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Research Article

Termite Damage to Buildings in Benue State, Nigeria: Termite Diversity and Nature of Attacks, Economic Cost of Maintenance and Residents' Perception and Control

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Abstract

Globally, the annual economic cost of termite damage and termite prevention in the housing sector is estimated in the billions. However, in sub-Saharan countries in Africa data on damage and cost of termite-related maintenance are scarce. This study was designed to investigate termite damage to public and residential buildings, quantify the financial cost of termite-related building maintenance with the intent of building the capacity of home owners to deploy cost-effective prevention and control measures in Benue state, Nigeria. Four Local Government Areas (LGAs) in all were selected, Makurdi and Otukpo representing urban LGAs while Ushongo and Ogbadibo represented the rural LGAs. Termite infestation was based on visual observation of signs such as termite mud tunnels on walls, pores in walls, damaged parts such as roofs, windows and door frames, and wooden furniture among others. Questionnaires administration and household inspection were conducted concurrently across all four locations. Through purposive sampling techniques, residents and home owners experiencing perceived termite-related challenges within the communities were randomly recruited until 400 participants were enlisted. The termites attacking each house were collected in a vial with 70% ethanol and labeled with the house ID number and relevant data. The overall termite infestation rate in all four locations was high with 71.4% of inspected house having evidences of termite infestation. The rural settlements had higher infestation rates but the differences were not significant ($P > 0.05$) (χ^2=7.783; P=0.100). *Macrotermes bellicosus* and *M. malacensis* were the most predominant termite species infesting buildings. Infestation rate was significantly higher in older buildings with building above 50 and 60 years having 29.0% and 23.3% infestations rate respectively ($P < 0.05$) (χ^2=6.31 P=0.177). The overall knowledge about termites, source of infestation and effective control measures is poor at all study locations, with 151 (37.8%) of home owners not having any idea of sources of termite infestation while 128 (32.0%) believed that termites infested their buildings from neigbouring apartments. This perception was not significantly different for both urban and rural locations ($P > 0.05$). A total of 167 (41.8%) of home owners whose house were infested expressed the desire to abandon their apartments if they had alternatives. These desires were stronger in rural settlements with Ogbadibo and Ushongo having 34.7% and 25.1% respectively. This study revealed that home owners do not have sufficient knowledge regarding termite control. This poor knowledge could be a hurdle in the effective management of termites. Building the capacity of communities to identify and deploy effective termite control strategies through training is vital.

Keywords

Termites, Infestation, Structural Damage, Economic Cost, Perception

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1. Introduction

Although termites are abundant worldwide, Africa seems to be the richest in the number of termite species both known and identified with about 38% of recognized termites [1]. Termite infestations pose a significant threat to the integrity of structural buildings worldwide especially in resource poor countries. These small, social insects are known for their ability to consume wood and other cellulose-based materials, which are commonly found in building structures. The impact of termite infestations on structural buildings can be severe, leading to costly repairs and, in extreme cases, the complete failure of structural elements [7, 8]. Termite activities significantly affect wood by weakening the material and compromises its load-bearing capacity. Over time, this can result in sagging floors, cracked walls, and other structural deficiencies.

The cost of termite control and repair of infested structures is substantial, with homeowners and businesses spending billions of dollars annually worldwide [12]. The presence of termites can also reduce property values and complicate real estate transactions. The annual economic cost of termite damage and termite prevention, worldwide is estimated in billions [8]. In Australia and China, termite infestations are widespread. It is estimated that 20% of Australian homes and up to 90% of Chinese homes south of the Yangtze River are affected by termite damage. Their economic security plans have enabled these countries to catalog, prevent and combat the termite damage done to their buildings and crops [7, 11, 13, 15]. However, in underdeveloped countries, especially in Africa, the funds for maintenance and damage prevention are not as readily available.

However, in underdeveloped countries data on termite damage is unavailable and it is difficult to estimate the cost of termite-related repairs because termite control has not been given enough research attention despite its widespread catastrophic impact [6, 14]. The economic cost of building maintenance resulting from termite-related damages in Nigeria has resulted in high repair costs, potentially impacting the value of the property and becoming a huge financial burden to home owners thereby exacerbating the impact of high cost of living [9, 2].

Local preventive measures are known to rapidly deteriorate under the humid tropical conditions making it difficult to effectively control. Furthermore, preventive measures and control are hampered by poor knowledge of termite biology and ineffective control practices. Understanding residents' knowledge and attitudes towards termite infestation in buildings provide the basis to design control strategies. Earlier studies have reported that the economic condition of the people and local knowledge of termites ultimately influence control measures designed for it [10]. This study was designed to investigate termite damage to public and residential buildings, quantify the financial cost of termite-related building maintenance with the intent of building the capacity of home owners to deploy cost-effective prevention and control measures in Benue state, Nigeria.

