policy		
– Formal Training/workshop	88	51.8
– On the job training	31	18.2
– Not Applicable (no policy is established)	51	30.0
Punishment is applied for non-compliance to safety rules	102	60.0
Trained on how to use the fire-extinguisher	166	97.6
Provision of fire-fighting equipment	35	20.6
Provision of personal protective equipment		
– Aprons	152	89.4
– Gloves	21	12.4
Regular use of personal protective equipment (apron and/or gloves) during work	129	75.9
Warning/hazard signs put at strategic places		
– No smoking signs	160	94.1
– Switch off handset signs	158	92.9
– Turn off engine sign	13	7.6
Health staff/safety officer employed for first aid treatment	26	15.3
Management organizes routine laboratory investigation of staff	12	7.1
Staff is covered by insurance scheme in cases of accident	1	0.6
Habits		
• Wash hand regularly after touching petroleum product	140	82.4
• Often asks motorists to turn off engine before refueling		

• Eat while working	29	17.1
• Allow motorists to make calls while refueling	34	20.0
	24	14.1

Source: adapted from Aguwa et al, 2014

Table 13: Factors that may affect control measures by staff

Variables	Yes (%)	No (%)	Yes (%)	No (%)
	Wear apron and/or gloves during work		Wash hands after touching petroleum	
Sex: Male	41(67.2)	20(32.8)	51(83.6)	10(16.4)
Female	88(80.7)	21(19.3)	90(82.6)	19(17.4)
	$\chi^2 = 3.91$, P value = 0.05 Odds Ratio = 0.49		$\chi^2 = 0.03$, P value = 0.86 Odds Ratio = 1.08	
Education: Primary	4(57.1)	3(42.9)	4(57.1)	3(42.9)
Secondary	109(77.9)	31(22.1)	118(84.3)	22(15.7)
Tertiary	16(69.6)	7(30.4)	19(82.6)	4(17.4)
	$\chi^2 = 2.14$, P value = 0.34		$\chi^2 = 3.47$, P value = 0.18	
Work experience (years)				
1 – 3	97(80.8)	23(19.2)	97(80.8)	23(19.2)
4 – 6	30(71.4)	12(29.6)	38(90.5)	4(9.5)
7 – 9	2(28.6)	5(71.4)	6(85.7)	1(14.3)
10 and above	0(0.0)	1(100.0)	0(0.0)	1(100.0)
	Likelihood-ratio $\chi^2 = 11.93$, P value = 0.01*		Likelihood-ratio $\chi^2 = 5.89$, P value = 0.12	
Aware of hazards in workplace				
Yes				
No	119(82.1)	26(17.9)	117(80.7)	28(19.3)
	10(40.0)	15(60.0)	24(96.0)	1(4.0)
	$\chi^2 = 20.62$, P value = < 0.01* Odds Ratio = 6.87		$\chi^2 = 3.53$, P value = 0.06 Odds Ratio = 0.17	
Are there punishments for noncompliance with safety rules				
Yes	96 (94.1)	6 (5.9)		
No	33 (48.5)	35 (51.5)	NA	NA
	$\chi^2 = 46.33$, P value = < 0.01* Odds ratio = 16.97			

*Significant. NA – Not Available. Source: Aguwa et al, 2014

Some control measures have been put in place to reduce the risk of hazards in filling stations. From present study, some of these include presence and enforcement of safety policies, provision of PPEs, improvement of hygienic environment, etc. However, there are still some stations where there are no known existing health and safety policies. Some do not provide adequate PPEs. The commonest PPEs provided are overalls; only a few (12.4%) provide gloves. This may be because they do not regard contact with fuel as a health hazard. Indeed as observed in present study not all wash

hands after touching fuel. Compliance with safety measures like PPEs improved when there is awareness of health hazards associated with the workplace or when there is punishment for not using these safety measures. Gender, level of education and age did not affect the use of PPEs. Interestingly, this study also observed that those who had worked for longer periods were increasingly less likely to wear overalls. This may be due to complacency and the feeling of “being experienced or used to the job”.

