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Determinants of Self-reported Morbidity among Victims of Occupational Hazard Exposure in Cement and Ceramic Production Companies in Kogi State, Nigeria

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Alfred Eboh, Patricia A. Taiwo and Bernard E. Owumi

Department of Sociology, University of Ibadan, Nigeria

Abstract

The burdens borne by employees who are victims of occupational health hazard (OHH) exposure in cement and ceramic factories, have aroused scholarly attention. Several studies have focused on health hazards with dearth of information on the actual determinants. This study therefore investigated the determinants of symptoms of self-reported morbidity distribution among victims of OHH exposure at the cement and ceramic companies in Kogi State. The study adopted a mixed methods approach involving 545 employees from Dangote Cement (DCP) PLC in Obajana and West African Ceramics Ltd (WACL) in Ajaokuta. Sample size was determined using Krejcie and Morgan (1970)'s formula. The Health Belief Model was employed as the explanatory framework. A semi-structured questionnaire was administered to the factory employees and complemented with 4 key informant interviews with medical personnel and 3 focus group discussion sessions with selected employees of the companies (DCP=2; WACL=1). Quantitative data were analysed using descriptive statistics and logistic regression, while qualitative data was content-analysed. The mean age of all the respondents was 34.70±9.18 years. Junior staff (80%) were more at WACL than DCP while senior staff dominated the cement company. Some of the common morbidity symptoms reported at DCP and WACL included body pains (52%), body weakness (52%), injuries and fractures (64%) and skin infections (64%). Patterns of morbidity symptoms were predicted by working in WACL (uOR: 9.503), being senior staff (aOR: 0.080), contract staff (aOR: 1.698), rotational shift (aOR: 0.208) and N69,000–79,000 salary (aOR: 1.110). Both companies are plagued by occupational hazards, underscoring the need for stringent compliance with available protective equipment and regular medical evaluations to enable timely detection and effective treatment.

Keywords: Determinants, occupational hazard exposure, self-reported, ceramic and cement factories

Introduction

The multi-relevance of cement and ceramic products is likely one of the major reasons for their market demand across the world. Both ceramics and cement products serve diverse purposes like cooking utensils, sanitary wares, sculptural aesthetics, filters, drilling bits, electrical insulators, tiles, calcium carbonate in toothpaste, building constructions, drainages among others. This invariably makes the demand for the products usually on the rise (Iyasara *et al.*, 2014). As a result of the constant demand for the products coupled with the increasing population, the companies are likely to put their factory employees under pressure with high production targets and health-threatening job schedules in order to meet the ever-rising and expanding market demand aimed at maximising profit from sales. In effect, the factory employees are likely confronted with exposure to occupational hazards with deleterious health consequences.

Meanwhile, the annual global cases of fresh occupational diseases resulting from the work-related hazard exposure has been reported to stand between 68 to 157 million (Rushton, 2017; Oluoch *et al.*, 2017). These health problems usually emanating from exposure to the hazardous work environments, conditions, substances, agents, processes and conditions characterising the activities of most manufacturing and construction companies (Koh *et al.*, 2011; Akiibinu *et al.*, 2016; Rahmani *et al.*, 2018) are too heavy to be glossed over in terms of the consequential effects on the employees' physical health status. For instance, sustained exposure to hexavalent chromium, crystalline silica, calcium oxide and alkaline compounds in cement production could result to carcinogenic problem, asthma, respiratory diseases and dermatitis respectively (Koh *et al.*, 2011; Leem, 2012). In the case of ceramic production, exposure to some substances like silicon, kaolin, feldspar, quartz and limestone over a long period of time could result in the development of silicosis, pneumoconiosis and other dust-related diseases (Trethowan *et al.*, 1995).

Occupational diseases are usually noted to be characterised by longer asymptomatic "incubatory" periods as compared to traumatic injuries whose impact are noticeable almost always immediately (Tedone, 2017). This might be due to the varying degree of time that it takes for workers to be exposed to the hazards before the manifest onset of the diseases and sicknesses. In the case of cement and ceramic-producing industries, the kinds of hazards that the employees are exposed to vary from ergonomic, mechanical, physical, chemical, to psychosocial (Amponsah-Tawiah & Dartey-Baah, 2011; Ahmed & Abdullah, 2012; Hathaway & Proctor, 2004).

Statement of the Problem

The burdens borne by employees who are victims of occupational health hazard (OHH) exposure in cement and ceramic factories have aroused scholarly attention. It has been noted by the International Labour Organisation that out of the annual 2.34 million work-induced deaths, 2.02 million was

attributed to occupational diseases (Yokoyama *et al.*, 2013, Cohen *et al.*, 2023; Pega *et al.*, 2023). A couple of studies (Sintorini, 2018; Nasirzadeh *et al.*, 2022; Del Rio *et al.*, 2022) have focused on the health hazards with dearth of information on the actual determinants within the comparative work contexts of cement and ceramic companies in Kogi State. Apart from the individual somatic consequences of exposure to occupational hazards, the impact of the work-related diseases on any economy may be quite huge, depending on the resilience capacity of such. It has been noted that the economic consequences of occupational injury and illness on the Gross Domestic Product (GDP) across the world ranged from 1.8% to 6.0%, with the average being 4% respectively (Takala *et al.*, 2014). At the micro level of production, high morbidity may slow down the production output and performance in terms of work absenteeism and the cost of medication.

In the cement and ceramic manufacturing sub-sectors, some of the hazards generated do not only affect the employees alone but also the host communities. In some cases, the impact of exposure to these hazards may be instantaneous, acute or chronic, depending on the intensity. For example, exposure to cement dust was associated with heightened risk of liver abnormalities, pulmonary disorders, carcinogenesis and respiratory crisis (Saji *et al.*, 2018). Similarly, Maxim and Utell (2018) noted that prolonged exposure to ceramic fibres cause decrement in lung functions. It is worrisome to state that an industrial employee who is persistently suffering from the aforementioned diseases may be declared incapacitated, thereby leading to early retirement from work (Brenner & Ahern, 2000). Without adequate compensatory package, it may further compound the victims' health status as well as cause a couple of crises of socio-economic survival on the victims' families, depending on the available buffers and resilient capacities.

Several occupational hazard control measures may be adopted by some company management in order to mitigate the deleterious health consequences of exposure. Some of the measures to control or manage the hazards include elimination, substitution, engineering, administrative, Personal Protective Equipment (PPE) and prevention through work design (De Casto, 2003). Some organisations are likely to adopt the use of the PPE as a form of hazards control and this could be reinforced by administrative control requiring training and re-training of workers. However, since cement and ceramic production activities are not without heavy generation of health-threatening hazards, it was imperative to do a comparative investigation of determinants of self-reported morbidity distribution among victims of OHH exposure in the cement and ceramic production companies in Kogi State. Meanwhile, the specific objectives were to: describe symptoms of illnesses reported among the victims of cement and ceramic hazards exposure, examine the common patterns of self-reported morbidity distribution and identify some factors associated with self-reported morbidity among victims of OHHs.