2. Materials and Methods

2.1. Description of Study Area

The study was carried out in Benue State in Nigeria. Four Local Government Areas (LGAs) in all were selected, Makurdi and Otukpo representing urban LGAs while Ushongo and Ogbadibo represented the rural LGAs. The geographic location of State in the country is quite unique as it lies roughly in the middle of the country. Benue state has a landmass of 33,955 square kilometers and lies between Latitudes 6.5 °and 8.5 °North and Longitudes 7.47 °N and 10 East. Residential and public buildings were randomly selected in each location and inspected for termite infestation. Termite infestation was based on visual observation of signs such as termite mud tunnels on walls, pores in walls, damaged parts such as roofs (wood and grass), windows and door frames, and wooden furniture among others. Infested houses were classified into five categories according to [4] as:

1) Collapsed: a highly damaged house, which is collapsed or had wood completely eaten out causing the collapse of the supported structure. Pieces of wood in the premises and wooden fences were also inspected for those houses which had wooden fences.
2) Severely attacked: windows, door frames, some of the woods in walls and/or roofs eaten out completely, and windows and/or door frames cut off or slanted;
3) Moderately attacked: woods, walls, windows and door frames, roofs, or woods supporting roofs have been partially eaten, but not completely;
4) slightly attacked: only mud tubes on walls, roofs, windows and door frames, and mounds (nests) at the base of walls and inside houses without any sign of damage or little damage;
5) No attack: no presence of mud tubes on walls, roofs, windows and door frames, and mounds (nests) at the base of walls and inside houses.

2.2. Selection and Training of Research Assistants

In each of the four LGAs selected for the study, two research assistants who were indigenes of the locality were selected. They were trained to administer questionnaire, conduct interviews and collect termite samples from infested buildings. Termite collection and administering questionnaire lasted for a period of four weeks simultaneously at the four LGAs.

2.3. Study Design

In each LGA, a team composed of two research assistants from the area were recruited and trained. To help design the questionnaire, a Focus Group Discussion (FGD) lasting approximately 90 minutes was conducted in each LGA. Each FGD was attended by twelve home owners or residents who had resided in the community for over 10 years and were thus likely to be well-informed on the termite-related knowledge in the communities and were able to guide researchers on the questions to be presented to the other participants. The FGDs also helped researchers ensure that the questionnaire was clearly understood by all members of the community. Following the FGDs, a structured questionnaire comprising 23 questions was developed. The field study was conducted in December 2024 - February 2025. Questionnaires administration and household inspection were conducted concurrently across all four locations. Through purposive sampling techniques, residents and home owners experiencing perceived termite-related challenges within the communities were randomly recruited until 400 participants were enlisted. To be recruited, participants had to be residing in the community for at least five years, must be above 18 years old, and reside in the corresponding LGA. Participant selection ensured that men, women, and youths were included for adequate representation. The questionnaire gathered sociodemographic and household-related data including age, gender, educational level, residents' perceptions of the challenges of termites as household pests, the most susceptible component of the building, the perceived structural damage and economic losses, and the practices used to control them. The questionnaire investigated the age of the building and roof, methods of control during the cause of infestation, and grading of the evidences of the damage such as mud tubes, mound, and wood damage. Knowledge of types of wood available for construction was also investigated using the questionnaire. Quantification of money spent on controlling termite infestation and/or maintenance of building was also be documented with other household termite-related knowledge, attitude and practices. The indigenous names and taxonomy of termites in the area were also gathered.

2.4. Laboratory Analysis and Curator Services

The indications of termite attacks recorded in the present study included galleries (trails of termites covered by soil, wood particles, and/or faeces), termite nests around houses, and parts of termite nests that were connected to the buildings. These signs were used to locate and indicate termite attack in the selected structures [11]. When a traditional house was found to be infested by termites, the condition was recorded digitally and manually. The termites attacking each house were collected in a vial with 70% ethanol and labeled with the house ID number and relevant data. Interviews (semi-structured questionnaires) were also conducted with the home owners to collect data on the building history, culture (such as daily life in the house), the frequency and intensity of termite attacks, and their traditional knowledge of avoiding and/or suppressing termite attacks. Termites were identified by referring to Keys in [11]. Termites were collected with a metal spatula and fixed in 5% formalin. Termites were identified to genus using the shape of the head, shape and serrations of mandible, and antennal elements. Samples were also sent to the National Insect Mesum at Ahmadu Bello University Zaria for confirmation of identification. Photographs of the infested wood structures and mud tubes were taken using a cannon camera.

