

SPATIAL SICK BUILDING SYNDROME CONTROL AND MANIFESTATIONS OF HEALTH CONDITIONS AMONG PEOPLE IN BUILDINGS IN ADAMAWA STATE

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Abstract

The purpose of this study is to determine the cause, symptoms and remedy of sick building syndrome among people of Adamawa State. The problem of the study is that, sick building syndrome among occupants of buildings is misconceived and attributed to other causes other than the building itself; instead of the person affected to get some relieve the condition gets worse under symptomatic treatments. The building due to some notable factors develops some harmful pathogens and emits some volatile organic compounds which affect unsuspected occupants who may seek medical care and remain in the building. Three specific objectives and research questions were formulated to guide the study. A descriptive survey research was used for the study; the area of the study is Adamawa State, in North Eastern Nigeria. The population of the study was made up of 20 Professional Estate developers and 30 Professional builders in the area of the study. Therefore, a sample size of 50 respondents was sampled using simple random sampling technique. A 26 items structured questionnaire which featured on tables 1, 2 and 3 were developed by the researcher and was utilized for the collection of data from the respondents. The structured questionnaire was on four point scale of Agree (A=4), Strongly Agree (SA=3), Disagree (D=2) and Strongly Disagree (SD=1). The instrument was validated by three experts in Modibbo Adama University, Yola. The number of instrument administered to the respondents were 51 copies with the help of research assistants' Out of which 50 copies were retrieved representing 95 percent. The reliability coefficient of the instrument was found to be 0.87 using Cronback Alpha formula after trial test on population other than that of the area of the study. Mean and standard deviation was used for the analysis of data. The decision rule was that any mean above 2.50 regarded as agree and any below 2.50 was regarded as disagree. The three hypotheses were tested using t-test at 0.05 significance level. The hypothesis was accepted when the value of t-calculated was less than the t-table value for the given degree of freedom. One among the findings is that the symptom of sick building syndrome presents itself in feelings of tiredness, headache, nausea, nose bleeding, lack of concentration suffocation, irritation of eyes and nose among others. One of the recommendations made was that; Buildings should always have a quality indoor air, free from chemical substances, toxic volatile Organic Compounds, have adequate oxygen circulation, well ventilated, regularly maintained parts; prevent the entry of monoxide from power source and avoid dampness in the building.

Keyword: Spatial Sick Building, Syndrome, Manifestations, Health Conditions, Adamawa State

Introduction

Homby (2015) defines sick building syndrome as a condition that affects people who work in homes and large offices, while Justus (2020) refers to sick building (SBS) as a term used to describe a situation in which the occupants of a building experience some acute health conditions or comfort related effects that seem to be linked directly to the time spent in the building, no specific illness or cause can be identified. In the same vein Jambe (2020) referred to sick building as a condition in which people develop symptoms of illness or become infected with chronic disease from the building in which they work and live inside.

Sick building according to David (2020) makes the occupants of a building feel tiered; head ache, have sore eyes and may even experience breathing difficulties. It is mostly thought to be caused by, for example the lack of fresh air or by chemicals in the air. It is obvious, directly or indirectly, some health conditions among people may results from the way they use the building accommodation to make the atmosphere conducive for habitation. Sometime the atmosphere may be too cold which will require warmth or too hot to require making it cool. When the room is cold it requires room heater and while warming the room the openings are kept tight. When the room condition is hot the cooling system is employed the openings are sealed tightly. The process of tightening the openings to maintain warmth or cool condition and does not allow fresh air from entering the room can be a factor for determining the cause of sick building.

The scenario of sealing up premises tightly was observed by James (2014) when he said, the health problems known as sick building syndrome stems from what was originally conceived as worthwhile Couse saving money on fuel to power Heating, Ventilation and Cooling System (HVCS). This was accomplished by sealing the premises up tightly, unfortunately the same process that does not allow heated and cooled air to escape also prevent fresh air from entering the room. In trying to condition the room atmosphere by sealing it results to circulation of all kinds of harmful substances which becomes concentrated inside the building making the indoor air quality very poor. In clear corroborative statement, Sodania (2019) referred to sick building as poor indoor air quality which is most common in workplaces such as high raised offices and even houses.

