

## **Original Research Article**

### **APPLICATION OF CAUSE-AND-EFFECT-ANALYSIS FOR EVALUATING CAUSES OF FIRE DISASTERS IN PUBLIC AND PRIVATE SECONDARY SCHOOLS IN ILORIN METROPOLIS, NIGERIA**

#### **ABSTRACT**

The contributions of fire disaster to the varying degrees of students', staff and schools' property and/or lives lost in secondary schools in Nigeria is recently alarming. The study assessed causes of fire disaster in public and private secondary schools in Ilorin metropolis, Kwara State, Nigeria. The objectives were to identify latent causes of fire disaster, use fishbone diagram to illustrate and analyze root cause of fire disaster in secondary schools. Exploratory research strategy was used. The target population was 18 senior public and private secondary schools, Ilorin having 18 principals, 965 teachers and 3765 sSenior sSecondary 2 students. From these population, simple random sampling technique through a pick and not-return balloting was employedapplied to sample 72.22% of the principals, 14.8% each of the teachers and students. Data were collected through in-depth interview, questionnaire, participatory observation checklist, and were analyzed using cause-effects-analysis. The findings reveals ~~that~~ fire disasters in public and private secondary schools in Ilorin metropolis are caused by arson, bush/waste burning, electrical fault/wiring, carelessness, and alcohol, smoking and drugs. It was concluded that open wiring and sparks from wrong connections, setting undergrowths on fire, cultism rivalry, use of combustible materials for decoration, and lack of proper fencing of the school compound are root-causes of fire disasters in PPSSs in Ilorin metropolis. The study recommends that schools in the metropolis should prepare and anticipate future fire tragedy. Consequently, ,and since there are several factors responsible for fire incidents, further studies could be conducted-should investigate to clarify the sequence or magnitude of each causes of fire outbreak.

**Comment [N1]:** Research designs are limited to case study scenarios, longitudinal, cross-sectional, comparative studies and so on. So in this case, strategy or approach is the right word instead of design(Line 13).

**Comment [N2]:** It would be helpful if the causes listed could be paraphrased to highlight or make readers know what primarily is the major cause of fire-outbreaks in Private and Public secondary schools (Line 20).

28 **Keywords:** Fire disaster, Fishbone-analysis, Ilorin metropolis, Secondary school.

29

## 30 INTRODUCTION

31 Fire disaster has become a global prevalent disaster experienced in most public and private

32 secondary schools and other learning institutions ~~with likely no country is exempted whether~~

33 ~~developed or developing~~. Lending credence to this, not fewer than 43% of 938 secondary schools

34 surveyed by the Arson Control Forum ACF (2006) in United Kingdom ~~(a developed country)~~

35 recorded large numbers of fires incidents between ~~years~~ 2003 and 2006 alone. Kenya, a

36 developing country in Africa has fire disaster as ~~a most~~ common ~~phenomenon~~ disaster

37 experienced in secondary schools and other learning institutions (Kirui, 2009; Akumu, 2013;

38 Shibutse, Omuterema, and ~~China,~~ 2014b). ~~The~~ National Fire Data Center (NFDC) ~~in,~~ (2007)

39 reported that, Africa ~~continent where Nigeria belongs~~ is one of the continents ~~recording a number~~

40 ~~of fire incidents across its regions at the verge of most of these school fires deaths related~~ due to

41 different ~~reasons~~ such as lack of preparedness ~~and limited awareness programs among the~~

42 ~~citizenry and some key institutions~~.

43 The incidents of fire ~~outbreaks~~ in Nigeria are grossly increasing every year ranging ~~from~~

44 different locations like residential buildings, warehouses, learning institutions ~~and so on, etc~~. Fire

45 disasters ~~situation~~ in learning institutions precisely secondary schools ~~are~~ worrisome ~~due to its~~

46 ~~the country because it~~ ~~persistence~~ continuing without cessation. ~~Fire~~ The incidents ~~in Nigeria~~ are

47 so incessant ~~in the country~~ to the extent that they occur on a daily basis (Adamu, 2013), with

48 enormous contributions, ~~amplifying to the~~ toll of ~~varying degree of losses from~~ death and

49 property losses ~~among~~ students and staff ~~lives losses~~ in public and private secondary schools

50 (PPSS). ~~Notable~~ among these incidents ~~in secondary schools in~~ Nigeria include ~~that of the year~~

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Comment [N3]: I guess you are trying to say no country is exempted from this disaster? ...with likely no country is exempted...addition of this sentence to the first line doesn't really make the sentence clear. Kindly reframe the line highlighted in red to make the sentence more clearer.

