URBAN FREIGHT MANAGEMENT SCHEMES AND EVALUATION OF SAFETY MANAGEMENT PRACTICE IN THE TRUCKING OF PETROLEUM PRODUCTS IN NIGERIA

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ABSTRACTS

Refined petroleum products (Petrol, Kerosene, Diesel, Liquefied Natural Gas, Ethanol, Thinner and other spirits) are majorly transported from Refineries, Deports and Jetties in Nigeria to petrol stations and industries through the use of petrol trucks.

In recent times, the explosion and involvement of these trucks in accidents has been at alarming rate and these have led to massive loss of lives, properties and damage to the environment.

Kaduna town in Northern Nigeria host one of the four refineries in the country and the town also serve as link road to other parts of Northern states for trucks that bridge petroleum products from southern parts of the country, the town attracts high volume of petrol trucks traffic.

This paper examined the urban freight management schemes available during the loading of products from Kaduna Refinery and Petrochemical Company and safety management measures taken by petrol stations owners at the points of products discharge in the town.

It also assesses the role of Petrol Trucks Operators and Traffic Law Enforcement Agencies in the effective management of safety measures and safety policy implementation in the trucking of the products within the country.

Deductions from empirical figures showed that at the loading point in the Refinery and discharging point at petrol stations safety standard measures are being enforced, however little is done by petrol trucks operators and law enforcement agencies in ensuring safe transportation of petroleum products on Nigerian roads and cities.

Consequently is recommended that the operators needs to safeguards their huge investments.Also law enforcement agencies like Vehicle Inspection Officers (VIO) and Federal Road Safety Commission (FRSC) needs to ensure the safety of other road users, from the menace of accidents from petrol trucks which are majorly resulted to non adherence to road safety rules and regulations.

Finally, results elicited from the traffic corridor used as case study and solution proffered will be quantified, aggregated and use as inputs for modelling of urban freight managements schemes for Nigerian roads.

1.INTRODUCTION

Freight transportation is a vital element in the economic prosperity of any country. A wide variety of products need to be efficiently transported within and among the consumer markets, industry sectors, and international trade networks, while addressing adverse impacts on congestion, environment, safety, etc. to the extent possible. Bryan et al. (2007) argued that transportation planners should consider different costs of road freight transport including environmental, maintenance and security, and congestion costs to formulate and offer practical solutions. As the businesses increasingly adopt sophisticated supply chain management strategies, freight shipment decision-making process is becoming ever more complicated.

Trucks and other trucks provide important freight transport services across Nigeria; from urban to rural and long distance inter-state services. While few trucks convey water, vegetable oil, and other liquids over long distances, a greater number products like kerosene, Petrol, Diesel, Liquefied Natural gas, ethanol, thinner, and other spirits which are hazardous in nature.

Hazardous or dangerous goods are such goods that have the potential to cause harm to people, property, or the environment. They include highly flammable fluids like Petrol, Corrosive substances like Acids, Radioactive materials like Uranium, Toxic wastes from factories, and various forms of air and water pollutants. The fact that these goods are regarded as hazardous or dangerous does not in any way detract from their value or usefulness. On the other hand the idea of transporting hazardous material is not a reflection of any form of irresponsibility, be it on the part of the shipper or on the part of the carrier. Infact transportation experts have found that the movement of hazardous materials in commerce is necessary and desirable to maintain economic vitality and meet consumer demands. (Chigozie 2008)

However in satisfying the transportation needs of any industrialized society, it is required that the entire operation be conducted in a safe and efficient manner.

In recent times in Nigeria, the explosion and involvement of these trucks in accidents has been at alarming rate and these have led to massive loss of lives, properties and damage to the environment.

Considering the Nigerian truck traffic situation, statistics show that whilst the number of deaths from crashes involving buses fluctuates each year, estimates of casualties of Truck explosions have remained on the increase in recent times. Transportation Risk Analysts have blamed this scourge on the over-reliance of the Nigerian National Petroleum Corporation (NNPC) and Pipeline and Products Marketing Company (PPMC) on the road mode for distribution of petroleum products without giving due consideration to the environmental consequences. (Ameyan 1996)

Kaduna town in Northern Nigeria host one of the four refineries in the country and the town also serve as link road to other parts of Northern states for trucks that bridge petroleum

products from southern parts of the country, thus the town attracts high volume of petrol trucks traffic and serve as base for many petrol Truck operator.

2. MATERIALS AND METHODS

Basically, the types of data used for this research, were operational data from the respondents who are stakeholders in trucking of petroleum products. The respondents were Petrol trucks operators, drivers of the trucks and petrol station outlet all in Kaduna town Nigeriawhich serve as the study area of the research.

Such data include; year of operation and fleet composition, accidents and safety issues, as well as other operational issues.

This information for the study were obtained from both primary and secondary sources. The primary source was based on the administration of 21, 45 and 55 questionnaires to Petrol truck operators, drivers of the trucks and petroleum products retail outlet all in Kaduna town respectively. While, the secondary data were sourced from relevant documents.