2.5. Data Analysis

Descriptive statistics and bar charts were produced using Microsoft Excel version 2016. Presentation of data and visualization were performed using simple percentages and statistical analysis were calculated using the total number of responses obtained in each specific question. Similarly, categorical data deriving from multiple-choice questions or frequency-based responses were also analyzed using a Chi-square test. To assess whether the damage caused by termites was more severe in rural or urban areas related-samples t-test was used to obtain a comprehensive and robust understanding of the interrelationships among key variables and practices.

3. Results

3.1. Demographic Characteristics and Level of Termite Infestation

The demographic profile of home owners' cuts across all the productive sector of the communities in the study area with 56.6% falling within the 41-50 age category and 52.6% attaining post-secondary education (Tables 1, 2 and 3). The overall termite infestation rate in all four locations was high with 71.4% of inspected house having evidences of termite infestation. Then rural settlements had higher infestation rates but the differences were not significant ($P > 0.05$) (χ^2=7.783; P=0.100) (Table 4). Slight and moderate infestation levels accounted for 23.3% and 26.8% respectively. *Macrotermes bellicosus* and *M. malacensis* were the most predominant termite species infesting buildings in Benue State (Figure 1). Infestation rate was significantly higher in older buildings with building above 50 and 60 years having 29.0% and 23.3% infestations rate respectively ($P < 0.05$) (χ^2=6.31 P=0.177). (Table 5). Outcome of visual inspection are documented in Figures 7-11.

The predominant evidence to indicate termite infestation was termite tunnels on the wall (38.6%) and damage to window and door frames (22.3%). Other striking evidences included damaged ceiling batons and beams holding the roof of the building (Table 6). In all the four locations, the most af-

fected part of the building are the roof and wooden components (Figures 7-11). The predominant species of wood used for roofing and construction were *Gmelina arborea, G. balsamiferum* and *Khyaya senegalensis* (Figure 2), these woods were grouped into two based on house owners perceived susceptibility or resistant to termites.

3.2. Termite Control Practices by House Owners

Pre-construction preventive measures against termite infestation were done by 72.9% of house owners. While 41.3% treated their wood with chemicals before use, 27.0% of respondents did nothing to prevent infestation before building. There was significant difference in urban and rural preventive activities, while 47.4% and 48.0% in urban areas did pre construction activities, 38.6% of home owners in rural did nothing to control termites before building (χ^2=33.99; P=0.000, P<0.05) (Table 7). While 34.8% of home owners used pesticides to control infestation, as at the time of the study 27.3% of home owners whose houses were infested with termites were yet to decide on what control measures to use (Table 8). Soligium (Common active ingredients include propiconazole, tebuconazole and permethrin) was the predominant pesticide used to control termites in all four locations, other pesticides used to control termites by home owners are shown in Figure 3.

3.3. Termite Control Expenditure by Home Owners

Home owners' termite-related expenditures ranged from direct control expenses and cost of replacement of damage structures. 35.5% of spent N50,000 while 40.1% spent N100,000 annually on termite-related issues. The expenditures were higher in urban locations in Makurdi and Otukpo (Figure 4).

3.4. Termite-related Knowledge, Attitude and Perception of Home Owners

The overall knowledge about termites, source of infestation and effective control measures is poor at all study locations, with 151 (37.8%) of home owners not having any idea of sources of termite infestation while 128 (32.0%) believed that termites infested their buildings from neigbouring apartments. This perception was not significantly different for both urban and rural locations (P > 0.05) (Figure 5). Based on the ranking of the seriousness of termite infestation, 26.0% of home owners ranked the rate of infestation as a very serious problem. On the sharp contrast, respondents whose houses were not infested were of the opinion that termite infestation was not a problem in their communities. A total of 167 (41.8%) of home owners whose house were infested expressed the desire to abandon their apartments if they had alternatives. These desires were stronger in rural settlements with Ogbadibo and Ushongo having 34.7% and 25.1% respectively (Table 9). There is no existence of any form of community efforts targeted at termite control because infestations were considered as personal problems for affected individuals to handle themselves, 58.6% of home owners were not aware of any community effort to tackle termite infestation.

The major challenge encountered while controlling termites is the difficulty in reaching affected parts of the building (32.6%) and resistant to pesticides leading to reinfestation of treated wood (36.3%). Another challenge of note was the lack of financial resources to effective tackle termite infestation (27.0%) (Figure 6). Of the home owners who have used pesticides to control termites in their apartment, 39.8% reported that they moved into the building on the same day, while 19.0% said they moved in after two days. While 55.6% of respondents said they were aware of other termite control measures apart from synthetic pesticides, none of them have ever used such methods.