Comment [N4]: China????

Comment [N5]: You stated just one reason thus, lack of preparedness. You should have stated more than one since you used ...different reasons. I added another reason for your perusal/attention.

Comment [N6]: PPSS could be used instead of PPSSs

Comment [N7]: Long sentences. Try to break them or make them simple and concise.

51 | 2001 ~~when a public fire disaster at a Government Girls sSecondary sSchool~~ in Bwalbong-Gindiri  
52 | village, Plateau State, ~~recorded where 23 deaths among its students. students died~~ In addition, the  
53 | ~~school segregated for girls in the aforementioned village had and~~ 40 ~~students been~~ injured. In the  
54 | incident, students were trapped in the dormitory because it was locked and ~~fortified~~ with iron bars  
55 | and a chain (The Independent Newspaper, ~~March, 8~~ 2001).

**Comment [N8]:** Fortified??? In this context I suggest you use another word since it may not be appropriate.

**Comment [N9]:**

56 | In a similar event, ~~the fire outbreak in Government Girls College in~~, Jogana, Kano State ~~I in was~~  
57 | ~~on the night of 30<sup>th</sup>-November, 2015 claimed the experienced fire disaster incident. The incident~~  
58 | ~~took 7~~ lives of ~~7~~ female students and left 21 others injured (Mohammed, 2015). Similarly,  
59 | important documents including class register, records of students, books, some learning aids were  
60 | reduced to ashes by fire in ~~year~~ 2016 in a section of Ogbe Secondary School, ~~Benin City~~, Edo  
61 | State (Ibileke, 2016). ~~Fire wiped entire block of two female hostels at Federal Government~~  
62 | ~~College, Keffi, Nasarawa State in 2017. Books and other students' property were destroyed in the~~  
63 | ~~incident (Premium Times, November, 27 | 2017). Punch Newspaper gathers that in December,~~  
64 | ~~2017 fire burn down a student hostel at Government Science Secondary School, Kware, Sokoto~~  
65 | ~~State. The same source added that, 80 students escape fire at Government Girls Secondary~~  
66 | ~~School, Mabera, Sokoto State on January 21, 2018. The inferno suspected to be caused from~~  
67 | ~~electrical sparks completely destroyed the four-room A'isha hostel and valuables but no student~~  
68 | ~~was hurt (Punch Newspaper January 22<sup>nd</sup>, 2018).~~

**Comment [N10]:** Kindly check how to cite newspapers and other literature. I corrected a number of them, kindly cross check the main text.

69 | Ilorin, ~~the capital of being the~~ Kwara State, ~~capital~~ has ~~over the year~~ continued to attract  
70 | migrants from various parts of the country. ~~Reasons for such migrations maybe partly,~~  
71 | ~~particularly downue~~ to its strategic location as a gateway between the northern and southern parts  
72 | of the country (Usman, Malik and Alausa, 2015). The religious intolerance experienced in the  
73 | northern parts of Nigeria in the late 90s (Ahmed, 2005), the insurgency in northern-eastern parts

**Comment [N11]:** Needs to be re-written to make it more concise for readers. Especially as the author cites instances and case by case scenarios of such incidents.

74 of the country (Ibrahim, Adetona and Olawoyin, 2014; Usman et al., 2015), and the recent  
75 herdsman activities has contributed to these influx of people ~~into~~ the city. ~~Based on these, one of~~  
76 ~~the challenges people recently faced is fire disaster from H~~human errors are one of the major  
77 contributory factors to fire outbreaks. ~~as a result of D~~demand and careless use of facilities and  
78 utilities such as gas cookersing gas, electrical appliances and so on, ~~ete~~ in public and private  
79 secondary schools (PPSSs) along with ~~nearby~~ houses ~~near them~~.

80 However, losses emanating from ~~accompanying~~ these fire incidents in PPSSs in Ilorin metropolis  
81 are very alarming. For instance, ~~in only~~ 3 fire disaster events purported from sparks of ~~afrom a~~  
82 working generator and setting undergrowth on fire by unknown persons in 2012 resulted in the  
83 loss of ~~,~~ properties worth ₦ 6,600,000 million naira ~~were destroyed in year 2012~~ at St. Mary  
84 International School, and Cherubim and Seraphim College, Ilorin between ~~in the year~~ 2015 and  
85 2019 in (Kwara State Fire Service Headquarters ~~KSFSSH~~, 2019 annual report). These huge losses  
86 are clear evidence of lack of preparedness, urgency ~~what fire is~~ and mode of prevention ~~how it~~  
87 can be prevented (Pascal, 2006).