According to Mills (2000) the symptoms of sick building syndrome in most cases is attributed to other causes other than the building itself. Sometimes people dismiss it as nothing serious but as the condition persists the symptoms also persist. It was reported by Justus (2020) in his investigative study on sick building syndrome that some symptoms such as fatigue, dizziness, headache and suffocation among others were the common symptoms of the syndrome. Moses(2002) recommend a change of environment for a while to prove beyond reasonable doubt that sick building syndrome is responsible for the symptoms, after close observation if there is relief in the usual symptoms in a new environment then sick building syndrome should be suspected.

Problem of the Study

Sick building syndrome has always been attributed to some causes and solution is often sought for through the usual medical process, some people overlook the situation considering it as some of those casual health conditions that can be abated over a while. The condition may often persist hence the cause is always associated with the building of residence. If care is not taken to discover the cause and handled carefully, it may result to resistance ill health which may not be easily understood. Therefore, this study is determined to sensitize the public on the existence of sick building syndrome and proffer solution on how to avoid sick building syndrome in buildings.

Purpose of the study

The general purpose of the study is to determine the cause, symptoms and solutions to sick building syndrome on people in building accommodations, the following are the specifically objectives of the study.

The study sought to:

1. determine the cause of sick building syndrome on people in building accommodations
2. determine the symptoms of sick building syndrome on people in building accommodations
3. determine the solutions to sick building syndrome on people in building accommodations

Research Questions

The following research questions were raised to guide the study.

1. What is the cause of sick building syndrome on people in building accommodations?
2. What is the symptoms of sick building syndrome on people in building accommodations?
3. What is the solution to sick building syndrome in buildings?

Hypothesis

The following null hypotheses were formulated and tested at 0.05 level of significance.

H₀₁: There is no significant difference in the mean responses of Estate managers and Professional Builders on the cause of sick building syndrome.

H₀₂: There is no significant difference in the mean responses of Estate managers and Professional Builders on the symptoms of sick building syndrome.

H₀₃: There is no significant difference in the mean responses of Estate managers and Professional Builders on the solutions to sick building syndrome.

Methodology

A descriptive survey research design was adopted for the study. The area of the study was North Eastern Nigeria. The targeted Population for the study was Professional Estate managers and Professional Builders. A sample size of 50 respondents was sampled using simple random sampling techniques which comprises of 20 Estate managers, and 30 Builders were used for the study. A 26 items structured questionnaire which featured on tables 1,2,and 3 was developed by the researcher which was utilized for collecting data from

the respondents. All sections of the structured questionnaire were structured on a four-point scale of Strongly Agree (A)=4, Agree (SA)=3, Disagree (D)=2 and Strongly Disagree (SD)=1

The validation of the instrument was done by three experts, in Modibbo Adama University, Yola. The number of instruments administered to the respondents was 53 copies with the help of two research assistants out of which 50 copies representing 95 percent were returned. The reliability coefficient of the instrument was found to be 0.85 using Cronbach Alpher formula after a trial test on respondents drawn from different population other than the area of study. Mean and standard deviation was used for data analysis. The decision rule for the analysis was that, any mean score above 2.50 was regarded as agree while the mean below 2.50 was disagree, while t-test statistic was used to test the null hypothesis at 0.05 level of significance. The hypothesis was accepted when the value of t-calculated is less than the t-table value for the given degree of freedom.

Results and Discussion

The research questions were answered using mean and standard deviation while the hypotheses were tested using independent sample t – test.

Research Question 1. What is the cause of sick building syndrome on people in building accommodations?

