

WORKPLACE ASSESSMENT OF HYPERTENSION:

**PREVALENCE & AWARENESS IN A MANUFACTURING INDUSTRY IN
OWERRI NIGERIA**

ABSTRACT

Workplace health assessment is the process of gathering information about the factors that support or hinder the health of employees at particular opportunities to improve or address them. It helps to identify the current picture of health at a company as well as improve potentials to increase productivity, decrease absenteeism and health cost for both employees and the organisation. This study was designed to determine the prevalence and awareness of hypertension among manufacturing industry workers. The prevalence was determined as a rate and reported in percentage as 48.6%. The awareness among workers was determined using the Kendall's W coefficient of concordance. A total of 107 workers were physically and anthropometrically assessed with respect to blood pressure, fasting blood sugar, waist circumference, weight, height, and body mass index. Data on sex, age, etc, were equally obtained. The Kendall's W Statistic was 0.5235 (52.35%) on awareness of hypertension. This implies that there was an agreement of about 52.35% on awareness of hypertension. The high prevalence of hypertension with a relatively average awareness among manufacturing industry workers strongly suggest that there is paucity of Occupational health services in the manufacturing industry.

Key words: Workplace, Hypertension, Prevalence, Awareness, Kendall's statistic, Industry.

1. INTRODUCTION

Workplace Health Assessment is the process of gathering information about the factors that support or hinder the health of employees at particular opportunities to improve or address them (CDC, 2013). A workplace health assessment helps to identify the current picture of health at a company as well as improve potentials ways to increase productivity, decrease absenteeism, and health care cost for both employees and the organisation. Workplace health assessment will improve employee health, results in higher productivity and reduces number of missed work days, which will ultimately reduce organisational costs. It is a necessary first step before goals are developed, resources allocated, strategies adopted, intervention implemented and outcomes are measured. Many factors influence health in the

workplace and can be impacted by supportive changes within the following levels of influence.

Hypertension is the most common cardiovascular disorder posing a major clinical and public health challenges worldwide because of its high prevalence and concomitant increase risk of diseases (Ezzati *et al*, 2002; Yach, *et al*, 2004). It is the most important risk factor for cardiovascular, cerebrovascular and renal diseases. It is the leading global risk factor for mortality and the third leading risk factor for disease burden. Cardiovascular disease is the leading cause of mortality for both men and women worldwide and it is estimated to have accounted for about 14.3 million deaths in 1990 and 16.7 million in 2000 (Murray *et al*, 1997). There is a double burden of communicable and chronic non-communicable diseases due to epidemiological transition (Nawi *et al*, 2006).

Many workers with hypertension are unaware of their condition and among those with hypertension medical adherence is lacking. The prevalence of hypertension varies around the world with the lowest prevalence in rural India (3.8 % in men and 6.8% in women) and the highest prevalence in Poland (68.9% in men & 72.5% in women). Hypertension may cause prolonged employee absence, compromised concentration and work performance due to its accompanying symptoms. Employee's health directly affects the company's productivity. It is very important for employers to have a proactive approach in keeping their workers blood pressure regulated. Researchers have shown that employees that suffer from chronic diseases like hypertension always experience unscheduled absences from their job. Unscheduled absences are disruptive to the business and result in increased indirect costs of absenteeism (Vijan *et al*, 2004). Other manipulations of absenteeism include loss of productivity, high – cost of replacement of workers, excess staffing, higher turnover, poor quality of goods and services, excess manager time and safety issues.

58 The trend is that there is a paradigm shift to prevent, protect, promote and maintain
59 health in the work place. Occupational health has shifted in bringing the well being of
60 workforce as this will impact positively to both employees and employers (Onoh, 2014).
61 Workplace is not only a setting to practice health promotion but a key determinant of health.
62 This necessitates the need for a comprehensive workplace health promotion (CWHP) which
63 is an approach to protecting and enhancing the health of employees. It relies and builds upon
64 the efforts of employers to create a supportive management via the efforts of employees to
65 care for their own wellbeing.

