

# Caustic Cement Burn in a Nigerian Male: A Surrogate for the State of Occupational Safety in Nigeria.

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## ABSTRACT

### BACKGROUND

Cement is an important material used in the construction industry. When mixed with water, it has abrasive, caustic and drying properties that could cause allergic and sensitivity reactions to the skin, chemical skin burns and damage to the eyes following contact. Cement burns to the skin appears to occur commonly among apprentice masons or individuals who have little knowledge about the hazards of wet cement. Rowe and Williams first reported the adverse effects of wet cement to the skin in 1963. Inadequate knowledge about possible hazards following contact with wet cement is a serious risk factor for the occurrence of caustic cement burn. The aim of this presentation is to ensure that sufficient information is made available to the public, small scale and large scale industries, to reduce and prevent future occurrence of cement burns. This would also reduce sickness absence and employee turn-over rates in industries.

### METHOD

The case presentation of a 37 year old male who presented with cement burns and a review of literature using Google and Medline search with the following key words; caustic cement burn; sickness absence; safety standards, personal protective equipment.

### RESULTS

This report presents the cement burn incident of a 37-year-old mason employed as a contract staff in a medium-scale construction company. He presented with a history of exposure to wet cement for a few hours which led to the occurrence of cement burns on his lower limbs.

Clinical findings revealed blister formation with swelling and pain initially, followed by formation of necrotic ulcers. There was also poor compliance of the company in keeping to safety standards and legislation. The Construction Company did not grant him a statutory sick pay claiming that their absence policies did not cover the contract staff.

### CONCLUSION

It is possible to prevent the potential hazards of wet cement through providing sufficient information to employees and the general public and ensuring adequate use of personal protective equipments. Employers should ensure that workers are qualified for the job they are employed to carry out. Implementation of sickness absence policies and other occupational health legislation especially in small and medium-scale construction companies in Nigeria should be enforced to secure the health and safety of the workers who may not be aware of risk and hazards associated with the jobs.

### KEYWORDS

Caustic Cement Burn; Occupational Safety; Nigeria.

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### INTRODUCTION

Cement is a word originated by the Romans who described the art of masonry by the term 'opus caementicium'. The art of masonry at the time had a resemblance of contemporary concrete produced by a combination of compressed rock and burnt lime which acts as a binder. Cement is significantly used in

producing mortar (a paste used to join construction blocks together and fill the gaps in-between them). It is also used to produce concrete which is produced from mixing cement and aggregate and this forms a strong building material.

Cement is used in construction industries either in the hydraulic or non-hydraulic form. Hydraulic cement hardens as a result of hydration. An example is the Portland cement. Non-hydraulic cement does not harden in water but may harden by reacting with atmospheric carbon-dioxide e.g. slaked lime.

Dry cement contains calcium oxide which is not very harmful to the skin. On the other hand, if water is mixed with cement, calcium hydroxide is produced, and this is highly alkaline in nature having a Ph value of 12 to 13. The Ph of a normal human skin is 5.5; therefore, contact of the human skin with wet cement gives rise to alkaline (caustic) skin burns. The burns continue and worsen even without further exposure to wet cement and without the worker feeling any form of discomfort until later stages. Identifying early skin changes following contact with wet cement is vital such that prompt action is effected to care for the affected skin.

Burns from wet cement presents with skin discolouration, pains, skin ulcers and amputation in worst cases. Other patients have reported inflammation and redness of the skin as well as blistering in areas around the skin burn from wet cement. This may also lead to allergic dermatitis.

Cement burn commonly occurs among pre-casters because they have direct contact with wet cement. Adequate training and a safe working environment is essential for preventing these burns which occur as a result of the caustic nature of cement that has been mixed with water.

The number of working days lost to skin problems as a result of direct contact with wet concrete is highly significant.

Soyinka F (1997) in his study on epidemiology of disease among 240 bricklayers in Nigeria stated that the incidence of cement-eczema was 2.3%, wear and tear dermatitis 2.0%, and sensitivity against chrome was 2.8%. Occurrence of skin problems leads to a reduction in number of days worked decreased earnings and eventually job loss.