In conclusion, most filling station workers are aware of the hazards in the workplace yet accidents occur commonly. Use of safety measures are achieved by creating awareness and enforcement of safety policy. There should be training and re-training of the attendants on safety measures. Workplace Health and Safety Policy should be enforced in order to achieve compliance with use of PPEs.

(C) WOODWORKERS



Small-scale woodwork and furniture making is a common occupation in most parts of Nigeria. These utilize timber from forest reserves and provide employment for thousands of Nigerians. Common timber/wood in Nigeria include: Mahogany, Iroko, Afara, Mansonia, Teak, Beach, Omar, Walnut (black), Cedar and Oak. For these woods to be felled, preserved, processed and transported to the end users, several occupations are involved. These include loading/offloading of timber or sawdust,

sawmill, carpentry/furniture making, carving, etc. Treatment and processing of these woods are by carpenters and furniture makers. In all these occupations, workers are exposed to varying degrees of wood dust and other harmful agents like chemicals used as preservatives, biological agents (mainly fungal), mechanical agents from machinery causing injuries and physical agents (causing deafness or hearing impairment, violent earache, vibration white finger and giddiness). Some of these agents can also cause skin irritation (dermatitis) or eye irritation.

Exposure to the wood dust by inhalation still remains the commonest and most hazardous occupational health problem of the woodworkers. The degree of pathology caused in the respiratory system by inhalation of wood dust depend on the following:

- Concentration of airborne dust: Workers most at risk are those in indoor workplaces with inadequate dust extraction system. A recommended exposure limit for hardwood dust of 2mg dust per cubic metre of air has been adopted as the threshold limit value (T.L.V) while for softwoods or particle board a general nuisance dust limit of 10mg dust per cubic metre of air is currently in place (Baradell 1994).
- Size of dust particles: Typically, particles of wood dust differ widely in size, varying from the large ones created during boring, chipping and sawing to the small ones generated during sanding of wood. The dust produced from hardwoods tend to consist of smaller particles with a given method of production than that from softwoods. Particles with any dimension less than 10microns occur only rarely in wood dusts produced in other than sanding operations. Even in dust produced from hardwoods by machine sanding, comparatively few particles have any dimension smaller than 2microns. Most wood dusts are therefore deposited in the nose or respiratory tract where they produce irritation or allergenic effect.
- Type of wood: Each type of wood/timber has its own inherent chemical property and may affect people differently. Timbers are generally divided into two categories:
 1. Softwoods (derived from coniferous trees) e.g. Pine and Cedar.
 2. Hardwoods (derived from deciduous trees) e.g. Oak and Teak.

Despite their varying sizes, these woods have varying degrees of toxicity and affect different parts of the body. Mansonia, Oak and Obeche have irritant and sensitizing

effects on the eyes, skin and respiratory system while other woods like Cashew, Walnut, Iroko and Mahogany have only sensitizing effect on the eyes and respiratory system (Rowland 2002). The fine dust from working with *Mansonia* wood produces sneezing, sore throat, nose bleeding, headache and dermatitis. Cedar has been known to contain plicatic acid as a primary irritant while pine (family – pinacene) has abietic acid as its primary irritant (Ayars 1989).

Additives in the woods: These additives may be preservatives used to protect the wood against biological degradation or against fire, coatings for protection or to give the wood a more favourable aesthetic appearance. Formaldehyde for example is a colorless, flammable, strong-smelling chemical that is used in resins (i.e., glues) used in the manufacture of composite wood products (i.e., hardwood plywood, particleboard and medium-density fiberboard). It presents a high potential health hazard because it destroys living tissue. The occupational exposure limit (O.E.L) is a ceiling of 0.3 parts of formaldehyde in one part per million (ppm) of air. However, airway irritation has occurred in some workers with exposures to formaldehyde as low as 0.1 ppm. Wood particles may serve as important carriers of formaldehyde into the respiratory tract. It can cause respiratory irritation, airway obstruction, eczema, dermatitis and is even a suspected human carcinogen (myeloid leukemia).

