

Sick Building Syndrome and Productivity of Building Users in South East, Nigeria

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Abstract— Humans spend about 90% of their time inside buildings. This time is mostly spent in residential and office buildings. However, it has been found that an increasing number of building occupants feel sick when in particular buildings but get relieved when they leave these buildings. This phenomenon is known as Sick Building Syndrome. Amongst other negative effects, Sick Building Syndrome causes a reduction in the productivity of people who work or live in these buildings. Loss of productivity due to Sick Building Syndrome cost as much as 60 billion US dollars annually. This is a very great loss. It is against this background that this paper examined how the incidence of Sick Building Syndrome affects the productivity of building occupants in office and residential environments as well as the maintenance culture practised in this two building types in the South East of Nigeria. Data were generated from questionnaires distributed to three hundred and eight occupants of the sampled buildings. Collated data were analyzed using tables, Simple Percentage, Frequency distribution and SPSS 21. Amongst others, the findings show that occupants of office buildings were more susceptible to the Sick Building Syndrome and as a consequence experiences a decline in productivity more than their counterparts in residential buildings, because those in offices observed less maintenance routines than those in residential buildings. Amongst others, the study recommended that building occupants should practice the maintenance culture established by this study for healthier buildings and increased productivity.

Keywords— Sick building syndrome, Sick building, Building, Productivity, Maintenance.

I. INTRODUCTION

Humans spend about 90% of their time inside buildings (Schwartz, 2008; Stylianos, 2014; Clements-Croome, 2014; Iyagba, 2005; Ahmadi and Behzadi, 2014; Chang, Yang, Wang and Li, 2015; Abdul-Wahab, 2011). This could either be in homes or in work buildings (Stylianos, 2014). In other words, many people use buildings for work or residence (Abdul-Wahab, 2011). This is the situation in Nigeria where building use is majorly for residence or for work (office).

It has been observed however that there is an increasing number of instances of building occupants complaining of a general feeling of being unwell or experiencing acute ill-health and discomforting effects that appear to be linked to time spent in a building (Ogunde, Amusan, Mosaku, Tunji-Olayeni, Obembe and Adekeye, 2015). In other words, there is an increasing number of reports of occupants feeling sick as a result of being in a building. Symptoms experienced by these occupants are usually associated with the respiratory or cerebral

system, tired eyes or dry skin, or musculoskeletal discomfort (Clements-Croome, 2014). This feeling of being unwell or sick with the attended symptoms could be experienced by occupants only when they are in a particular room, or irrespective of any part of the building where they are. In other words, this experience could be localized in a particular room or zone or widespread throughout the whole building (Ogunde *et al.*, 2015). However, the building occupants get relieved soon after leaving the building (Ogunoh, Okolie, Ezeokonkwo, and Ezeokoli, 2014). This phenomenon is known as the Sick Building Syndrome (hereafter referred to as SBS).

According to Brauer (2005), there is no general consensus on a definition of SBS. However, there is a general agreement among researchers that SBS describes a medical condition where people in a building suffer from symptoms of illness or feel unwell for no apparent reason with symptoms tending to increase in severity with the time they spend in the building, but improve over time or even disappear when they leave the building (Stylianos, 2014; Abdul-Wahab, 2011; Okolie and Adedeji, 2013). In this regard, a sick building is a building which at least 20% of its occupants suffer from the symptoms of SBS and get relief soon after leaving the building (Okolie & Adedeji, 2013). In other words, a building is said to be 'sick' if 20% of its occupants suffer from SBS. In this regard, not every time people complain about having symptoms similar to illness that they are actually sick. Sometimes, these symptoms are as a result of working in a sick room or building.