66 **Justification of The Study**

67 In 2008, globally 40% of adult aged 25 years and above had been diagnosed with
68 hypertension. The number of people with the condition rose from 600 million in 1980 to 1
69 billion in 2008. The WHO Health Report 2002 indicates that hypertension caused 7.1 million
70 premature deaths worldwide and 4.5% of the disease burden. (i.e. 64 million disability
71 adjusted life years (DALYS). In the United States, about 77.9 million (1 out 3) adult
72 Americans have high blood pressure, 69% of people who are hypertensive have heart attack,
73 77% have stroke and 4% have congestive heart failure. High blood pressure was listed in
74 death certificates as the primary cause of death of 61,762 Americans in 2009 (Go *et al*, 2013).

75 The prevalence of hypertension is highest in the African region at 46% of adults aged
76 25 years and above. While lower prevalence of 35% was found in the Americans. High
77 income countries have a lower prevalence of hypertension, 35% than other groups at 40%.
78 Furthermore, because of weak health systems, the numbers of people with hypertension who
79 are undiagnosed, untreated and uncontrolled are also higher in low and middle income
80 countries compared to high income countries. Hypertension shows an increasing prevalence
81 worldwide with increasing predisposing obesity and physical inactivity. Hypertension
82 constitutes 25% of emergency medical admissions in Nigeria. It is the medical condition most

frequently diagnosed in elderly Nigerians (Ogah, 2006). It is also the most common condition in senior executives and army recruits Autopsy reports reveal that hypertension is the most common cause of sudden death.

Studies in Nigeria gave a prevalence rate of 11.5% using the then recommended cut off of 160/95 mm hg. By extrapolation using the current WHO/ISH cut off of (140/90 mm hg) this would give a prevalence of about 20%. Emerging data appear to confirm an upward trend (Onwuebere, 2005). Only about a third Nigerians who have hypertension are aware of their conditions. The awareness appears to be higher in female than male and of those that are aware that they are hypertensive only two-thirds are on treatment.

Premature death, disability, personal and family disruption, loss of incurred health care expenditures due to hypertension takes a toll on families, communities and national finances. Families face huge health care expenditures, which is often long term in the case of hypertension complications, pushing tens of millions of people into poverty. More so, the loss of family income from death or disability can be devastating. In certain low- and middle-income countries, current health expenditure on cardiovascular diseases alone accounts for 20% of total health expenditure.

2. METHODOLOGY

2.1 Study Area

Owerri is the study area; situated at latitude 5.48° , longitude 7.03 and 159 metres above the mean sea level. It is the capital of Imo State in Nigeria. The city is located in South-East of Nigeria and it is a part of the Niger-Delta, home of oil and gas activities in Nigeria (see Figure 1). It has an estimate-d population of about 400,000 people as at 2006 census. It is approximately 100km² in area (NBS, 2010). Owerri is bordered by the Otamiri River to the east and Nworie River to the south (Acholonu and Okorie, 2003).



Figure 1: Map of Study Area, Owerri Nigeria

Source: Google Map (2015)

2.2 Study Site

The study site was Rapido Foods, a subsidiary of Rapido Ventures Limited located at km 5, Uratta/MCC Road, Umuoba, Owerri. It was established in 2011 with the purpose of investing in processed food production and agriculture. The processed food production focuses on quality products meeting accepted international standards with hygienic processes as priority.

The Rapido Foods has several departments including Quality Assurance, Administrative, Accounts, Business Development, and Production. They are the makers of Fibi beef roll. It is known for excellence and best industry practice. They employ the principles of Hazard Analysis and Critical Control Points (HACCP) System in which products are monitored from production processes in all factories for compliance to Good Manufacturing Practices (GMP). They ensure good management of the interface between the customers/consumers during handling, distribution and storage with respect to product quality issue. Rapido Foods employs the use of high-tech, strongly built, elegant and high degree reliable ISO 9001-2000 certified standard Baking Oven B – 2200 and industrial ovens with sophisticated, computerized and programmable controller. Their brand of beef sausage is Fibi and is set to bring a whole new excitement in taste to consumers. The management of Rapido Foods believes that Fibi sausage roll is well articulated initiative to satisfy the

yearnings of millions of Nigerians who consistently seek value in the consumption of packaged foods. They maintained that Fibi beef sausage roll comes with a distinctive blend of natural beef, yummy texture and nourishing ingredients with pure Nigerian spices that distinguishes Fibi from other brands of beef sausage roll in the market.

