Building Collapse in Nigeria (2009- 2019), Causes and Remedies – A Review

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Abstract

There has been incessant collapse of buildings in Nigeria which has led to the loss of many lives. Many of these incidences were not analyzed based on their frequencies per year, height of the structures, causes of collapse and geopolitical zones of occurrence. Therefore, this study investigated the number of collapsed buildings in Nigeria from 2009 to 2019, based on the factors highlighted above. Published journal articles, conference proceedings, academic reports and newspapers were reviewed to obtain the data used for the analysis. The results show that the leading causes of building collapse within the period are structural defects. The highest rate of collapse occurred in 2014 while 2016 has the highest number of lives lost. It was also noted that the rate of collapse is predominant in the south west which recorded 34 collapses (60.71% of the total collapse during the years under review) and 132 lives lost (64.08% of total lives lost during the period under review). It was recommended that the SON (Standard Organization of Nigeria) should ensure that only certified building materials are allowed in the market, soil tests, Environmental Impact Analysis and structural analysis should be mandatory and proper supervision of construction works by competent professionals should be ensured.

Keywords

Building collapse, structural defect, south west, substandard materials

1. Introduction

A building structure can be defined as an artistically and aesthetically created space that provide home for humans and other living things for their comfort to prevent the adverse effect of the natural and artificial ecological condition for their survival (Omenihu, Onundi, & Alkali, 2016). Building collapse is the inability of a building component to withstand the loads it was designed

to carry. A building is said to have failed when one or more elements of the structure cannot perform its original function proficiently due to the malfunction of the constituent materials thus leading to collapse. Although Nigeria has good environment and weather condition when compared with other countries of the world, it is still greatly affected by incessant increase in building collapse (Omenihu et al., 2016).

Adebowale, Gambo, Ankeli, & Daniel, (2016) carried out analysis and evaluation of the death rate involved in 47 reported cases of building collapses verified between 2000 and 2010 and over 300 death rates were recorded for Lagos, Abuja and port Harcourt which are the three major areas with high rate of casualties.

Building collapse may either be due to natural disasters resulting from earthquakes, hurricanes, floods or manmade factors also known as human errors as a result of poor design and construction methods. There are many factors that cause building collapse in Nigeria such as poor structural design, poorly skilled workmen, lack of quality material and lack of quality management (Ayeni & Adedeji, 2015).

Collapse of buildings poses great danger to lives and properties. Ayeni & Adedeji (2015) and Babalola (2015) noted that every aspect of building planning process from the architectural designs through the electrical, structural, mechanical Engineering, construction and maintenance require proper supervision and quality input by professionals in the building industry. Thus, this study aims to identify the major causes of building collapse in Nigeria in the last decades (2009–2019) and suggest ways of preventing such incidence.

2. Literature Review

Buildings are structures that serve as shelters for man and his properties which must be well conceptualized, designed and constructed to gain the desired comfort from the environment (Odeyemi, 2012). Buildings exists to meet the primary physical need of shelter for man, his goods, his animals and all the mechanical and electrical equipment he requires for his present-day existence. In recent times, Nigeria has experienced the collapse of sundry buildings which claimed the lives of many of her citizens and damaged properties worth millions of Naira. Though, building collapse occurs in many

parts of the world, the rate of at which it happens in Nigeria demands an urgent intervention.

Collapse is a state of complete failure, when the structure has factually given way and most members have caved-in, crumbled; the building can no longer stand as originally built (Ede, 2010). It can be seen therefore, that collapse is a very acute state of failure. Ayininuola & Olalusi, (2004) opined that failure can be considered as occurring in a component when such component cannot perform its intended functions. According to Adebowale et al. (2016), the term failure can manifest in three forms: Ultimate limit state, which results in collapse; Serviceability limit state, which has to do with deflections and cracks, and finally; Durability, which has to do with deterioration of the elements.

Building collapse had been linked to either natural or man-made occurrence. The natural phenomena include earth tremor and hurricane while man-made occurrences consist of tragedies caused by man's carelessness. Most collapse buildings were found to be constructed with low quality building materials, incompetent craftsmen rather than professionals were found to be engaged while the existing building codes, meant to guide builders were rendered ineffective because of lack of political will to enforce same by the Town Planning Authorities (Ede, 2010).