Shah R K and Tiwari R R 2010, in their study on occupational skin problems in construction workers in India, stated that skin conditions were commoner among workers aged 20-25 years, males, those having greater than one year experience and employees who work longer hours. They also indicated that half of the employees who did not consistently use personal protective equipment reported skin-related symptoms.

Winder C and Carmody M 2002 also carried out a study on the dermal toxicity of cement. They concluded that cement and concrete must be handled as unsafe materials, and employees utilizing these materials should avoid direct contact as much as possible.<sup>3</sup>

Complications occur both to the employees and employers, when employers fail to make provision for a safe and favourable working environment or when employees fail to use facilities provided in the appropriate manner. A company or organization demonstrates its ability to control and reduce the frequency and severity of occupational related health events, accidents or property damage by adopting a Health and Safety Management System (HSMS).

Health and safety laws guarantee that organizations safeguard the health, safety and welfare of employees and visitors by protecting them from risks emanating from their work activities, and that employees use facilities and resources provided by their employers in a manner that will neither lead to property damage nor put them or others at risk. Typical examples of health and safety Act and policy used in Nigeria include; Factory Act of 1990 (adapted from the UK Factory Act of 1961),

Occupation Safety and Health Act of 1970 (USA), the Control of Substance Hazardous to Health Regulations of 1988 (UK), the Personal Protective Equipment at Work Regulations of 1992 (UK), the Management of Health and Safety at Work Regulations of 1999 (UK), The Manual Handling Operations Regulations of 1992 (UK), the Construction Design and Management Regulations of 2007 (UK).

This case report of occupational cement burn intends to highlight and improve awareness of occupational risk among cement workers. It also intends to discuss the complications, and case management in addition to the importance of work place and absence management policies and procedures for prevention of similar injuries especially in Nigeria where work occupational health safety and practice and regulation is weak.

### CASE PRESENTATION

A 39 year old male mason who was employed as a contract staff and had worked for 5 months with a construction company, presented to the Accident and Emergency unit of the University of Port Harcourt Teaching Hospital in Rivers State Nigeria, with complains of pains, blisters and necrotic ulcers on his left and right feet. He indicated that approximately 6 days prior to presentation; he had been in prolonged contact with wet cement at a construction site, while mixing water and cement to make a cement paste for bricklaying activities. He stated that some wet cement spilled onto his footwear which was a pair of rubber slipper, while trying to lift up a basin of mixed cement. He ignored it hoping to address the issue at the close of work. He started having pains two hours after he returned home and also realised he had some burning sensations and blisters in the inter-digital parts of the toes on both feet. The feet became swollen and painful by the following morning such that he could not report to work despite the cold compress he tried to apply for some relief. The blisters progressively worsened and became necrotic four days later, with increasing pain.

On clinical physical examination, the patient was conscious and alert, complaining of obvious pain from both feet. His pulse was regular, with full volume at 90 beats per minutes; his blood pressure was 110/70mmHg.

The inter-digital regions of the toes on both feet showed necrotic lesions with erythema around the ulcers [Figures 1 and 2]. Laboratory investigations carried out were a full blood count, serum electrolyte, urea and creatinine, erythrocyte sedimentation rate (ESR) and urinalysis. The ESR was 60mm/hour. Other results obtained were within acceptable range.

In the accident and emergency unit, the worker was given a combination of acetaminophen and codeine for pain relief, intramuscular tetanus toxoid was also given, a wound debridement was done with application of 6% hydrogen peroxide and a dressing was applied. Three weeks later, the ulcers began to heal and the pains subsided.

Investigations carried out reported that the worker had little or no experience or training in masonry. He was an apprentice who was contracted for the job. No formal training or safety measures were given to the worker, he was not provided with safety boots or hand gloves.