Table 1. Causes of sick building syndrome on people in building accommodations.

S/n	Items	X EM	SD	X PB	SD	Remarks
1	Poor indoor air quality	3.61	0.40	3.68	0.45	Agree
2	Presence of chemical substances imitate by room conditioners	3.75	0.50	3.62	0.47	Agree
3	Emission of toxic Volatile Organic Compounds (VPC) by some building materials	3.75	0.42	3.65	0.51	Agree
4	Lack of adequate fresh air circulation due to tightly sealed rooms	3.64	0.45	3.68	0.53	Agree
5	Frequent Breathing of moist laden air with pathogens; bacteria and fungi which tends to develop in dampness	3.75	0.47	3.64	0.54	Agree
6	Carbon mono oxide from stand by power source	3.68	0.42	3.72	0.45	Agree
7	Leaks in parts of the building	3.63	0.48	3.66	0.49	Agree
8	Lack of regular maintenance vents and intake of conditioners	3.60	0.49	3.64	0.46	Agree
	Grand Mean	3.67	0.45	3.20	0.48	Agree

KEY: XEM=Mean of Estate Managers, XPB=Mean of Professional Builders, SD=Standard deviation

Table 1, reveals the mean responses of Estate managers and Professional Builders on the 8 items posed to determine the causes of sick building with the grand mean of 3.67 and 3.20 which is above the decision rule of 2.50 implies that the respondents agree with all the items as symptoms of sick building. The standard

deviation also ranges between 0.40-0.51 which shows positive indication that the opinion of the respondents are not far from the mean and close to one another.

Research Question 2 What is the symptoms of sick building syndrome on people in building accommodations?

Table 2. Symptoms of sick building syndrome on people

S/n	Items	X EM	SD	X PB	SD	Remarks
1	Breathlessness	3.75	0.75	3.61	0.56	Agree
2	Fatigue	3.75	0.75	3.44	0.58	Agree
3	Head ache	3.68	0.68	3.54	0.49	Agree
4	Lack of concentration	3.64	0.45	3.72	0.65	Agree
5	Feeling of nausea	3.65	0.65	3.73	0.67	Agree
6	Nose bleeding	3.74	0.55	3.34	0.49	Agree
7	Irritation in the eyes and nose	3.68	0.61	3.45	0.69	Agree
8	Suffocation	3.64	0.65	3.56	0.48	Agree
9	Tremor	3.68	0.53	3.72	0.54	Agree
10	Swollen ankles	3.65	0.45	3.59	0.65	Agree
	Grand Mean	3.68	0.60	3.59	0.62	

KEY: XEM=Mean of Estate Managers, XPB=Mean of Professional Builders SD=Standard Deviation

Table 2 shows the mean responses on the symptoms of sick building syndrome which ranges between 3.34-3.75 and a grand mean 3.68 and 3.59, this indicates that the respondents agree that the 10 items presented are symptoms of sick building syndrome. The standard deviation ranges between 0.45-0.75 which shows that there is a little deviation from the mean which indicate that the opinions of the respondents are not far from one another. Generally, the result shows that the 10 items on table 2 are symptoms of sick building syndrome which is above the 2.50 decision rule.

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Research Question 3. What is the solution to sick building syndrome in buildings?

Table 3. Solutions to Sick Building Syndrome in buildings

S/no	Items	X EM	SD	X PB	SD	Remarks
1	Adequate ventilation via heating or cooling systems	3.75	0.76	3.67	0.56	Agree
2	Regular maintenance of system ductworks, intake vents and replacement of ductwork filters	3.72	0.73	3.68	0.58	Agree
3	Avoid furnishing materials that contain volatile organic compounds by cleaning supplies, eg. Paints, synthetic fiber upholstery etc.	3.68	0.63	3.77	0.49	Agree
4	Avoid indoor combustion appliances that may contribute carbon monoxide gas in the air	3.65	0.74	3.56	0.65 0.46	Agree
5	Avoid dampness in buildings which add to the potent brew alleges and pathogens, eg mold, bacteria, fungi and viruses.	3.69	0.66	3.69	0.67	Agree
6	Relocation to another facility	3.65	0.54	3.56	0.49	Agree
7	Sill all possible avenues for leaks in the building	3.74	0.65	3.54	0.69	Agree
8	Install CO Monitors to check for dangerous levels of carbon monoxide in buildings	3.66	0.56	3.53	0.48	Agree
Grand Mean		3.69	0.65	3.62	0.63	

