

Conditions of Vehicle Tyres on Nigerian Roads—Better Road Safety Data for Better Safety Outcomes

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Abstract: Tyre related crashes accounted for 8.38%, 9.24%, 7.40%, 7.24%, 6.73%, 6.10% of total crashes on Nigerian roads in year 2011, 2012, 2013, 2014, 2015 and 2016 respectively, making appraisal of conditions of tyres very crucial. Data on the use of tyres in the country are not available hence, the need to conduct a survey on this aspect. The aim of the research is to collate data to assess the conditions of tyres for informed decision on road safety. The objectives are to ascertain the level of awareness on tyre usage and identify the condition of tyres being used. Questionnaires were administered to private, commercial and government drivers nationwide by the Federal Road Safety Corps (FRSC). A total of 124,510 tyres on 30,242 vehicles were checked. Forty percent (40%) of the total tyres were expired out of which 44% were for commercial vehicles. Thirty percent (30%) of total tyres surveyed had correct pounds per square inch (PSI) as many of the tyres were either under or over inflated. Sixty-five percent (65%) of the tyres met thread depth of 1.6 mm while 8% of the tyres had bumps. Twenty-three percent (23%) of the drivers are unaware of tyre information. FRSC used this in developing strategies to educate the public on better usage of tyres.

Key words: Tyre, safety, road, crash.

1. Introduction

“Tyre is ring-shaped part either pneumatic or solid (including rubber, metals and plastic composites), that fit around rims to protect them and enhance traction. It is made of chemically treated rubber and fabric.” [1]. Tyre enables better vehicle performance by providing required traction, braking, steering, and load support, tyre determines the stopping distance of vehicles in terms of braking. According to Alhassan [2], “Tyre forms a flexible cushion between the vehicle and the road, which smoothens out shock and makes for a comfortable ride”.

1.1 Tyre Related Crashes

Globally, tyre related crashes are huge. In the US for example, more than 500 people die every year in 33,000 tire-related vehicle crashes resulting in about 19,000 injuries. It is believed that most of these

crashes are simply preventable with adequate knowledge, education and sensitization. About 1.5 to 2 million tires on the road were potentially unsafe for use, therefore a call for caution on the vehicle owners globally as some tires pose potential high risk for users due to various factors such as facilitated recall due to factory errors [3].

A lot of risk of crashes could be linked to the conditions of tyres. When thread depth for example is below 1.6 mm, road traffic crashes rates are trebled and even increase seven-fold when the thread depths go below 0.5 mm [4]. Thread depth below 0.5 mm could also result in a fault known as aquaplaning, a situation where the tyre fails to clear the water on the road when the tyre contacts the ground [5]. There are several other tyre conditions such as over-inflation, under-inflation and tyre damage that could result in tyre related crashes.

1.2 Tyre Related Crashes in Nigeria (2011-2016)

Tyre related crashes are among six (6) major causative factors in road traffic crashes in Nigeria [6].

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1.3 Aim

The aim of the research was to assess the conditions of tyres on Nigerian roads for informed decision on road safety.

1.4 Objectives

The objectives were:

- To ascertain the level of awareness on tyre usage;
- To identify the condition of tyres being used in the country;
- To evaluate the level of correct tyre usage and identify the combination of new and expired tyres.

1.5 The Study Areas

The survey was conducted in all the states and Federal Capital Territory.

2. Methodology

Questionnaires were randomly distributed to private, commercial and government drivers by the Federal Road Safety Corps (FRSC) field commands nationwide. Tyres of the vehicles being driven by the drivers were examined and pressure (pounds per square inch (PSI)) also measured. A total of

30,124 vehicles were checked with a total of 124,235 tyres.

Simple descriptive statistics and charts were employed in the analysis.

Statistical packages like SPSS and Microsoft Excel were used in running the analysis.

3. Analysis

A total of 30,124 vehicles drivers were stopped and tyres checked. And 124,235 tyres were checked from randomly stopped vehicles. Fifty-five percent (55%) of the surveyed tyres were from private vehicles, 42% from commercial vehicles, while 3% were from government vehicles (see Table 1).