2.3 Population for the Study

The study population comprised of workers in the selected industry who met with the inclusion criteria. The company's registers were used to determine the population/sampling frame.

2.4 Inclusion Criteria

The criterion includes staff of the manufacturing company who are aged 18 years and above, who gave their informed written consent for the study.

2.5 Exclusion Criteria

The criteria excluded pregnant workers and workers with physical deformities affecting the spine and/or deformities that could not stand for height and weight anthropometric measurements.

2.6 Sample size Estimation

The sample size was determined using the prevalence formula:

$$N = \frac{Z^2 P(1-P)}{T^2} \quad (1)$$

Where $z = 1.96$, that is the level of significance (standard normal deviate) which corresponds to 95% confidence level; P = prevalence from a previous study (Nyenwe *et al*, 2003); and T =tolerance error (0.05). Substituting the applicable parameters to Equation (1) yields:

$$N = \frac{1.96^2 \times 0.07(1-0.07)}{0.05^2} = 100.03$$

The sample size was determined to be 100. Allowance for 10% attrition rate gave a sample of 110 workers.

2.7 Sample Techniques

A Stratified random method was used to obtain a representative sample based on the inclusion criteria; each job description in the organization was regarded as a stratum.

2.8 Methods of data collection

2.8.1 Training of Research Assistants

Five health care professionals were recruited on the job for data collection for the purpose of this study. They were tested and certified for the research.

2.8.1 Participants

A total of one hundred and ten questionnaires were distributed and one hundred and seven were properly filled and returned giving a response rate of 97.3%. The reason for default may have been due to apathy on the side of the defaulters. Age distribution and gender of participants are as summarised in Table 1.

Table 1: Age Distribution among workers

Age Group	Male		Female		Total
	Respondents	Proportion (%)	Respondents	Proportion (%)	
15 - 24	0	0.0	1	1.9	1
25 - 34	12	21.8	6	11.5	18
35 – 44	29	52.7	27	51.9	56
45 – 54	12	21.8	14	26.9	26
55 – 64	2	3.6	4	7.7	6
Total	55	100.0	52	100.0	107

2.8.2 Questionnaire

The questionnaire design is of two parts. The first part addresses the background information of the participants with respect to age, gender, job title, address. Part 2 of the questionnaire is of ten questions designed to assess the level of awareness amongst workers

on hypertension. The questionnaire is of interviewer – administered and have five options, namely: Strongly Agree, Agree, Disagree or Strongly disagree. The pretesting of the questionnaire was done internally at the Centre for Occupational Health, Safety & Environment, University of Port Harcourt, Rivers State (COHSE) and externally at the Rapido Foods Limited, Owerri. Five staff of the COHSE, Port Harcourt was randomly used for pretesting of the questionnaire and five workers from the Rapido Foods Limited, Owerri were used. The pretesting was done to assess the applicability of the Questionnaire tool internally and externally. All the participants used for pretesting of the questionnaire instrument gave valid and reliable responses, confirming the clarity and applicability of the questionnaire tool, and questions were interpreted with the same meaning as intended. The questionnaires were administered by the recruited and trained five Research Assistants. The basic demographic variables of age, and gender were also documented and the physical anthropometric measurements were also recorded.

2.8.3 Blood Pressure Measurements

Blood pressure readings were based on the Seventh Report of the Joint Committee on Prevention, Detection, Evaluation and Treatment of high Blood Pressure, Classification and Guidelines (Yach *et al.*, 2004).