KEY:XEM=Mean of Estate Managers, XPB=Mean of Professional Builders SD=Standard Deviation

Table 3 shows the mean responses of Estate Managers and Professional Builders on the solutions to sick building syndrome which ranges between 3.54-3.77 and a grand mean of 3.69 for Estate Managers and 3.62 For Professional Builders. The mean of which is above the 2.50 decision rule. This indicates that the respondents agree that the 8 items presented are solutions to sick building syndrome. The standard deviation ranges between 0.46-0.76 which shows that there is a little deviation from the mean which indicate that the opinions of the respondents are not far from one another. Generally, the result shows that solutions to sick building syndrome are tenable using the presented items.

Hypothesis 1

There is no significant difference in the mean responses of Estate managers and Professional Builders on the cause of sick building syndrome.

Table 4. t-test analysis of the Responses of Estate managers and Builders on the causes of sick building syndrome

Group	N	Mean	SD	df	t-cal	t-crit	Decision
Estate Managers	20	3.67	0.45	48	0.48	1.02	Accepted
Professional Builders	30	3.20	0.48				

Table 4, shows the calculated t- value of 0.48 and t-critical value of 1.02 at 48 degrees of freedom (df). Since the t-calculated is less than t-critical it shows that there is no significant difference in the opinions of the Estate Managers and Professional Builders, the Hypothesis is therefore accepted.

Hypothesis 2

There is no significant difference in the mean responses of Estate managers and Professional Builders on the symptoms of sick building syndrome.

Table 5. t-test analysis of the Responses of Estate managers and Builders on the symptoms of sick building syndrome

Group	N	Mean	SD	df	t-cal	t-crit	Decision
Estate managers	20	3.68	0.60	49	0.46	1.04	Accepted
Professional Builders	30	3.59	0.62				

Table 5, shows the calculated t- value of 0.48 and t-critical value of 1.02 at 48 degrees of freedom (df). Since the t-calculated is less than t-critical it shows that there is no significant difference in the opinions of the respondents on the symptoms of sick building syndrome.

Hypothesis 3

There is no significant difference in the mean responses of Estate managers and Professional Builders on the solutions to sick building syndrome.

Table 6. t-test analysis of the Responses of Estate managers and Builders on the solutions of sick

Group	N	Mean	SD	df	t-cal	t-crit	Decision
Estate managers	20	3.69	0.65	49	0.47	1.03	Accepted
Professional Builders	30	3.62	0.63				

Table 6, shows the calculated t- value of 0.48 and t-critical value of 1.02 at 48 degrees of freedom (df). Since the t-calculated is less than t-critical it shows that there is no significant difference in the opinions of the Estate Managers and Professional Builders on the solutions to sick building syndrome.

Summary of Findings

The following are the summery of the findings of the study:

1. It was found that the causes of sick building syndrome include: poor in-door air quality, presence of chemicals substances in the buildings, emission of toxic volatile organic compounds in buildings, inadequate air oxygen in the room, lack of ventilation, irregular maintenance, emission of monoxide from power source and persistent moist breathe.
2. It was found that the symptoms of sick building syndrome among others presents itself in feelings of tiredness, headache, nausea, nose bleeding, lack of concentration, suffocation, irritation and even breathlessness
3. To provide solution for sick building syndrome, provide adequate ventilation in buildings, Practice regular maintenance of buildings, install monoxide control to check carbon monoxide in the buildings, avoid material containing organic compounds, avoid indoor combustion emitting carbon monoxide, avoid dampness in the buildings and control leaks in parts of the building.
4. Significant difference does not exist in the mean responses of Estate managers and Professional Builders on the causes of sick building syndrome among people in buildings.
5. Significant difference does not exist in the mean responses of Estate managers and Professional Builders on the symptoms of sick building syndrome among people in buildings.
6. There is no significant difference in the mean responses of Estate managers and Professional Builders on the solutions to sick building syndrome among people in buildings.

Discussion of findings

Finding number one reveals that the causes of sick building syndrome include: poor in-door air quality, presence of chemicals substances in the buildings, emission of toxic volatile organic compounds in buildings, inadequate oxygen in the building, lack of ventilation, irregular maintenance of the building parts, emission of monoxide from power source and persistent moist breath in the building due to prevalence of moist air. The cause of sick building syndrome according to Jambe (2006) is always attributed to some factors other than the building itself, while Moses (2002) posited that sick building result from inadequate circulation of fresh oxygen in the building which results to suffocation of occupants. It was suggested by Bills (2007) that a change of environment for a period of time can be a reassuring confirmation for real cause of sick building syndrome.

Finding number two state that sick building present itself with a number of symptoms; which include the feelings of tiredness, headache, nausea, nose bleeding, lack of concentration, suffocation, irritation in

eyes, and breathlessness. According to Decker (2007) the symptoms of sick building syndrome has clear difference with the symptoms resulting from allergies and other common health conditions. In trying to distinguishing the symptoms of sick building from symptoms of other health conditions, he suggests a change of environment for some time. The symptom of sick building syndrome diminishes when the individual is away from the usual building, for example at another location or on a vocation, this should arouse suspiciousness that sick building syndrome might be behind the problem if the symptoms are abated in another location.

The third finding provide solution to sick building syndrome which include; adequate ventilation should be provided in buildings, buildings should be regularly maintained, install monoxide control device to check carbon monoxide in the building, avoid the use of building materials containing organic compounds, avoid indoor combustion emitting carbon monoxide, avoid dampness in the building, and control water leakages in any part of the building to avoid creating conducive atmosphere to brew allergies and pathogens, which develops damp areas.

It is critical to create consistent healthy atmosphere in the building to avoid the exposure to the symptoms of sick building syndrome. It is very necessary to ensure that there is adequate means of exchange of fresh and healthy indoor air even when the openings are tightly closed when conditioning the building (David 2020). Significant difference does not exist in the mean responses of Estate managers and Professional Builders on the causes, symptoms and solutions for sick building syndrome among people in buildings.