- **Organic contaminants in the wood:** Some of the important fungal growth on wood include *Alternaria*, *Aureobasidium*, *Penicillium*, *Rhizopus* and *Aspergillus*. These fungal growths may be in the form of spores or of fragments of hyphae. They are human allergens and have been associated with pulmonary diseases; e.g. hay fever and woodworker's lung which is characterized by chills, fever, dyspnea, cough, body ache and weight loss.
- **Susceptibility of workers:** Some people are known to react more than others when exposed to sensitizing agents e.g. the asthmatics. It is due to atopy i.e. a genetic predisposition toward the development of immediate (type 1) hypersensitivity reactions against common environmental antigens. There is often a positive family history of asthma in these persons. They readily form Ig E antibodies to commonly encountered

allergens. In presence of allergens e.g. from the wood they often present with allergic rhinitis, bronchial asthma and atopic dermatitis.

- Effectiveness of exhaust ventilation: Locally applied exhaust ventilation is important in removing dusts (e.g. wood dusts), vapours and fumes at source. However, for it to be effective, the velocity induced by the local exhaust must exceed or at least be equal to the velocity at which the dust, etc. are being dispersed in order to extract the substances before they contaminate the general atmosphere.
- Other safe procedures; e.g. the use of personal protective measures like dust masks, respirators, gloves and overalls. These must be replaced or cleaned often to prevent inhalation of wood particles that settle on them. They also must never be taken home to avoid contaminating other people.

In 2004, along with other researchers I carried out a study to assess the prevalence of occupational asthma and rhinitis among woodworkers in south-eastern Nigeria (Aguwa et al, 2007). Studies have shown high levels of wood dust exposure have been associated with respiratory disorders among woodworkers (Bernstein, 1997) and in developing countries occupational respiratory problems among wood workers appear to be worse. This is partly because of the high prevalence of communicable diseases tends to overshadow the importance of occupational health (Aguwa 2007). Recently, in southern Nigeria, small scale woodwork and furniture making industries providing employment for thousands of Nigerians are being established and these utilize timber such as Mahogany, Iroko, Cedar and Mansonia. Unfortunately, there is paucity of the magnitude of the respiratory problems among wood workers in south western region of Nigeria.

Our study was specifically carried out to determine the extent of occupational rhinitis and asthma among south-eastern Nigerian woodworkers exposed to high level of wood dust. Rhinitis and asthma were studied to indicate exposure to wood dust since they can occur within a relatively short time of exposure. The study showed that the prevalence of occupational rhinitis and asthma among wood workers is high and increases with years of exposure. It is necessary for the wood workers to be educated on associated health problems of wood dust. Also, they should be encouraged to use

control measures like local exhaust ventilation, wetting the floor to prevent the dust from being airborne and use of personal protective measures such as dust masks.

Table 14: Relationship between duration of exposure to wood dust and prevalence of Occupational Rhinitis and Asthma

Duration (Years)	Number (%)	Persons with Occupational Disease		Person without Occupational Disease
		Rhinitis	Asthma	
< 2	98 (16.6)	35 (8.7)	1 (1.9)	62 (46.3)
2 - 5	148 (25.0)	96 (23.9)	11 (19.6)	41 (30.6)
6 - 10	129 (21.8)	99 (24.8)	8 (14.2)	22 (16.4)
>10	216 (36.5)	171 (42.6)	36 (64.3)	6 (6.7)
Total	591	401	56	134
χ^2 trend for Rhinitis = 64.36, df= 1; P < 0.001				
χ^2 trend for Asthma= 23.52, df=1, P< 0.001				

Source: Aguwa et al, 2007

(D) ROADSIDE FOOD VENDORS



Indoor and outdoor air pollution are common causes of morbidity and mortality especially in resource-poor communities. A significant source of air pollution is the burning of fuels such as biomass in stoves. Over 3 billion people worldwide cook in their homes with biomass (WHO 2018). Restaurants and commercial food vendors are a major consumer of biomass in the form of charcoal and firewood. Cooking with this source of fuel exposes people to the toxic fumes which contain dangerous

particulate matter (PM), carbon monoxide (CO), nitrogen oxides, formaldehyde,

benzene, 1,3 butadiene, polycyclic aromatic hydrocarbons (such as benzo[a]pyrene) and other toxic pollutants from the fire wood smoke (WHO 2014) . Inhaling these pollutants is known to claim the lives of over 4 million people yearly worldwide (WHO 2018) and in some sub-Saharan African Countries the particulates released during cooking are responsible for up to 780/1000 deaths resulting from lung cancer, ischaemic heart disease and cardiovascular diseases combined (Evans, 2012).

