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An Evaluation of Sick Building Syndrome in Some Financial Institution in Zamfara State

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ABSTRACT:

The paper examines the causes and effects of sick buildings in some financial institution in zamfara state. The data for the study were generated from two bank in zamfara state. Survey research was adopted in sourcing information for the study. A sample size of fifty (50) people was chosen for the study while simple random sampling technique was used in selecting the fifty samples. Questionnaires were administered to the fifty samples while forty-five correctly filled and returned, questionnaires were used for data analysis. The data collected were presented in tables and bar charts, while frequencies and chi-square test were used for data analysis. The following findings were made after data analysis. Occupants' activities affect the indoor air quality of the building and therefore result to sick building syndrome. The major causes of sick building syndrome include little air, stuffy, cold, dim and unpleasant odour (perfumes and smoke) in the working environment. The identified major effects of sick building syndrome are health impaired symptoms like sore throat, skin dryness, headache, drowsiness and running nose. It is therefore recommended that occupants' education on the subject will be the best remedy to this occurrence.

INTRODUCTION:

The term "sick building syndrome" (SBS) is used to describe situation in which building occupants experience acute health and comfort effects that appears to be linked to time spend in a building, but no specific illness or cause can be identified. The complaints may be localized in a particular room or zone or may be widespread throughout the building. In contrast, the term "building related illness" (BRI,) is used when symptoms of diagnosable illness are identified and can be attributed directly to airborne building contaminants.

A 1984 world health organization committee report suggested that up to 30% of new and remodeled building worldwide may be subject of excessive complaints related to indoor air quality (IAQ). Often this condition is temporary, but some buildings have long- term problems. Frequently, problem result when a building is operated or maintained in a manner that is inconsistent with its original design or prescribed operating procedures. Sometime air problems are a result of poor building or design or occupants activities.

The building occupants complaint of symptoms associated with acute discomfort, e.g. headaches, eye, nose, or throat irritation: dry cough: dry or itchy: skin: dizziness: and nausea: difficulty in concentration: fatigue: and sensitive to odours, most of complaints report relief soon after leaving the building ,symptoms are temporary related to time spent in a particular building, symptoms recur seasonally (heating/cooling). Co-workers have noted similar complaints. These symptoms are the indicator of sick building syndromes, the syndromes reduce workers' productivity and may also increase absenteeism including sick leave. It is important to note that complaint may also result from other causes. These may include an illness contacted outside the building acute sensitivity (e.g. to allergies), job related stress or dissatisfaction and other psychological factor.

Not everyone who work in a sick building will become sick, as the whole population does not succumb to a bout of the flu during an epidemic. There are many factors that determine a person's physical response to environment, although the response in sick building syndrome is rarely so severe that the person needs to take sick leave.

Causes of Sick Building Syndromes

Despite numerous investigation, journal articles and conferences, little has actually been proven about the causes of sick building syndrome. Different experts have different theories-some say the main cause is chemicals, others that fungi are primary to blame, or physical factors such as humidity, temperature or lighting, or the air conditioning system itself.

In the USA, investigations carried out up to the end of 1983 by the National Institute for Occupational Safety and Health (NIOSH), a governmental organization, showed inadequate ventilation" to be the causal factor in about half of buildings with health complaints. Inadequate ventilation was often given as the cause when no other, more precise, cause, could be found.

What is certain is that symptoms are more common in buildings with air-conditioning or mechanical ventilation.

Airborne pollutant

Nearly everything we use sheds particles or given off gases, particularly when new. People shed dead skin and hair all the time. Clothing, furnishings, curtains, carpets etc., contribute fumes, fibers and other fragments. Cleaning processes such as sweeping, vacuuming and dusting may remove the larger particles but often increases the level of smaller, respirable, particles in the air. Chemicals used for cleaning are often toxic, and office supplies and equipment may also give off harmful chemicals.

Buildings are complex environments which can trap and concentrate pollutants as well as generate them. Outside pollutants find their way into the buildings through air intakes and inadequate filtering systems. As long as ample ventilation ensures a constant supply of fresh air, indoor pollution problems may be kept to a minimum. But general ventilation is often inadequate and office equipment may have no local exhaust system venting fumes to the outside.buildings through air intakes and inadeq9uate filtering systems. As long as ample ventilation ensures a constant supply of fresh air, indoor pollution problems may be kept to a minimum. But general ventilation is often inadequate and office equipment may have no local exhaust system venting fumes to the outside.