2.8.4 Operational Definitions

The authors defined hypertension as a systolic and/or diastolic blood pressure ≥ 140 per 90 mmHg or documented use of antihypertensive medications in a previously diagnosed with hypertension (Yach *et al.*; 2004).

3. DATA ANALYSIS

The prevalence of hypertension was determined as a rate and expressed in percentage. The Blood Pressure measurements were based on the Seventh Report of the Joint Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, Classification and Guidelines. The level of awareness was determined using the Kendall's test of

concordance, a non-parametric statistic (W). It is a normalization of the statistic of Friedman test and can be used for assessing agreement among raters (Nwaogazie, 2011). Its value ranges from zero (no agreement) to unity (complete agreement). In other words, if W is 1.0, then the survey respondents have unanimous response. If W is zero, there is no overall trend of agreement among respondents and their responses can be regarded as random.

However intermediate values of W indicate high or low degree of unanimity among the various responses (Nwaogazie, 2011).

Consider an object i given a rank r_{ij} , if by respondent member j ; and we further assume that there were a total of n objects and m respondents. Then the total rank given to object i :

$$R_i = \sum_{j=1}^m r_{ij} \dots\dots\dots(2)$$

and the mean value of these total ranks is:

$$\bar{R} = \frac{1}{2} m(n+1) \dots\dots\dots(3)$$

The sum of squared deviation, S_d is given as:

$$S_d = \sum_i^n (R_i - \bar{R})^2 \dots\dots\dots(4)$$

Kendall's W statistic is defined as:

$$W = \frac{12S_d}{m^2(n^2 - 1)} \quad 0 \leq W \leq 1 \dots\dots\dots(5)$$

Computing Kendall's W coefficient/statistic for workers in the Study group

Given that $m=107$, $n= 10$, thus Equation (2) gives:

$$\bar{R} = \frac{1}{2} m(n + 1) = 0.5 \times 107 (10 + 1) = 588.5$$

The sum of the squared deviation (see Equation 3) becomes:

$$S_d = \sum_i^n (R_i - \bar{R})^2 = 494438.5 \text{ (see Table 2), and Kendall's } W \text{ statistic becomes:}$$

$$W = \frac{12 \times 52}{107^2 \times (107^2 - 1)} = \frac{12 \times 494438.5}{107^2 \times 10 (107^2 - 1)} = 0.5235 = 52.35\%$$

The Kendall's W statistics was 0.5235 (52.35%) among the number of sampled workers in industry under study. This implies that there was an agreement of about 52.35% on the awareness of hypertension. The range distribution for systolic blood pressure was from 100 to 260mmhg, diastolic blood pressure was from 40 to 220mmHg, fasting blood sugar was from 73 to 144 mg/dl, waist circumference was from 51 to 106 kg, height was from 1.5 to 1.87m and BMI was from 19.59 to 36.26 kg/m², respectively.

Table 2: Kendall's Parameters on Workers Awareness on Hypertension in the Industry

Parameters	R _i	Mean	(R _i - $\bar{R}$) ²
AW – HYP -1	395	3.6916	37442.25
AW – HYP – 2	323	3.0187	70490.25
AW – HYP – 3	355	3.3178	54522.25
AW – HYP – 4	341	3.1869	61256.25
AW – HYP – 5	370	3.4579	47742.25
AW – HYP – 6	392	3.6636	38612.25
AW – HYP – 7	396	3.7009	37056.25
AW – HYP – 8	401	3.7477	35156.25
AW – HYP – 9	309	2.8879	78120.25
AW – HYP – 10	404	3.7757	34040.25
			$\sum 494438.5$

4. RESULT & DISCUSSION

4.1 Results

A total of one hundred and seven (107) workers who scaled through the inclusion criteria were physically examined, thereafter questionnaires were administered to them. The descriptive statistics and the distribution of the measured variables for the workers and the control group are represented in TableS 3 & 4. The mean Systolic blood pressure (SBP), diastolic blood pressure (DBP), fasting blood sugar (FBS), waist circumference (WC), Weight (W), Height (H), body mass index (BMI) of the respondents are as shown in Table 3. The mean and modal distributions of measured variables (SBP, DBP, FBS, WC, W, H and