88 Nevertheless, despite the ~~the~~ fire incidents and losses incurred, ~~over the years~~ researchers have  
89 been working relentlessly ~~vigorously~~ to provide different models and analytical ~~analysis~~ tools to  
90 explain and establish logical ~~find~~ solutions to fire outbreaks ~~disaster problems,~~ ~~,~~ ~~F~~for instance,  
91 Oladokun and Emmanuel (2014) invoke fuzzy logic model to analyzed urban market fire disasters  
92 management in Nigeria while Oladokun and Ishola (2010) used a risk analysis model to explained  
93 fire disasters situation in commercial complexes in Nigeria. T~~Meanwhile,~~ the purpose of  
94 providing such tool(s) is/are to assist s in unveiling the key causes of fire disasters, take- results  
95 oriented ~~corrective~~ actions for prudent management and continuous improvement on fire situations  
96 (Balanced Scorecard Institute, 2007; Tarun, 2012). Therefore, this study sought to find out ~~is about~~

**Comment [N12]:** Too long/lengthy sentences. Kindly break it down to make it more concise and clearer. It could be...Despite the incidents and losses incurred over the years.....Must be well punctuated!!!

97 ~~“The Cause-and-Effect-analysis (fishbone-analysis)”~~ along with its ~~and its~~ application to latent  
98 analysis and ~~analysis latent~~ causes, ~~root causes and~~ as well as proposing ~~viding~~ solutions to fire  
99 ~~disaster incidents~~ problems and cost of property loss ~~in it~~ in various PPSSs in Ilorin metropolis.

## 100 MATERIALS AND METHODS

101 Ilorin Metropolis is located between latitude 8° 24' 0" N and 8° 56' 0" N of the Equator and  
102 between longitude 4° 32' 0" E and 4° 56' 0" E of the Greenwich Meridian with an elevation of  
103 290m above ~~the~~ sea level. It lies on the southern fringes of savanna region and north of the forest  
104 zone of Nigeria. The city is situated in the nNorth central geo-political zone with a land mass of  
105 approximately 100km<sup>2</sup> (Adediji, Ajayi and Olawole, 2009; Usman et al., 2015). The metropolis  
106 has about 20 political wards, and comprises ~~part~~ of three Local Government Areas (L.G.As)  
107 namely: Ilorin East, Ilorin South, and Ilorin West.

108 Ilorin is one of the fast growing cities in Nigeria with relatively high growth rate. The city is a  
109 confluence of cultures, primarily dominated by Yoruba, Hausa/Fulani, Nupe, Baruba, Igbo  
110 while the minors are other natives ~~Nigerian languages~~, and foreigners. The indigenous people's  
111 religion is predominated ~~by~~ Muslims ~~Islam~~ and Christians ~~ity is majorly practiced by non~~  
112 ~~indigenes and few indigenes. The population according to the [1991] Population Ceensus, put~~  
113 Ilorin's population is estimated to be around 532,088 (NPC, 2006), and was projected to be  
114 1,049,168 by 2013 (Ibrahim et al., ~~Bako, Raheem, and Abdulyekeen~~, 2014). Significant increase  
115 in ~~The population in recent years have~~ explosions has greatly contributed to different human errors  
116 such as careless use of gas cooker ~~s~~ and electrical appliances in schools and houses closed to  
117 schools, ~~and uprising establishment of new secondary schools leading to inferior use of building~~  
118 ~~materials that can easily catch fire. Ilorin is a fast growing in educational wise with different~~  
119 ~~learning institutions from primary to university level. Ilorin metropolis has 64 public and 45~~

**Comment [N13]:** Since it's about the study area, it could have a subsection header like: Study Area right after the materials and methods.

**Comment [N14]:** The author is advised to add more precise data or info to this paragraph which delves into demography of the study area.

**Comment [N15]:** Is there no current population census? If the last population census carried out in Nigeria was 1991 that's fine...if not kindly use estimate/projection for the last census for the study area.

120 registered private senior secondary schools with a population of 47,568 students, 5010 teachers,  
121 and 109 principals/head teacher (MOEHCD, 2017).