The A-Z list below contains some of the more common pollutants that may be found inside buildings and is compile mainly from information supplied by the Queensland and Lacombe Workers Health Centre (1989) and the Northern Trade Union Health and Safety Centre. It is not an exhaust list of the many thousands of chemicals present in the environment.

When air monitoring for any of these substances is carried out, levels are likely to be below those considered to be 'acceptable' or 'safe'. However, little is known about the health effects of long-term exposure to low levels of a variety of chemicals and some are sensitive to extremely low concentration of toxic agents.

Ammonia

Cleaning solutions, blueprint machines (plan printer) and cigarette smoke are sources of ammonia. This gas irritates mucous membranes and so affects the respiratory system and eyes.

Benzene

This cancer-causing chemical is released from synthetic fibers and plastics, and is found in cleaning solutions and tobacco smoke. It damages the central nervous system and skin, and causes respiratory irritation.

Carbon monoxide

Any process of combustion can produce carbon monoxide, so this gas is produced by tobacco smoking, gas cookers, and gas or oil heaters. We all exhale a small amount of carbon monoxide in our breath. A major source of carbon monoxide is vehicle exhaust fumes.

Detergent dust

Detergent residue from carpet cleaning may cause respiratory irritation such as cough, dry throat, breathing difficulty, nasal congestion and headaches. Effects depend on the type of detergent used and its formulation.

Fiberglass

Fiberglass is used for insulation. Large fibers can cause itching and skin irritation; smaller fibers are suspected of causing lung diseases and cancer in a manner similar to asbestos.

Hydrogen chloride

Hydrogen chloride is emitted by electronic stencil-cutting machines. It irritate the mucous membranes of eye, nose and throat

Methanol (methyl alcohol)

Methanol is used in spirit duplicating machines, and causes irritation to the eyes, respiratory system and skin.

Nitrogen

Like carbon monoxide, nitrogen oxides are produced as products of combustion, so sources include vehicle exhaust, tobacco smoke and gas heaters. These chemicals cause irritation to the respiratory system and eyes.

Ozone

Ozone is naturally present in the air since it is produced from oxygen by ultraviolet radiation. However, it can also be produced by electrical discharges and it's emitted by some items of electrical equipment such as photocopiers and electrostatic (devices used to clean the air by removing dust). A single photocopying machine can produced more than 0.1 parts per million (ppm), which is the recommended limit for exposure to ozone in the UK and Australia.

Paint

Paint fumes, depending on the formulation, nay cause headache and irritation to the eyes and respiratory system, damage to the nervous and reproductive systems, and kidney and bone marrow injury at high exposure levels.

Radon

Radon is a decay product of uranium and is present in varying amounts in the soil. It moves from the soil by diffusion into the soils air pockets and into soil water, from where it can migrate through building foundation cracks etc., into the indoor space. Building materials such as concrete and stone may also contain radon. Out-gassing from these materials, and from radon in the water supply, adds to the indoor air levels drive primarily from the soil below the building.

Sterilant gases

Gases such as ethylene oxide are sometimes used in an attempt to sterilize humidification and air-conditioning systems. The effects will depend on the gas used, and may range from irritation of mucous membranes to cancer, such gases should not be used

Tobacco smoke

Cigarette smoking is a considerable source of airborne contamination. Amongst other things, tobacco smoke contain carbon monoxide, carbon dioxide, nicotine, formaldehyde, acrolein (a strong irritant), ammonia, hydrogencyanide, nitrogen oxides, coal tars and particulates. Many of these substances

have toxic or irritant properties causing symptoms similar to those of sick building syndrome – eye and nose irritation, coughing, breathing difficulties, sore throat and hoarseness, headache, nausea and dizziness-in both smokers and non-smokers. The long-term effects of smoking include lung cancer and heart disease.