3.0 DATA ANALYSIS AND INTERPRETATION

TABLE 1 - ORIGIN OF PETROLEUM PRODUCTS

ORIGIN	Frequency	Percent
Kaduna	18	40.0
Outside Kaduna State	27	60.0
Total	45	100.0

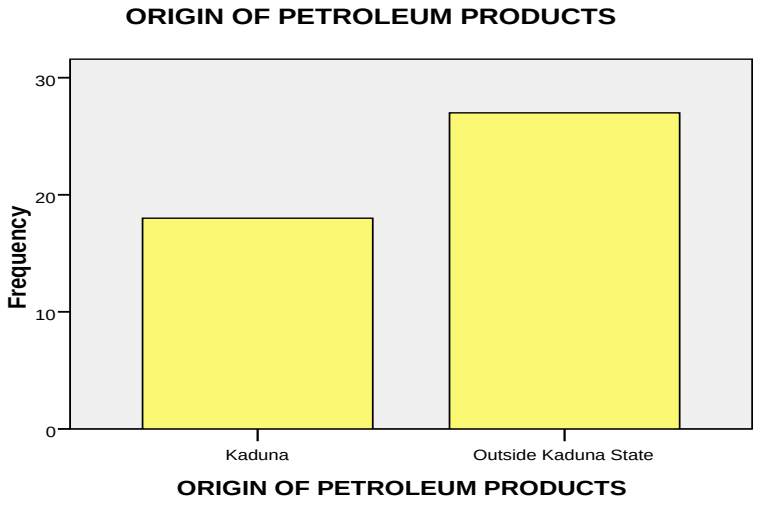
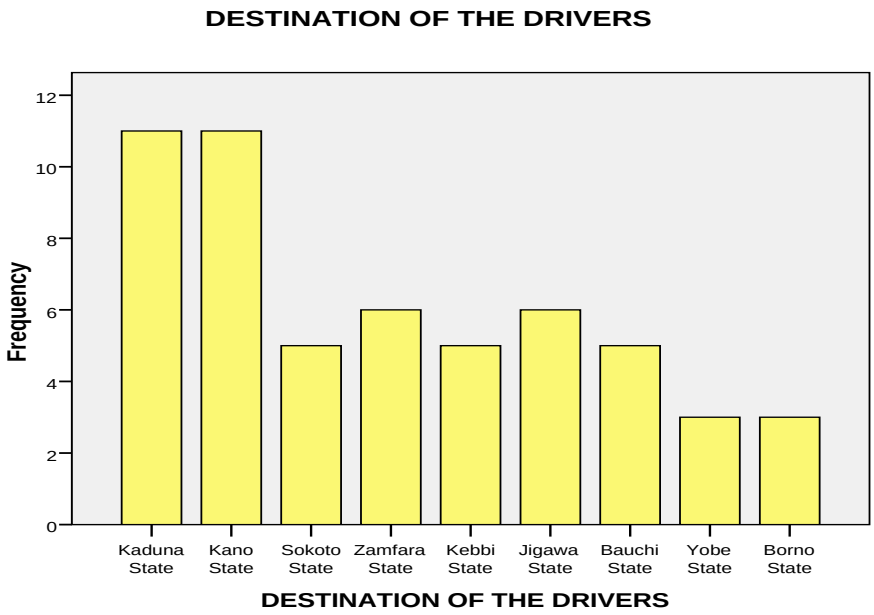


Table 1 shows the result of questionnaire administered on the petrol truck driver with petroleum product in Kaduna environ of Northern Nigeria on the origin of the petroleum product on transit. The table shows that 60 % of the respondents loaded their products from

refineries and deports outside Kaduna refinery, thus only on transit to various destination via Kaduna town, hence only 40% loaded products from Kaduna refinery.

TABLE 2 - DESTINATION OF THE DRIVERS

DESTINATION	Frequency	Percent
Kaduna State	11	20.0
Kano State	11	20.0
Sokoto State	5	9.1
Zamfara State	6	10.9
Kebbi State	5	9.1
Jigawa State	6	10.9
Bauchi State	5	9.1
Yobe State	3	5.5
Borno State	3	5.5
Total	55	100.0



Kaduna town in Northern Nigeria serve as link town to other parts of Northern states for trucks that bridged petroleum products from southern parts of the country. Table 2 Buttressed this with 80.0% of the drivers interview had the destination spreading to other states in Northern Nigeria which Kaduna serve as link road, while 20% (1/5) of the respondent has their destination to be within the Kaduna state.

TABLE 3 - TRANSPORTATION MODE OF GETTING PETROLEUM PRODUCTS

MODE	Frequency	Percent
Road by Trucks	45	100.0

According to petroleum products retailer's responses in table 3, the only medium of getting petroleum products to sales outlets is through road transport by the use trucks to convey the products to the sales outlets.

TABLE 4 - YEARS OF OPERATION OF TRUCK OPERATORS

YEARS OF OPERATION	Frequency	Percent
1-5 Years	2	8.0
6-10 Years	3	12.0
11-15 Years	8	32.0
16-20 Years	7	28.0
21 Years and above	5	20.0
Total	25	100.0