**Comment [N16]:** This lineThis line is misleading and must be reframed (line 322 to 324) is misleading and must be reframed. If the population figure stated is limited to the key elements in schools then must be clarified as such to make it clearer and distinct from the population in Ilorin which is 532, 088.

122 Data used ~~for~~ this study were obtained from both primary and secondary sources. ~~The~~ primary  
123 source of data were collected from principals/vice-principals through an in-depth interview,  
124 teachers and students through the use of questionnaires, and participatory observation. The data  
125 include information on causes of fire disasters and the physical outlook of PPSSs surroundings.  
126 The secondary data was sourced from Kwara State's Ministry of Education and Human Capital  
127 Development (MOEHCD) for population of secondary schools in Ilorin metropolis. In addition,-  
128 Kwara State Fire Service Headquarters (KSFSH) ~~further provided~~ detailed datas on cases  
129 related to fire incidents in secondary schools fires, as well as and Kwara State Ministry of Lands  
130 and Surveying for ~~Ilorin~~ map of the study area. This study adopted exploratory research  
131 strategy design. The target population ~~constituted~~ was 18 senior PPSSs having 18 principals, 965  
132 teachers and 3765 SS 2 students (MOEHCD, 2017). From the target population, simple random  
133 sampling technique through a pick and not-return balloting ~~were~~ employed applied to sample  
134 72.22% of the principals, 14.8% each ~~for~~ of the teachers and students that helped in identifying the  
135 causes of fire disasters in PPSSs in Ilorin.

**Comment [N17]:** I would suggest that if you would not include map of the study area in this text, you need not to include this. I humbly suggest to you to include a header section "study area" after the materials and methods, you can include map of the study area to validate ...map of the study area in line 333. There is no map within the text so if you do not include it then omit or reframe line 333.

**Comment [N18]:** Refer to my comment on replacing design with strategy in the abstract section.

**Comment [N19]:** -Why did you choose this sampling methodology? Any justification?

-In what way does this validate information given by respondents.

-Does this technique make or justify the target group as true representation of the entire students, teachers and head of institutions in PPSS in Ilorin metropolis?

136 However, Cause-and-Effect-Analysis (CEA) model was used to evaluate the causes of fire  
137 disaster ~~in the and as well it root causes~~ region (Balanced Scorecard Institute, 2007). The  
138 "fishbone diagram" known as a CEA ~~known model as an Ishikawa or "fishbone diagram"~~ is a  
139 graphic tool used for that helps people identification, sorting, and exhibition of display  
140 potential ~~ssible~~ causes of a problem ~~or quality characteristic~~ (IHI ~~Institute for Healthcare~~  
141 ~~Improvement IHI~~, 2016). The name It is defined as "fishbone" emanates from because of its  
142 structural outlook and appearance (Tarun, 2012). The study further asserts that ~~Same source added~~

143 ~~that~~, in a typical fishbone diagram, the main problem which is required to be resolved is linked  
144 ~~top~~ on the head of the diagram, ~~and~~ the causes are related to the bones and then smaller bones  
145 are created and used as the resemblances of the sub-causes.

146 Fishbone diagram or analysis was used to evaluate the causes, sub-causes and aid ~~assists~~ to  
147 uncover the symptoms of fire disasters in PPSSs in Ilorin (American Society for Quality, 2005).

**Comment [N20]:** Not properly cited. Kindly cite this properly

148 In other words it was used to graphically illustrate the relationship between fire disaster and the  
149 causative factors ~~that influence it~~ (IHI, 2004). Henrik (2009) described cause-and-effect diagram  
150 as a simple and pragmatic way of doing root cause analysis. The essence of using this  
151 ~~model~~ fishbone diagram was to identify ~~the causes in particular~~ the root causes of fire disasters in  
152 PPSSs in Ilorin metropolis. ~~The~~ is study therefore considered this model ~~very important because~~ as  
153 useful to achieve the specific objectives of this study as it is. ~~The~~ model has not being explored  
154 by other researchers in fire disaster incidences and ~~fire~~ safety management. To construct the  
155 fishbone diagram, the following steps identified in Ishikawa (1968), Brassard (1988), Vivek  
156 (2008) and Tarun (2012) were:

**Comment [N21]:** The steps could be placed in a box with a caption beneath it.

- 157 i). Fire disaster (i.e. effect) was written in a box on the right-hand side of the page (fish  
158 head).
- 159 ii). A horizontal line (spine) was drawn to the left of the effect.
- 160 iii). Diagonal lines were drawn above and below (these are the fish bones) the horizontal line  
161 (spine), and were labeled with the categories chosen in 4 below.
- 162 iv). The main categories of factors (causes) contributing to fire disaster identified were  
163 labeled. The major categories typically utilized were electrical fault, arson, carelessness,  
164 bush/waste burning, and drugs (including alcohol and smoking).