Table 1. *Some demographic characteristics of Respondents Age of respondents.*

Age Group	Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
21-30	13	2	2	7	24
31-40		16	19	23	75
41-50	46	66	67	47	226
Above 50	22	17	12	21	72
Total	99	101	100	99	399

Table 2. *Sex of respondents.*

Sex	Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
Male	78	81	78	76	
Female	21	20	22	23	
Total	99	101	100	99	399

Table 3. *Educational status of respondents.*

Educational status	Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
No formal education	5	20	19	5	49
Primary school	10	11	10	14	45
Secondary school	34	17	16	28	95
Tertiary school	50	53	55	52	210
Total	99	101	100	99	

Table 4. *Termite infestation in building and level in study locations.*

Location	Number of houses inspected	Number infested with termites (%)	Slightly infested (%)	Moderately infested (%)	Severely infested (%)	Collapsed (%)	Species of termites collected
Makurdi	99	71 (71.7)	16 (16.1)	29 (29.2)	15 (15.1)	11 (11.1)	*Macrotermes malaccensis* *Microtermes bellicosus*
Okadigbo	101	76 (75.5)	31 (30.6)	23 (22.7)	13 (12.8)	9 (8.9)	*Microtermes bellicosus* *Macrotermes malaccensis* *Reticulitermes lucifungus* *Eutermes parvulus*
Otukpo	100	68 (68.0)	25 (25.0)	28 (28.0)	9 (9.0)	6 (6.0)	*Microtermes bellicosus* *Eutermes parvulus* *Macrotermes malaccensis*
Ashong	99	70 (70.7)	21 (21.2)	27 (27.2)	14 (14.1)	8 (8.0)	*Reticulitermes lucifungus* *Microtermes bellicosus* *Eutermes parvulus*
Total	399	285 (71.4)	93 (23.3)	107 (26.8)	51 (12.7)	34 (8.5)	

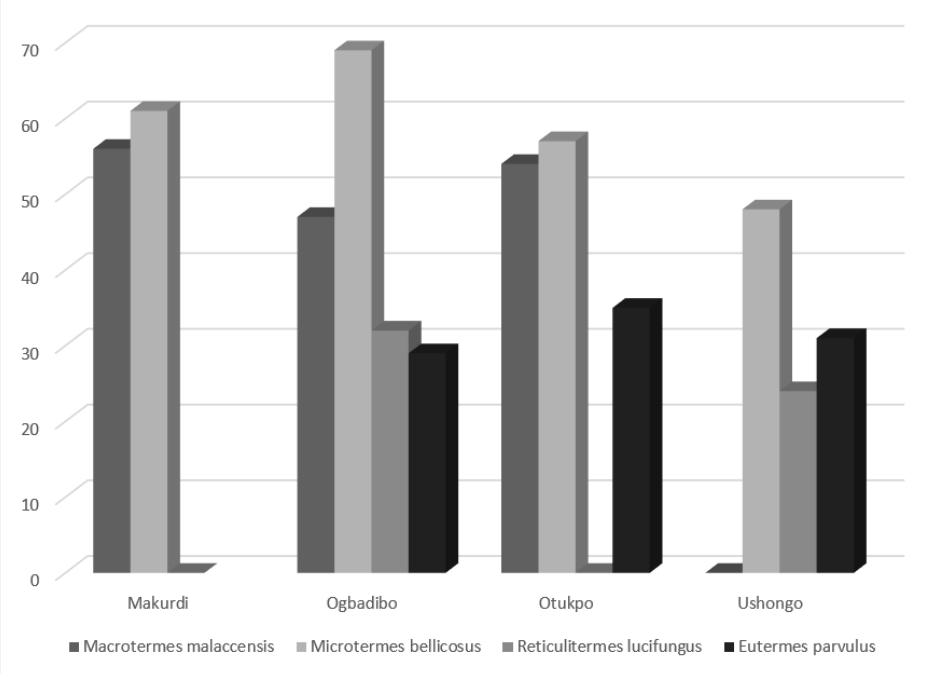

Figure 1. *Termite species abundance in study locations.*

Table 5. *Age of Buildings inhabited by respondents.*

Age Building	Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
Less than 10 years	6	5	5	7	23 (5.7)
11-20 years	11	10	10	12	43 (10.7)
21-30 years	6	5	5	6	22 (5.5)
31-40 years	5	6	7	7	25 (6.2)
41-50 years	18	21	20	18	77 (19.3)
51-60 years	29	30	29	28	116 (29.1)
Above 60 years	24	24	24	21	93 (23.3)
Total	99	101	100	99	399