Among other negative effects, the incidence of SBS is a major cause of reduction in human productivity (Okolie and Adedeji, 2013). As a consequence, many office workers in Nigeria are not as productive as they should be. A research conducted in the US on 56 office buildings showed that 23% of the people who work in the offices have reported they experienced at least two symptoms associated with the SBS (Fisk, 2000; Stylianos, 2014). Similarly, a study performed in the UK on 4373 office workers in 46 buildings revealed that 29% of those studied experienced five or more of the characteristic symptoms of SBS (Ogunde *et al.*, 2015). In the two studies, it was found that the productivity of the affected workers was low due to SBS. In this regard, Stylianos (2014) estimated that the average cost of SBS due to the loss of productivity ranged between 50 -60 billion US dollars annually. This is a very great loss. It therefore becomes necessary to

investigate the relationship between incidence of SBS and building occupants' productivity in Nigeria, and also find out the relationship between incidence of SBS and the maintenance culture practiced in the sampled buildings, with a view to promoting a viable maintenance culture for healthier buildings and increased productivity.

SBS is not an entirely new idea. The study by Iyagba (2005) explored the menace of Sick buildings, its prevention and treatment. Ogunde *et al.* (2015) focused on the examination of some buildings for SBS to determine their effect on human health conditions with respect to the level of dangers that might be posed by them. The research by Okolie and Adedeji (2013) examined the factors underlying the outbreak of SBS in commercial Bank buildings within the Awka urban environment of Anambra State, Nigeria. The study conducted by Ahmadi, Golbabaie and Behzadi (2014) focused on observing the effect of SBS on the productivity of administrative staff. It is against this background that this study examined how SBS affected the productivity of building occupants as well as the maintenance culture practised in both the office environments and residential buildings in the South East of Nigeria, and established a viable maintenance culture for healthier buildings and increased productivity. In other words, unlike past studies which focused on SBB in office buildings, this study considered office as well as residential buildings.

II. REVIEW OF RELATED LITERATURE

2.1 Sick Building Syndrome

According to the Heating, Ventilating and Air Conditioning Manufacturers Association HEVAC (2000), SBS occurs when people in a particular building or part of it feel their health is being affected by the building's environment. In other words, it is the conditions in which the occupants of a building feel non-specific symptoms as a consequence of their continuous presence in a building (Stylianios, 2014). These non-specific symptoms according to the Health and Safety Executive HSE (2000) tend to increase in severity with time spent in the building and improve over time or disappear when occupants leave the building. In this vein, the study by Okolie and Adedeji (2013) believed that some conditions within buildings predispose occupants to SBS.

Indicators of SBS include building occupants' complaints of symptoms like headache, eye, nose and throat irritation, dizziness, nausea, difficulty in concentrating, fatigue amongst others (Ogunde *et al.*, 2015). However, Sundin (2012) warned that many of the SBS symptoms may be confused with other causes such as allergies that can be contracted from other sources, other illnesses, and discomfort at one's workplace, job-related stress or other psychosocial factors. The study therefore argued that one of the keys to diagnosing SBS is that the individuals' acute symptoms vanishes or decreases when they leave the building.

2.2 Effects of Sick Building Syndrome

SBS affects the health of building occupants, ranging from irritation and discomfort to disability or life threatening diseases (Ogunoh *et al.*, 2014), and if not detected and treated

early enough, could result to reduction in life expectancy ratio of urban residents (Ekhaese & Omohinmin, 2014).

According to a report by WHO (2006), up to 8% of the British working population regularly experience SBS symptoms to such an extent that the health and productivity of workers are seriously affected. Similarly, a report by Health & Safety Executive indicated that the syndrome causes half a million people in a year to take time off work (HEVAC, 2000; Ogunde *et al.*, 2015).

Apart from health hazard, SBS also leads to reduction in worker's productivity (Okolie and Adedeji, 2013; Sundin, 2012). In this regard, it has been estimated to cost approximately 3 billion US dollars in lost productivity annually in the United States (Ogunoh *et al.*, 2014). In Australia, SBS is estimated to cost industry several hundred millions of dollars every year due to lost productivity.

Another aspect of the effect of SBS is a medical legal battle between building owners, workers, tenants etc. in terms of not providing a safe working environment (Okolie & Adedeji, 2013). Other effects include increased staff turnover (Iyagba, 2005; HSE, 2000; Schwartz, 2008), increased absenteeism, employee sick leave applications (Sundin, 2012), low morale (Iyagba, 2005), extended breaks and reduced overtime, lost time complaining and dealing with complaints (HSE, 2000), employee sickness, low job satisfaction (Schwartz, 2008) and shut-down of operations (Salloum, 2015).