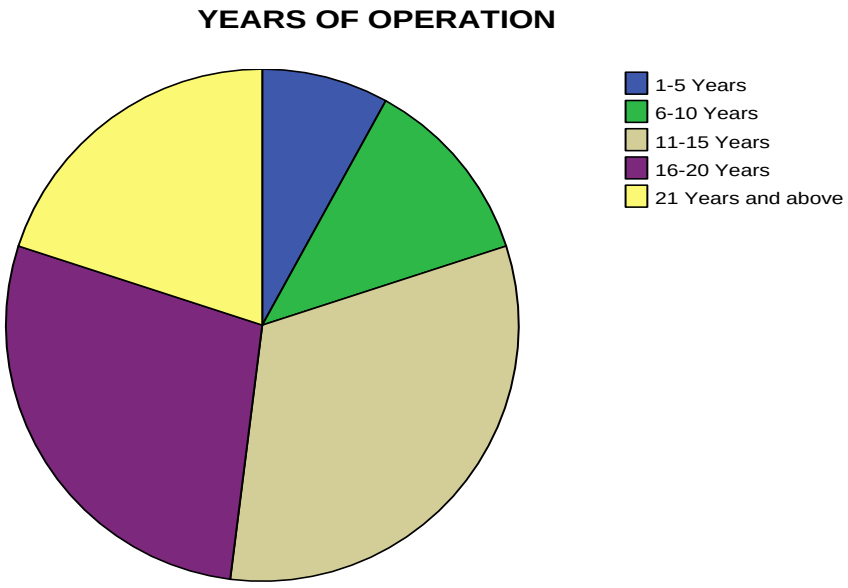


Table 4 shows the responses from Petroleum Truck Operators on years in business. 32% of the operators have been in operation between 11 to 15 years and this constitutes the majority. This is followed by those who have been operating between 16-20 years with 28.0% while 21 years and above is next with 20.0%. Thus majority of the respondents have been in operation for a long time. 1 to 5 years are 8% and 6 to 10 years are 12%.

TABLE 5 - NUMBER OF FLEET

NUMBER OF FLEET	Frequency	Percent
1-4	3	12.0
5-10	7	28.0
11-15	8	32.0
16-20	3	12.0
26-30	2	8.0
31 and above	2	8.0
Total	25	100.0

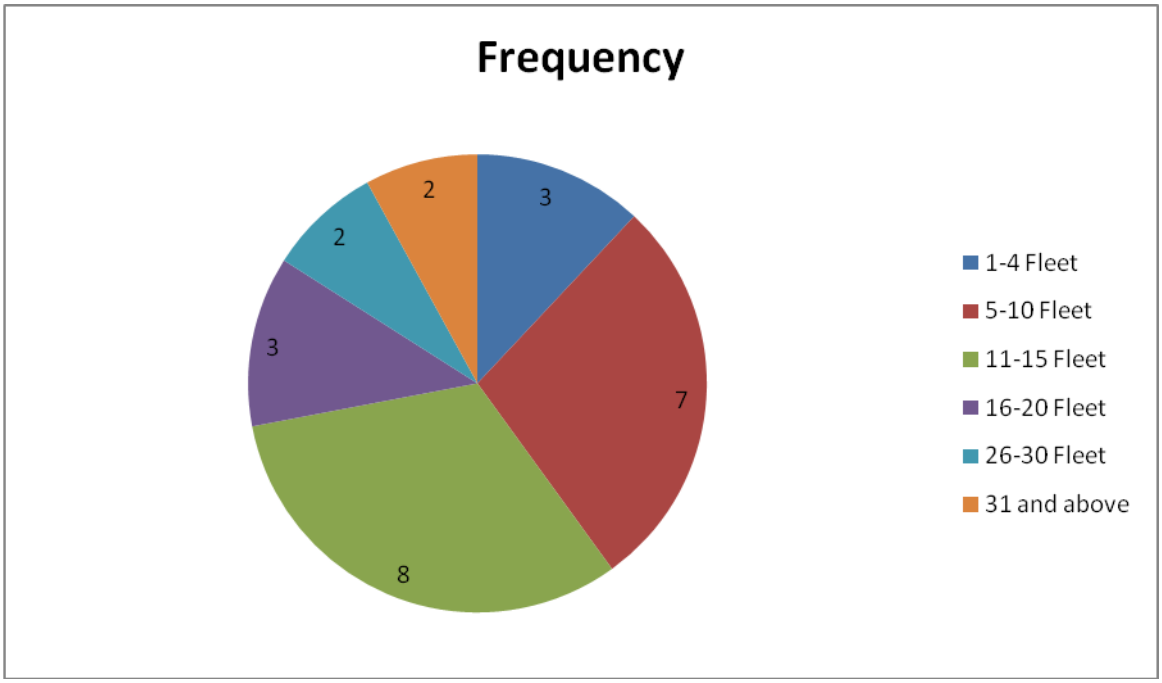


Table 5 above revealed the responses from Petroleum Truck Operators on the number of fleet owned by the Operators. According to the table, 32 % of the operators have between 11-15 trucks and this is followed by those with 16-20 fleets which is of 12%. Those that have 26-30 and above 31 fleets constitute 8 % each while those with 4 and less fleets constitute 12%. Thus, the table shows that 88% of the operators qualified to meet the requirement of the country Federal Road Safety Commission (FRSC) Road Transport Safety Standardization Scheme (RTSSS) for operator with 5 fleets and above.

TABLE 6 - EVER EXPRIENCED FIRE OUTBREAK DURING PRODUCTS DISCHARGED

FIRE OUTBREAK	Frequency	Percent
Yes	9	20.0
No	36	80.0
Total	45	100.0

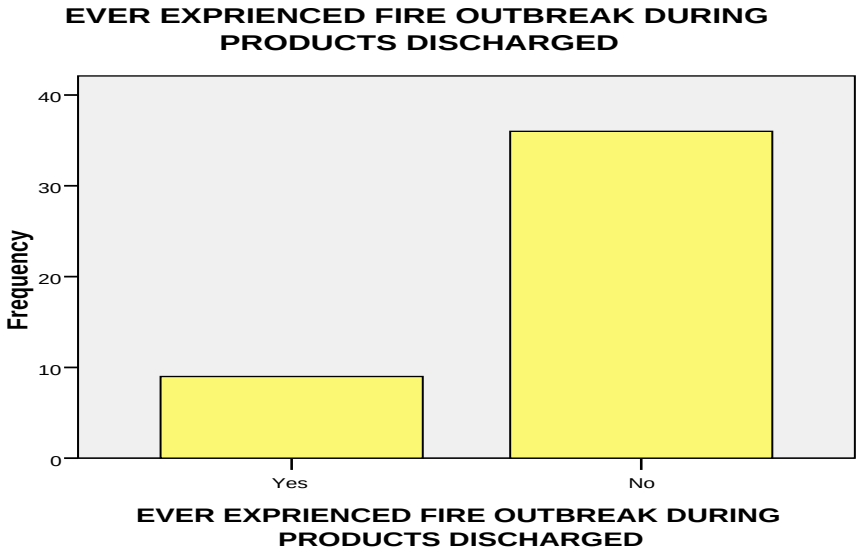


Table 6 revealed the responses of petroleum products retailers on fire outbreak experience during the discharge of products by petrol trucks. The table shows that 80% of the retailers responded that they have never experienced fire outbreak during product discharge while only 20% said they have experienced fire outbreak.