3.1 Analysis of Expired/Non-expired Tyres

As showed in Chart 1, 60% of the total tyres surveyed from vehicles had not expired while 40% of the tyres had expired. Analysis also revealed high percentage of good tyres among government vehicles as only 30% of their tyres were recorded expired. See the details in Table 2 and Charts 1 & 2.

Chart 2 below indicated that 44% of commercial vehicles tyres had expired while the remaining 56% had not expired.

Table 1 Summary of national tyres surveyed.

SN	Particular	Private	Commercial	Government	Diplomat	Total
1	Number of expired tyres	25,975	22,630	915	0	49,520
2	Number of non-expired tyres	42,660	29,030	3,025	0	74,715
3	Number of tyres purchased as tokunbo	24,635	29,270	1,045	0	54,950
4	Number of tyres purchased as rebore	425	720	0	0	1,145
5	Number of tyres purchased as new	43,840	21,310	2,990	0	68,140
6	Number of tyres with correct PSI	23,725	12,700	2,515	0	38,940
7	Number of tyres with wrong PSI	44,570	37,545	3,180	0	85,295
8	Number of under inflated tyres	21,765	19,500	1,260	0	42,525
9	Number of over inflated tyres	22,805	18,045	1,920	0	42,770
10	Number of tyres with good thread or grid level	49,255	27,710	3,565	0	80,530
11	Number with fair thread or grid level	15,625	15,685	525	0	31,835
12	Number with bad thread or grid level	4,730	7,035	105	0	11,870
13	Number of tyres with burge/damage or cut	5,225	6,475	260	0	11,960
14	Number of tyres without burge/damage or cut	65,085	42,720	4,470	0	112,275
15	Number of drivers with knowledge of tyre expiration	14,185	8,160	935	0	23,280

Table 2 Analysis of expired/non-expired tyres.

Category of vehicle	Number of expired tyres	Number of non-expired tyres	Total number of tyres surveyed	Percentage of tyres surveyed
Private	25,975	42,660	68,635	55%
Commercial	22,630	29,030	51,660	42%
Government	915	3,025	3,940	3%
Diplomat	0	0	0	0%
Total	49,520	74,715	124,235	100%

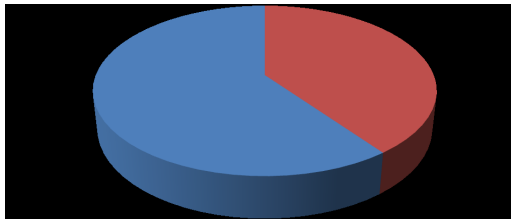


Chart 1 Percentage of expired/non-expired tyres for all vehicles tyres surveyed.

40%—Number of expired tyres.
60%—Number of non-expired tyres.

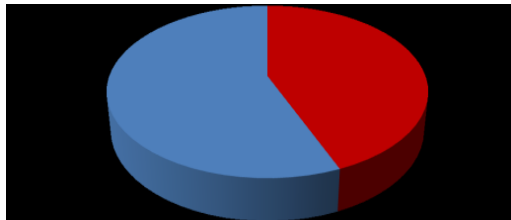


Chart 2 Percentage of expired/non-expired tyres for commercial vehicles tyres surveyed.

44%—Number of expired tyres.
56%—Number of non-expired tyres.

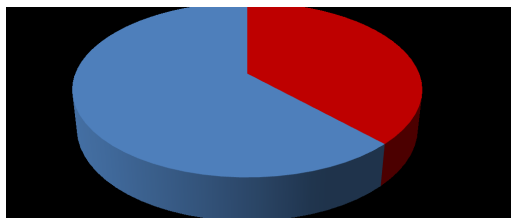


Chart 3 Percentage of expired/non-expired tyres for private vehicles tyres surveyed.

38%—Number of expired tyres.
62%—Number of non-expired tyres.

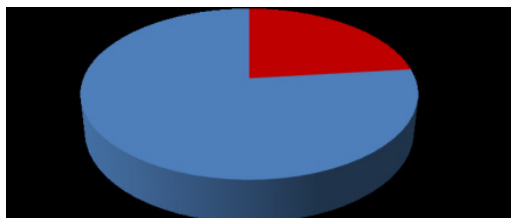


Chart 4 Percentage of expired/non-expired tyres for government vehicles tyres surveyed.