Review of Related Literature

Industry-based Occupational Morbidity Distribution Patterns

The International Labour Organisation (ILO) in conjunction with the World Health Organisation (WHO) has unanimously acknowledged the enormous challenges associated with data collection and availability regarding the global burden of diseases. In this case, it has been quite problematic to give an accurate estimation of the global burden of diseases. However, several organisations update their records at regular intervals as the statistics have shown that 5%-7% of the global fatalities are ascribed to occupational illnesses, diseases and injuries. Also, some global cases of fresh occupational diseases resulting from the work-related hazards exposure were put at 68-157 million annually (Rushton, 2017; Oluoch *et al.*, 2017).

Over the years, there has been an accumulation of documented literature from multi-disciplinary studies bordering on workers' exposure to occupational hazards and the associated diseases and illnesses. Some of the published works relevant to this current study that were carefully teased out for reviews included that of Rahmani *et al.* (2018); Akiibinu *et al.* (2016); Leem (2012); Koh *et al.* (2011); Chohan and Bilga (2011); Goldsheydera *et al.* (2004); Trethowan *et al.* (1995); Jakobsson, Horstmann and Welinder (1993) and a catalogue of others. For example, Jakobsson *et al.* (1993) carried out a study in 2 Swedish cement factories and concluded that long term exposure to cement dust was a risk factor for getting cancer. However, the authors identified time duration was a critical risk factor for hazard exposure and morbidity. It is on this premise that the current study equally considers time as a critical factor of exposure to some hazards and the likely manifestation of morbid conditions. Similarly, some authors have averred that exposure to cement dust result in skin disorders, including those living around the vicinity of cement plant machine (Chohan & Bilga, 2011; Leem, 2012). Even though the above studies adopted clinical methods of investigation, the current one played a complementary role by examining the self-reported morbidity profiles of the cement and ceramic factory employees.

Leem (2012) noted that cement dust might contain dangerous heavy metals and exposure to these metals either by absorption or ingestion without proper and adequate protection may be a necessary risk for occupational dermatitis. Ahmad and colleagues (2021) emphasised the potential health hazards linked to occupational exposure to cement dust and underscored the significance of implementing protective measures for individuals employed within the cement manufacturing sector. The research by Morshed, Ardeni, and Laylani (2022) indicated that exposure to cement dust from the Kirkuk cement factory appeared to have a negative impact on kidney functions, suggesting that potential adverse effects of prolonged cement dust exposure on renal activity.

Furthermore, a study averred that a large proportion of cement concrete labourers were exposed to one form of musculoskeletal disorder or the other. However, hazard exposure agents and factors were identified to include

bending or twisting the back, extreme weather condition, and carrying of heavy objects (Goldsheydera *et al.*, 2004). Similarly, Rahmani *et al.* (2018) conducted a clinical study to understand the general health conditions and other life activities of some cement factory workers through the analysis of the retrieved questionnaire and the sputum collected from the respondents. The results indicated that the majority of the respondents suffered from different types of respiratory afflictions, such as cough, asthma and lung infections. Again, the authors identified time as a significant risk factor for hazard exposure and morbid conditions.

In a retrospective cohort carried out among the Portland cement workers in Korea, Koh *et al.* (2011) discovered that there was an increased incidence ratio of stomach cancer in production workers. Though not statistically significant, the mortality ratio for lung cancer increased in production workers. The authors, therefore, concluded by stating a potentially suggestive association between cement dust exposure and stomach cancer incidence. The study adopted a retrospective cohort design as against this current study that relied largely on a cross-sectional design. Distinctively, the cement and ceramic factory employees that served as the study participants were given the opportunity to highlight their own experience of exposure to occupational hazards and the associated health consequences.

Relatedly, Akiibinu *et al.* (2016) conducted a study among the employees of Elephant/Lafarge cement depot in Ibadan and discovered that exposed workers suffered from kidney problem. However, it was a semi-controlled experimental study using biomedical approach of investigation. The study participants were not directly involved in the day-to-day cement factory production but loading. Nevertheless, the workers were exposed to cement dust and its consequential health effect. So, it could even be worse for the cement factory employees involved in the day-to-day production of cement and ceramic products. Similarly, Mohamed (2017) using correctional research design studied construction building workers and found that the majority of the workers had musculoskeletal injuries affecting their eye, bones, including strain/sprain. This was asides the experience of the skin disease. In conclusion, a statistically significant relationship was noted between hazard exposure and the manifestation of health problems among the workers.

Rahmani *et al.* (2018) conducted a clinical study to understand the general health conditions and other life activities of some cement factory workers. The authors documented that the majority of the respondents suffered from different types of respiratory afflictions, such as cough, asthma and lung infections. In the light of this, Manjula *et al.* (2013) equally linked high blood pressure, stuffy nose, dermatitis and lower respiratory illness to cement dust exposure among the factory employees. According to Neboh *et al.* (2015), exposure to cement dust did not only affect respiratory system but could also change some haematological parameters and white blood cell differentials in the exposed cement loaders. A comparative study finding submitted that higher respiratory symptoms and sustained accelerated blood pressure were associated

with the hazard exposed cement factory employees compared to the unexposed (Aweto *et al.*, 2018). Meanwhile, Pahlevan *et al.* (2020) found a significant association between sex, age, duration of employment, and respiratory healthy challenge among tile and ceramic factory workers in Iran.

In a study conducted by Tsao *et al.* (2017), the researchers aimed to investigate the relationship between exposure settings at work and the clinical severity of silicosis in patients from various types of ceramic production facilities in Taiwan. The study involved 221 patients who were diagnosed with silicosis at the occupational medicine clinic of Northern Taiwan in 2012. The researchers collected various data points for each patient, including demographic characteristics, smoking habits, working history, duration of exposure to silica dust, and the number of years spent on their first relevant job. The results of the study indicated that sanitary ceramic workers, a specific subgroup within the ceramic industry, exhibited certain characteristics that set them apart from other ceramic workers. Sanitary ceramic workers had worse X-ray findings, which suggest more severe lung damage, when compared to workers in other ceramic production settings. Additionally, sanitary ceramic workers tended to be older, had longer working durations, and a higher proportion of them started their first relevant job before the year 1975. However, after adjusting for some confounding factors, it was noted that age and work duration among sanitary ceramic workers did not exhibit a significantly higher risk of severe lung damage as indicated by X-ray results.

Moreover, a ceramic production-based study documented higher significant prevalence of breathing and hearing challenges among the exposed workers (Rasoul *et al.*, 2017). Likewise, rice mill workers in Ebonyi state Nigeria have been found with some occupationally-induced health afflictions like backache, headache, cough, catarrh, skin rashes, eye injuries, bruises and wounds among others (Oginyi *et al.*, 2017). Also, Kurtu *et al.* (2020) identified pneumoconiosis with ceramics workers in Turkey using clinical approach of investigation. The authors noted time as a significant factor for dust exposure and the occurrence of the disease. It is disturbing to note that some ceramics workers proved asymptomatic to the pneumoconiosis. In the nutshell, some other studies involving factory productions of iron and steel (Biswas *et al.*, 2014), ceramics (Brenner & Ahern, 2000; Alim *et al.*, 2014) and cement (Mirzaee *et al.*, 2008; Kakooei *et al.*, 2012; Rampuri, 2017) have associated MSDs, CVDs, cough, dermatitis and anemia with production activities.