TABLE 7 - CAUSE OF THE FIRE OUTBREAK

CAUSE	Frequency	Percent
Metal to Metal touch	7	77.8
Hot Sun Radiation	2	22.2
Total	9	100.0

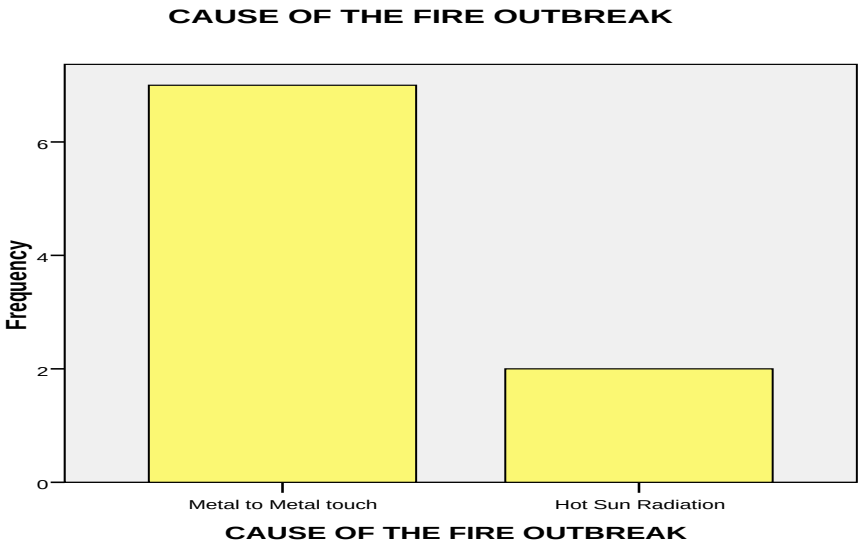
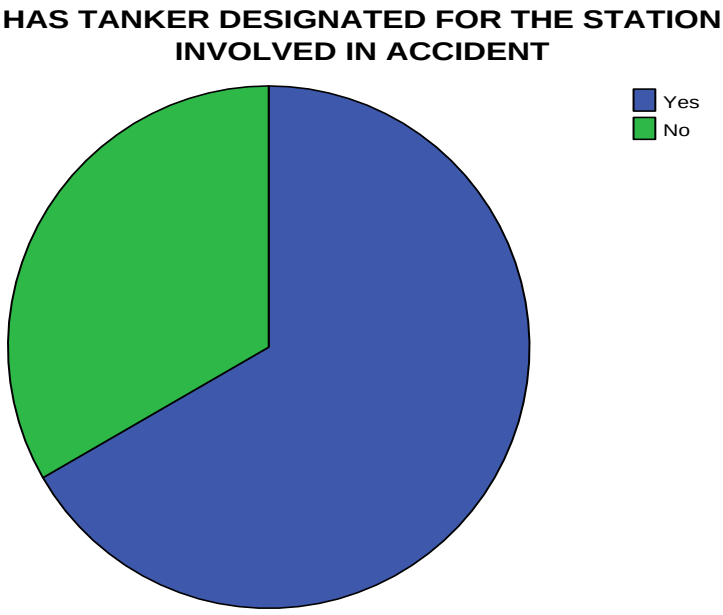


Table 7 shows the causes of fire outbreak at the petroleum products retailers' outlets that have experienced fire outbreak at the point of products discharged. According to the table, 77% of the occurrences were caused by metal to metal touched while 2 (22%) out of the nine respondents said the fire outbreak was caused by hot sun radiation.

TABLE 8 - HAS TRUCK DESIGNATED FOR THE STATION INVOLVED IN ACCIDENT

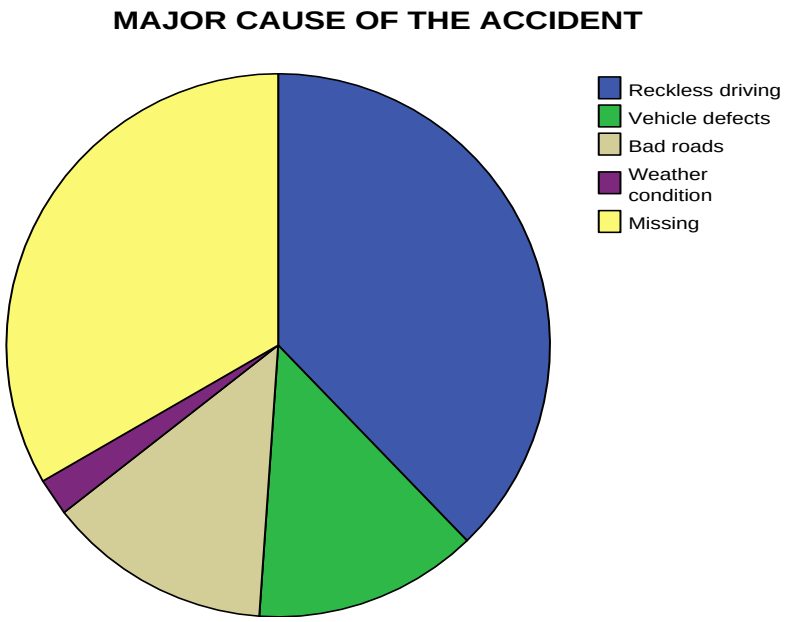
ACCIDENT	Frequency	Percent
Yes	30	66.7
No	15	33.3
Total	45	100.0