23%—Number of expired tyres.
77%—Number of non-expired tyres.

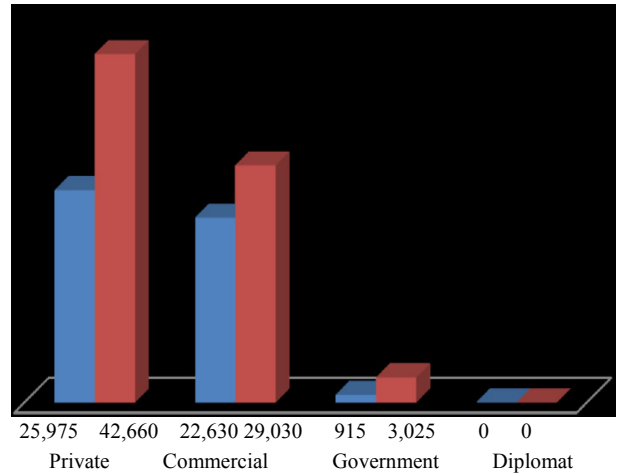


Chart 5 Number of expired/non-expired tyres for various vehicle categories surveyed.

In Chart 3, 38% of the private vehicle tyres had expired while 62% were still within the valid period. This is an indication that commercial vehicles have more expired tyres than private vehicles.

3.2 Tyres Purchased as Tokunbo, Rebore and New

This analysis showed categories of tyres used by road drivers, either new, rebore or fairly-used tyres popularly known as tokunbo in Nigeria.

Table 3 and Chart 6 show that 55% of the total tyres surveyed were brand new, 44% were purchased as tokunbo and 1% were purchased as rebore.

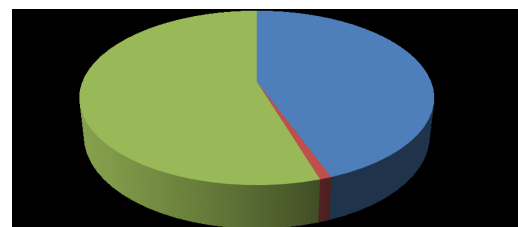


Chart 6 Types of tyres purchased for all categories of vehicles surveyed.

44%—Number of tyres purchased as tokunbo.
1%—Number of tyres purchased as rebore.
55%—Number of tyres purchased as new.

Chart 7 below indicates that 57% of commercial vehicles tyres were bought as fairly used “tokunbo” while that of private vehicles stood at 36% as shown in Chart 8. This revealed that most commercial drivers used more of tokunbo tyres than new.

Further analysis also revealed that 42% of commercial vehicles tyres were new tyres while that of private vehicle is 63%. This showed that private vehicles owners use brand new tyres than commercial vehicles owners. It is observed from the figures in Table 3 that only 1% of both private and commercial vehicles use rebore tyres.

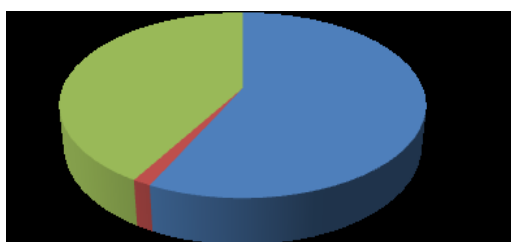


Chart 7 Types of tyres purchased for commercial vehicles surveyed.

57%—Number of tyres purchased as tokunbo.
 1%—Number of tyres purchased as rebore.
 42%—Number of tyres purchased as new.

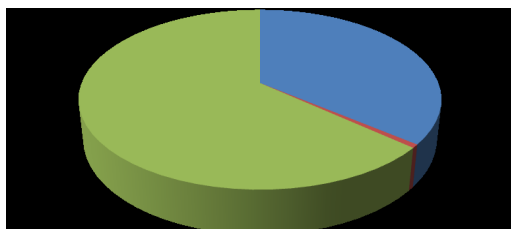


Chart 8 Types of tyres purchased for private vehicles surveyed.

36%—Number of tyres purchased as tokunbo.
 1%—Number of tyres purchased as rebore.
 63%—Number of tyres purchased as new.