Determinants of Morbidity Distribution Patterns

Certain factors may accentuate or lessen the intensity of the occupationally-induced morbid conditions of workers in any manufacturing company. A study conducted among pharmaceutical workers in Ethiopia discovered that previous personal disease background, family history of the disease, previous exposure to work-related dusty working environment, ever smoking habit history and years of service were predictors of chronic respiratory health challenge (Asfaw *et al.*, 2018). In the same vein, Gizaw *et al.* (2016) focusing on cement factory

employees in Ethiopia, associated respiratory disease symptoms with gender, age, educational status, work department, work experience, smoking habit among others.

Another study was carried out in Nepal involving some cement factory workers. The authors noted that educational qualification, work shift and availability of preventive aids were associated with occurrence of musculoskeletal disorders (Pandeya *et al.*, 2021). Also, Vikkey *et al.* (2020) identified years of work experience with cough among cement workers in Togo. In like manner, respiratory symptoms among textile workers were partly determined by educational status, work unit and the use of PPE (Kifle *et al.*, 2019). In a collaborative research, respiratory and musculoskeletal disorders were identified with some risk factors like work unit, gender and educational attainment among a cross-section of Ethiopian textile factory workers (Zelee *et al.*, 2021). Age, years of work, smoking habit and work unit have been identified as risk factors for getting silicosis in ceramic workers in Turkey (Karataş *et al.*, 2019) just as years of work in a ceramic company was identified as a necessary risk factor for the experience of pneumoconiosis (Kurtu *et al.*, 2020). As an occupationally-related disease, the proximal risk factor for the occurrence of pneumoconiosis is exposure to inhalation of dust substances like coal, asbestos and silica, aluminum oxide, cobalt and talc. Some common symptoms of the disease were difficulty in breathing, chronic cough and tightness of chest. So, some ceramic factory employees may be “incubating” the disease without knowing, especially if the aforementioned early warning symptoms are not diagnosed on time.

Theoretical Framework

The theoretical framework of the study was Health Belief Model (HBM) of Hochbaum, Rosenstock and Kegels. According to the trio, life is compartmentalised into regions expressed in positive, negative or neutral term (Frankish *et al.*, 1999). In this context, occupational morbidity is a negative phenomenon that must be avoided or escaped from, so that cement and ceramic factory employees could remain in positive or neutral life spaces. In the womb of the model is the perception of threat and assessment by individuals. Threat perception as opined by Charles and Sheeran (2015) comprises perceived vulnerability and expected severity of the consequences of illnesses. Similarly, behavioural assessment of threat deals with the belief in advantages of taking the recommended health action as well as the costs or barriers associated with it. The recommended action may be in the form of the use of the available PPE to prevent or mitigate the consequential effect of exposure to OHHs health. Again, Tang and Wong (2004) affirmed that individuals exhibit preventive health behaviour based on their perception of the magnitude of health threats. Occupational health risk could be perceived and evaluated either objectively or subjectively (Cree & Kelloway, 1997), depending on the individual worker’s experience, gender, educational level, personal health values, safety consciousness and social relations of work.

Manstead (2018) shared a common perspective that social class differences in identity shape people's perception.

There may be some perceived barriers to using the available PPE. The barriers might include unsuitable PPE, pain and discomfort induced by the use of PPE, forgetfulness, disruption of work speed and even the lack of PPE use awareness. However, certain cues to action of using the PPE may come into play. First, the perceived fear of being incapacitated due to perceived vulnerability to work-related illnesses and the tendency of being disengaged from the job may serve as a cue to using the PPE. Similarly, imposition of sanctions on non-compliant factory employees may serve as deterrence to others. This may be reinforced by the employees' personal health values and work safety consciousness. In the nutshell, the strength of the HBM in explaining the patterns of morbidity distribution among the cement and ceramic factory employees can never be overemphasised, especially as it recognises some predisposing demographic and work-related factors influencing the patterns.

Materials and Methods

Research Design

Since the primary focus of investigation pertains to the morbidity profiles of the affected employees and their determinants, a mixed methods research design was employed. This design aimed to enhance the comprehensiveness of the study's findings by integrating both quantitative and qualitative data techniques. The approach allowed for a deeper exploration of the underlying factors influencing the observed distribution patterns of illnesses among the factory employees.

Research Setting

Geographically, the study was conducted in Kogi State. But as a comparative study, two companies, namely: Dangote Cement PLC, Obajana and West African Ceramic Ltd, Ajaokuta, both in Kogi State were selected. The annual production capacity of the former at a time was put at 5 million tons, thereby making it the largest cement factory in Africa and by extension, one of the largest productive cement factories globally. The company's 13.25 metric tons per annum (MTA) Obajana Cement Plant in Kogi State, Nigeria was, employs thousands of people directly and indirectly with 10.25 metric tons capacity across four production lines (Emmanuel et al., 2015). The latter has been engaged in the production of porcelain and ceramic tiles. It has been producing tiles in Nigeria since 1995 under the umbrella of Royal Ceramics. But in 2009, it changed its name to West African Ceramics Limited (WACL). It is the premium producer of porcelain, vitrified and glazed tiles in West Africa.

Population of Study

The study population comprised cement and ceramic factory employees who formed the bulk of the workforce. However, additional information was

sourced from the medical personnel providing health care services to the employees and were privy to the health records of the affected workers as regards the various diseases treated. They provided information about the proximal and distal work-related causes of the diseases and illnesses of the employees treated prior to the study.

Inclusion Criteria

The following conditions being met qualified one to be a respondent in the study. They must-

- i. Be a factory plant employee of the company.
- ii. Be among those whose routine job functions entailed the use of the PPE.
- iii. Medical doctors and nurses in the accredited health facilities providing health services for the employees.
- iv. Disengaged and retired factory employees.

The Sample Size and its Determination for the Quantitative Data

The total population sample frame of the factory employees involving both companies was 4,375. However, the sample size of 645 was determined with the application of the Krejcie and Morgan (1970) formula for sample size determination relating to a finite population. This was complemented with the qualitative research data whose respondents and participants were purposively selected. However, the application of the formula for the quantitative sample size determination is thus shown below:

Krejcie and Morgan (1970):

$$n = \frac{X^2 NP(1-P)}{d^2 (N-1) + X^2 P(1-P)}$$

Where:

X² = the table value of chi-square for 1 degree of freedom at the desire confidence level (3.841).

N= Population size

P= the population proportion (assumed to be 0.5 since this would provide the maximum sample size).

d= the degree of accuracy expressed as a proportion (.05).

Therefore, for Dangote Cement Plc, the total number of the non-management permanent factory employees, excluding the transport division was 2,875.