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Table 3: Descriptive Statistics for workers in the Study group

Descriptive Statistics	SYSTOLIC BP (mmHg)	DIASTOLIC BP (mmHg)	FBS (mg/dl)	WAIST CIRM (cm)	WEIGHT (kg)	HEIGHT (m)	BMI (kg/m²)
Mean	130.11	85.50	94.32	82.85	73.21	1.66	26.48
Median	130	82	91	86	72	1.66	26.37
Mode	120	80	101	88	72	1.63	28.48
Standard Deviation	19.51	19.51	16.12	15.85	10.86	0.08	3.44
Standard Error	1.89	1.89	1.56	1.53	1.05	0.01	0.33
Standard Variance	380.59	380.57	259.80	251.30	117.88	0.01	11.81
Kurtosis	17.38	20.78	2.93	3.29	0.57	-0.25	0.50
Skewness	2.74	2.82	1.70	-0.91	0.30	-0.05	0.65
Range	160	180	71	106	55	0.37	16.67
Minimum	100	40	73	9	51	1.5	19.59
Maximum	260	220	144	115	106	1.87	36.26
Sum	13922	9149	10092	8865	7833	177.84	2833.77
Count	107	107	107	107	107	107	107

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241 **Table 4: Descriptive Statistics for workers in the Control group**

Descriptive Statistics	SYSTOLIC BP (mmHg)	DIASTOLIC BP (mmHg)	FBS (mg/dl)	WAIST CIRM (cm)	WEIGHT (kg)	HEIGHT (m)	BMI (kg/m²)
Mean	123.76	79.80	81.38	76.81	67.84	1.7	23.32
Median	120	81	81	76	69	1.7	23.055
Mode	131	83	72	85	71	1.73	21.259
Standard Deviation	22.31	15.26	10.45	10.08	12.61	0.09	3.72
Standard Error	2.19	1.50	1.02	0.99	1.24	0.01	0.36
Standard Variance	497.80	232.88	109.21	101.65	159.03	0.01	13.84
Kurtosis	2.79	1.31	-0.71	1.08	0.20	-0.21	0.12
Skewness	1.32	0.90	0.40	-0.27	0.40	0.17	0.31
Range	112	69	43	55	62	0.44	18.94
Minimum	85	53	61	49	42	1.52	15.81
Maximum	197	122	104	104	104	1.96	34.75
Sum	12871	8299	8463	7988	7055	177.25	2424.85
Count	104	104	104	104	104	104	104

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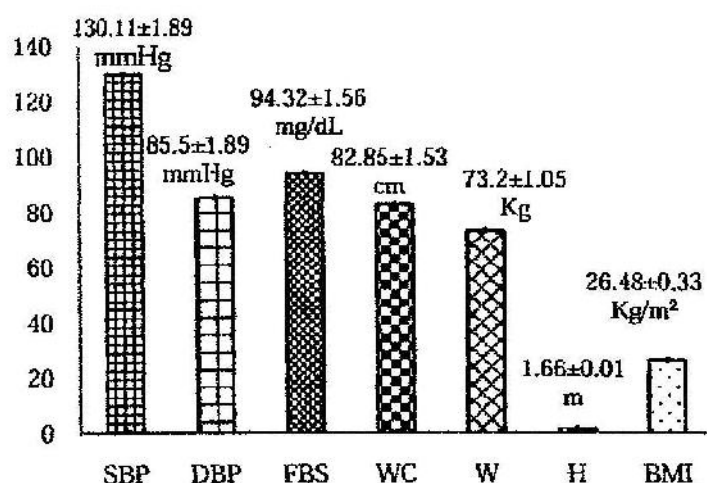