Table 6. *Evidence of termites' infestation in buildings inspected.*

Evidence of termite infestation	Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
No infestation	41	36	38	35	150 (37.6)
Tunnel on wall	24	23	23	25	95 (23.8)
Damage to roofing wood	11	14	12	12	49 (19.9)
Damage to window and door frame	11	13	15	16	55 (13.7)
Damage to ceiling wood	12	15	12	11	50 (12.5)
Total	99	101	100	99	399

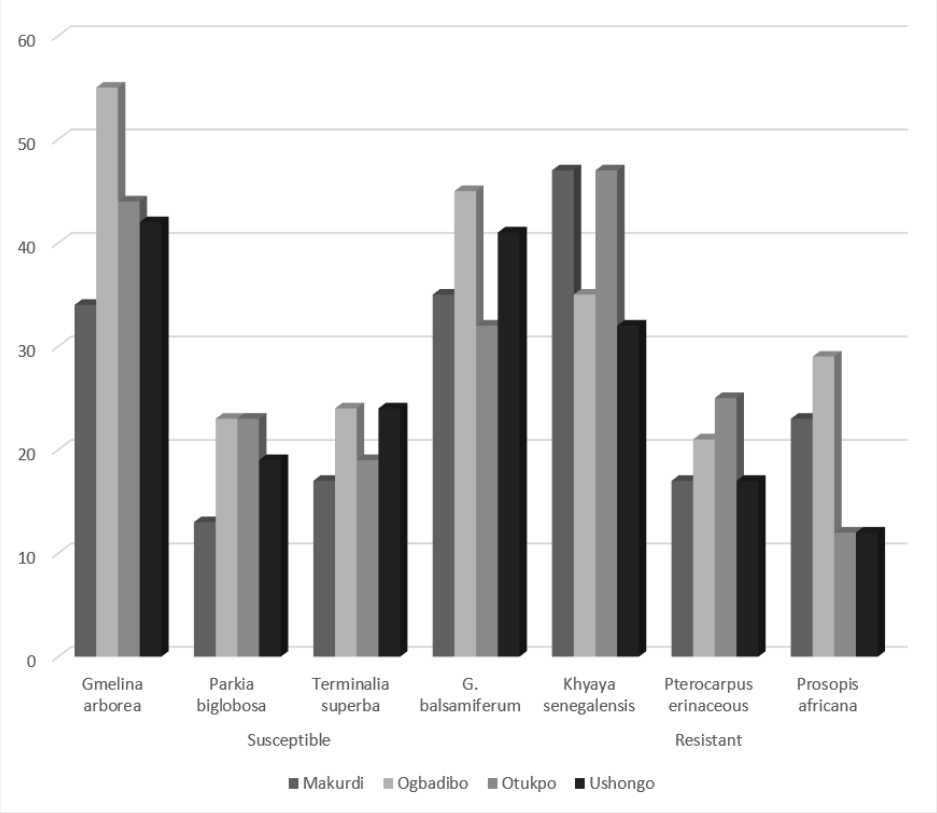

Figure 2. *Varieties of wood used for construction in inspected houses in study locations and house owners' their perceived response to termite attack.*

Table 7. *Pre-construction termite control measures taken by home owners.*

Pre-construction termite control measures	Makurdi (%)	Ogbadibo (%)	Otukpo (%)	Ushongo (%)	Total (%)
Treated wood before roofing	47 (47.4)	28 (7.0)	48 (48.0)	42 (42.4)	165 (41.3)
Treated wood used for door and window frame	13 (3.2)	17 (4.2)	13 (13.0)	14 (14.1)	57 (14.2)
Did nothing to prevent termites	22 (5.5)	39 (38.6)	22 (22.0)	25 (25.2)	108 (27.0)
Destroyed termite mounds around construction site	15 (3.7)	10 (2.5)	15 (15.0)	18 (18.1)	58 (14.5)
Used termite resistant wood	2 (.5)	7 (1.7)	2 (2.0)	0 (0.0)	11 (2.7)
Total	99	101	100	99	399

Table 8. *Post-construction termite control measures taken by home owners.*

Post-construction termite control measures	Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
Spray wood with chemical	30 (30.3)	47 (46.5)	32 (32.0)	30 (30.3)	139 (34.8)
Remove infested wood	10 (10.1)	14 (13.8)	10 (10.0)	12 (12.1)	46 (11.5)
Remove termite tunnels	9 (9.1)	16 (15.8)	10 (10.00	12(12.1)	47 (11.70
Apply spent engine oil on affected wood	13 (13.1)	22 (21.7)	12 (12.0)	11 (11.1)	58 (14.50
Yet to apply any control measures	17 (17.1)	22 (21.7)	36 (36.0)	34 (34.3)	109 (27.3)
Total	99	101	100	99	399