2.3 Symptoms of Sick Building Syndrome

There are so many symptoms of SBS. However, the following symptoms were found to be commonly associated with SBS from literature:

Symptoms	Source
Headaches	Sundin, 2012; Stylianios, 2014; Brauer, 2005; Ogunde <i>et al.</i> , 2015; WHO, 2006; Gomzi and Bobic, 2008; HSE, 2000
Fatigue or drowsiness	Brauer, 2005; Sundin, 2012; Stylianios, 2014; Okolie and Adedeji, 2013; Ogunde <i>et al.</i> , 2015; Chang <i>et al.</i> , 2015; Gomzi and Bobic, 2008
Nausea	Okolie and Adedeji, 2013; Sundin, 2012; Stylianios, 2014; Ogunde <i>et al.</i> , 2015; Gomzi and Bobic, 2008
Lethargy or Excessive tiredness	Sundin, 2012; Stylianios, 2014; WHO, 2006; HSE, 2000
Difficulty Concentrating	Okolie and Adedeji, 2013; Sundin, 2012; WHO, 2006; Ogunde <i>et al.</i> , 2015; HSE, 2000
Stuffy or Runny nose	HSE, 2000
Mental fatigue	Gomzi and Bobic, 2008
Dry or itchy eyes	Ogunde <i>et al.</i> , 2015
Dry or itchy throat	Ogunde <i>et al.</i> , 2015
Dry or itchy skin	Okolie and Adedeji, 2013; WHO, 2006

2.4 Contributing Factors and Causes of SBS

According to Okolie and Adedeji (2013), the United States Environmental Protection Agency listed four causes of SBS as: Inadequate Ventilation, Chemical Contaminants from outdoor sources, Chemical Contaminants from indoor sources, and Biological Contaminants. In their study, Ogunoh *et al.* (2014) argued that 50% of SBS problems are due to poorly designed, operated or maintained heating, ventilation and air conditioning systems (HVAC). However, the works by Iyagba (2005), and

Okolie and Adedeji (2013) indicated that lack of maintenance culture is one of the major causes of SBS. In this regard, Ogunoh *et al.* (2014) admitted that good maintenance routines are often the best way to prevent or reduce SBS, with simple maintenance routine such as cleaning of a building, suggested as a major factor in the prevention of SBS (HSE, 2000).

Other factors that can influence the prevalence of SBS include; use of Photocopiers and Computers (Iyagba, 2005), Noise (Schwartz, 2008), Female gender (Brauer, 2005; Gomzi & Bobic, 2008), Young age (Brauer, 2005) amongst others.

2.5 Sick Building Syndrome and Occupants' Productivity

For an organization to be successful and meet the necessary targets, Clements-Croome (2014) opined that the performance expressed by the productivity of its employees is of vital importance. In this regard, improving productivity is a major concern for any profit-oriented organization (Enshassi *et al.*, 2007). However, Stylianos (2014) argued that the prevalence of SBS may have an adverse influence on the productivity of workers.

2.6 Sick Building Syndrome and Building Maintenance

The study conducted by Ofori, Duodu and Bonney (2015) indicated that the maintenance of the built environment is very important, because it is on the state of homes, offices and factories that humans depend not only for comfort, but for economic survival. However, lack of regular maintenance can render a building and its auxiliary facilities and services unhealthy for living and drastically depress the quality of life (Olatunji, 2013).

There are indications that the savings made by reduced absenteeism, staff sickness and more efficient operation of the air-cooling or humidity control equipment, by far outweighed the cost of maintenance (HEVAC, 2000). Similarly, research by Clements-Croome and Li (2000) found that spending money on improving the work environment is the most cost effective way of improving productivity, because a small percentage increase in productivity of 0.1% to 2% can have dramatic effects on the profitability of the company. Therefore, the objective of a maintenance programme is to increase productivity of the organization and lower the maintenance cost of its operations (Iyagba, 2005).