Building construction should be based on achieving the stability of such buildings. However, many clients put more interest in the aesthetics. As the architects are accountable for the design; quantity surveyors to the cost so also engineers ensure the stability of building structures. No matter how small a building is, there is a possibility of failure. It is therefore a danger if engineers are not involved in the design and construction of building structures. The failure of a project starts with poor preparation. The involvement of the right personnel at the right time would aid adequate planning and ensure thriving project sustainability. Until the right reason is given on who designs, gives approval to the designs, builds, supervises and gives final approval upon construction, building collapse would be an issue of concern.

Quite a lot of lives and properties have been destroyed in the several incidents of building collapses in Nigeria, and these have impacted negatively on the socio-economic status of the Nigerian citizens. Oseghale,

Ikpo, & Ajayi, (2015) revealed that there was no loss of lives in 20.3% of the occurrences of building collapse, between one and five lives were lost in 44.4% of the recorded incidents, while the worst-case condition was the death of more than 21 people in 9.3% of incidents. The amount of death records in building collapse incidents buttress the severity of the problem, and in cases where deaths are not recorded, physical injuries are just as severe. Still, any event of building collapse would eventually result in loss of productive time which does not augur well for sustainable development goals (Windapo & Rotimi, 2012).

Oseghale et al. (2015) opined that weakening of reinforced concrete could occur from corrosion of the reinforcement from carbonation and chloride ingress and cracking from overloading of the concrete structure and construction defects. The findings of Oseghale et al. (2015) and Folagbade (2002) revealed that poor structural design, use of substandard building materials, non-compliance with approved building design, poor workmanship, lack of qualified and appropriate professionals to ensure quality construction are major causes of building collapse in Nigeria.

Oseghale et al. (2015) studied scientific and non-scientific factors that were responsible for the incidence of collapse buildings in the South-West Nigeria. They identified scientific factors to include building design errors, use of poor materials and faulty design of foundations while non – scientific factors were lack of trade training and corruption.

Ayininuola & Olalusi (2004) reasoned that building failures occurred due to inadequate knowledge of building structural performance and unexpected environmental phenomena. Fagbenle & Oluwunmi (2010) blamed the high frequency of structural collapse on the low level of compliance with approved architectural and structural drawings before construction, ineffective monitoring apparatus used by the concerned government agencies and the low level of awareness of the existing building regulations by clients and contractors.

Building collapse in Nigeria was also studied by Ede (2010) and he discovered that the ‘Nigerian factor’ such as lawlessness, corruption, and the assumption that any Engineer in the construction industry can undertake all forms of responsibility in the building process even without acquiring the

basic skills required for such jobs are factors that lead to collapse of structures.

3. Research Methodology

In this research, collapse of buildings in Nigeria between 2009 and 2019 were investigated. Published journal articles, conference proceedings, academic reports and newspapers were reviewed to obtain relevant data such as height of the structures, cause of the collapses, the geopolitical zones where the structures were erected and the year that the collapse occurred after which the data obtained were analyzed based on the aforementioned parameters.

4. Results and Discussion

The occurrences of building collapse in Nigeria from 2009 to 2019 were investigated. The locations, dates of occurrence, the building types, the suspected causes of the collapse and the casualty figures were obtained and reported in Table 1

Table 1: Some reported cases of collapsed buildings in Nigeria for period of 10 years (2009-2019)

S/No	Location	Date of collapse	Type of building	Causes of collapse	Casualty figure
1	Ogbomoso, Oyo state	February 2009	Six storey Lautech Teaching hospital under construction	Substandard material Poor supervision	5 died
2	Ogbomoso Oyo state	March 2009	Four storey building under construction	Not reported	5 died
3	Lagos	June 2009	Two storey building	Not reported	7
4	Aghaji crescent GRA Enugu	August 2009	A fence wall	No proper drainage	1
5	Oke padre street Itamorin Abeokuta	18th October 2009	Uncompleted residential building	Use of substandard materials Hasty construction	3 died 11 injured
6	Garki Abuja	November 2009	2-storey commercial building	Structural failure Substandard material	-
7	Isopakodowostreet,cairoosho di Lagos	26th April 2010	Residential building under construction	Use of substandard material	4 died 12 injured