**Figure 1:** Right Foot Showing Brown, White And Gray Necrotic Tissue Changes Following Caustic Burns From Wet Cement (Taken with permission)



**Figure 2:** Left Foot Showing Brown, White And Gray Necrotic Tissue Changes Following Caustic Burns From Wet Cement (Taken with permission)



## DISCUSSION

Generally, diseases of the skin following exposure to wet cement occur commonly among employees in small and medium scale organizations. Accidents occur 20% more often in small scale organizations compared to the organizations with greater than 100 employees and 40% more often than in organizations of greater than 1,000 employees. Accidental exposure to wet cement can lead to adverse effects on the skin such as contact dermatitis, abrasions and skin burns. We discuss some possible factors that can influence the occurrence of skin burns following exposure to wet cement.

Lack of work experience may have contributed to the worker's incident. Most cases of damage to the skin as a result of contact with wet cement occur amongst apprentices. This is probably due to lack of skills involved in handling wet cement. Valid research in the United States carried out among 442 apprentice cement masons indicated significant damage to the skin in 71% of the workers within the last one year. Only 7% reported lost time or doctors visits concerning the incident while 93% of apprentices who had skin problems continued working and did not seek medical treatment. The patient in this case had been with the construction company

for five months only and had no working experience prior to his current employment.

Some employees are also not aware of the dangers they face or come in contact with at the workplace. This may lead to accidents and injuries following exposure to a hazard. A study done by Lewis P M et al on wet cement; a poorly recognised cause of full thickness burns indicated that 51% of the patients who had cement burns were unaware of the adverse effects of wet cement and therefore took no precautions. The index case may not have been aware of the dangers of wet cement prior to his commencement of the job and therefore did not take any precautionary measures.

Prolonged skin contact may have influenced the occurrence of this event. Due to the highly alkaline nature of cement, and the duration of contact with wet cement even in few minutes is sufficient enough to cause a skin burn. Skin burns from wet cement can progressively get worse when clothes, protective foot wears or hand gloves are saturated with wet cement and are rubbed against the skin while working. Our patient probably had wet cement rubbed against his toes and the slipper part in between his toes and continued working that way thus creating friction between the skin and the slipper which had wet cement. As a reminder, damage to the skin from acid burn leads to a burning sensation and can alert the patient to take action, however skin damage from alkalis is not associated with initial pain or heat such that by the time a patient feels pains, it is too late to apply a first aid treatment to prevent further damage.

Both irritant and allergic contact dermatitis can occur to an individual following contact with wet cement.<sup>17</sup> Research has indicated that 5-10% of employees in the construction industry may be sensitized to cement.<sup>17</sup> No skin patch test was done to elicit the patient's sensitivity to hexavalent chromium, which is the skin sensitizing metal contained in cement. Therefore it would have been necessary to find out if the patient has been sensitized prior to the occurrence of this

incident.

Poor compliance of the construction company with standards and legislation could also be a contributory factor to the occurrence of cement burns. The construction company in Nigeria is engaged mostly in manual labour and the employees are usually of low socio-economic status and are employed as cheap labour. Therefore a formal organizational structure is rarely seen in such companies and do not follow the required health and safety regulations for their employees.

The Factory Act of 1990 in Nigeria, which is a version of the UK Factory Act of 1961, established both legislative basis for inspection and enforcement of health and safety conditions in factories. This ensures that systems and structures for reporting accidents and injuries (where necessary) are put in place. It also stipulates the nature of punishments for non-compliance. Despite these provisions, contractors in Nigeria's construction industry are left to use their discretion in managing health and safety issues. As a result, contractors assign little resources to health and safety management, rarely keep report, or release accurate records of accidents and injuries occurring at their work sites.

Conformity with Nigerian standards would considerably lower the probability of the occurrence of cement burn. Appropriate assessment of risk in conformity with *Occupational Safety and Health Regulations* and the *Code of Practice for Control of Workplace Hazardous Substances* would limit adverse events such as the index case described.

Complications resulting from skin burns generally are; bacterial infection and sepsis, hypovolaemia, hypothermia, formation of contractures and keloids, scar formation and limitation of movement in the affected area. With respect to this patient, the most likely health complication that will occur is scar formation since he improved remarkably

following medical intervention. Another work related complication that could occur is the number of days lost to injury, job loss and income loss.