2.7 Study Area

The study was confined to Abia and Imo states, which are two out of the five states in the South East geopolitical zone of Nigeria. The two states were studied for the South East geopolitical zone of Nigeria, because states in each geopolitical zones have similarity in location, culture, ethnic group, and history (Agbor and Ashabua, 2018) and going by the study by Salkind (2010) a small sample from a group can provide enough representation to the entire population if the group to be studied is fairly homogeneous on the characteristics of interest. In other words, if there are similarity among a large group, a small sample size could be used from the group. In this regard, studying the two states in the geopolitical zone can provide enough representation to the entire geopolitical zone.

Abia state has its capital in Umuahia and major city in Aba. With an area of 5,243.75Sq Km, the state lies within Latitudes

4° 40' N and 6° 14' N, and Longitude 7° 10' E and 8° E (Iheke & Oliver-Abali, 2011). It has 17 Local Government Areas, a population of about 2,833,999; and a per capita income of \$3,003 (National Bureau of Statistics, 2007).

Crude oil and gas production is a prominent activity, which contributes 39% of the state's GDP while the manufacturing sector accounts for just 2% of the GDP. Representing 27% of the GDP is agriculture, which employs 70% of the state's workforce. This is so, because Abia state has much arable land with an adequate rainfall especially in the Southern part, which gets rainfall as heavy as 2,400mm (Iheke & Oliver-Abali, 2011).

Imo state on the other hand, has Owerri as its capital and largest city also. The state has an area of about 5,100Sq Km and 27 Local Government Areas (Ozor, Umunakwe, Ani & Nnadi, 2015), lying within Latitudes 4° 45' N and 7° 15' N and Longitude 6° 50' E and 7° 25' E. With a population of about 3,934,899, Imo has a \$3,527 per capita income (National Bureau of Statistics, 2007). Though Imo state is endowed with several natural resources like crude oil, natural gas amongst others, its economy depends primarily on agriculture and commerce with annual rainfall that varies between 1,500mm to 2,200mm.

III. METHODOLOGY

The study adopted a case study research design approach using Ministry A and Housing Estate B in Umuahia, Abia State, and Ministry C and Housing Estate D in Owerri, Imo State as case studies. The cases were so named, to protect their privacy so as not to publicly expose the building conditions of the sampled buildings, more especially in the event that they are found to be sick.

The four cases involved modern buildings with air conditioning systems. They were ideal for the study, since SBS is more pronounced in buildings with air conditioning systems (HEVAC, 2000).

The population of the study comprised of all the offices in Ministry A (33) and Ministry C (26), all the buildings in Housing Estate B (72) and Housing Estate D (85), and all the occupants of these offices/buildings. Since a building is said to be 'sick' if 20% of its occupants suffer from SBS (Okolie & Adedeji, 2013), only offices/buildings containing five or more workers/residents were considered.

In addition to the condition above, level of education and age was also used as criteria in selecting the respondents. This was so, for proper understanding and adequate responses to the questionnaires. In essence, residents/staff that were selected to answer the questionnaire had at least an SSC (Senior School Certificate) educational qualification, and were aged 19 years or more. Therefore, the researcher opted for offices/building with five or more staff /residents that possess at least an SSC educational qualification, and aged 19 years or more.

Using convenience sampling, it was found that (13) offices in Ministry A, (8) offices in Ministry C, (33) buildings in Housing Estate B, and (47) buildings in Housing Estate D met the three conditions. From the above, (5) offices in Ministry A, (5) offices in Ministry C, (20) buildings in Housing Estate B

and (20) buildings in Housing Estate D were picked using simple random sampling technique.

Totally, 308 respondents answered the questionnaires (i.e. 27 from Ministry A, 30 from Ministry C, 123 from Housing Estate B, and 128 from Housing Estate D).

The questionnaire was structured into five sections and distributed to the 308 respondents. The five sections were as follows:

Section A – Demographic Features.

Section B – SBS.

Section C –Incidence of SBS.

Section D – Relationship between the Incidence of SBS and Occupant’s Productivity. Section E – Relationship between SBS and the Maintenance Culture Practiced in the Sampled Building.