8	Adenike Street off new market oniru estate VI Lagos	2nd June 2010	Uncompleted storey building	Use of substandard materials	1 died 2 injured
9	Plot 702 Port-Harcourt crescent Garki 11 Abuja	July 2010	6 suspended floors for commercial purpose with a basement	Substandard materials Unqualified professionals	-
10	2 Okolie street off Gimbiya street, Abuja	11th August 2010	Uncompleted four storey building	Substandard materials Disregard for building regulations	23 died 11 injured
11	Tinubu street VI Lagos	28thSeptember 2010	4-Storey Building	Structural defect	3
12	No 9B Adenubi close ikeja Lagos State	13th March 2011	5- storey hotel under construction	Poor quality concrete	2
13	Oba ile Housing Estate Akure	2011	Collapse of a hotel Building under construction	Structural failure	-
14	Mararaba (near Abuja)	29th June 2011	Collapse of a 2-storey Zenith Bank Plc Expansion Building	No Geotechnical investigation, Undersized Reinforcement, Large span slab, No specific floor thickness on drawing	2 died 11 injured
15	No 6 Magaji close idumota Lagos	July 2011	3-storey building	Not reported	18
16	Aderibigbe street, Maryland Lagos	October 2011	5-storey block of structure with a pent house	Structural failure	2
17	No 3 Ademola Awosike Road Kubwa Extension III, Abuja	8th August 2012	Collapse of 2-storey building under construction	Poor quality material, poor workmanship, weak foundation, failure of structural element	3 died 9 injured
18	Gwarinpa Estate Abuja	28th January 2012	Collapse of two storey building	Structural Defect, Demolition operation	3
19	Apo Mechanic Village Abuja	13th June 2012	1-storey commercial building under construction	No qualified professional on site, poor supervision, use of poor quality material	-
20	Hadeja Road by Ibrahim Taiwo Road Gombe	July 2012	101 year old 3-storey commercial/residenti	Old age, Lack of	1

			al building	maintenance	
21	Muri Okunola street Eti-Osa LGA of Victoria Island Lagos	4th November 2012	Collapsed building under construction	Structural failure Poor construction	3 dead 50 trapped
22	Jakande estate in Oke-Ake-Afa, Isolo Lagos	20th November 2012	Collapsed of a building (in use)	Structural Failure, Occupants ignored governments safety warning	3
23	!74 Corporation drive Dolphin Estate, Ikoyi Lagos	20th November 2012	Collapsed of a building	Structural Failure	-
24	Ojodu, Lagos	8th May 2013	2-storey Building under construction	Illegal approval Structural failure	1
25	Agbama area, Umuahia	15th May 2013	Building under Construction	Not Reported	7
26	Ojodu, Lagos	May 2013	Three |storey building	Not reported	2
27	Agege motor road, Mushin Lagos	11thjune 2013	Three storey building	Unauthorized conversion Use of quacks	1
28	Ishago road, surulere Lagos	21stjuly 2013	2-storey uncompleted building under construction	Non compliance to regulatory authority warnings Inferior Building materials	4
29	Ebeute-meta, Lagos	11thjuly 2013	Residential Building	Structural Defect	7
30	Maitama, Abuja	6th September 2013	Building Collapse	Not reported	3
31	Nyanya, Abuja	27th September 2013	Storey Building of Government secondary school	Not reported	8 injured
32	Lagos Island	25th September 2013	Three storey building fell on a bungalow	Not reported	2
33	Amassoma in southern ijaw LGA of Bayelsa State	5th October 2013	Lecture theatre building at the permanent site of the Niger Delta University	Use of substandard material No compliance with the standard procedures in the use of materials	-
34	Ologuneru in Ido LGA of	May 3rd 2014	An uncompleted 2-	Not reported	