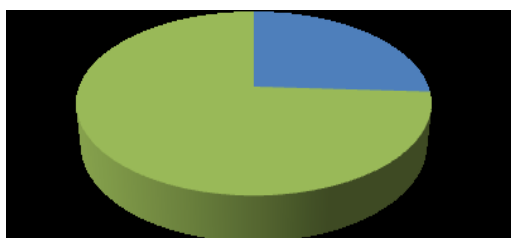


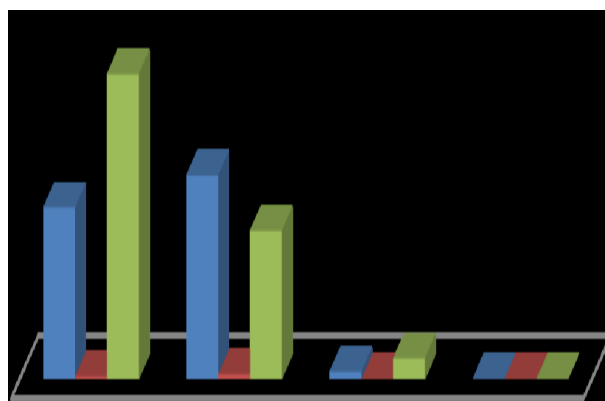
Chart 9 Types of tyres purchased for government vehicles surveyed.

26%—Number of tyres purchased as tokunbo.
 0%—Number of tyres purchased as rebore.

Table 3 Tyres purchased as tokunbo, rebore and new.

Category of vehicle	Number of tyres purchased as tokunbo	Number of tyres purchased as rebore	Number of tyres purchased as new	Total number of tyres surveyed
Private	24,635	425	43,840	68,900
Commercial	29,720	720	21,310	51,750
Government	1,045	0	2,990	4,035
Diplomat	0	0	0	0
Total	54,950	1,145	68,140	124,235
Percentage	44%	1%	55%	100%

74%—Number of tyres purchased as new.



24,635 25 43,840 29,720 20 21,310 1,045 0 2,990 0 0 0

Chart 10 Comparison of tyres purchased as tokunbo, rebore and new by vehicles categories.

In Chart 9, 74% of government vehicles tyres were new and 26% were tokunbo.

3.3 Vehicles with Correct Tyre PSI

Maintaining correct tire inflation pressure helps optimize tire performance and fuel economy. Correct tire inflation pressure allows drivers to experience tire comfort, durability and performance designed to match the needs of their vehicles.

Table 4 below gave the relationship between correct and incorrect tyres PSI. It was noted that only 31% of total tyres surveyed had correct PSI while the remaining 69% had wrong PSI.

And 34% of the private vehicles tyres checked had correct PSI, 25% of commercial vehicles tyres also had correct PSI, while 44% of government vehicles tyres recorded correct PSI. This means that governments’

vehicles drivers are mindful of their tyres gauge than private and commercial vehicles drivers. The least correct PSI was recorded from commercial vehicles with only 25% having correct PSI.

Table 4 Number of vehicles with correct PSI.

Category of vehicle	Number of tyres with correct PSI	Number of tyres with wrong PSI	Total number of tyres surveyed	Percentage with correct PSI
Private	22,725	44,570	67,295	34%
Commercial	12,700	37,545	50,245	25%
Government	2,515	3,180	5,695	44%
Diplomat	0	0	0	0%
Total	38,940	85,295	123,235	32%
Percentage	31%	69%	100%	

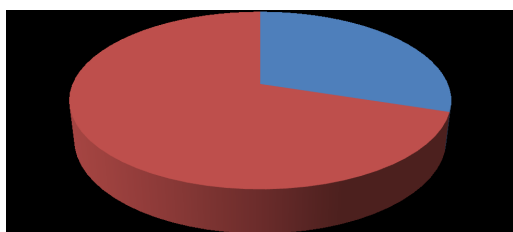


Chart 11 Percentage of tyres with correct/incorrect PSI.

31%—Number of tyres with correct PSI.
69%—Number of tyres with wrong PSI.