The instrument contained thirty-five (35) questions that were validated by experts in the Building discipline. In order to ensure that the questionnaire is reliable, a pilot test was conducted using the validated version of the instrument.

The questionnaires were personally administered to the sampled population by the researcher, with the opinion of the respondents rated on a nominal scale using “Yes” or “No”. The data obtained from the questionnaires was analyzed using SPSS 21, tables, Simple Percentage and Frequency distribution.

Table 1: Questionnaire Distribution

	Ministry		Housing Estate	
	A	C	B	D
No. Distributed	27	30	123	128
No. Returned	27	30	123	128
% Returned	100%	100%	100%	100%

Source: Field Survey, 2021.

Table 1 shows how many questionnaires that were distributed, filled and returned, and the percentage of these.

IV. DATA PRESENTATION AND ANALYSIS

The questions from the various sections of the questionnaire and responses were presented and analyzed as follows:

4.1 Evaluation of respondents’ awareness on SBS/related issues

- ❖ Do you know think the activities of occupants of a building can predispose them to health issues?

Table 2: Response on occupants’ awareness of SBS/related issue

	Yes	No	Total
Count	50	258	308
%	16.2%	83.8%	100.0%

Source: Field Survey, 2021.

Table 2 shows that only16.2% of all the respondents are aware that activities of building’s occupants could predispose them to health issues.

- ❖ Are you aware that a building can be sick and cause sickness to occupants?

Table 3: Response on occupants’ awareness of SBS/related issue

	Yes	No	Total
Count	39	269	308
%	12.7%	87.3%	100.0%

Source: Field Survey, 2021.

Table 3 shows that only12.7% of all the respondents are aware that buildings can be sick and could cause sickness to occupants.

- ❖ Have you heard about Sick Building Syndrome?

Table 4: Response of occupants’ awareness on SBS

	Yes	No	Total
Count	32	276	308
%	10.4%	89.6%	100.0%

Source: Field Survey, 2021.

Table 4 shows that only10.4% of all the respondents have heard of Sick Building Syndrome.

4.2 Incidence of Sick Building Syndrome

- ❖ When in this building are you at your best possible health state/

Table 5: Respondents’ state of health when in the Office/building

	Yes	No	Total
Count	257	51	308
%	83.4%	16.6%	100.0%

Source: Field Survey, 2021.

Table 5 shows that 16.6% of all the respondents are of the opinion that they are not at their best possible health when in the sampled building.

- ❖ When in this office/building, do you experience any of the following complaints?

Table 6: Occupants’ response to SBS symptoms

Complaints	Count (% Percentage)			
	Male		Female	
	Yes	No	Yes	No
Headache	40 (24.0%)	127(76.0%)	46(32.6%)	95(67.4%)
Fatigue and drowsiness	24(14.4%)	143(85.6%)	20(14.2%)	121(85.8%)
Nausea	12(7.2%)	155(92.8%)	17(12.1%)	124(87.9%)
Lethargy or excessive tiredness	23(13.8%)	144(86.2%)	18(12.8%)	123(87.2%)
Difficulty concentrating	23(13.8%)	144(86.2%)	11(7.8%)	130(92.2%)
Stuffy or runny nose	36(21.7%)	129(77.7%)	53(37.6%)	88(62.4%)
Mental fatigue	21(12.6%)	146(87.4%)	6(4.3%)	135(95.7%)
Dry or itchy eyes	60(35.9%)	107(64.1%)	38(27.0%)	103(73.0%)
Dry or itchy throat	39(23.4%)	128(76.6%)	15(10.6%)	126(89.4%)
Dry or itchy skin	41(24.6%)	126(75.4%)	43(30.5%)	98(69.5%)

Source: Field Survey, 2021.

Table 6 shows the respondents’ health complaints when in the office/building. With dry or itchy eyes being the highest complaints by men (60%) while the highest complaints by women (53%) is stuffy or runny nose.

- ❖ Health wise, do you feel better when you leave this building?

Table 7: Respondents’ state of health outside the building/Office

	Yes	No	Total
Count	73	235	308
%	23.7%	76.3%	100.0%

Source: Field Survey, 2021.