Thus, the sample size was:

$$s = \frac{(3.841) (2,875 * .5)(1-.5)}{(.05)^2 (2,875-1) + 3.841 * .50(1-.50)}$$

$$s = \frac{(3.841)(1437.5) (0.5)}{}$$

$$(.0025)(2,874) + 3.841*.5(.5)$$

$$s = \frac{2761}{20.598 + 0.960}$$

$$s = \frac{2,761}{8.145}$$

$$s = 339$$

West African Ceramics (1,500):

$$\text{Therefore: } s = \frac{(3.841)(1500*.5)(1-.5)}{(.05)^2 (1500-1) + 3.841*.5(1-.5)}$$

$$s = \frac{(3.841)(1500*.5)(.5)}{(.0025)(1499) + 3.841*.5(.5)}$$

$$s = \frac{1440.38}{3.75 + 0.9603}$$

$$s = \frac{1440.38}{4.71}$$

$$s = 306$$

The workforce distributions and the proportionate sample sizes of the companies selected for this study have been highlighted in Table 1 above. The unpublished information regarding the work force sizes of the factory employees involving the two companies were sourced from the respective human resources and personnel departments. The work force size of Dangote Cement PLC, Obajana as of 2021 was put at 2,875 factory employees, excluding transport division, security section and other ancillary support staff. Therefore, the proportionate sample size of 339 was determined. Similarly, the staff record of the West African Ceramics Ltd showed a population workforce distribution of 1,500 factory employees as at the same period of the study, with a corresponding sample size of 306.

Table 1: Workforce Size Distribution and Proportionate Sample Size

Name of companies	Population of Factory employees	Sample size
Dangote Cement PLC, Obajana	2,875	339
West African Ceramics Limited	1,500	306
Total	4,375	645

Source: Unpublished staff records of the selected companies

Sampling Techniques for the Quantitative Data Collection

In the context of quantitative data collection, the study employed a multi-stage sampling technique. This entailed a purposive sampling technique that was tailored to the specific population composition of the factory employees. The rationale for adopting the technique was to ensure methodological rigor and

capture pertinent insights from the workforce. The sampling process unfolded in the following stages: The first stage involved the purposive selection of manufacturing sub-sectors, focusing on Dangote Cement PLC and West African Ceramics Ltd. These companies were chosen based on their current productive viability, substantial workforce sizes within the state, and the notable prevalence of health hazards, accidents, and diseases associated with their operational and work environments. In the second stage, the respondents were exclusively selected from the non-management staff. This sub-group of staff was anticipated to be particularly susceptible to the adverse effects of hazard exposure. To facilitate analysis and interpretation, the non-management staff were further classified into distinct and non-overlapping hierarchical positions: junior and senior staff.

The third stage involved a purposeful selection of specific work units or departments within the companies. It was important to note that not all work departments were considered for inclusion. The selection criteria were based on the relevance of the departments to the research objectives. Work units such as quarry, raw mill, kiln, quality assurance, press, mines, sorting and packaging, clinker, and other plant production areas were included in the study. The fourth stage encompassed the implementation of a simple random sampling technique, achieved through a balloting process. This step was employed as a fair and unbiased method to select eligible respondents from each staff cadre, ensuring equitable representation within the sample. Through these methodological stages, the study's sampling approach was tailored to comprehensively address the research objectives while enhancing the overall validity and reliability of the data collection process. Meanwhile, the IDI and FGD respondents and participants were purposively selected to complement the above technique.

Methods of Data Collection

A semi-structured questionnaire was utilised as the primary data collection instrument for this study. The questionnaire was administered to a total of 645 participants, with 339 respondents from cement companies and 306 respondents from ceramic companies. The design of the questionnaire was done to reflect the specific objectives by first starting with the socio-demographics and work-related characteristics of the respondents, extent of patterns of self-reported morbidity distribution and socio-demographic predictors of self-reported morbidity among victims of OHHs. Meanwhile, a pilot study was conducted involving 250 factory employees in Lafarge Cement manufacturing company located at Ewekoro in Abeokuta, Ogun State in order to ensure the reliability and validity of the research process before the main study was carried out. This was complemented with 4 Key Informant Interviews (KIIs) comprising 1 doctor and 1 nurse from the cement company as well as 1 doctor and one nurse from the ceramics. Three consecutive sessions of Focus Group Discussion (FGD) were conducted involving employees selected from cement and ceramic factories. Each session was organised into

two groups: the first group comprised 7 male participants from the Mines department in DCP, and the second group comprised 8 male participants from the glaze line department in WACL. Additionally, another session was held, which included eight participants from the raw mill and kiln departments in DCP. Also, 4 disengaged factory employees, 2 each from both companies were enlisted as In-depth Interview (IDI) respondents to further probe into their post-retirement physical health conditions in order to buttress the link between previous occupational hazard exposure and self-reported morbidity symptoms.

Definition and Measurement of Variables

Self-reported morbidity served as the dependent variable in this study. It was indicated by the respondents' experience of any illness some months before they were engaged in this study. The following questions about self-reported morbidity were given to the respondents in order to evaluate their experiences of illnesses: *Pains in some body parts, weakness of the body, numbness of body parts, swelling of some parts of the body, dry palm, burning sensations in the body, injuries and fractures, skin infections/irritations, constant high blood pressure, anemia/shortage of blood, breathing difficulty, and others sicknesses and diseases* – with yes "1" or no "0" responses in each of the questions. Subsequently, the responses were summed up and re-classified as HIGH MORBIDITY [6–12] = "1" and LOW MORBIDITY [0–5] = "0." The primary objective of this classification was to make sure that it could be used in a logistic regression to examine the influences of socio-demographic and work-related characteristics on patterns of self-reported morbidity, which was best performed with a dummy variable.

Methods of Data Analysis

The study's design resulted in two distinct yet interconnected sets of data. In terms of quantitative data, analyses were conducted at the univariate, bivariate, and multivariate levels, utilizing a probability value of 0.05 as a threshold. Also, mean/median imputation was used to handle the missing values during the analysis. This method implies data missing completely at random (MCAR) and that the mean or median is a reasonable estimate. It is best suited for variables with a small proportion of missing data especially in this study. The qualitative data were content-analysed according to the relevant themes derived from the objectives. Both quantitative and qualitative data analyses were facilitated by the application of the Statistical Package for Social Sciences (SPSS) version 23 and the ATLAS.ti 7.5.7 software, respectively.

Ethical Considerations

In terms of regulatory and institutional compliance, the researcher meticulously followed established protocols, initially securing ethical clearance and approval from the Social Science and Humanities Research Ethics Committee (SSHREC) of the University of Ibadan under reference number: UI/SSHREC/2021/0002. Subsequently, ethical clearance was obtained from

the Health Research Ethics Committee of Kogi State Ministry of Health (KSMoH), Lokoja, with certificate reference number: MOH/PRS/465/V.1/012. Detailed information regarding these ethical clearances can be found in the appendices of this study. In addition, the research was meticulously carried out in accordance with the essential ethical tenets of research in social and behavioural sciences. These principles encompassed maintaining confidentiality, averting harm, ensuring advantageous outcomes, encouraging voluntary engagement, and safeguarding participant anonymity.