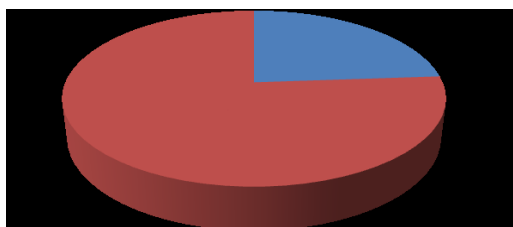


Chart 12 Percentage of commercial vehicles' tyres with correct/incorrect PSI.

25%—Number of tyres with correct PSI.
75%—Number of tyres with wrong PSI.

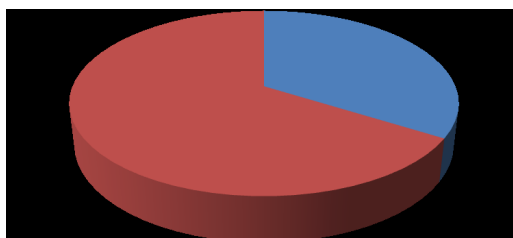


Chart 13 Percentage of private vehicles' tyres with correct/incorrect PSI.

34%—Number of tyres with correct PSI.
66%—Number of tyres with wrong PSI.

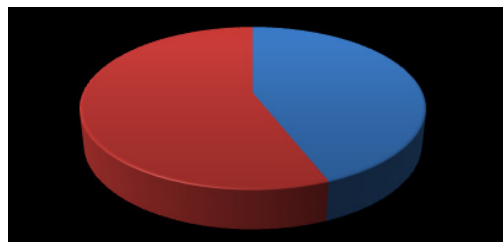


Chart 14 Percentage of government vehicles' tyres with correct/incorrect PSI.

44%—Number of tyres with correct PSI.
56%—Number of tyres with wrong PSI

3.4 Wrong PSI of Vehicles Tyres

Analysis of tyres with wrong inflation (PSI) showed that 51% of private vehicles tyres are under inflated and 49% over inflated. Further analysis also indicated that 52% of commercial vehicles with wrong inflation are under inflated while 48% are over inflated.

While government vehicle tyres checked had 39% under inflated, and 61% over inflated. Details are as shown in Table 5 and Charts 16, 17 and 18 below.

Table 5 Number of tyres under/over inflated.

Category of vehicle	Number of under inflated tyres	Number of over inflated tyres	Total number of tyres with wrong PSI	Percentage of under inflated	Percentage of over inflated
Private	21,765	22,805	44,570	49%	51%
Commercial	19,500	18,045	37,545	52%	48%
Government	1,260	1,920	3,180	39%	61%
Diplomat	0	0	0	0%	0%
Total	42,525	42,770	85,295	50%	50%

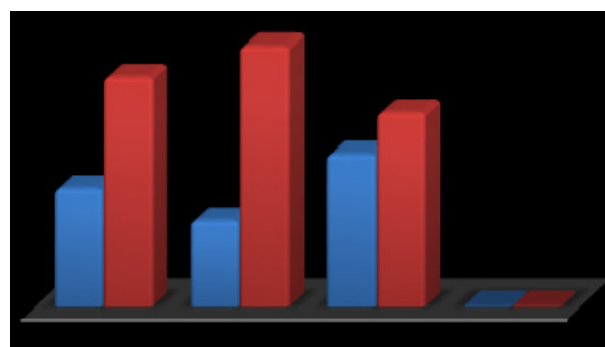


Chart 15 Percentage of tyres with correct and wrong PSI by vehicles categories.

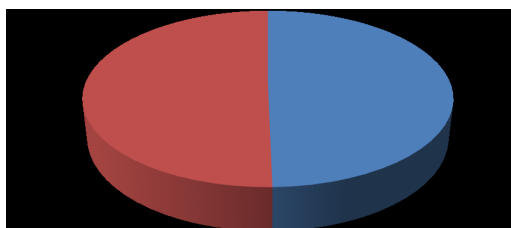


Chart 16 Percentage of under and over inflated private vehicle tyres.

50%—Number of Under inflated tyres.

50%—Number of over inflated tyres.

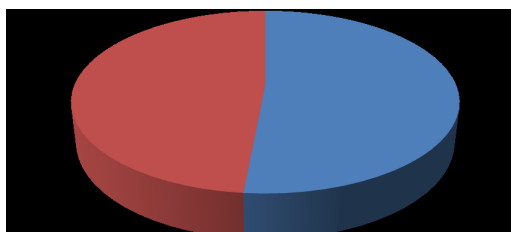


Chart 17 Percentage of under and over inflated commercial vehicle tyres.