Table 7 shows that 23.7% of all the respondents believe that they feel better when they leave the office/building

4.3 Relationship between Incidence of Sick Building Syndrome and Productivity

- ❖ When in this office/building, do you think you are less productive than elsewhere?

Table 8: Evaluation of respondents' productivity when in the building/Office

	Yes	No	Total
Count	59	249	308
%	19.2%	80.8%	100.0%

Source: Field Survey, 2021.

Table 8 shows that 19.2% of the respondents think they are not in their best productive capacity when in the building

4.4 The relationship between Symptoms of SBS, and age, sex and type of Building

Table 9: Correlation between Symptoms of SBS, and age, sex and type of Building

SBS Symptoms	Dependent variables		
	Age	Sex	Building Type
Headache	0.061	-0.096	-0.486**
Fatigue and drowsiness	0.104	0.003	-0.403**
Nausea	0.156**	-0.083	-0.304**
Lethargy or excessive tiredness	0.028	0.015	-0.404**
Difficulty concentrating	0.051	0.095	-0.339**
Stuffy or runny nose	0.057	-0.179**	-0.413**
Mental fatigue	0.060	0.147*	-0.355**
Dry or itchy eyes	0.237**	0.096	-0.482**
Dry or itchy throat	-0.112	0.167**	-0.418**
Dry or itchy skin	0.106	-0.067	-0.384**

Source: Field Survey, 2021.

4.4 Maintenance culture practiced in the sampled building

- ❖ Do you practice the followings in your building?
- ❖ Relationship between the SBS symptoms and maintenance culture practised in the sampled building

Table 10: Occupants' response to the maintenance culture practised in the office/building

Maintenance	Count (%)			
	Office		Residence	
	Yes	No	Yes	No
Is there a planned maintenance system in place?	11 (19.3%)	46 (80.7%)	55 (21.9%)	196 (78.1%)
Do you undertake general maintenance	12 (21.1%)	45 (78.9%)	60 (23.9%)	191 (76.1%)
Maintenance of the light system	14 (24.6%)	43 (75.4%)	65 (25.9%)	186 (74.1%)
Sweeping of the building	55 (96.5%)	2 (3.5%)	246 (98.0%)	5 (2.0%)
Cleaning of building fabrics including exterior windows	23 (40.4%)	34 (59.6%)	115 (45.8%)	136 (54.2%)
Cleaning of internal surfaces including carpets, floors and furniture	37 (64.9%)	20 (35.1%)	185 (73.7%)	66 (26.3%)
Cleaning of air vents/diffusers	8 (14.0%)	49 (86.0%)	40 (15.9%)	211 (84.1%)
Cleaning of luminaries	7 (12.3%)	50 (87.7%)	35 (13.9%)	216 (86.1%)
Cleaning of air filters	6 (10.5%)	51 (89.5%)	30 (12.0%)	221 (88.0%)
Cleaning and inspection of ventilation ducts	8 (14.0%)	49 (86.0%)	40 (15.9%)	211 (84.1%)
Cleaning of heating/cooling coils	6 (10.5%)	51 (89.5%)	30 (12.0%)	221 (88.0%)
Vacuuming of the filing cabinets	11 (19.3%)	46 (80.7%)	55 (21.9%)	196 (78.1%)
Cool shampooing or steam cleaning of soft furnishing	11 (19.3%)	46 (80.7%)	55 (21.9%)	196 (78.1%)
Cleaning of upholstery	16 (28.1%)	41 (71.9%)	80 (31.9%)	171 (68.1%)

Source: Field Survey, 2021.