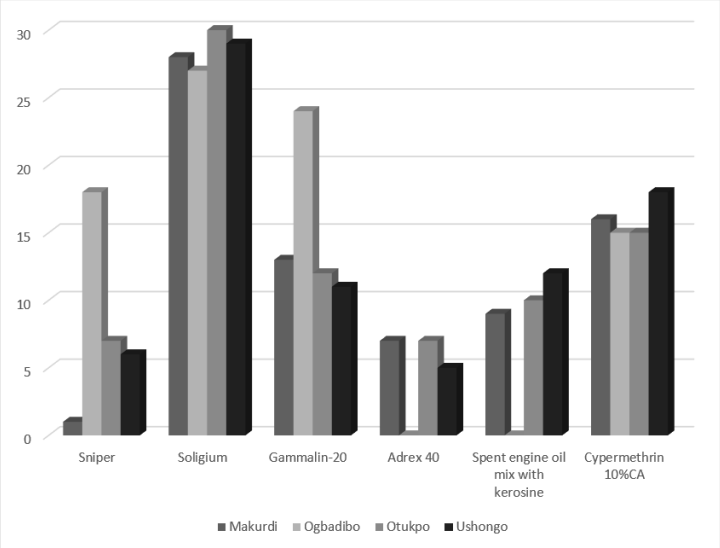

Figure 3. *Pesticides commonly used to control termites by respondents.*

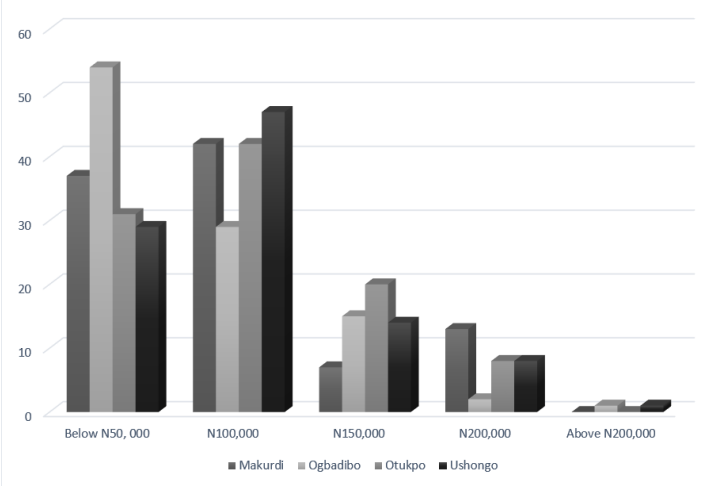

Figure 4. *Annual expenditure on termite-related maintenance by home owners' Pre-construction termite control measures taken by home owners.*

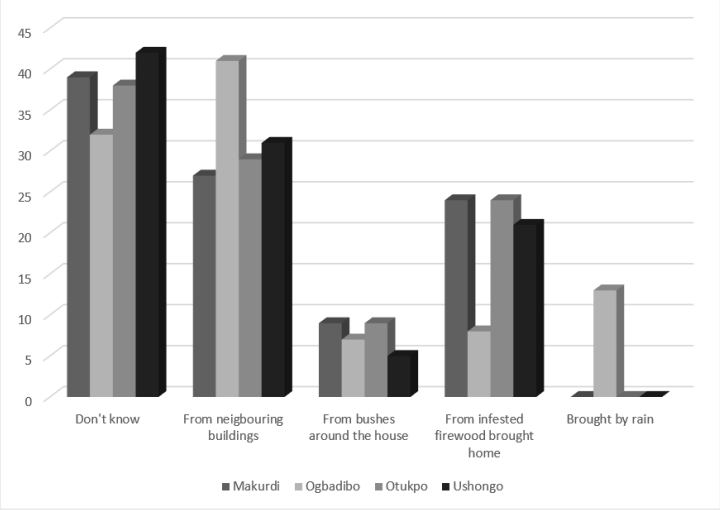

Figure 5. *Respondents' perception on sources of termite infestation in buildings.*

Table 9. *Some respondents' termite-related knowledge, perception and practices.*