Unfortunately, those who are most at risk are the women and children who make up to 85% of these deaths due to their increased exposure in the cooking environment (Mishra, 2003). Some of the early manifestations of exposure to indoor air pollution are rhinitis and asthma (an obstructive lung disease). Obstructive lung diseases that may result are diagnosed by performing a lung function test (FEV_1/FVC). Due to the associated health hazards of indoor air pollution attempts have been made to reduce its emissions. In developing countries where use of biomass as source of fuel is prevalent the high costs associated with developing stoves that will cut these emissions have remained a big challenge.



However, in the past few years several improved cookstoves have been developed and studies have compared their efficacy, safety and emissions (Oanh et al, 2005; Tsai et al, 2003).

Incidentally, not much research has been carried out to ascertain the pattern of domestic biomass use, its performance in terms of quantity of firewood used for cooking and effect on respiratory (lung) functions of end users in Nigeria. Between 2012 and 2013 we (Fajola et al 2014) carried out an intervention study in Port Harcourt, Rivers State Nigeria among households that use firewood as source of cooking fuel to assess the effect of an improved cookstove on indoor particulate matter, lung function and fuel efficiency of firewood users.

Survey carried out in 81 households showed that very few respondents (14.8%) were aware of any improved cookstove and even fewer people (9.9%) had seen one. There was significant reduction in the mean particulate matter concentration when the improved cookstove was used compared to when traditional stove was used ($p = 0.02$). Table 15 shows a 32.1% reduction in mean indoor PM_{2.5} from firewood to cookstove. Plates 1a and 1b show pictures of PM_{2.5} in one of the randomly selected homes (before and during the use of the improved cookstove). The lung function (FEV₁ and FVC) of the 81 respondents whose kitchen were monitored for PM_{2.5} improved and proportion of respondents who had obstructive lung conditions as obtained from FEV₁ / FVC% reduced while cooking with improved cookstoves. These results were however not statistically significant (Table 3). Finally, families spent three times on firewood when cooking with traditional tripod firewood stand than when cooking with improved cookstoves

Table 15: Comparison of mean particulate matter (PM) before and during use of cookstove

Particulate Matter (PM)	Mean	N	Std. Deviation	Paired Differences	T test (P value)
				95% Confidence Interval of the difference	
Mean PM before cooking with cookstove	4.43	81	8.14	0.27 – 2.57	2.46 (0.02)*
Mean PM during cooking with cookstove	3.01	81	9.18		