The ordering of petroleum products from marketers is being done by products retailers, the products sales outlets is the final destination for truck drivers. Table 8 shows the involvement in accidents of trucks with products designated to petroleum sales outlets. 66.7 % of the retailers said that trucks with petroleum products designated to their station have involved in an accident while only 33.3 % said that truck designated to their station have never involved in accidents.

TABLE9 - MAJOR CAUSE OF THE ACCIDENT

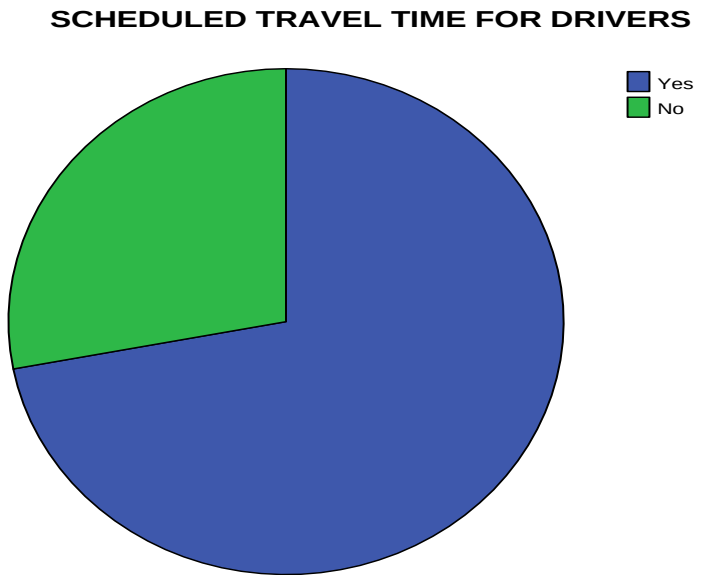
CAUSE OF THE ACCIDENT	Frequency	Percent
Reckless driving	17	56.7
Vehicle defects	6	20.0
Bad roads	6	20.0
Weather condition	1	3.3
Total	30	100.0



Petroleum products retailers attributes the major cause of truck accidents designated to their station to reckless driving by drivers. This shows in table 9 as 56.7% of their responses indicated reckless driving of truck drivers. This is followed by vehicle defects and a bad road with each having 20 % as the cause of the accidents.

TABLE 10 - SCHEDULED TRAVEL TIME FOR DRIVERS

TRAVEL TIME	Frequency	Percent
Yes	18	72.0
No	7	28.0
Total	25	100.0



The petroleum truck operators set driving rules for the truck drivers. However, 72% of the operators indicated that they have scheduled travel time for their truck drivers while 28 % of the operators have no travel time schedule for their drivers and by implication the drivers can be on transit at any time of the day. Table 10.

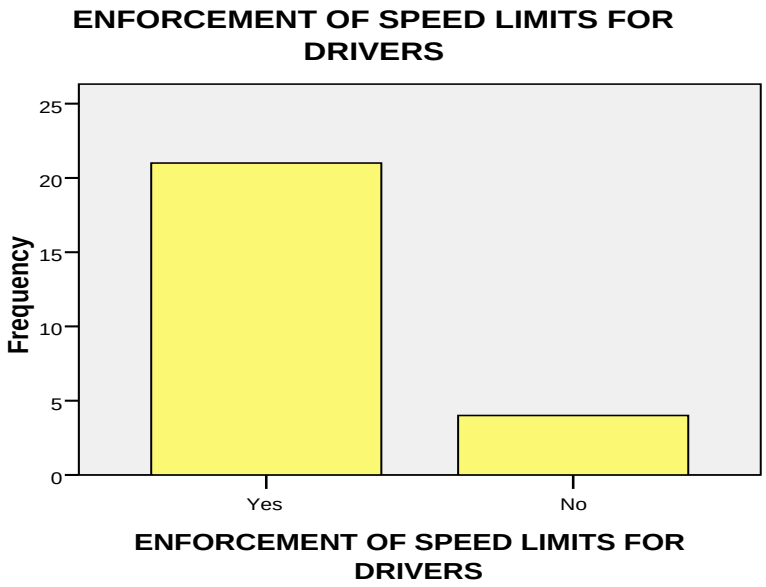
TABLE 11 - TIME SCHEDULED FOR TRAVELLING

TIME	Frequency	Percent
Between 6amand 6pm	18	100.0

As for the petroleum truck operators that have travel schedule time, all the operators indicated that the travel time scheduled for their driver is between 6am and 6pm. This revealed that the drivers are to be on transit only between these periods of the day. Table 11.