Results

Socio-demographic and Work-related Characteristics of the Respondents

Out of the 645 questionnaire counts administered and retrieved, 545 of them were considered valid for data analysis; giving a response rate of 84%. The socio-demographic characteristics of the respondents were considered in aggregated and in comparative forms as reflected in Table 2. The mean age of all the respondents was 34.70 ± 9.18 years. The characteristics and disparities are outlined as follows: Respondents aged 28-37 were prominent in both companies, but DCP had more in this age bracket (43% compared to WACL's 37%). DCP had a higher proportion of married employees (65% vs. WACL's 51%), and WACL had more never-married employees (51% vs. DCP's 27%). Both companies had a majority of Igala respondents (29%), but DCP had more O'kun Yoruba employees (29% vs. WACL's 18%). DCP had a higher percentage of respondents with university degrees and post-graduate qualifications (68% vs. WACL's 9%). In terms of employment cadre, WACL had more junior staff (80% vs. DCP's 42%), and DCP had more senior staff (49% vs. WACL's 17%).

The work Shift distribution shows that DCP had a higher proportion of respondents on permanent day shifts (60% vs. WACL's 19%). However, WACL had more respondents on rotational day and night shifts (77% vs. DCP's 31%). The monthly income distribution in naira terms shows that DCP had a higher proportion of respondents earning 80,000 Naira and above (69.6%) compared to WACL (3.5%). Conversely, WACL had a larger percentage of respondents earning less than 30,000 Naira (22.3%) compared to DCP (2.4%). This indicates notable differences in income distribution between the two companies. In sum, the differences in the demographics between DCP and WACL were statistically significant.

Table 2: Percentage Distribution of the Respondents by Socio-demographic and Work-related Characteristics

Demographic variables	Variable categories	Categories of Companies		Total (n=545, %)
		DCP (n=289, %)	WACL (n=256, %)	
Age (in years)	18 – 27	42 (14.5)	95 (37.1)	137 (25.1)
	28 – 37	123 (42.6)	76 (29.7)	199 (36.5)
	38 – 47	94 (32.5)	59 (23.0)	153 (28.1)
	48 – 57	25 (8.7)	23 (9.0)	48 (8.8)
	58 – 67	5 (1.7)	3 (1.2)	8 (1.5)
Marital Status	Married	187 (64.7)	104 (40.6)	291 (53.4)
	Never Married	77 (26.6)	131 (51.2)	208 (38.2)
	Divorced	5 (1.7)	10 (3.9)	15 (2.8)
	Separated	12 (4.2)	7 (2.7)	19 (3.5)
	Widowed	8 (2.8)	4 (1.7)	12 (2.2)
Tribe	Igala	56 (19.4)	100 (39.1)	156 (28.6)
	Ebira	32 (11.1)	40 (15.6)	72 (13.2)
	Okun Yoruba	83 (28.7)	18 (7.0)	101 (18.5)
	Hausa	45 (15.6)	32 (12.5)	77 (14.1)
	Igbo	23 (8.0)	13 (5.1)	36 (6.6)
	Nupe	6 (2.1)	8 (5.1)	14 (2.6)
	Bassa	2 (0.7)	9 (3.5)	11 (2.0)
	Edo	12 (4.2)	21 (8.2)	33 (6.1)
	Others	30 (10.4)	15 (5.9)	45 (8.3)
	Highest education	No formal education	5 (1.7)	18 (7.0)
Primary school		8 (2.8)	45 (17.6)	53 (9.7)
Secondary school		24 (8.3)	124 (48.4)	148 (27.2)
OND/NCE		56 (19.4)	46 (18.0)	102 (18.7)
Degree/Postgraduate		196 (67.8)	23 (9.0)	219 (40.2)
Employment cadre	Junior staff	121 (41.9)	204 (79.7)	325 (59.6)
	Senior staff	142 (49.1)	43 (16.8)	185 (33.9)
	Management staff	26 (9.0)	9 (3.5)	35 (6.4)
Current work shift	Permanent day	173 (59.9)	49 (19.1)	222 (40.7)
	Permanent night	7 (2.4)	-	7 (1.3)
	Rotational day and night	90 (31.1)	198 (77.3)	288 (52.8)
	Unscheduled time	19 (6.6)	9 (3.5)	28 (5.1)
Monthly income (in Naira)	Less than 30000	-	57 (22.3)	57 (10.5)
	31,000 – 39999	7 (2.4)	100 (39.1)	107 (19.6)
	40,000 – 49999	9 (3.1)	44 (17.2)	53 (9.7)
	50,000 – 59999	10 (3.5)	14 (5.5)	24 (4.4)
	60000 – 69999	36 (12.5)	13 (5.1)	49 (9.0)
	70000 – 79999	26 (9.0)	19 (7.4)	45 (8.3)
	80000 and above	201 (69.6)	9 (3.5)	210 (38.5)

Patterns of Self-reported Morbidity among Victims of OHHs

The results in Table 4 revealed sharp disparities in the distribution of symptoms of illness associated with hazard exposure between the two company categories. The statistics highlighted these disparities, underscoring the extent of the differences such that nearly half (51.9%) of the employees in the DCP category reported experiencing pains in some body parts, whereas this was the case for 48.1% of the WACL category. The symptom of bodily weakness followed a similar pattern, affecting 52.0% of the DCP category and 48.0% of the WACL category. Numbness of body parts was more prevalent among the DCP category, affecting 59.7%, compared to 40.3% in the WACL category. The WACL category had a higher prevalence of swelling in some body parts at

58.4%, in contrast to 41.6% in the DCP category. Dry palms were reported by 45.0% of the DCP employees and 55.0% of the WACL employees, indicating a significant gap. Burning sensations in the body affected the majority (55.1%) of the DCP category and 44.9% of the WACL category.

Injuries and fractures were notably more common in the DCP category (63.9%) compared to the WACL category (36.1%). Skin infections/irritations were reported by 64.1% of the DCP employees and 35.8% of the WACL employees. Constant high blood pressure affected 47.8% of the DCP category and 52.2% of the WACL category. Anemia/shortage of blood exhibited a disparity, with 41.2% in the DCP category and 58.8% in the WACL category. Breathing difficulty was reported by 65.8% of the DCP category and 34.2% of the WACL category, emphasising a significant difference. Other sicknesses or diseases affected 57.8% of the DCP employees and 42.2% of the WACL employees. Across all symptoms, the disparities culminated in a total of 545 reported cases, highlighting the contrast between the two categories. The statistics obtained during the 2022 field survey highlight the contrasting encounters of employees belonging to the two company categories concerning illness symptoms linked to exposure to hazards one month prior to the study.