	Ibadan city		storey building		1
35	Akure, Ondo state	9th May 2014	A hostel building under construction	No geotechnical report Use of quacks	2
36	Agudama-Epie, near Yenagoa	19th May 2014	Uncompleted Church building	Heavy downpour	20 injured
37	Onitsha, Anambra state	2nd June 2014	An uncompleted four storey building	Structural failure	4
38	Pedro police station, somolu Lagos	30th June 2014	2-storey barrack building	Not reported	-
39	Ejigbo, Osun state	10th July 2014	School building complex few hours before commissioning	Not reported	2 people criticall y injured
40	Bucknor estate, jakande-isherioshun Rd. Ejigbo/isolo Lagos state	30th July 2014	Collapse of three storey building	Structural failure	Nil
41	Osogbo, Osun state	19th August 2014	One storey building	Heavy downpour	One injured
42	Lagos	12th September 2014	Collapse of a warehouse at synagogue church	Demolition process	4
43	Bukuru Jos	September 2014	Abu naimi school building collapse	Structural defect Illegal conversion	10 pupil
44	Benin	30th September 2014	Collapse of liberty power bible church	Structural defect Use of substandard material	Nil
45	Ebute meta Lagos	15th July 2015	3-storey Residential Building	Structural defects	4 rescued
46	Swamp street Odunfa Lagos island	21st October 2015	3-storey Residential Building	Structural defects	4 rescued
47	Lekki, Lagos	9th March 2016	Five storey Building Under Construction	Heavy rainfall and foundation failure	34
48	Mile 12, Lagos	19th March 2016	Two storey building	Structural defects	1 dead 1 injured
49	Malete, Kwara state	2016	Three storey building	Not reported	-
50	Lagos Island	27th August 2017	Residential Building	Heavy downpour Vibration	8
51	Zulu Gambari Road, Ilorin	18th August	Four Storey Building	Not Reported	3

52	Abuja	2017 18th August 2018	An abandoned Building	Old age Illegal conversion	Injured 2 Dead 3Injured
53	Port-Harcourt	November 19th 2018	7- Storey Building under construction	Not Reported	15 dead 31 rescued
54	Lagos	February 3rd 2019	3-storey Building	Not reported	2 dead 1 injured
55	Ita-faji, Lagos Island	13th March 2019	3-storey building	Non compliance to regulatory authority warnings.	20 dead 41 Injured
56	Sogoye, Bode Area of Ibadan	15th March 2019	3- Storey building under construction	Old age Concrete was not allowed to cure before continuing the construction.	-

Source: (Babalola, 2015; Omenihu et al., 2016)

4.1 Collapse records based on year

The records of collapse based on year are shown in Figure 1. It shows the summaries of building collapse and casualties involved in the last decade (2009-2019). From the graph, year 2014 recorded the highest number of collapse and more lives were lost in 2016 with a total loss of 35 people.

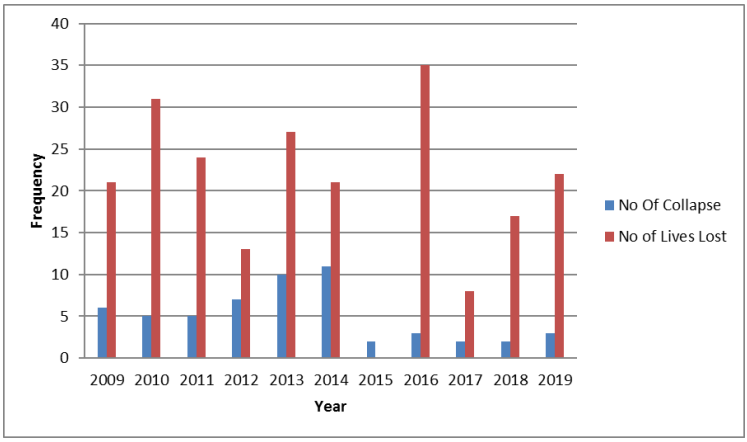


Figure 1: Collapsed records based on year

4.2 Collapse records based on geo-political zones

The records of collapse based on the geopolitical regions in Nigeria are shown in Figure 2. It shows the summary of each geopolitical zone with the number of collapses. From the graph, highest number of collapses is recorded in the south west region of the country.

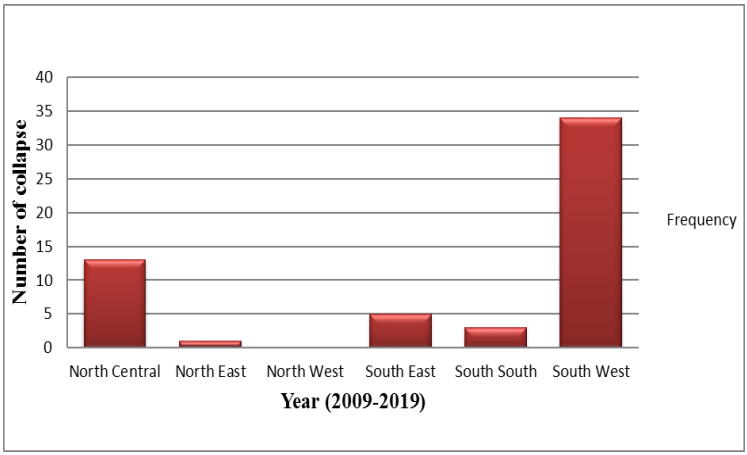


Figure 2: Collapse records based on Geopolitical zone

4.3 Collapse records based on Height of building

The record of collapse based on the height of building is shown in Figure 3. From the graph, it revealed that there is high rate of 3-storey building collapse in the last decade.