- 165 v). List of causes for each category was generated, and branch bones off the fish bones  
166 connecting the causes to their respective categories were drawn to produce sub-factors.
- 167 vi). Analyzes of the results were done after an adequate amount of detail has been provided  
168 under each major category.

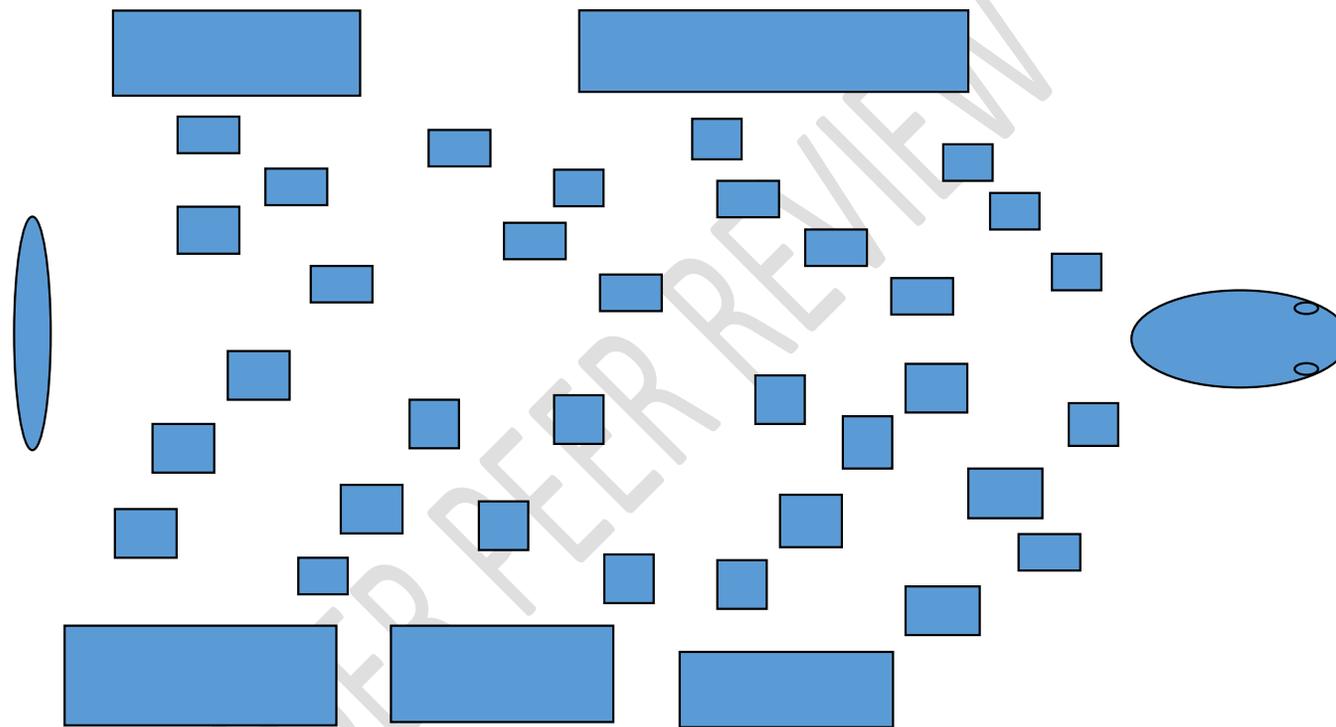
## 169 RESULTS AND DISCUSSION

170 The various main causes of fire disaster as well as their root causes identified in PPSS in Ilorin  
171 metropolis are presented in Figure 1. The identified major causes were bush/waste burning, arson,  
172 electrical fault/wiring, carelessness, and alcohol, drugs and smoking.