Table 11: Correlation between SBS symptoms and maintenance culture practised in the sampled building

	Headache	Fatigue or Drowsiness	Nausea	Lethargy or Excessive Tiredness	Difficulty concentrating	Stuffy or Runny Nose	Mental Fatigue	Dry or Itchy Eyes	Dry or Itchy Throat	Dry or Itchy Skin
Maintenance of the light system	-0.067	-0.027	-0.037	-0.011	-0.017	-0.075	-0.051	-0.098	-0.114*	-0.109
Sweeping of the building	-0.002	0.001	0.049	-0.133*	-0.016	-0.047	0.047	-0.036	0.013	0.093
Cleaning of building fabrics including exterior windows	-0.081	-0.051	-0.112	-0.065	-0.047	-0.079	-0.095	-0.139	-0.124	-0.053
Cleaning of internal surfaces including carpets, floors and furniture	-0.032	0.006	-0.047	-0.097	-0.012	-0.021	-0.037	-0.057	-0.094	-0.025
Cleaning of air vents/diffusers	-0.108	-0.073	-0.047	-0.089	-0.009	-0.132*	-0.038	-0.082	-0.104	-0.062
Cleaning of luminaries	-0.100	-0.054	-0.031	-0.100	-0.019	-0.125*	-0.090	-0.109	-0.109	-0.116*
Cleaning of air filters	-0.091	-0.062	-0.013	-0.083	0.001	-0.139*	-0.041	-0.097	-0.088	-0.064
Cleaning and inspection of ventilation ducts	-0.128*	-0.073	-0.047	-0.116*	-0.037	-0.151**	-0.070	-0.101	-0.127*	-0.102
Cleaning of heating/cooling coils	-0.114*	-0.062	-0.048	-0.083	-0.031	-0.161**	-0.041	-0.140*	-0.088	-0.109
Vacuuming of the filing cabinets	-0.113*	-0.055	-0.033	-0.088	-0.007	-0.137*	-0.050	-0.102	-0.116*	-0.107
Cleaning of upholstery	-0.106	-0.054	-0.025	-0.057	-0.058	-0.115*	-0.085	-0.129*	-0.107	-0.097

Source: Field Survey, 2021.

Table 9 shows that A. Except dry or itchy throat symptom, the older the occupant the more susceptible he/she will be to the SBS symptoms. B. Women are more susceptible to SBS than men. This agrees with the study by Brauer (2005), and Gomzi and Bobic (2008). C. Office environments are more susceptible to the SBS symptoms than their counterparts in residential environment. This agrees with the study by Salloum (2015).

Table 10 shows that sweeping of the building is the most practiced maintenance routine for all the sampled buildings while the cleaning of air filters and heating/cooling coils were the least practiced maintenance routine.

Table 11 shows that the more maintenance routine is observed, the less susceptible occupants will be to SBS symptoms.

V. DISCUSSION

From the data analysis, it can be deduced that the incidence of SBS brings about the reduction of the productivity of building occupants. This deduction agrees with the work done by Stylianos (2014). A closer look at the analyzed data shows that, the more maintenance routine is practiced, the lower the prevalence of SBS symptoms and vice versa.

VI. CONCLUSION AND RECOMMENDATION

The study identified stuffy or runny nose, Dry or itchy eyes, Headache, and Dry or itchy skin as the most common SBS symptoms affecting building occupants. It was however discovered that the more maintenance routines such as sweeping, cleaning, vacuuming e.t.c. of a building is practiced, the less prevalent the incidence of the SBS. Of all the sampled buildings, all the maintenance routines developed by the researcher was observed in nine of the buildings. As a result, none of the occupants in these building suffered any of the SBS symptoms. This shows that the religious practice of the maintenance routine developed by the researcher could help in addressing the incidence of SBS for healthier buildings and increased productivity.

→ Therefore, these maintenance routines should be adopted as a culture, and practiced for healthier buildings and increased productivity.

→ Secondly, very few people in the study (10.4%) knew about SBS. Furthermore, only 16.2% of the respondents indicated that they knew that the activities of occupants can predispose them to sickness. These occupants' activities include smoking indoors, noise, use of computer in a poorly lighted room, use of photocopiers in a poorly ventilated room, cooking in a poorly ventilated room e.t.c. Therefore, there is need to educate occupants to be careful on their activities inside their buildings.

→ Lastly, there is also a need to educate building users on the importance of routine maintenance. From the data analyzed, majority of the respondents only swept their building without practicing the other routines, leading to more prevalence of SBS. At this point, it is clear that addressing the SBS goes beyond just sweeping the building.

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