Source: Fajola et al 2014

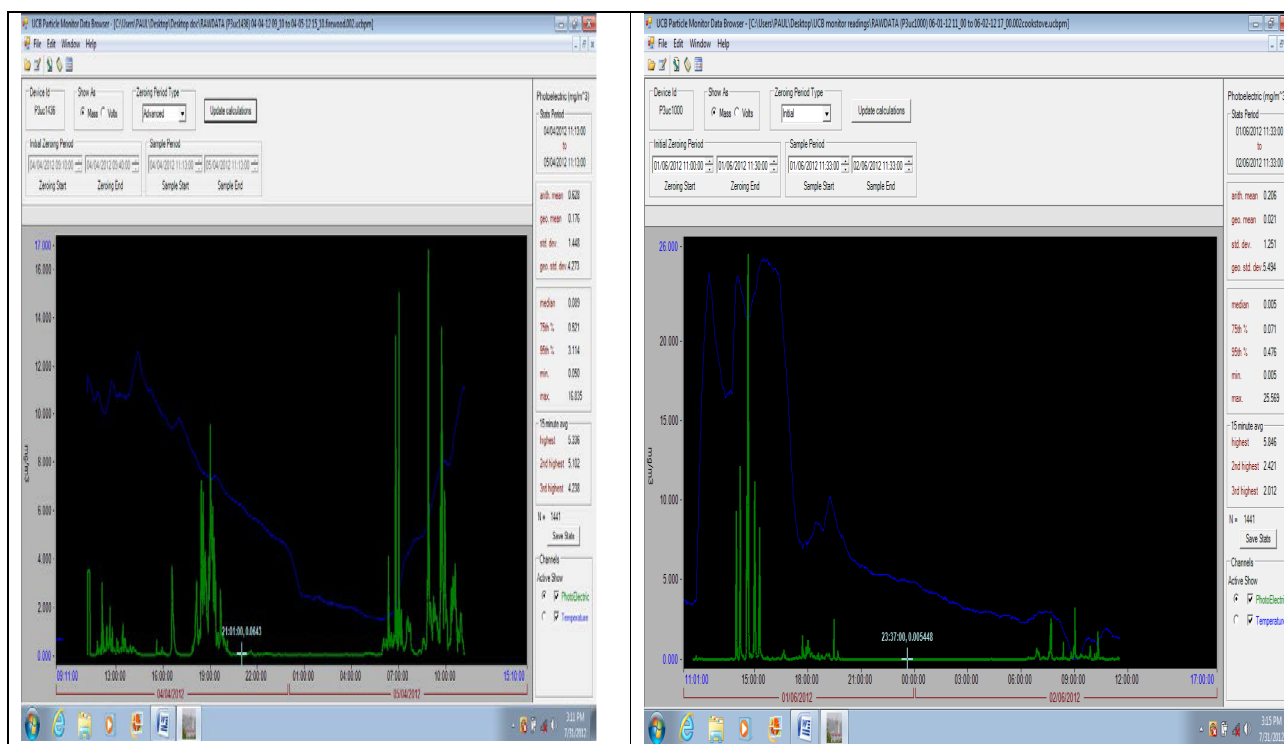
Table 16: Lung function tests of respondents while using firewood and six months into using clean cookstove (before and after study)

Lung function test	Cooking with firewood (N = 81)		After cooking with cookstove for 6 months (N=81)		T test (P Value)
	Mean	SD	Mean	SD	

FEV ₁	1.97	0.21	2.02	0.22	1.48(0.141)
FVC	2.44	0.27	2.49	0.25	1.22(0.233)
FEV ₁ /FVC (%)	80.7	0.25	81.1	2.8	0.96(0.339)
Respondents showing signs of obstruction based on FEV ₁ /FVC (%)					
FEV ₁ /FVC value	Freq.	Percent	Freq.	Percent	χ^2 (P Value)
Normal	45	55.6	56	69.1	3.182(0.074)
Obstruction	36	44.4	25	30.9	
Total	81	100.0	81	100.0	

Source: Fajola et al 2014

UCB1436.002firewood Before using cookstove	House 2 –	House 2 – After using cookstove
---	-----------	---------------------------------



The green line represents Particulate matter in the air
Source: *Fajola et al 2014*

Above findings reveal that despite well documented evidence of the harmful effects of the use of solid fuels on both the environment (deforestation, soil erosion, flooding, global warming, declining agricultural productivity, etc.) and health of especially mothers and children (pneumonia, lung cancer, chronic obstructive lung disease, heart disease, etc.), the present study observed that many households studied still use biomass as their main source of fuel for cooking. This is similar to global estimates of about 50% that use biomass (Staton et al, 2000).

Use of biomass differs from country to country and even within the same country from one region/community to another. In Nigeria 70% use solid fuels and even most of these use open fire/stove without chimney or exhaust hood (Desalu et al, 2012). This use is greater in rural Nigerian communities where in a particular community up to 84% of the dwellers used biomass as source of fuel (Desalu et al. 2012). Interestingly, even the educated are not isolated from the exposure to pollution from use of biomass as

fuel. In the present study, about 60% of those interviewed had at least secondary education and many of them use solid fuels. Hence, the use of this source of fuel may not be from illiteracy alone but also from other factors like income, lack of knowledge of health consequences of indoor air pollution and low awareness of existing alternative improved cookstoves (Duflo et al, 2008; Mobarak et al, 2012).

ONGOING AND FUTRUE RESEARCH WORKS

- **A Review of Lassa Fever Outbreaks in Nigeria: Epidemiological Profile, Drivers and Public Health Response**

This study is aimed at describing the epidemiology of Lassa fever outbreaks in Nigeria from 1969 to 2017 and the public health responses to the different outbreaks. It is under consideration for publication.