Figure 2: Mean distribution of measured variables

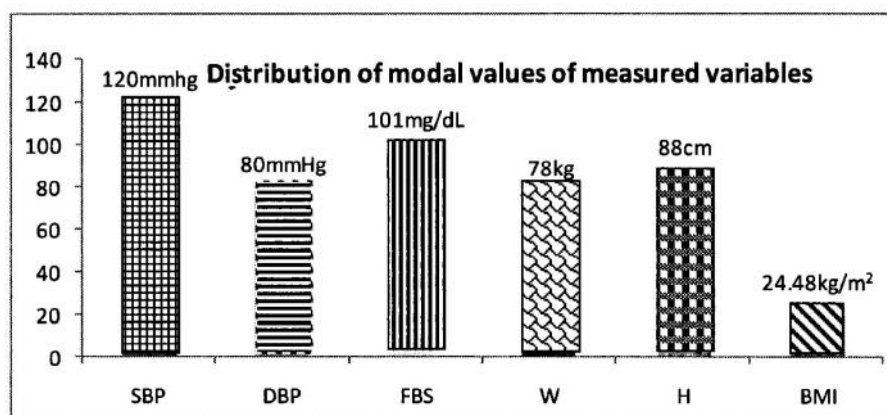


Figure 3: Modal Distribution values for measured variables

Risk Factor Analysis

The respondents were subjected to risk of obesity, hypertension and diabetes analyses. It was found that 14 respondents representing 13.1%, fifty two respondents representing 23.4%. 25 respondents representing 23.4% sampled population were at risk of developing obesity, hypertension and diabetes, respectively (see Figure 4).

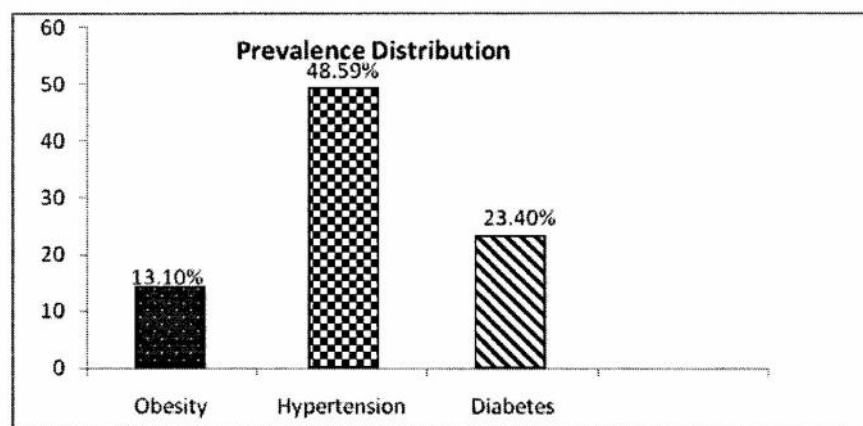


Figure 4: Risk Factor Analysis

The systolic blood pressure of the workers in the company were compared with the control group. The systolic blood pressure of the control group were in correspondence with those of the respondents (Figures 5 & 6)