173

**Comment [N22]:** There must be results on number of respondents attributing root causes to the interpretations listed below and discussed accordingly. Key interpretations listed in line 505 and so on is like a key/legend

**Comment [N23]:** Reframe and restructure the introduction for this section. Not good enough



**Figure 1: Fishbone Diagram for Causes of Fire Disasters in Public and Private Secondary Schools in Ilorin Metropolis**

**Source:** Adapted from Institute for Healthcare Improvement IHI, (2016)

**Comment [N24]:** I suggest you retake a look at the diagram. There is no spine. It could be better labelled regarding the head, tail spine, bones and so on for readers to understand when further elaborated or liaised to the causes, sub-causes and effects

**Keys Interpretation**

- A High voltage.
- B Negligence or failure to put out light after school hours.
- C Abuse and misuse of electronic gadgets such as overloading of sockets and extension boxes.
- D Improper handling of electrical appliances in the school or nearby houses.
- E Improper and illegal connection of wires from the nation grid, in the laboratory e.g. Physics, Chemistry laboratories and other places within the school.
- F Lose wire or open connections
- G Sparks from electrical gadgets due to fallen electrical poles during rainy season.
- H Political reasons.
- I Psychological reasons
- Ia Drugs and hard substances.
- J Emotional reasons
- Ja Cultism rivalry.
- K School policy
- Ka School fees
- Kb School prefects.
- L Setting undergrowths on fire by hunters and other persons.
- M Improper disposal of refuses within the school and dung hill near school.
- N Indiscriminate waste burning in houses near the school.
- O Bushy school surrounding especially during dry season before holidays.

**Keys Interpretation**

- P Mishandling of chemicals in pre-room and science laboratories in practical.
- Q Overturn and careless use of gas cooker and other cooking materials in Home Economics laboratories and kitchens in boarding schools.
- R Mistakenly and careless drop of cigarette stub in waste bin within or near the school.
- S Careless use of combustible materials in the school buildings
- Sa Playing with candle or using it to read in boarding schools' hostels
- Sb Use of glossy paints and other combustible materials for decoration and beautification of offices, classes, rooms in the hostels etc.
- T Refilling of explosive materials
- Ta Refilling of lighted kerosene lamp and cooking stoves while is still on
- U Lack of proper fencing of the school compound.
- V Smoking by gardeners at night.
- W Smoking of cigarette, India helm and other dangerous substance by hoodlums.
- X Accident from drunkard school drivers while filling school bus with petrol.
- Y Improper disposal of cigarette stub.
- Z Psychological disturbance from drugs addicts.

178 **Electrical fault/wiring Problem:**

179 Usage of electrical appliances for ~~a school~~ day-to-day activities ~~are~~ is good but bears some  
180 consequences when not properly used ~~is dangerous~~. Findings ~~as regard this~~ shows ~~that~~ faulty  
181 electrical appliances, wrong connections, overloading of electrical outlets and so on have been  
182 weighing different assault on lives and especially property of students, teachers and school  
183 valuables in PPSSs Ilorin metropolis. For instance~~example~~, properties worth over ₦2million  
184 naira were destroyed in a fire incident ~~of fire at in one of the private secondary schools in Ilorin~~  
185 ~~(St Mary International College, Ilorin)~~ in ~~the year~~ 2012 as a result of sparks from a working  
186 generator (KSFSH, 2019). Citing~~An inside look at the case~~ electrical problems in PPSSs in Ilorin  
187 as case scenario through study observation reveals ~~that, the some of the~~ root causes of these  
188 problems could be attributed to~~are~~ non-insulated wiring system, overloading of junction boxes  
189 in some classes, computer laboratories~~rooms in schools coupled with, and~~ leaving classrooms  
190 and offices lights on even after school hours. Sparks happened from high voltage leading to fire  
191 disaster when bulbs were not put off and when overloaded boxes were~~are~~ heated and could no  
192 longer bear the load (demand)~~s pressures~~.

**Comment [N25]:** For academic purpose I suggest you reframe this sentence.

193 **Bush/waste burning Problem**

194 Bush/waste burning has been one of the problems faced by~~in~~ PPSSs in Ilorin from indiscriminate  
195 waste burning in nearby houses, ~~to~~ school premises~~environment~~ and immediate environs~~bushy~~  
196 school surroundings particularly during the ~~dry~~ed season. Setting undergrowth on fire by  
197 hunters amongst others ~~are other~~~~other persons on fire on the other hand is another~~ root causes  
198 of some fire disasters in PPSSs in Ilorin resulting to huge ~~which has caused a lot of~~ losses and  
199 destruction of personal and public properties~~to school buildings and property~~. An example of

200 | huge loss from bush/waste burning in secondary schools in Ilorin were fire incidences in ~~year~~  
201 | 2015 and 2019 at Cherubim and Seraphim College, Ilorin. ~~Palone with properties~~ worth ~~N~~  
202 | 100, 000 ~~million naira were lost to this phenomenons~~ (KSFSH, 2019).