Questions		Makurdi	Ogbadibo	Otukpo	Ushongo	Total (%)
Would you abandon your building because of termite infestation if you have alternative?	Yes	32	58	35	42	167 (41.8)
	No	67	43	65	57	232 (58.2)
Is there any form of community action to deal with termite problem?	Yes	13	36	14	13	76 (19.0)
	No	86	65	86	86	323 (80.0)
Have you noticed reinfestation after controlling termites?	Yes	37	23	49	36	145 (36.3)
	No	62	78	51	63	254 (63.7)
Have you ever engaged a professional to help in control?	Yes	35	40	33	38	146 (36.5)
	No	64	61	67	61	253 63.5)
Are you aware of any other method of termite control apart from pesticides?	Yes	51	63	53	55	222 (55.6)
	No	48	38	47	44	177 (44.4)

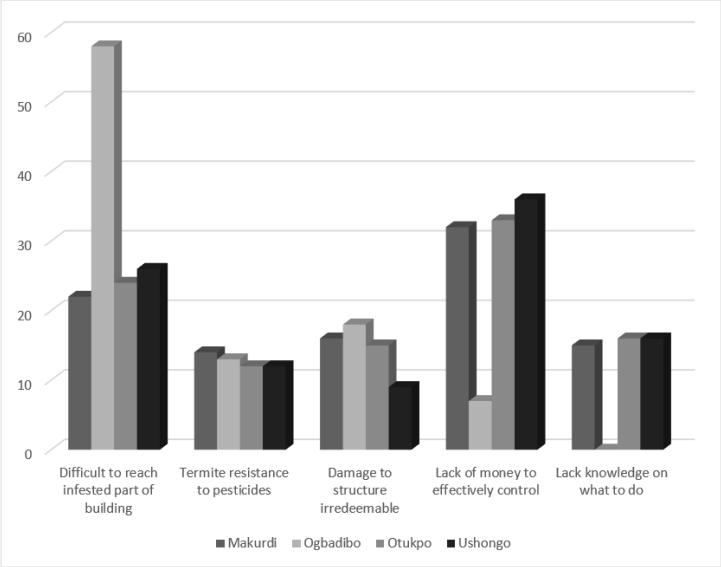

Figure 6. *Challenges encountered in controlling termite infestation in buildings.*

Figure 7. *Termite damaged window frame in Ogbadigbo.*

Figure 8. *Termite damaged ceiling in a residential apartment in Otukpo.*

Figure 9. *Collasped ceiling in a residential apartment in Ogbadigbo.*

Figure 10. *Roofing beam in a school severely infested with termites in Otukpo.*

Figure 11. *Roofing beam in a commercial building severely infested with termites in Makurdi.*

4. Discussion

The overall termite infestation rate in all four study locations was high with *M. malacenensis* and *M. bellicosus* as the most predominant species responsible for structural damages in homes. The severity of infestation and damages is dependent on the age of the building and inability to adopt effective control measures. Other reason for high infestation is the proximity of buildings and the congested pattern of home construction in both urban and rural areas. The materials used for building construction contributed the high infestation rate in the rural areas, houses constructed with mud bricks and plastered with mud were accounted for 35.6% of inspected houses in Okadigbo and Ashong. it has been reported else-

where that mud houses are more vulnerable to termite infestation [4]. [7] had reported in their study in Zambia that faulty construction practices in rural areas like improper timber selection and inserting timber directly into the ground can lead to termite penetration of buildings.

Though termites on their have the ability to infest houses and spread from one apartment to another, faulty construction practices contribute significantly severity of termite damages. [13] reported that the degree of termite damage is highest when wooden items are in direct contact with the ground. In this current study, the high infestation rate can be attributed to materials used for construction of the foundation of the buildings, some of the inspected buildings in especially the rural areas where the foundation is made of earth materials makes the building vulnerable to infestation.

The predominant species encountered in this study corroborates earlier studies in Nigeria [14, 2] and Ethiopia [4] and Zambia [7]. In Nigeria, there are 320 recorded termite species with 57 distinct genera, of which 13 species are known to cause extensive damage to wood and cellulosic products [1]. Among these 13 species are of the genera Amitermes, *Macrotermies, Microtermes, Reticulutermes* and *Odontotermes* which are subterranean termites. They live in colonies in rotten wood, ground and construct mud galleries or tubes to protect the workers which forage for food. It is this group that causes wide spread damage to buildings in sub-Saharan Africa. The rich diversity and wide distribution of these termite species in Nigeria makes many houses vulnerable to attacked by within a few years of construction. These species are responsible for construction of termite mounds that were within the close proximity of residential areas especially in rural settlements. The ability of these species to feed on agricultural produce in storage and wood used for building construction accounts for the dominance in study locations. The widespread utilization of *Gmelina arborea, Gossweilerodendron balsamiferum* and *Khyaya senegalensis* for building construction in the study area corroborate earlier studies by [5]. Their perceived susceptibility or resistance to termites however needs further research inquest to ascertain these claims considering the fact that some of the so-called resistant varieties had visible termite damages on them. Furthermore, some of these woods reputed for their termite resistance ability become target for logging leading to their scarcity and higher cost. Thereby forcing home owners to use low-quality wood for building or repairing their houses. This corroborates reports from Indonesia and Korea [11, 13]. These circumstances make such houses more vulnerable to termite damage.