Information on the hazardous characteristics of wet cement in the work-related and domestic environment is necessary. Controlling the hazard which occurs with cement is needed to reduce the risk of cement burns. The workplace should be a safe and healthy environment, it should not be wet, and any skin contact with wet cement or wet cement products should be limited. Adding fresh ferrous sulphate decreases the amount of water-soluble chromate in cement.

### **PHYSICIANS RESPONSIBILITY TO REPORT**

It is important to investigate and report incidents of patients who present to the hospital following an adverse occupational exposure. This is to ensure that other workers are not at risk or predisposed to the same exposure leading to the incident. In the index case, a visit to the construction site indicated that no effort was put in place to improve the working conditions of the workers. Neither did they have plans of hiring professional workers for the job. A few workers had similar experiences in the past but felt it was their responsibility cater for their own health needs and did not report the incident.

Physicians suspecting undesirable hazards in the workplace should inform the government occupational health service operating in the area, since employees are categorised under the authority of their territorial government agency, which has its own occupational health and safety laws.

### **CASE MANAGEMENT TEAM AND ITS PERFORMANCE**

The attending physician carried out his responsibilities accordingly, even though no skin patch test was done. He also invited the occupational health team in the hospital based on the fact that the company was initially

unwilling to take financial responsibilities for the case. He invited the occupational health team to carry out job rehabilitation counseling for the patient. The occupational health team on their part did a proper history taking from the patient with respect to his occupation, carried out a work site visit, discussed with the management team of the construction company, and interviewed other workers on site before inviting the government representative to enforce the law on the company, compelling them to take responsibility for the workers medical bills. Therefore the performance of the case management team was efficient enough to help the employee promptly.

### **ABSENCE MANAGEMENT POLICIES**

Sickness absence can be described as any absence from work ascribed to ill health or injury and established as such by the employer. Sickness absence from work is frequently inevitable, but when excessively prolonged it is not economical and harmful to individuals and their families, employers and our wider society. The Chartered Institute of Personnel and Development (CIPD) yearly survey for 2012 stated that the cost of sickness absence for a worker is £600. This gives an average annual loss of 6.8 working days per employee. Altogether, approximately 131 million days were lost to sickness absence across the UK in 2011.

Absence management policies explain procedures that are carried out by the employer when the employee cannot be present at work as a result of ill health. It gives information on how payments should be made during sickness absence and states the roles and responsibility to the employees, the employers, and the occupational health physician. Procedures on how an employee should report a sickness absence are stated.

The construction company where the patient worked had an absence management policy, but claimed it was for only the staff workers and not for contract workers. Apparently no information concerning who is responsible for

medical bill if a worker falls ill was passed to the patient. The occupational health physician was obliged to bring in the occupational and environmental health doctor from the state government who stated the legal implications that the company might be faced with to compel them to pay for the emoloyee's medical bills. Therefore following the absence management policy was not an easy task especially for the company.

### **PATIENT'S FINAL OUTCOME AND SATISFACTORY STATUS OF ALL PARTIES INVOLVED**

The final outcome of the patient was a stable clinical state and the presence of a scar on the affected lower limb. His medical bills were paid by the construction company, but because no statutory sick pay covers contract workers in the company, the patient was not paid for the period he was not at work. The construction company was satisfied with paying the medical bills after being advised about the legal implications they would face for not taking responsibility concerning adverse events to workers while on duty in their organization. The occupational health unit carried out their duties appropriately and advised the construction company concerning statutory sick pay and creation of absence management policies for the contract staff since they may face adverse health events as a result of the job.

### **CONCLUSION**

In conclusion, implementation of sickness absence policies and other occupational health legislations especially in small and medium scale construction companies in Nigeria should be enforced to secure the health and safety of the workers who are not usually aware of risk associated with the jobs they do especially those workers who have little or no experience in the job.

There is also under reporting of the incidence of cement burn among construction workers, this should be encouraged and records should be kept by companies to generate baseline data for health surveillance.

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