52%—Number of under inflated tyres.

48%—Number of over inflated tyres.

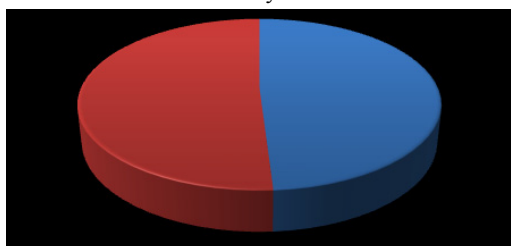


Chart 18 Percentage of under and over inflated private vehicle tyres.

49%—Number of under inflated tyres.

51%—Number of over inflated tyres.

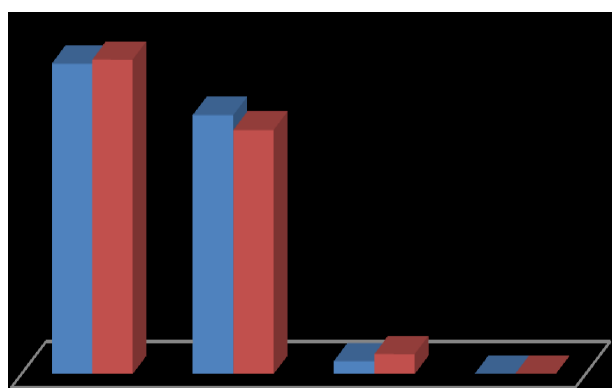


Chart 19 Percentage of under and over inflated government vehicle tyres.

3.5 Rating of Tyres' Condition

It was observed that 65% of total tyres checked had good thread/grid level (above 1.6 mm), 26% with fair thread/grid level, while 10% had bad thread/grid level (Table 6).

Seventy one percent (71%) of private vehicles tyres checked had good thread, 55% of commercial vehicles tyres have good thread/grid level while 85% of government vehicles tyres.

Table 6a Percentage of tyres with good, fair and bad thread or grid.

Category of vehicle	Number of tyres with good thread or grid level	Number with fair thread or grid level	Number with bad thread or grid level	Total number of tyres surveyed
Private	71%	22%	7%	100%
Commercial	55%	31%	14%	100%
Government	85%	13%	2%	100%
Diplomat	0	0	0	
Total	65%	26%	10%	100%

Table 6b Number of tyres with good, fair and bad thread or grid.

Category of vehicle	Number of tyres with good thread or grid level	Number with fair thread or grid level	Number with bad thread or grid level	Total number of tyres surveyed
Private	49,255	15,625	4,730	69,610
Commercial	27,710	15,685	7,035	50,430
Government	3,565	525	105	4,195
Diplomat	0	0	0	0
Total	80,530	31,835	11,870	124,235
Percentage	65%	26%	10%	100%

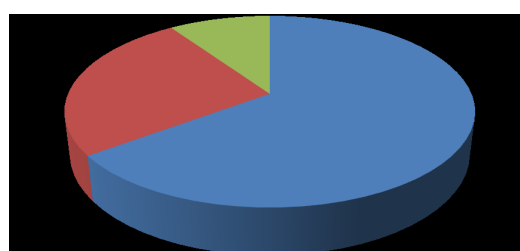


Chart 20 Number of tyres with good, fair and bad thread or grid for all categories of vehicles.

65%—Number of tyres with good thread or grid level.

26%—Number with fair thread or grid level.

9%—Number with bad thread or grid level.

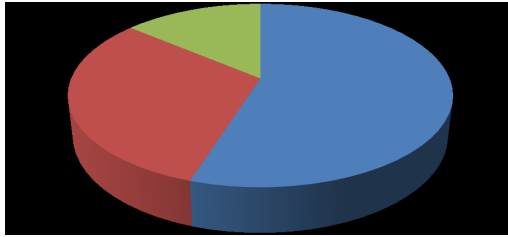


Chart 21 Number of tyres with good, fair and bad thread or grid for commercial vehicles.