TABLE 12 - ENFORCEMENT OF SPEED LIMITS FOR DRIVERS

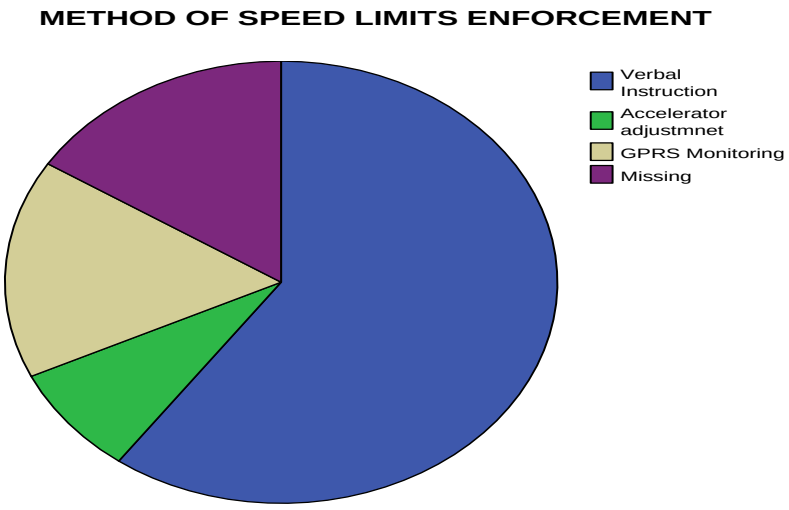
ENFORCEMENT OF SPEED LIMITS	Frequency	Percent
Yes	21	84.0
No	4	16.0
Total	25	100.0



The Traffic rules of Nigeria stipulated different speed limit for different types of vehicle. However, transport operators also have rules for their drivers which are in line with the country traffic rules, but some transport operators are silent on enforcement of speed limit for their drivers. Table 12 revealed that 84 % of petroleum truck operators enforce speed limit for their drivers while only 16 % do not enforce speed limit rules on their drivers.

TABLE 13 - METHOD OF SPEED LIMITS ENFORCEMENT

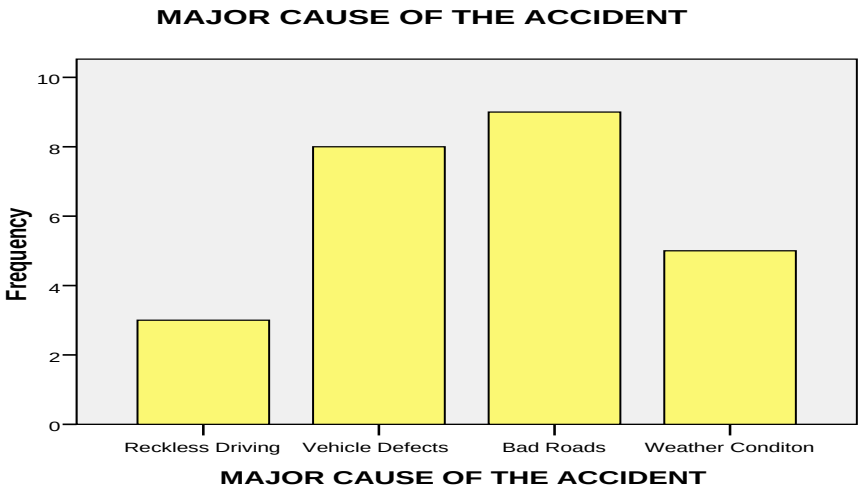
METHOD	Frequency	Percent
Verbal Instruction	15	71.5
Accelerator adjustment	2	9.5
GPRS Monitoring	4	19.0
Total	21	100.0



Transport operators employ different method to enforce speed limits rules on their drivers. However, the petroleum truck operators according to table 13, revealed that majorly, 71.5 % gave verbal instruction to drivers, while 19 % uses Global Positioning Radar System (GPRS) to monitor and enforce speed limits on their drivers and 9.5% of the operators uses accelerator adjustment to enforce speed limits for their drivers.

TABLE 14 - MAJOR CAUSE OF THE ACCIDENT BY DRIVERS

CAUSE	Frequency	Percent
Reckless Driving	3	12.0
Vehicle Defects	8	32.0
Bad Roads	9	36.0
Weather Condition	5	20.0
Total	25	100.0



Trucking of petroleum products in Nigeria has been one of the major menace and nightmare as a result of involvement in accident and wanton destruction of properties and loss of many lives. Table 14 above revealed the perception of truck drivers on the causes on accidents while on transits. Majority of the truck drivers that is 36 % attribute the major cause of their involvement in accidents to bad roads and this is followed by 32% of those with the view that vehicle defects is the cause of accident. 20 % of the truck drivers attributed the cause of accident to bad weather condition and only 12 % indicated reckless driving by drivers as the major cause of accidents while on transits.

TABLE 15 - DEVICE FOR THE SPEED LIMIT ENFORCEMENT BY DRIVERS

DEVICE	Frequency	Percent
Verbal Instruction	35	85.4
Accelerator Adjustment	3	7.3
GPRS	3	7.3
Total	41	100.0