The significant difference between moderately infested buildings and severely and/or collapsed ones is an indication that despite the high cost of termite-related building maintenance, there is an appreciable effort to control termites and reduce damage to apartments, this effort is however hampered by lack of resources and skills. The lack of resources and knowledge to effectively adopt termite pre and post termite control measures before construction is responsible for the high rate of infestation. It is this lack of capacity to deploy effective control that has resulted to high level of termite tolerance and apathy resulting to severe damages with some home owners willing to abandon their properties if they had alternatives.

Furthermore, the current high cost of living has made it difficult for home owners to deploy adequate resources for termite control. The mean annual one hundred thousand naira reportedly spent on termite related control or maintenance translate to 62.5 USD which is beyond the capacity of an average Nigeria domestic expenditure. Consequently, many home owners do nothing at all to control termite infestation resulting in significant damage to their property and compromising their structural integrity and safety of human habitation. The absence of community effort to tackle termite problem may explain why some home owners are of the opinion their neigbouring apartments were the source of termite infestation in their homes. This is because of the high mobility of termites in spreading within a community. An apartment with termites within a community is a potential source of infestation or re-infestation to other apartment where some control measures have been applied.

Termite infestation is precipitating and unprecedented increase in the use of synthetic insecticides to control termites in residential apartments. The lack of knowledge on termite biology and effective prevention or control measures has necessitated a high dependence on chemical treatment that may rapidly deteriorate under the tropical conditions of high humidity and put occupants of such buildings at risk of pesticide residue in homes. Some of the demographic information of home owners and the lack of adequate skill to use these chemicals is an emerging public health concern. This is particularly important because of the period of treatment and re-occupation of the building while serious pesticide residue could still be active indoors. Some of the pesticides mentioned to be widely used in the Benue State to control termites are on the list of banned pesticides elsewhere [8]. As at the time of this study, there has never been any effort from government to control termites in any part of Nigeria despite the widespread damage to buildings reported across the country [2, 14, 9, 15]. Consequently, the importation and sale of pesticides used to control termite is unregulated and is driven by private individuals strictly for economic interest. The transition from synthetic pesticides to bio-pesticides being advocated by earlier studies [3] needs to vigorously pursued for environmental safety and protection of human lives. Other non-chemical control practices reported in the study communities like mixing kerosine with spent engine oil and using the mixture to treat wood is fast becoming too expensive because of the removal of government subsidy in the petrochemical industry in Nigeria. Though this was widely reported, it cannot be deployed on a large scale considering the quantity of spent engine oil and kerosine required to treat wood for large buildings.

5. Conclusion

Termites are one of the major structural pests and pose economic burden on the communities particularly in developing countries like Nigeria. This study revealed that home owners do not have sufficient knowledge regarding termite control. This poor knowledge could be a hurdle in the effective management of termites [10, 9]. Building the capacity of communities to identify and deploy effective termite control strategies through training is vital. Such capacity building targeted at vulnerable populations with the purpose of reviewing regional construction styles, pre-construction assessment and the use of appropriate timber will increase the ability of individuals to tackle termite-related challenges. The inadequate knowledge and current ineffective practices demonstrated in this study justifies such training. In addition to training the community members, other stakeholders in the building industry especially timber merchants and carpenters responsible for roofing needs training in emerging environmentally friendly termite control strategies.

Abbreviations

FGD	Focus Group Discussion
LGA	Local Government Authority
TETFUND	Tertiary Education Fund

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Author Contributions

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Ethical Approval and Consent to Participate

This study was approved by the Research and Ethics Committee of the Benue State University (approval number CREC/RS/002), in accordance with country regulations. Informed consent was obtained verbally before participation. Participants were anonymized and personal information was stored according to Nigerian regulations.

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Conflicts of Interest

Authors declare that there is no conflict of interest in representation, interpretation and reporting of this research findings. there was no involvement of anyone whose interest could jeopardize the outcome of this research. The authors have no affiliation to individuals or organizations with interest on this publication.

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