203 | ~~Bush/waste burning challenges has been faced by many PPSSs in Ilorin and lot of properties has~~  
204 | ~~lost from this.~~

### 205 | **Arson Problem**

206 | Arson (intentional fires) is ~~a~~ fires deliberately set by an individual, ~~a person~~ or group of persons  
207 | on ~~private or public ones or others~~ properties, ~~mainly in a as a~~ form of protest or vengeance  
208 | against ~~institutions or others or~~ government (Ilori, 2017). Some fire outbreaks in PPSSs in Ilorin  
209 | are caused by some ~~individualshuman beings~~ with ~~maliciousevil~~ intent ~~to show displeasure or~~  
210 | ~~create destruction~~ (Tolofari, 2010). Public and private secondary schools in Ilorin are not free  
211 | from arson. ~~Fset fires set upwhich~~ are engineered politically or psychologically ~~through the use~~  
212 | ~~of e.g. drugs, hard substances and or when individuals are~~ psychologically depressed. ~~Resultant~~  
213 | ~~fires may be~~ Some arson fire root cause is emotionally ~~inducedcaused~~ from cultism rivalry among  
214 | male teachers and students over ~~a girl or superiorityfriend~~ within and outside the school. Other  
215 | root factor is school policies/laws with sub-causes such as ~~tuitionschool~~ fees and ~~studet leaders~~  
216 | ~~fond of bullying other studentsbully prefect etc.~~ On arson caused fires, KSFSH (2019)  
217 | documented that arson suspected individuals gutted Government High School, Ilorin on fire ~~inon~~  
218 | ~~25<sup>th</sup> November-~~ 2012. The culprits could probably do ~~sothat~~ to show dissatisfaction due to one ~~or~~  
219 | ~~more of the aforementioned reasons. r some of the early defined reasons.~~

### 220 | **Carelessness Problem:**

221 Some public and private secondary schools in Ilorin has experienced some form of destruction  
222 from carelessness. Carelessness is as result of different reasons ~~linked to which include~~  
223 mishandling of chemicals in ~~various the science~~ laboratories ~~during experimentation before and~~  
224 ~~during practical~~, overturn and careless use of gas cookers ~~amongst others and other cooking~~  
225 ~~materials in Home Economics laboratories and kitchens in boarding schools~~. Careless use of  
226 combustible materials like ~~the, the~~ use of candles in ~~boarding schools~~ dormitories, hostels, glossy  
227 paints and other combustible materials for decoration and beautification of offices, classrooms  
228 ~~and, hostel's rooms etc~~. For instance, during visitations to schools ~~to collect data~~, some students  
229 at Cherubim and Seraphim College, Ilorin were jokingly discussing between themselves how one  
230 of them played with fire which later escalated ~~s~~ beyond his expectation. Careless ~~ness is a major~~  
231 ~~contributory factor to fire outbreaks in most PPSS, resulting to loss of lives, personal and public~~  
232 ~~properties, playing with fire and other forms of carelessness has been troubling many PPSSs and~~  
233 ~~putting them in serious debts~~.

#### 234 **Alcohol, drugs and smoking Problem:**

235 Lack of proper fencing of the school compound ~~has resulted in the intrusion of drug addicts and,~~  
236 ~~smokers at odd periods, by gardeners at night, Improper disposal of cigarette stub, leakage of~~  
237 ~~fuel from accident from drunken school drivers while filling school buses with petrol~~ were  
238 ~~notable parts of~~ root causes of fire disaster in PPSSs in Ilorin ~~from alcohol, drugs and smoking~~.  
239 ~~Per From~~ observation, ~~one of the authors found that~~, some hoodlums ~~often smoked frequently do~~  
240 ~~their smoking activities~~ in the evening after ~~the~~ school hours. ~~Furthermore, findings show in~~  
241 ~~secondary schools since more than~~ 61.11% of PPSSs in Ilorin are partially or not fenced. ~~This~~  
242 ~~made it so easy for those guys to do their activities and by virtue some pieces of paper which are~~  
243 ~~viable fuel of fire disaster were in some classrooms being used by these gangs.~~

**Comment [N26]:** Must be backed by data not just stating it (Line 724 and 725).

**Comment [N27]:** Line 727-729 must be reframed to be clearer and more concise.

244 **Problems and Solutions:**

245 Several factors are responsible for fire disasters in PPSSs in Ilorin metropolis. It is ideal that  
246 quick action is taken to avert these incidents so as to mitigate the future occurrence and emerging  
247 losses even though the occurrence is few but the cost of property loss in these events were  
248 brilliantly in millions of naira. Therefore, for the safety of lives and property of students,  
249 teachers, principals, the school itself and other users some solutions are provided for the five  
250 main categories of causes of fire disasters in PPSSs in Ilorin.