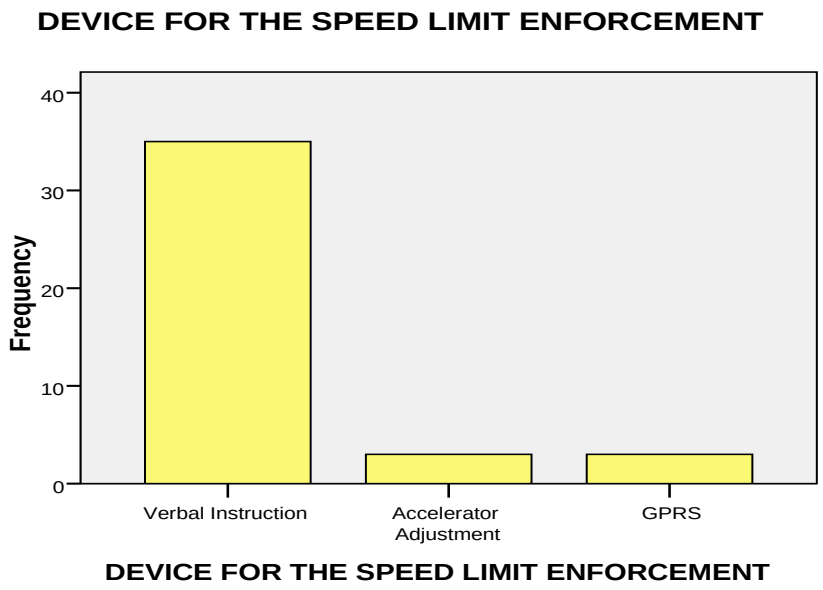
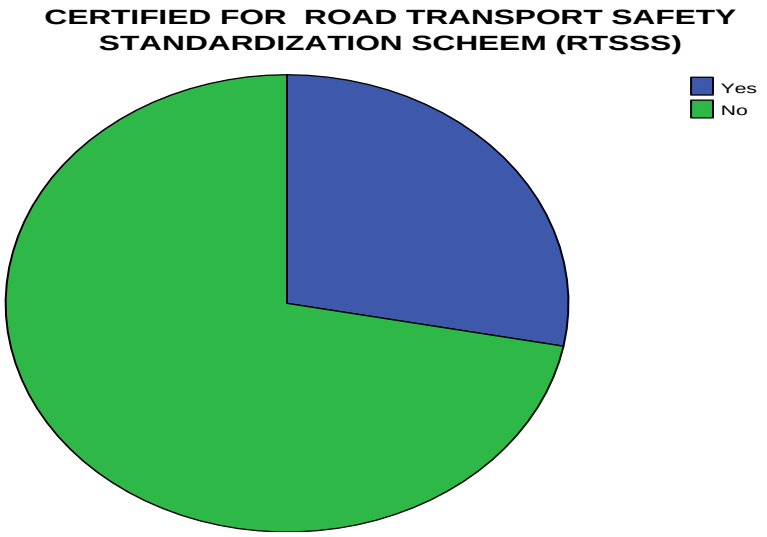


Table 15 revealed the responses of truck drivers on the measures their operators used in enforcing speed limits. 85 % of the drivers indicated that speed limits enforcement while on transits were given to them through verbal instruction by their operators. While the drivers with other method of enforcement techniques which are accelerator adjustment and the use of GPRS are of 7.3 % each.

TABLE 16 - CERTIFIED FOR ROAD TRANSPORT SAFETY STANDARDIZATION SCHEEM (RTSSS)

CERTIFIED	Frequency	Percent
Yes	7	28.0
No	18	72.0
Total	25	100.0



Road transport sector of Nigeria commercial operator used to be a sector with free entrance and exist for the operators. However, as a result of high rate of road traffic accident, the agency on road safety measures enforcement, that is Federal Road Safety Commission introduced a scheme called Road Transport Safety Standardization Scheme (RTSSS) in 2007 in which fleet operator with 5 fleet above have to be certified for operation. The certification process centered on three elements which are Operators Safety Standard, Driver's Safety Standard and Vehicle Safety Standard. Table 16 shows that only 28 % of the truck operators have been certified while 72% have not been certified.

TABLE 17 - SAFETY STANDARDS PROCEDURE NOT YET CERTISFIED

CONSTRAIN	Frequency	Percent
Operators Safety Standard	5	27.8
Driver's Safety Standard	4	22.2
Vehicle Safety Standard	2	11.1
All of the above	7	38.9
Total	18	100.0

SAFETY STANDARDS PROCEDURE NOT YET CERTISFIED

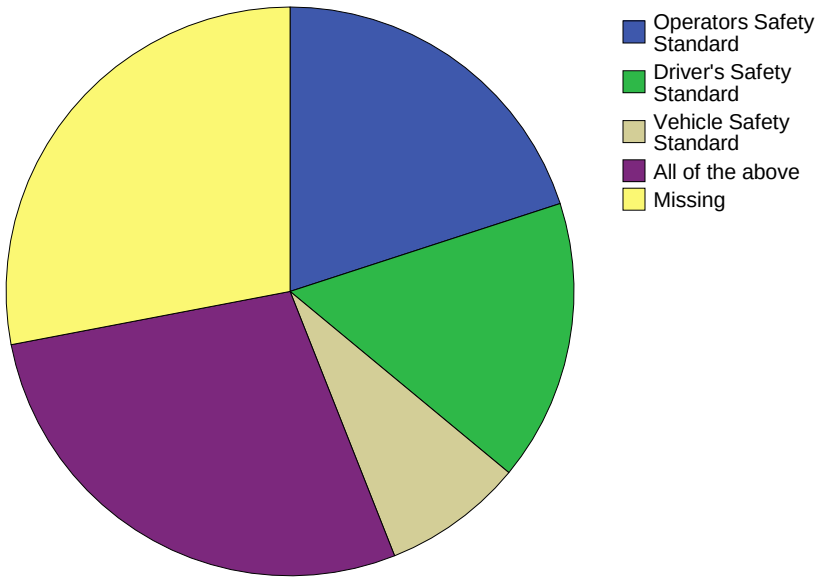


Table 17 revealed the conditions that have not been met by the truck operator for certification. According to the table, 27 % of the operators have not met the operators safety standard requirements which include having safety unit, headed by safety expert, provision of standard terminus, comprehensive vehicle maintenance policy, enforce mandatory rest hours for drivers etc. 22% of the operators have not met the Driver's Safety Standards which include drivers passing drivers certification programme, periodic medical/ health visual acuity tests, maintenance / use of log book etc. while 11.1 % of the operators are yet to meet the Vehicle Safety Standards to. However, 39 % of those that have not been certified have the three conditions to meet.