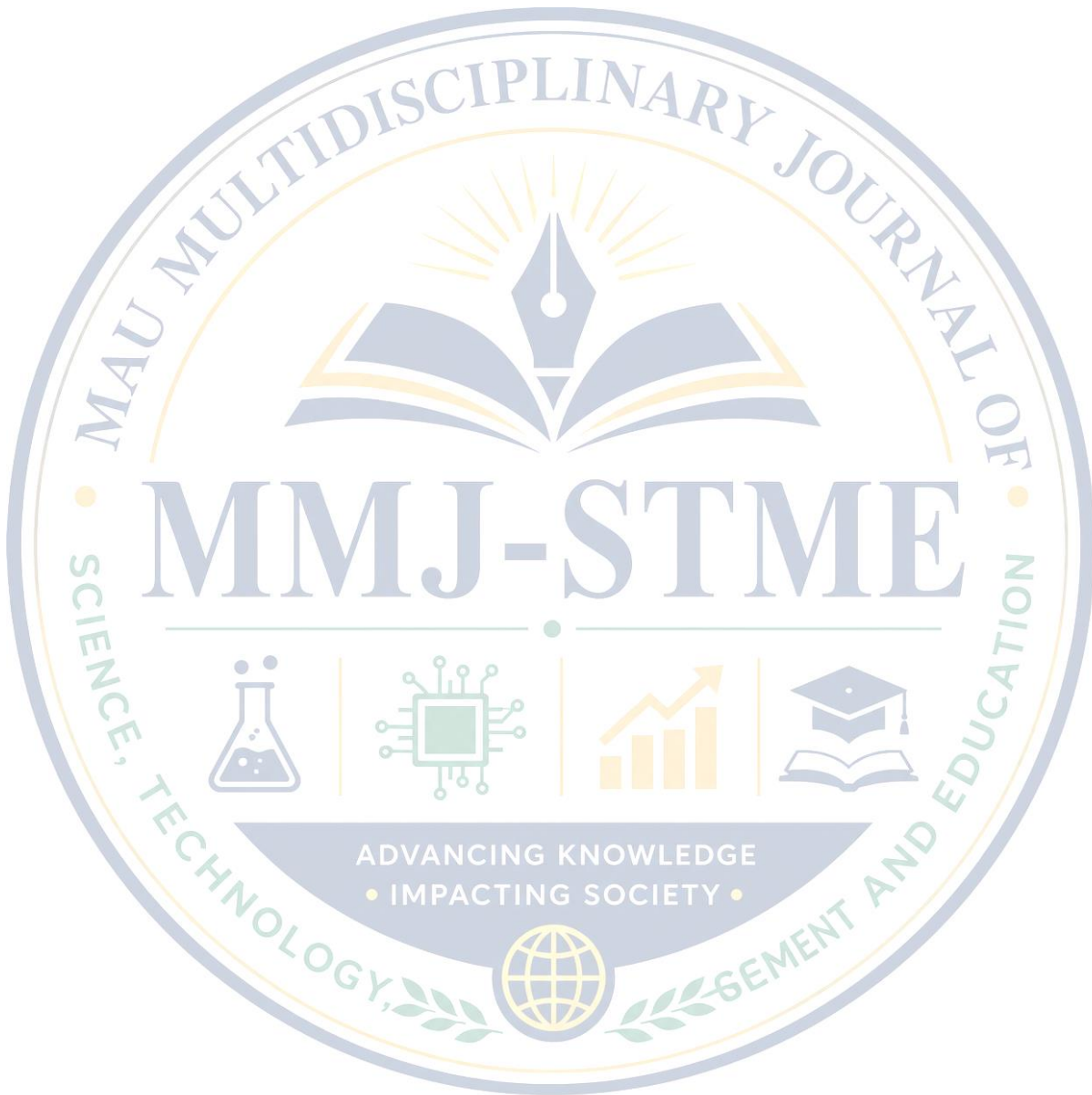
Conclusion

Sick building syndrome according to Monday (2020) is the effect of the condition of the building created by certain measures taken by occupants to condition the building for their comfort and by lack of care that might create an atmosphere conducive for the growth of harmful emissions and growth. It is therefore, Very essential to avoid all kinds of harmful substances from becoming concentrated inside the building by maintaining the building regularly, by ensuring that the building is adequately ventilated all the time.

Recommendations

1. Buildings should always have a quality indoor air, free from chemicals substances, free from toxic Volatile Organic Compounds, adequate oxygen, well ventilated, regularly maintained, control the emission of monoxide from power source and dampness which breed some pathogens.
2. Whenever sick building syndrome is suspected (where feelings of tiredness, headache, nausea, nose bleeding, lack of concentration, suffocation, irritation and even breathlessness) the individual should take a leave to stay away from that building.

3. Residential and office accommodation should have adequate ventilation, regular maintenance, install monoxide control to check carbon monoxide in the buildings, avoid material containing organic compounds, avoid indoor combustion emitting carbon monoxide, avoid dampness in the buildings and control leaks in parts of the building before using the building again.



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