- **Prevalence and Predictors of Stress and Burnout in Bankers in Enugu Metropolis**

This is to further strengthen the previous work I did among bankers in Aba, Abia State. This study is a descriptive cross- sectional study of 370 bank workers in Enugu Metropolis and aims at determining the prevalence and predictors of stress and burnout among bank employees in Enugu Metropolis. It is hoped that the findings from this study will inform the bank management about the need for effective occupational health services in their organization for promotion of health and wellbeing of the bank employees.

- **Emergency Preparedness for Hemorrhagic Fevers Outbreak among Healthcare Workers in a Tertiary Institution**

This study is a descriptive cross-sectional study carried out among healthcare workers in a tertiary institution in Enugu state. It is expected to build upon the existing knowledge of healthcare workers on viral haemorrhagic fevers, assess their risk perception and their level of emergency preparedness with hope of promoting effective training.

- **Prevalence of Workplace Violence among Healthcare Workers in Tertiary Institutions in Enugu**

According to World Health Organization, between 8% and 38% of health workers suffer physical violence at some point in their careers while many more are threatened or exposed to verbal aggression and most violent acts are perpetrated by patients and visitors. This study will be carried out among health workers in a major tertiary institution in Enugu State. Its aim is to determine the prevalence, existence of workplace violence policies and opinion of workers towards workplace violence in this population.

CONCLUSION: Working is a necessity of life. It provides the resources required for taking care of daily requirements: feeding, housing, shelter and training of family members. It gives us self-fulfillment and satisfaction. Some provide avenues to regularly exercise and medical checkups. Work however can be a source of disease, disability and death: there are long established linkages between presence of hazards and increased mortality and morbidity. The deciding factor to effect of work on man is the work environment.

This presentation has shown that the work environment is full of hazards and all occupations, though to varying degrees, have them. It also concludes that employers have often not provided necessary control measures. Also employees have continued to show poor knowledge, negative attitude to and utilization of control measures even when provided. These may therefore explain the increasing incidence of workplace hazards.

RECOMMENDATIONS: Most of these have been provided under each subtitle and fortunately some of the hazards are easily controlled with very affordable measures like policy implementation, training and regular provision of personal protective equipment. The general approach to achieving a healthy workplace include:

- Development of workplace health and safety policy/programme: This should be developed and workers trained on the policy implementation.

- Appointing a health and safety person in each unit: responsibility to include active case finding, investigate and reporting cases of hazards or incidents
- Hazard-Risk assessment: There should be an active search for potential hazards in work environments. In order of priority the following steps can be used: Administrative control; Substitution; Engineering/Environmental control; Consistent and correct use of appropriate Personal Protective Equipment.
- Lastly there should be total commitment of the policy makers/government, managers/employers of labour and employees towards achieving a Zero workplace incident.

APPRECIATION

I remain most grateful to GOD Almighty for guarding and guiding me. When I graduated as a medical doctor I came across a shop and instinctively bought two pictures: in one was inscribed “*Prayer changes everything*” and in the other was “*With GOD everything is possible*”. Indeed I had wanted to be an aeronautical engineer but God had plans for me. I ended up being a doctor. Here again my interest was cardiothoracic surgery but fate made me change my mind when I did a postgraduate course in Public Administration. To God be the glory that I am now a Public Health physician.

Family: Support from my family has been crucial in what I have become. The pillars of my life: my beautiful wonderful wife Adaugo and my children – Chiugo, Chidi, Chinwendu and Chizara, to you all I owe everything. My wife’s contribution to what I am cannot be overemphasized. Most times we discuss major family decisions and I often lean towards her superior advice. My children when much younger were once asked their father’s hobby and they chorused “Working with computer”. I have a regular place in my house reserved for me and my computer. Even when we travelled to USA my place in the basement was often kept for me and my computer. Incidentally they want to follow my first love and are tending towards engineering: Chiugo, my first child is presently studying Engineering at UNN and Chidi has applied for electronics engineering. I am just waiting to see the decisions of the last two. No matter what they decide, they are assured of my fatherly advice and support.

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APPENDIX 1 - PUBLICATIONS BY PROF EN AGUWA

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