4. 0. DISCUSSION OF RESULT

4.1 Trucking Movement and Operation

Kaduna town in Northern Nigeria host one of the four refineries of the country, however, the petroleum products according to table 1 shows that majority of the retailers bridged their products outside the state with a figure of 60% while 40 % got their products from the town by implication the refinery in the town. Also table 2 revealed that 80% of the truck drivers uses Kaduna as a link road to other Northern states in Nigeria while only 20 % of the trucks with products are designated for retailers within Kaduna state.

In addition table 3 showed that all fuel retailers acquired their petroleum products through road transport. This is major means in which petroleum product gets to retail outlets across Nigeria including Kaduna town.

Petrol Trucks are majorly owned by private transport operators. Table 4 shows that 32% of the operators have been operation between 11 to 15 years and this constitute the majority. This is followed by those who has been operation between 16-20 years with 28.0% and 21 years and above followed with 20.0%. Thus majority of the respondents have been in operation for a long time. 1 to 5 years are 8% and 6 to 10 years are 12%.

Table 5 shows the fleet composition of the operators that responded. According to the result majority of the respondents 32.0 % owned between 11-15 fleets, this followed by those with 5-10 fleets 28.0%. 1-4 and 16-20 fleet's owners occupied the third position. Those with 26-30 and 30 and above constitute 8% each.

4.2 Safety Issues

Petroleum products most especially gasoline is an inflammable product, thus the issue of explosion or fire outbreak at loading, transits and discharging. However, table 6 shows that the majority of the retailers 80 % have not experienced explosion or fire outbreak at the point of products discharge at their stations. While 20 % which is $1/5^{th}$ of the respondents have experienced explosion or fire outbreak at the point of discharge in their retail outlets.

Table 7 shows what caused the explosion or fire outbreak to 20 % of respondents from table 6 Seven out of the nine respondents said the fire outbreak was caused by fire metal to metal contact while the other two respondents said the fire was caused from extreme hot sun radiation.

The petroleum product retailers do get their products through petrol trucks. However, the accident rate of these trucks is relatively high because according to table 8, 66.7 % of the respondents said that trucks designated for their stations have involved road traffic accidents. While 33.3% indicated that trucks designated for their station has not been involved in any accident.

Table 9 shows that 56.7% of the respondents agreed that reckless driving were the major causes of the accident while, 20.0% of the respondents said that vehicles defects was the cause of the accident. Bad roads also constitute major cause of the accident with 20.0 % and weather constitutes only 3.3% of the cause of the accident.

One of the major safety measures in trucks operation is travelling time scheduled restriction for the drivers while driving. Table 10 shows that majority of the operators has travelling time schedule for their drivers and this constitutes 2/3 that is 72 % of the respondents. 28% of the respondents said their organization has no travelling time schedule for their driver.

Table 11 shows that all those respondents that have travelling time schedule for their drivers scheduled their drivers to travel between 6am and 6pm. This by implication that the drivers should only travel in the day time not in the night

Speed limit enforcement rule is allows the transport operators to compliments the work of traffic law enforcement agencies. Thus, table 12 shows that almost all the respondents 84 % said that they have speed limit enforcement rule as one of their organizational rule. Only 16 % said that their organization do not enforce speed limit rule.

Enforcement of speed limit rule has different methods or devices for enforcement. Table 13 shows that even though majority of the respondents has speed limit rules but it is been majorly by verbal instruction with 71.4 % while 9.5 % adjusted their trucks accelerator and 19.0 % make use GPSR monitoring device.

Table 14 shows that drivers that have involved in road traffic accident 36% attributed the major cause of their accident to bad roads situation in the country. This is followed by 32 % that attributed it to vehicle defect while 12% the lowest accepted their reckless driving as the cause of the accidents. Bad weather condition like rain, poor visibility etc carried the third position with 20% as another important cause of the accidents.

4.3 Trucking and Freight Management Schemes

On the method or devices used in enforcing the speed limits table 15 revealed that verbal instruction or warning from trucks operators is the major method do use to control the drivers speed limits because this carried 85.4% of the result from respondents that is the trucks drivers. The remaining 14.4 % used accelerator adjustment and GPRS monitoring system.

Table 16 revealed that only 7(28%) out of the 25 operators have been certified by the Federal Road Safety Commission of Nigeria with Road Transport Safety Standardization Scheme (RTSSS) having met the conditions which are Operators safety Standard, Driver's Safety Standard and Vehicle Safety Standard.

Road Transport Safety Standardization Scheme (RTSSS) certification is a new scheme introduced by Nigeria Road Safety Commission (FRSC) for any transport operator with five fleets and above. However, three conditions of Operators safety Standard, Driver's Safety Standard and Vehicle Safety Standard must be met before an operator can be certified. Table 17 shows that majority 38.9 %of the truck operators that have not been certified have not met the three conditions. While 27.8 % have only Operators Safety Standard to be met, 22.2% has Driver's Safety Standards to be met and 11.1% has only Vehicle Safety Standards to be met.

5.0 CONCLUSION AND RECOMMENDATIONS

The important of urban freight transport for the distribution of petroleum products in Nigeria is paramount to efficient function of economics, political and social activities of the country. Thus, there is therefore an urgent need for traffic law enforcement agencies like Federal Road Safety Commission (FRSC) and Vehicle Inspection Officers (VIO) for enforcement to step up enforcements of safety standard for efficient safety management practice in the trucking of petroleum products in Nigeria. Transport Management professionals to be harnessed for improving transport productivity, efficiency, safety, environmental performance, and regulatory efficiency in a uniform or nationally consistent manner.

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