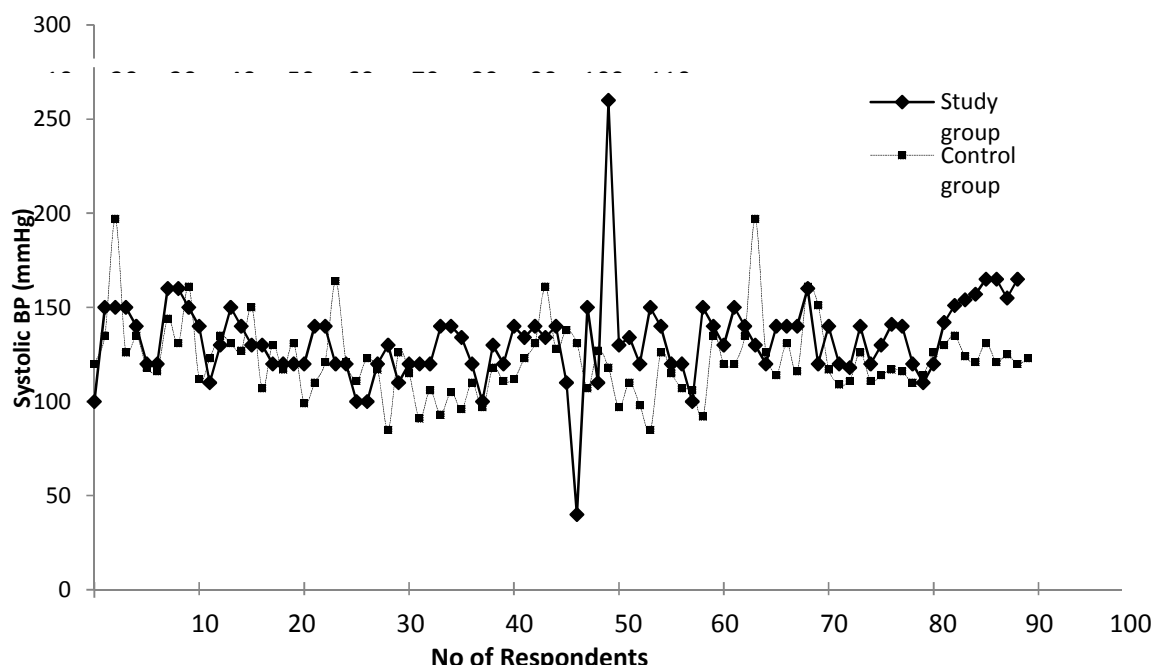


Figure 5: Systolic Blood Pressures against the Respondents in Industry

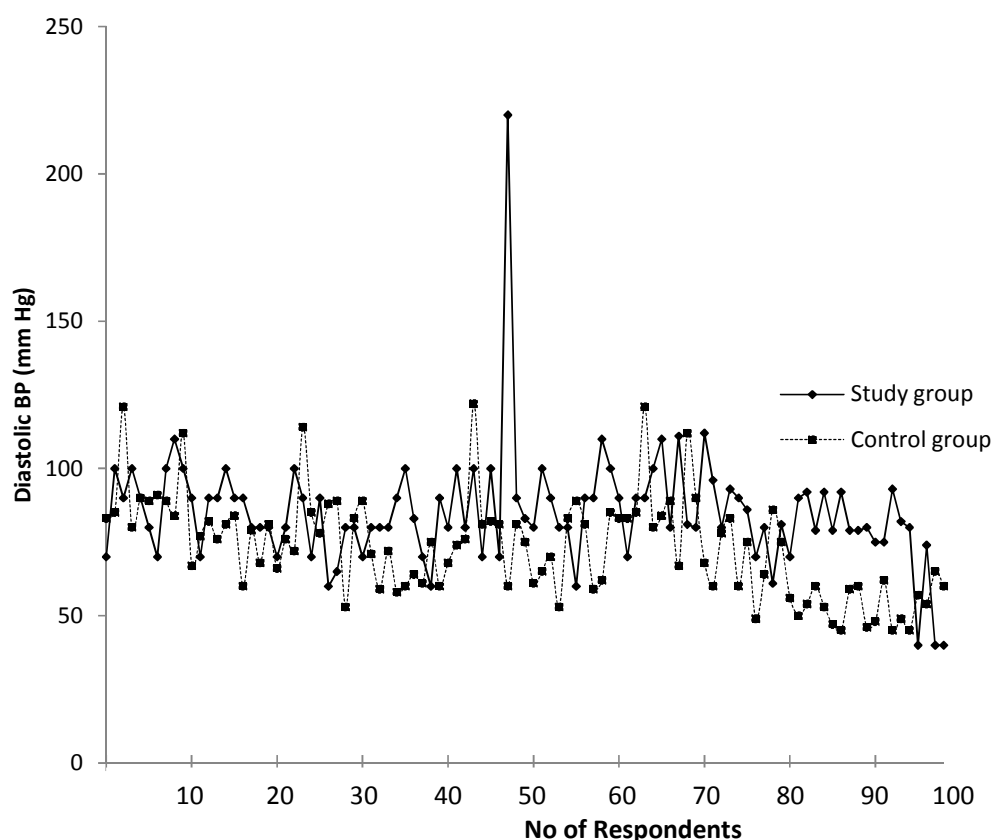


Fig 6: Diastolic Blood Pressures against the Respondents in Industry-1 & 2.