251

252 **Solutions of Electrical fault/wiring Problem:**

253 To get rid of these electrical fire problems in PPSSs in Ilorin, conscientious actions must be  
254 taken such as putting off all electrical appliances like computer systems, fans, electric kettle,  
255 cookers, socket and air-conditioning systems when not in use in the laboratory, kitchen, hostel  
256 and offices even for a short moment. By so doing sudden sparks from high voltage that causes  
257 alarming destruction to lives and property will be prevented. Replacing burnt fuses with cables  
258 of higher melting point personally may result into a great fire disaster hence; trained  
259 engineers/qualified electrician(s) should be employed by each school to fix electrical problems.

260 **Solutions of Bush/waste burning Problem:**

261 The remedy to this may include; clearing of school compound against bushy environment, strict  
262 punishment on any student and even teacher who littered the school compound, provision of  
263 waste bin in all classes, staffrooms, and strict restriction of hunters and herders getting access to  
264 school compound.

**Comment [N28]:** Were the solutions proposed by respondents or target population? If so must be stated and outlined as such.

Line 730: Caption must be revised

**Comment [N29]:** Kindly revise sections for the solutions and back them up with data. They need to be revised. I suggest the authors to read more about structure and composition of developing manuscripts on related fields/subject.

265 **Solutions of Arson Problem:**

Comment [N30]: Refer to comment for line 764

266 To curb arson problems, proper and full fencing of school compound with secure gates and  
267 placement of security men at the entrances would help schools in reducing such crime and also  
268 help to bring culprits to book.

269 **Solutions of Carelessness Problem:**

Comment [N31]: Same

270 As the case may be carelessness can be prevented among other methods by making matches  
271 sticks available to light gas burner in kitchens in the boarding schools, in home economics and  
272 science laboratories before turning on the burner. Adding to this, keeping gas cylinder outside  
273 kitchens and laboratories would help the flow and leakage into the air outside the laboratory and  
274 kitchen to prevent risk of sudden fire explosion from careless use of this equipment.  
275 Furthermore, combustible materials should not be used for decoration, and in any circumstance if  
276 petrol must be used, it should be kept far away from kitchen, lantern or candle light. All these  
277 and many others will help in preventing unexpected losses in PPSSs in Ilorin.

278 **Solutions of Alcohol, drugs and smoking Problem:**

Comment [N32]: Same

279 To tackle this act in or around PPSSs in Ilorin, proper and full fencing of school compound with  
280 secure gates and security men at the entrances would help schools in reducing fire disaster  
281 eventualities from the perpetrators. Prohibition of smoking within and around the school  
282 premises especially during school hours by school users should viscosly enforced. School  
283 management should consistently monitor a school driver that engaged in smoking or that takes  
284 alcohol.

285 **CONCLUSION**

286 The study has established from it analyses that fire disaster situations in public and private  
287 secondary schools in Ilorin metropolis are ~~primarily~~major caused by bush/waste burning,  
288 electrical faults, arson, carelessness, and alcohol, drugs and smoking. From these major factors,  
289 setting undergrowth on fire, open wiring and sparks from wrong connections, cultism rivalry, use  
290 of combustible materials for decoration, and lack of proper fencing of school compound are root-  
291 causes of fire disasters. This study therefore, recommends that schools should prepare and  
292 anticipate future fire tragedy, and since there are several factors responsible for fire incidents  
293 further studies should investigate to clarify the sequence or magnitude of each causes of fire  
294 because these factors magnitude may not be the same.

**Comment [N33]:** Entire manuscript needs to be proofread to check for grammatical errors/tenses, punctuations and so on.

-Conclusion needs to be revised and properly written

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**Comment [N34]:** References must conform to the journal's format. Kindly check the correct format and do so accordingly (Author, year. Title of paper/book....name of publisher/institution, city/country the paper was published. In some cases you could add the link)

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