Solution to Sick Building Syndrome

Pollutant source removal or modification

Is an effective approach to resolving an IAQ problem when source are known and control is feasible. Example include routine maintenance of HVAC system, e.g. periodic cleaning or replacement of filters, replacement of water stained ceiling tile and carpeting, institution of smoking restriction , venting contaminant source emission to the outdoor; storage and use of paint, adhesive, solvent and pesticides in well ventilated areas, and used of these pollutant source during period of non-occupancy; and allowing time for building materials in new or remodeled areas to off-gas pollutant before occupancy. Several of these option may be exercise at one time.

Increasing ventilation rate

Air distribution often can be a cost effective means of reducing indoor pollutant levels; HVAC system should be design , at a minimum, to meet ventilation standards in local building codes, however, many system are not operated or maintained to ensure that design ventilated rates are provided. IAQ can be improved by operating the HAVC system to at least its design standard, and to ASHRAE, standard 62-1089if possible, when there are strong pollutant source, local exhaust ventilation may be appropriate to exhaust contaminated air directly from the building. Local exhaust ventilation is particularly recommended to remove pollutants that accumulate in specific areas such as rest rooms, copy rooms, and printing facilities.

Air cleaning

Can be useful adjunct to source control and ventilation but has certain limitations. Particle control devices such as the typical furnace filter are inexpensive but do not effectively capture small particles, high performance air filter capture the small, respirable particles but are relatively expensive to install and operate. Mechanical filters do not remove gaseous pollutants may be absorbent beds, but these devices can be expensive and require frequent replacement of the adsorbent material. In some air cleaners can be useful, but have limited application.

Education and communication

Are important elements in both remedial and preventive indoor air quality management programs. When building occupants, management and maintenance fully communicate and understand the causes and consequence of IAQ problem, they can work more effectively together to prevent problems from occurring, or to solve them if they can do.

METHODOLOGY

The study adopted the survey research approach using unity and access bank in Gusau Zamfara state as case studies. The staff of the two banks form the population of the study. A sample size of fifty (50) was chosen using the Yaro Yamamis model, while simple random sampling technique was used to select the fifty (50) samples (i.e. twenty five from each bank

Questionnaires were however distributed to the fifty respondents and structured to contain four parts namely

- subjective evaluation of the working environment.
- the health impaired symptoms noticed while in the building
- workers degree of control over their working environment and evaluation of occupants activities.

Data retrieved from forty five (45) respondents or 90% of the samples were subsequently presented in tables and bar charts while frequencies were used to analyzed and answer the research questions. The hypothesis of this study postulates that occupants' activities have significant effect toward indoor air quality. The data collected were subjected to inferential statistical test using chi-square technique.

The details of questionnaires distribution is as shown in table 1 below.

Table 1: Questionnaire Distribution

Bank workers	Unity Bank Gusau			Access Bank Gusau		
	No. Distributed	No Returned	%	No Distributed	No Returned	%
	25	24	92%	25	22	88%

Source: field survey (2021)

Data presentation and analysis

The data obtained from the study were presented in tables on bar charts while frequencies were used to analyze and answer the research questions. This was to enable the result to be properly evaluated and understood.

Subjective Evaluation of Working Environment

Do you experience the following conditions in your working environment? Please tick (V) where appropriate.

Table 2: Response on subjective evaluation of working environment (unity and Access bank)

Item	condition	Frequency of response			
		always	Often	sometime	never
A	Too little air	-	7	33	5
B	Too cold	10	20	15	2
C	stuffy	5	16	25	-
D	Too dim	15	20	10	-
E	Unpleasant odour	20	13	8	4

Source: field survey (2021)

From table 2 above, it could be seen that the respondents are subjected to different conditions in their working environment at varying degree. Most people (33 persons) are sometime subjected to too little air, some (20 persons) to too much cold, while others are subjected to stuffy, too dim and unpleasant odour sometimes, often and always respectively. This implies that the respondents are subjected to the conditions mention above in their working environment.

Health impaired symptoms

Do you experience any of the following complaints in your working place? Also, indicate if the problem is consistently, more common in the afternoon than in the morning by stating either YES or NO in the column provided.