55%—Number of tyres with good thread or grid level.
 31%—Number with fair thread or grid level.
 14%—Number with bad thread or grid level.

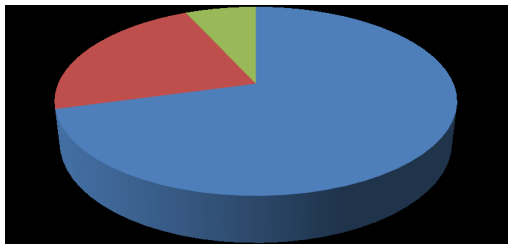


Chart 22 Number of tyres with good, fair and bad thread or grid for private vehicles.

71% —Number of tyres with good thread or grid level.
 22%—Number with fair thread or grid level.
 7%—Number with bad thread or grid level.

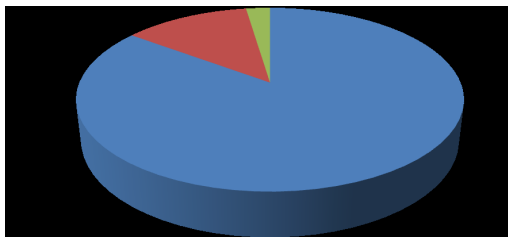
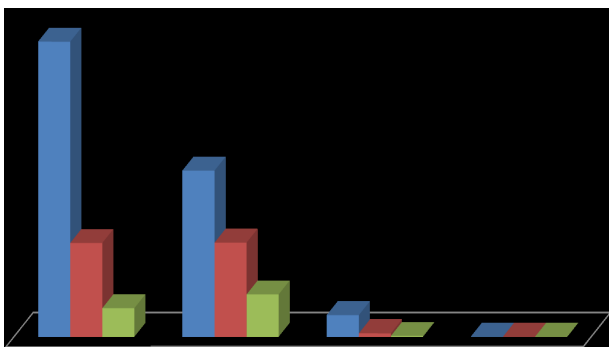


Chart 23 Number of tyres with good, fair and bad thread or grid for government vehicles.

85%—Number of tyres with good thread or grid level.
 13%—Number with fair thread or grid level.
 2%—Number with bad thread or grid level.



71%,22%,7% 55%,31%,14% 85%,13%,2% 0%,0%,0%
 Private Commercial Government Diplomat

Chart 24 Number of tyres with good, fair and bad thread or grid by categories of vehicles.

Seven percent (7%) of private vehicles tyres checked were bad, 14% of commercial were bad and 2% of government owners were bad. This analysis is an indication that commercial vehicles tyres do have high number of bad tyres compared with private vehicles tyres or government vehicles tyres.

3.6 Tyres with and without Swollen/Damage

Table 7 showed that 26.1% of total vehicles tyres surveyed were swollen/damaged. Further analysis revealed that commercial vehicles had the highest percentage of damaged/swollen tyres (13.2%), while government vehicles had the lowest, 5.5% and private had 7.4% of tyres checked damaged. See Table 7 and Charts 25, 26 and 27.

Table 7 Tyres with and without swollen/damaged.

Category of vehicle	Number of tyres with burge/damage or cut	Number of tyres without burge/damage or cut	Total number of tyres surveyed	Percentage of burge/damage
Private	5,225	65,085	70,310	7.4%
Commercial	6,475	42,720	49,195	13.2%
Government	260	4,470	4,730	5.5%
Diplomat	0	0	0	0%
Total	11,960	112,275	124,235	26.1%

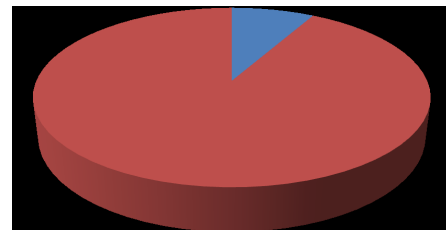


Chart 25 Percentage of Commercial tyres with & without burge/damage.

13.2%—Number of tyres with burge/damage or cut.
 86.8%—Number of tyres without burge/damage or cut.

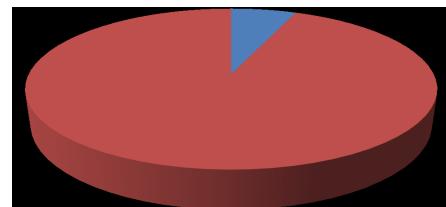


Chart 26 Percentage of private vehicle tyres with & without burge/damage.