The prevalence of hypertension among study population was 48.6%. The level of awareness on hypertension was 52.35%. The modal age of workers in the manufacturing industry was 35 – 44 years while the modal age of the control group was 25 – 34 years.

4.2 Discussion

The modal age bracket in the study group was 35 – 44 years, whereas that of the control group was 25 – 34 years. Thus there are younger workers in the control group. This is in conformity with risk factor analysis because epidemiologically, age is a risk factor for the development of hypertension. According to Singh *et al.* (1998), who used multivariate logistic regression analysis on pooled data from five cities, after adjustment for age, showed that age was strongly associated with hypertension. Both the systolic and diastolic blood pressure measurements of the workers were in correspondence with those of the control. The prevalence of hypertension is highest in the African region at 46% of adults aged 25 years and above. While lower prevalence of 35% was found in the Americans. High income countries have a lower prevalence of hypertension, 35% than other groups. Furthermore, because of weak health systems, the number of people with hypertension who are

undiagnosed, untreated and uncontrolled are also higher in low and middle income countries compared to high income countries.

Hypertension shows an increasing prevalence worldwide with increasing predisposing obesity and physical inactivity. The prevalence of hypertension among the study population was 48.6%. This is higher than 12.4% reported among bankers in Owerri (Diwe *et al.*, 2015). A prevalence of hypertension of 32.5% was reported among middle-aged adults in Ahiazu Mbaise local government area of Imo State, Nigeria. (Mba *et al.*, 2013). In a study carried out in Nsukka, Enugu State, the prevalence of hypertension was reported to be 21.1% (Ekwunife *et al.*, 2010). Hypertension shows an increasing prevalence worldwide with increasing predisposing obesity and physical inactivity. The high prevalence of hypertension reported in this study implies a high cardiovascular risk factors and carries a lot of morbidity at workplace. This could impact negatively on work performance, increase absenteeism and poor productivity.

The awareness of hypertension among population using the Kendall's coefficient of concordance was found to be 52.35%. This is an improvement to the 33.33% reported by Onwubere in 2005. In a study carried out among staff and students of a tertiary institution in Nigeria, an awareness of 21.6% was reported (Okpara *et al.*, 2015).

5. CONCLUSION

This study has demonstrated a high prevalence of hypertension. Unexpectedly, there is a relatively high level of awareness of hypertension among the manufacturing industry workers. The underlying explanation for this phenomenon is paucity of occupational health services in the manufacturing industry. There are virtually non-existent health protection, promotion, preventing, rehabilitating program in the industry. The following are the summary of major findings:

- i) The prevalence of hypertension in Owerri population is 48.6%;
- ii) The level of awareness of hypertension among the manufacturing industry workers is 52.35%; and
- iii) The risk factor of developing hypertension amongst industry workers examined is 23.4%.

6. RECOMENDATION

As a result of this study, the following recommendations are made:

- 311 i) There is need to provide effective occupational health services through the
 312 provision of a well-articulated company policy. For good occupational
 313 services to be realized, top management must show leadership and
 314 commitment;
- 315 ii) Occupational Health Programme must be instituted. It has the potential of
 316 preventing and controlling hypertension, thus promoting a healthy workplace
 317 and consequently increased productivity;
- 318 iii) The Occupational Health Services (OHS) should be able to maintain health
 319 surveillance which enables the identification of those employees likely to be at
 320 risk from occupational ill-health; and
- 321 iv) The Dietary Approach to Stop Hypertension (DASH) diet plan and the
 322 Medical Nutrition Therapy are advocated as they help in control of
 323 hypertension.

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