Table 3: Percentage Distribution by Symptoms of Illness Associated with Hazard Exposure

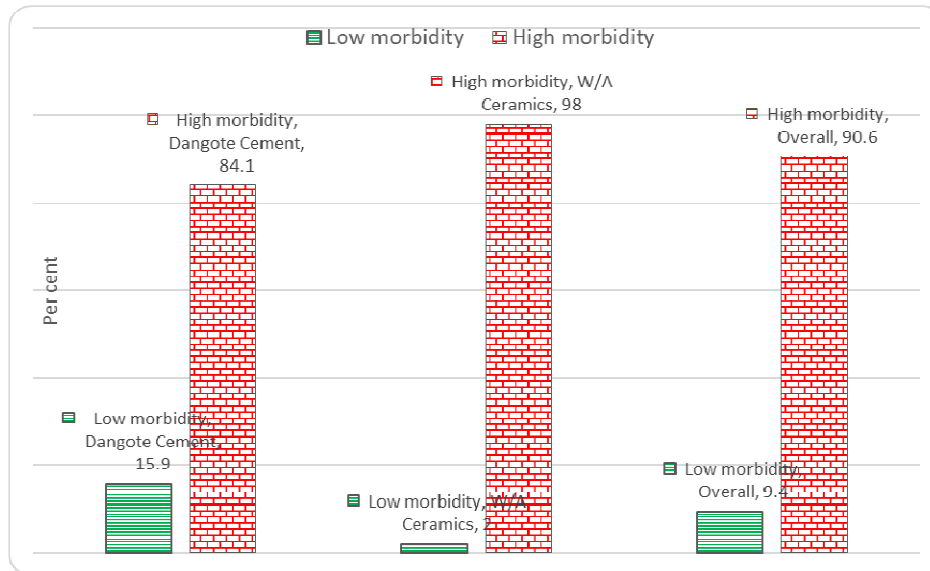
S/N	Symptoms of illness associated with work	Company Category		Total
		DCP (%)	WACL (%)	
i	Pains in some body parts	273 (51.9)	253 (48.1)	526
ii	Weakness of the body	272 (52.0)	251 (48.0)	523
iii	Numbness of body parts	212 (59.7)	143 (40.3)	355
iv	Swelling of some parts of the body	128 (41.6)	180 (58.4)	308
v	Dry palm	198 (45.0)	242 (55.0)	440
vi	Burning sensations in the body	141 (55.1)	115 (44.9)	256
vii	Injuries and fractures	205 (63.9)	116 (36.1)	321
viii	Skin infections/irritations	163 (64.1)	91 (35.8)	254
ix	Constant high blood pressure	206 (47.8)	225 (52.2)	431
x	Anemia/shortage of blood	135 (41.2)	193 (58.8)	328
xi	Breathing difficulty	117 (65.8)	92 (34.2)	269
xii	Others sicknesses or diseases	52 (57.8)	38 (42.2)	90
**	TOTAL	-	-	545

Extent of Patterns of Self-reported Morbidity Distribution among the Respondents

Upon evaluating the 12-item questions concerning self-reported health issues, the combined and reclassified responses from Table 4 revealed that both company groups' respondents exhibited significant self-reported morbidity symptoms, as illustrated in Figure 1. Nevertheless, ceramic company

employees reported a higher prevalence of them (98%) compared to their counterparts at Dangote Cement (84%).

Figure 1: Distribution of Respondents by Self-reported Morbidity among Victims of OHHs



Socio-demographic Predictors of Self-reported Morbidity among Victims of OHHs

In this comparative study focusing on the associations between socio-demographic factors and self-reported morbidity among individuals exposed to Occupational Health Hazards (OHHs), the presented results offered insight into the disparities between Unadjusted Odds Ratios (uOR) and Adjusted Odds Ratios (aOR).

Company: The stark contrast between West African Ceramic Limited (WACL) and the reference company Dangote Cement PLC (DCP) in terms of Unadjusted Odds Ratio (uOR) and Adjusted Odds Ratio (aOR) underlines intriguing insights into the associations between company affiliations and self-reported morbidity among victims of Occupational Health Hazards (OHHs). The unadjusted analysis indicated a substantial uOR of 9.503 (95% CI: 3.713 – 24.318) for WACL, suggesting a noteworthy increase in the odds of self-reported morbidity among WACL employees when compared to those from DCP. However, delving deeper into the influence of various socio-demographic factors through adjustment led to an even more remarkable aOR of 12.903 (95% CI: 14.319 – 1162.792) for WACL. This adjustment amplifies the association, suggesting that specific characteristics unique to WACL are at play – characteristics that were not initially captured by the unadjusted analysis.

Age: Comparing unadjusted (uOR) and adjusted (aOR) odds ratios across different age groups revealed intriguing variations. For instance, the initial uOR for individuals aged 28 – 37 (0.705, 95% CI: 0.319 – 1.557) might have suggested a potential decrease in self-reported morbidity odds. However, the shift to an aOR of 1.875 (95% CI: 0.524 – 6.706) presents a different picture. This change might have arisen from factors not considered at first, but which came to light when all relevant influences in the adjusted analysis were accounted for. This shift brings to mind of the importance of looking beyond surface-level associations to truly understand how age impacts self-reported morbidity.

Marital Status: The difference between unadjusted (uOR) and adjusted (aOR) odds ratios for "Never Married" (uOR = 1.588, aOR = 2.032) and "Separated" (uOR = 2.381, aOR = 3.824) individuals suggested potential hidden links between marital status and other factors. Accounting for these hidden influences in the adjusted analysis offered a clearer view of how marital status is associated with self-reported morbidity. This underscored the need to consider broader contexts to comprehend the true connection between marital status and health outcomes, in line with the study's exploration of socio-demographics and self-reported morbidity among victims of occupational health hazards.

Employment Cadre: The notable difference between initial odds (uOR) and adjusted odds (aOR) for "Senior staff" (uOR = 0.384, aOR = 0.080) and "Management staff" (uOR = 0.508, aOR = 0.055) emphasised the need to factor in additional socio-demographic elements influencing these job roles. Adjusting reveals a richer understanding of the connection between employment cadres and self-reported morbidity. This highlighted the significance of considering a broader array of factors to grasp the nuanced relationship between job roles and self-reported morbidity.

Employment Confirmation Status: The aOR for "Contract staff" decreases notably from its uOR (6.604 vs. 1.698) upon adjustment. This suggested that other factors were likely influencing the connection between employment confirmation status and self-reported morbidity. Similarly, the shift in aOR for "Probation staff" (2.587 to 0.332) points to the impact of unmeasured variables that affected this relationship. The finding was consistent with those of Pahlevan et al. (2020) that found a significant association between sex, age, duration of employment, and respiratory health challenge among tile and ceramic factory workers in Iran.

Current Work Shift Schedule: Comparing unadjusted (uOR) and adjusted (aOR) odds ratios for various work shift schedules underscored the influence of concealed factors beyond shift type on self-reported morbidity. After considering these concealed variables in the analysis, the true relationships were unveiled. For example, for "permanent night" shift, the uOR was 0.221 and the aOR was 0.182. This suggested that the likelihood of self-reported morbidity is lower for the "permanent night" shift than initially implied by the unadjusted analysis. A similar trend is noted for "rotational day and night"

shifts, where the uOR was 0.853 and the aOR was 0.208. These adjustments highlighted the complexity of how different work schedules impact self-reported morbidity.