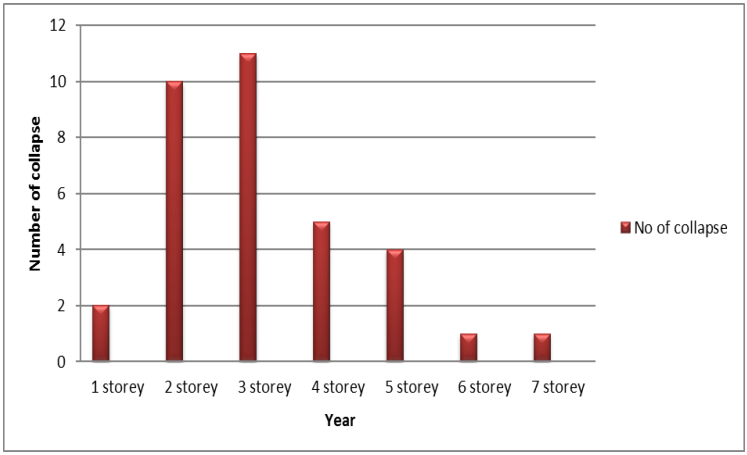


Figure 3: Variation of building collapse with respect to height of building

4.4 Collapse records based on causes of collapse

The record of collapse based on the causes of collapse in Nigeria is shown in Figure 4. From the graph, the major cause of collapse in the last decade is structural defect.

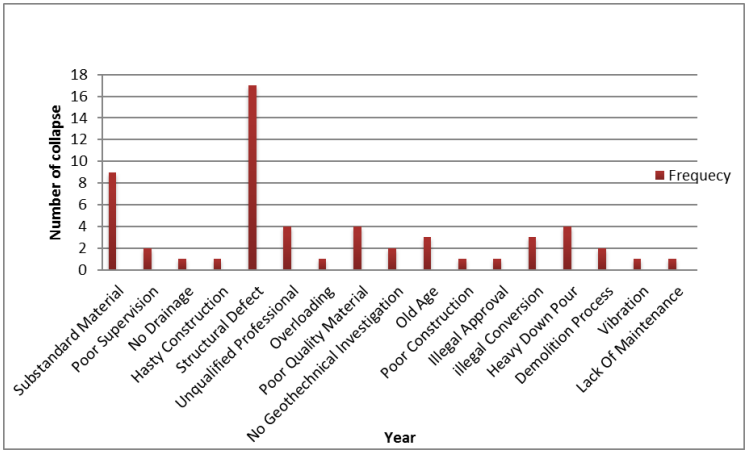


Figure 4: Collapsed based on causes of collapse

5. Conclusion

The following conclusion were drawn from the research:

i. The rate of building collapse dropped from about 11 cases in 2014 to 2 cases in 2015 the lowest recorded in the period under review. This figure increased to 3 in 2019;
ii. South west geopolitical zone experienced the highest number of collapses and the highest loss of lives during the period reviewed;
iii. Three (3) storey buildings were the most affected among the collapses recorded;
iv. Structural defect was the highest cause of building collapse during the period reviewed.

5.1 Recommendations

The incessant collapse of building in Nigeria can be curbed or eradicated through adherence to some of the following measures:

i. All stakeholders in the construction industry should adhere strictly to the provisions of the building code.
ii. The SON (Standard Organization of Nigeria) should ensure that only certified building materials are allowed in the market.
iii. Soil test Environmental Impact Analysis and structural analysis needs to be made mandatory and to be submitted along with the building plans to Town Planning Authorities by all building developers.
iv. Regulatory professional bodies such as the Engineering Regulatory and Monitoring (ERM) unit of COREN and their corresponding associations should on regular basis organize workshops for stakeholders in the building industry to update their knowledge and highlight the dangers and penalties associated with collapsed buildings.

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