7.4%—Number of tyres with burge/damage or cut.
 92.6%—Number of tyres without burge/damage or cut.

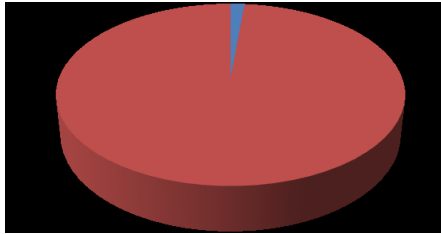


Chart 27 Percentage of government vehicle tyres with & without burge/damage.

5.5%—Number of tyres with burge/damage or cut.
94.5%—Number of tyres without burge/damage or cut.

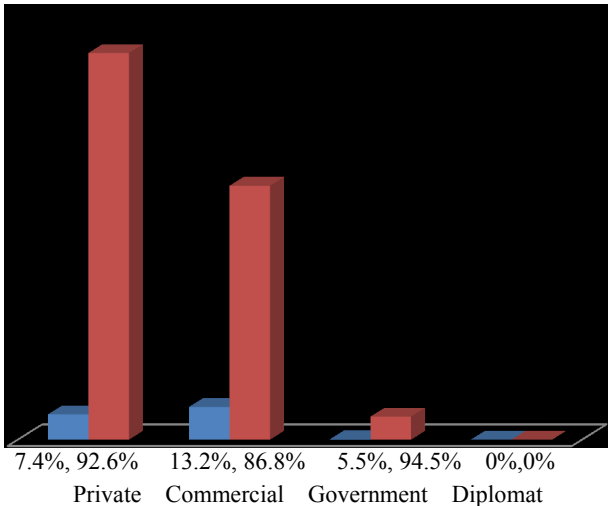


Chart 28 Number of tyres with burge/damage by categories of vehicles.

4. Findings

The following findings were made.

Commercial vehicles had more expired tyres (44%) than private vehicles (38%).

In total 23,280 out of 30,124 of drivers vehicles interviewed representing 77% had knowledge of tyres expiration. And 55% of the total tyres surveyed were brand new, 44% were purchased as tokunbo and 1% were purchased as rebore. This showed that private vehicles owners use brand new tyres than commercial vehicles owners. It was observed from the figures in Table 3 that only 1% of both private and commercial vehicles use rebore tyres.

And 34% of the private vehicles tyres checked had correct PSI, 24% of commercial vehicles tyres also had correct PSI, while 41% of government vehicles tyres recorded correct PSI. This means that

governments’ vehicles drivers are more mindful of their tyres pressure than private and commercial vehicles drivers.

Commercial vehicles had the highest percentage of damaged/swollen tyres (13.2%), while government vehicles had the lowest, 5.5% and private had 7.4% of tyres checked damaged.

5. Conclusion

Consequent upon the above findings, the under mentioned recommendations are proffered:

(I) Government should strictly enforce the laws on sales of substandard tyres. Importation of such tyres should also be completely banned.

(II) There is need for the law enforcement officers to intensify check of tyres in major parks and highways nationwide.

(III) The FRSC, other agencies of governments as well as Fleet Operators nationwide should step up public enlightenment on use of good tyres, expiration and correct inflation of tyres. The consequences of wrong usage should be brought to the consciousness of all road users.

(IV) There should be more collaborating efforts of all stakeholders.

(V) Presently, there is no tyre manufacturing company in Nigeria, hence all tyres are imported, making regulations on sales and use more difficult. The government should provide conducive environment for the establishment and operations of the manufacturing companies.

(VI) Efforts should also be made to improve the Nigerian economy as it is presently tough for most vehicle owners to procure brand new tyres for their vehicles, hence the resort to fairly used and substandard tyres which are cheaper but more dangerous.

(VII) Packing and storage of tyres while being imported and at sale points should also attract the regulators attention. These tyres are mostly damaged through wrong packing and storage.

(VIII) Loan facilities as well as other welfare packages should be encouraged by employers to assist their employees to acquire new and standard tyres for their vehicles.

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