Table 3: response on Health – Impaired Symptoms (Unity and Access Bank)

item	conditions	Frequency of Response				
		always	Often	sometimes	never	More common in the afternoon
A	Dry or sore throat	-	10	35	2	49
B	Skin dryness	15	20	10	2	42
C	Headaches	10	23	11	2	45
D	Drowsiness	-	30	12	3	46
E	Running nose	5	5	35	-	44

Source: field survey (2021)

Table 3 above shows that workers response to health impaired symptoms at different degrees. It could be seen that more people (33persons) experience dry or sore throat especially in the afternoon. Majority (20 persons) experience skin dryness more in the afternoon while most people (23 persons) experience headache, drowsiness (30 persons) and running nose (35 persons) more in the afternoon. This indicates that workers in the study area are actually subjected to health impaired symptoms.

Degree of Control over Environment

To what extent do you have control over the following conditions in your working place?

Table 4: Response on the degree of control over working place –Unity and Access Bank.

Item	conditions	Frequency of Response				
		None	A little	Some	mostly	complete
A	Temperature	-	-	-	7	38
B	Ventilation	-	35	2	6	2
C	Humidity	-	36	5	6	-
D	Lighting	-	5	23	12	5
E	Noise	-	34	10	1	-

Source: field survey (2021)

Table 4 above shows that workers in the study area have different degree of control over some condition in their working environment. Respondents (38 people) have complete control over temperature while most of them have little control over ventilation, humidity, lighting and noise. This includes that most of them do not have absolute control on some of these conditions.

Evaluation of Occupant Activities

How often do you react to the following (perfume and smoking)

Table 5: Response on occupants' reaction to perfume

	Frequency of Response				
	Always	Often	Sometimes	Never	Freq. Total
Unity	2	2	8	3	15
Access	1	2	6	1	10

Source: field survey (2021)

Table 6: Response on Occupants to Smoking

	Frequency of Response				
	Always	Often	sometimes	Never	Freq. Total
Unity	2	4	2	4	11
Access	3	1	3	2	4

Source: field survey (2021)