Monthly Income: The contrasting uOR and aOR values for distinct income ranges indicated that the initial correlation between income and self-reported morbidity was likely shaped by additional socio-demographic considerations. By factoring in these variables through adjustment, a more accurate understanding of the connection between income and self-reported morbidity emerged. For instance, considering the income range "Less than 30000," the uOR was 0.936, while the aOR was 3.411. This adjustment suggested that factory employees with income "less than 30000" may actually have increased odds of self-reported morbidity compared to what the initial unadjusted analysis indicated. This underscored the significance of a comprehensive analysis when exploring the intricate relationship between income and self-reported morbidity. In brief, the presented comparative analysis provided a comprehensive view of how adjusting for various socio-demographic factors influenced the associations between these factors and self-reported morbidity among victims of occupational health hazards. The uOR and aOR values provided insights into both the apparent and concealed impacts of these factors, emphasising the necessity of adjusted analyses to achieve a more precise comprehension of the associations, as implied by the table's title.

Table 5: Logistic Regression Model Predicting the Degree of Association between Socio-demographics and Self-reported Morbidity among the Victims of OHHs

Demographic variables	Variable categories	Unadj. OR [95% CI for Exp (B)]	Adj. OR [95% CI for Exp (B)]
Company	Dangote Cement (ref)	1.000	1.000
	WACL	9.503**[3.713 – 24.318]	12.903**[14.319–1162.792]
Age (in years)	18 – 27 (ref)	1.000	1.000
	28 – 37	0.705 [0.319 – 1.557]	1.875 [0.524 – 6.706]
	38 – 47	0.848 [0.359 – 2.001]	2.892 [0.597 – 14.017]
	48 – 57	0.551 [0.189 – 1.608]	0.599 [0.088 – 4.089]
	58 – 67	0.236 [0.042 – 1.326]	7.180 [0.216 – 239.205]
Marital Status	Married (ref)	1.000	1.000
	Never Married	1.588 [0.852 – 2.960]	2.032 [0.686 – 6.015]
	Divorced	-	-
	Separated	2.381 [0.308 – 18.409]	3.824 [0.372 – 39.322]
Ethnic identity	Widowed	-	-
	Igala (ref)	1.000	1.000
	Ebira	0.918 [0.302 – 2.790]	0.772 [0.165 – 3.619]
	Okun Yoruba	0.364* [0.158 – 0.838]	0.349 [0.099 – 1.231]
	Hausa	1.250 [0.379 – 4.122]	1.600 [0.379 – 6.744]
	Igbo	0.141 [0.136 – 1.330]	0.505 [0.098 – 2.609]
	Nupe	-	-
	Bassa	-	-
	Edo	0.308* [0.103 – 0.919]	0.145* [0.027 – 0.760]
	Others	0.548 [0.177 – 1.695]	0.270 [0.053 – 1.383]
Highest education	No formal education (ref)	-	-
	Primary school	-	-
	Secondary school	-	-
	OND/NCE	-	-
	Degree/Postgraduate	-	-

Employment cadre	Junior staff (ref)	1.000	1.000
	Senior staff	0.384* [0.209 – 0.706]	0.080* [0.014 – 0.444]
	Management staff	0.508 [0.163 – 1.582]	0.055* [0.006 – 0.544]
Years of service in the present company	Less than a year (ref)	1.000	1.000
	1 – 5 years	1.319 [0.283 – 6.143]	0.297 [0.030 – 2.999]
	6 – 10 years	0.874 [0.189 – 4.031]	0.380 [0.032 – 4.566]
	11 – 15 years	0.699 [0.143 – 3.422]	0.326 [0.023 – 4.627]
	16 – 20 years	2.000 [0.167 – 23.960]	0.953 [0.028 – 32.016]
Employment confirmation status	21 years and above	-	-
	Permanent staff (ref)	1.000	1.000
	Contract staff	6.604** [1.567 – 27.829]	1.698 [0.245 – 11.765]
Current work shift schedule	Probation staff	2.587* [1.130 – 5.919]	0.332 [0.052 – 2.106]
	Permanent day (ref)	1.000	1.000
	Permanent night	0.221 [0.040 – 1.219]	0.182 [0.008 – 4.033]
	Rotational day and night	0.853 [0.457 – 1.592]	0.208* [0.064 – 0.668]
Usual work time schedule	Unscheduled time	0.529 [0.165 – 1.694]	0.111* [0.017 – 0.724]
	7AM – 7PM (ref)	1.000	1.000
	8AM – 7PM	0.507 [0.106 – 2.417]	0.146 [0.012 – 1.820]
	7PM – 7AM	0.979 [0.282 – 3.400]	1.949 [0.384 – 9.900]
	8AM – 5PM	1.006 [0.527 – 1.921]	1.570 [0.457 – 5.399]
Monthly income (in Naira)	Less than 30000 (ref)	1.000	1.000
	N30001 – N39000	0.936 [0.166 – 5.275]	3.411 [0.343 – 33.892]
	39001 – 49000	-	-
	49001 – 59000	0.400 [0.053 – 3.019]	2.054 [0.096 – 43.763]
	59001 – 69000	0.218 [0.043 – 1.105]	2.121 [0.137 – 32.892]
	69001 – 79000	0.145* [0.030 – 0.712]	1.110 [0.062 – 19.822]
	Above 79001	0.246 [0.057 – 1.069]	6.501 [0.318 – 132.867]

Discussion

Patterns of Self-reported Morbidity among Victims of OHHs Exposure

The common patterns of occupational morbidity distribution among the victims of OHHs showed that general body pains, weakness of the body, numbness, swollen body parts, dry palm, sensations, injuries and fractures (clinical symptoms of musculoskeletal disorders), dermatitis, breathing difficulty, high blood pressure and shortage of blood were the health afflictions found among the employees, irrespective of working in the cement or ceramic company. The outcomes of this investigation are consistent with analogous research endeavours carried out in industries like steel (Chohan & Bilga, 2011), cement manufacturing (Leem, 2012; Manjula *et al.*, 2013; Rahmani *et al.*, 2018), and building construction (Mohamed, 2017). These referenced studies have all correlated exposure to cement dust with an array of health concerns encompassing skin disorders, respiratory infections, musculoskeletal injuries, general discomfort, hypertension, and nasal congestion. Furthermore, respiratory afflictions have been associated with ceramic fibers. Additional research endeavours, including Rasoul *et al.* (2017), Ahmad *et al.* (2021), and Morshed *et al.* (2022), have similarly established a definitive link between exposure to both cement and ceramic dust and the manifestation of unfavourable health symptoms. Furthermore, outcomes derived from the qualitative data analysis encompassing Focus Group Discussions (FGD) and Key Informant Interviews (KII) substantiated the findings concerning the distribution patterns of occupational morbidity symptoms among factory employees in the cement and ceramic sub-sectors. The visual representation in Figure 2 encapsulated the shared distribution patterns of occupational health

issues within these factory settings. The diagram highlighted that exposure to ergonomic (job design and function) and chemical hazards (such as cement dust, vapors, smoke, and mist) resulted in the emergence of occupational ailments and illnesses, including musculoskeletal disorders (muscle, bone, and joint pains), cardiovascular conditions (heart problems, coughing, asthma, high blood pressure, and breathing difficulties), dermatitis (skin disorders), fever, injuries, and eye problems. It is important to note, however, that the connection between hazard exposure and morbidity symptoms might not be direct and could be influenced by various demographic and work-related factors.