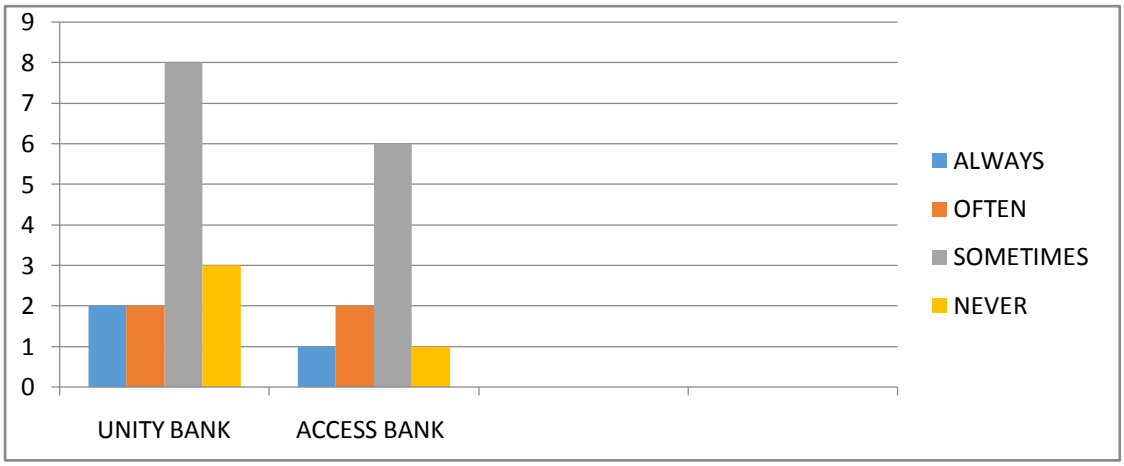

Fig 1: Multiple Bar Charts for Presentation of Response to Reaction to Perfume

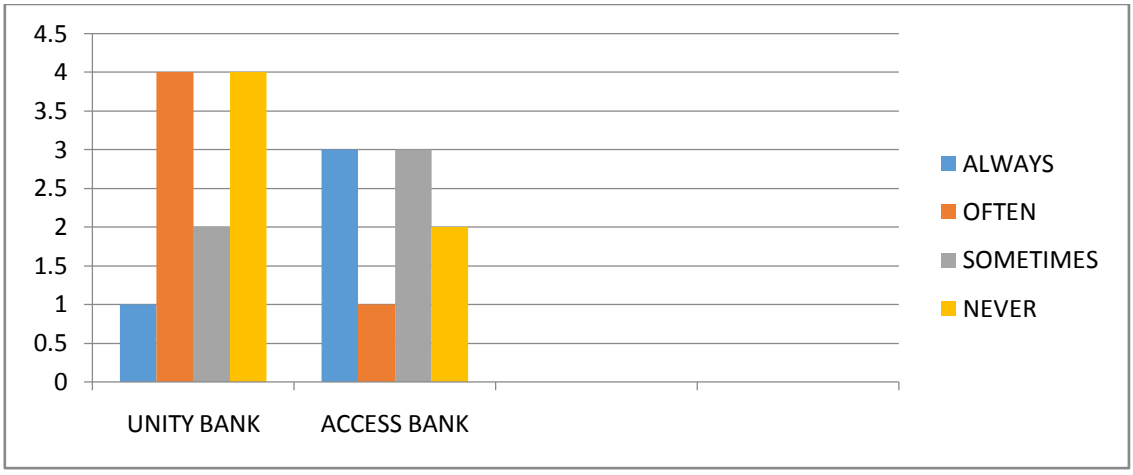

Fig 2: Multiple Bar Charts for Response to Reaction to Smoking

The entire hypothesis for the study were stated in Null (Ho) and Alternative (Hi) forms respectively. The statistical tool used was Chi-Square test statistics, it is a non –parametric statistical tools and is distributed free. This means that it can be used in the analysis of data of different population. So in this analysis, the two-way classification Chi-square contingency table was employed.

Hypothesis

Ho: Occupants activities have significant effect towards indoor air quality

Hi: Occupants activities have no significant effect towards indoor air quality.

Table 7: Grouped response on occupant activities towards indoor air quality

Bank	Effect	No effect	Total
Unity	19	7	26
Access	16	3	19
Total	35	10	45

Source: fields survey (2021)

Level of significance 5%
Expected values (eij) is computed as

$e_{ij} = \frac{\text{Row total x column total}}{\text{Grand total}}$

$e_{11} = \frac{26 \times 35}{45} = 20.22$

$e_{12} = \frac{25 \times 10}{45} = 5.78$

$e_{21} = \frac{20 \times 35}{45} = 14.22$

$e_{22} = \frac{20 \times 10}{45} = 4.22$

Table 8: a 2 x 2 contingency table on grouped response on occupant activities toward air quality.

Bank	Effect	No effect	Total
Unity	19(20.33)	6(5.56)	25
Access	16(15.56)	4(4.44)	20
Total	35	10	45

Source: field survey (2021)

$\frac{(19-20.22)^2}{20.22} + \frac{(6-5.56)^2}{5.56} + \frac{6}{15.56} + \frac{(4-4.44)^2}{4.44} = 0.007+0.01+0.03+0.04 = 0.15$

Table 8 above indicates that x^2 calculated 0.15 is less than x^2 table value 3.84.This shows that the null hypothesis is accepted showing that occupants activities have significant effect on indoor air quality.

Conclusion and Recommendation

It is inferred from the data that occupant activities affects the indoor air quality of the building and therefore result to sick building syndrome. This inference agree with the fact stated by the USA, investigation at the end of 1983 by the National Institute for Occupational Safety and Health, that indoor air quality could make a building sick. A closer look at the data analyzed shows that the major causes of sick building syndrome include: little air, cold, stuffy, dim and unpleasant odour (perfumes and smoke) in the working environment.

The identified major effects of sick building syndrome are health impaired symptoms like sore throat,skindryness, headaches, drowsiness and nausea. It was however discovered that certain conditions like ventilation, humidity, lighting and noise cannot be controlled by occupants of the building and these result to sick building syndrome.

It is therefore recommended that occupants' education on the subject matter is necessary so as to reduce their activities and how they relate to the indoor health of the building. If this is done, occupants will resort to milder perfumes and avoid smoking just before getting into public buildings.

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