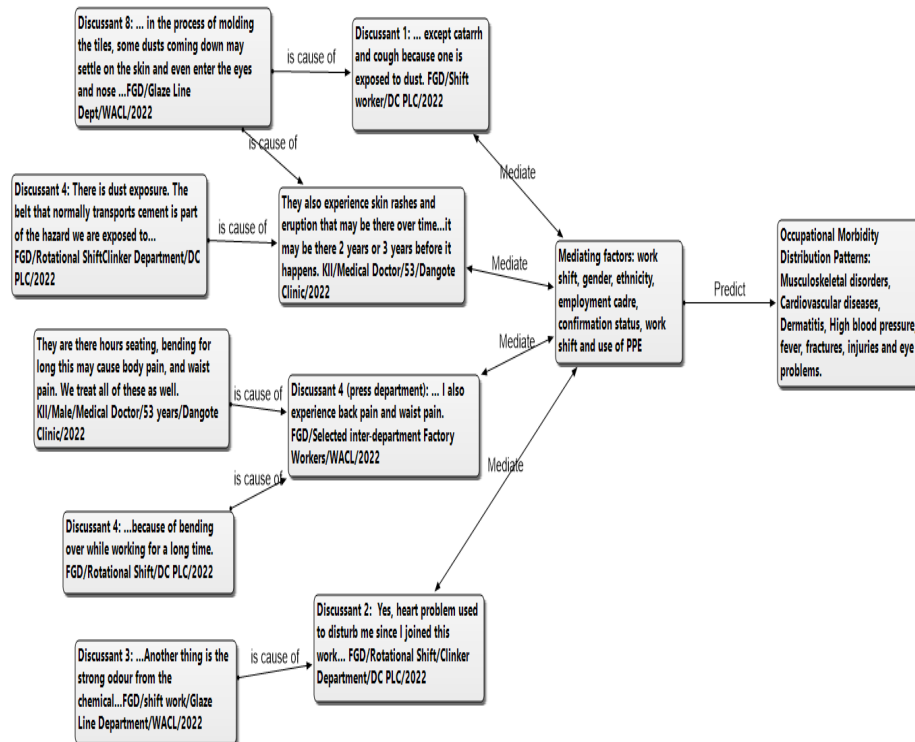


Figure 2: Exposure to OHHs and Patterns of Occupational Morbidity Distribution

Moreover, certain factors such as the company of work (cement or ceramic), gender, ethnic identity, employment cadre, employment confirmation status and current work shift schedule have been found to be independent predictors of patterns of self-reported morbidity distribution among victims of OHH exposure. This finding validates a couple of previous studies conducted in Ethiopia among cement factory worker (Gizaw *et al.*, 2016), some cement factory employees in Nepal (Pandeya *et al.*, 2021), textile workers in Ethiopia (Kifle *et al.*, 2019 and Zele *et al.*, 2021) and ceramic workers in Turkey (Karataş *et al.*, 2019).

On the other hand, age, marital status, educational qualification, years of service, work time schedule and income did not significantly influence patterns of self-reported morbidity distribution among the victims of OHHs. However, this was in contrast to

the study carried out among pharmaceutical workers in Ethiopia that associated years of service with chronic respiratory health problem (Asfaw *et al.*, 2018). It was also at variance with another study that associated years of work experience with cough among cement workers in Togo (Vikkey *et al.*, 2020). Likewise, respiratory symptoms among textile workers were partly determined by educational status, work unit and the use of PPE (Kifle *et al.*, 2019). Other previous studies that did not support the finding on the associations of some socio-demographic and work-related characteristics with patterns of morbidity distribution among the cement and ceramic employees included those of Zele *et al.* (2021) among textile workers in Ethiopia, ceramic workers in Turkey (Karataş *et al.*, 2019 and Kurtu *et al.*, 2020). However, it was consistent with an aspect of the qualitative finding where a participant associated catarrh and cough with cement dust exposure at Dangote company. Just like Tsao *et al.* (2017) in Taiwan that investigated the relationship between exposure settings at work and the clinical severity of silicosis, the current study delved into the associations between different socio-demographic factors and self-reported morbidity among victims of Occupational Health Hazards (OHHs).

Age played a significant role in both studies. The Tsao *et al.* study in Taiwan revealed that age had a notable influence on the risk of worse X-ray findings among sanitary ceramic workers. Similarly, in the current study, the discussion touched on the variations in odds ratios across different age groups. For instance, the shift in odds ratios from unadjusted (uOR) to adjusted (aOR) odds ratios for certain age groups highlighted how considering additional influences through adjustment could alter the interpretation of the impact of age on self-reported morbidity. Additionally, in both studies, the influence of specific workplace settings or affiliations was explored. In the Tsao *et al.* study, the focus was on different types of ceramic production facilities. The researchers found that certain characteristics unique to sanitary ceramic workers initially led to worse X-ray findings. However, when adjusting for confounding factors, the differences between sanitary ceramic workers and other ceramic workers became less significant.

In a similar vein, the current study discussed the differences between two companies, West African Ceramic Limited (WACL) and Dangote Cement PLC (DCP), in terms of self-reported morbidity. The unadjusted analysis indicated a substantial odds ratio for WACL, suggesting a higher odd of self-reported morbidity among WACL employees compared to those from DCP. However, the adjustment for various socio-demographic factors led to an even more remarkable odds ratio for WACL, highlighting the importance of capturing specific characteristics unique to WACL that were initially overlooked in the unadjusted analysis. Overall, both studies underscore the significance of thorough analysis and adjustment when exploring associations between various factors and health outcomes. They highlighted how initial findings can be influenced by confounding factors that become apparent only through careful adjustment, providing a more nuanced understanding of the relationships under investigation. In any case, the comparative nature of the current study involving cement and ceramic factory workers might be accountable for the dissonance in the finding with a couple of previous studies.

Conclusion

It was insightful to note that musculoskeletal disorders such as body pains, weakness of the body, fracture, and skin irritation among others were discovered as the common morbid conditions associated with the cement and ceramic factory employees in Kogi

State. Likewise, difficulty in breathing which is symptomatic of cardiovascular disorder was self-reported among the employees. The aforementioned somatic morbid conditions were more highly noticeable among the ceramic employees. However, they were mediated by certain socio-demographic and work-related characteristics of the employees.

Policy Implications of the Study

Since cement and ceramic production activities are not without exposure to hazards, early diagnosis of diseases and sicknesses are a key factor in the management of the morbid conditions, especially the seemingly asymptomatic ones. Therefore, Dangote cement PLC and West African Ceramic Ltd are advised to organise free, compulsory and periodic medical check-ups for all the factory employees of the companies once in every 3 months. This may help to detect and treat early, some undisclosed work-related sicknesses and diseases that may manifest in the nearest future. The company-based clinics and hospital affiliates should be made to conduct the exercise on the basis of work department by department in order not to affect the production process and output. By so doing, some musculoskeletal disorders, cardiovascular diseases, cancer, skin disorders, silicosis, pneumoconiosis and other related health challenges may be detected and managed early enough.

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