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Analysis of the Extent of Overloading on the Nigerian Highways

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Abstract: Overloaded trucks occurrences is largely common in Nigeria where the axle-load control and enforcement is poor. This paper presents the analysis of the weigh-in-motion survey in Lokoja-Abuja road and the extent of overloaded trucks on the section of the way. The GVW violations amongst the different truck types revealed that 20% of the 2-axle trucks are overloaded, about a half of the 3-axle lorries (50%) are also overloaded, the 4-axle, 5-axle and 6-axle vehicles are the main contributors to truck overloading occurrences in Lokoja-Abuja road, Nigeria with 86%, 73% and 94% overloaded respectively. From the relationship between the numbers of axles each truck category (travelling at a certain speed) and the changes in GVW, the correlation coefficient was 0.855 which was significant at 0.01 level, indicating a compelling contribution of the number axle to overloading on the Nigerian road. The analysis showed that the axle load from weigh-in-motion data is hugely greater than ECOWAS standard weight in Lokoja-Abuja road, which may lead to accelerated deterioration, reducing the service life of the pavement structures.

Keywords: Overloading, Highway, Truck, Axle-load and Gross Vehicle Weight

1. Introduction

Transportation is a vital sector of the Economy of any Nation. Nigeria is a fast-growing economy and has one of the largest Network of a road in Africa. Road transport is the most resilient mode of transport in Nigeria after the collapse of the rail transport system in the early 1980s. Road transportation accounts for over 90% of freight and passenger services for Inland transportation and therefore the importance of the inland road network as a significant contributor to the social, economic development of the country. As the economy grows, the growth of passenger transport and freight transport grows accordingly and calls for a massive demand for additional vehicles and a new network of roads and indeed need for better roads. The significant increase in traffic volume has resulted in the tendency of operators to overloading their vehicles to reduce operational cost. Overloading of trucks is now a familiar scene on Nigeria roads, and it is not surprising to see vehicles carrying as much as twice the legally permissible axle loads on the roads. The road network in Nigeria comprises of Federal, states and local government roads. The Federal Government funds the development of modern roads along the significant arterials.

As at 1914 (before the 1st world war), only about 3200km of motorable roads exist in Nigeria. These roads resulted from improvements to existing footpaths and bicycle tracks done by unskilled village labour working with local materials. By 1926, total length has increased to 4,750km, and the first bituminous surfacing (outside the township) Lagos - Abeokuta road was built between 1926 and 1939 (before the outbreak of 2nd world war) the total length of roadway maintained by Government had grown to 9,480km.

By 1946, the road system was classified into Trunk A, Trunk B and local government roads. The central and regional governments were maintaining the trunk roads. By this time, trunk A and B roads added to 46,000kms, and only 1,782kms of this were surfaced with bitumen. At independence in 1960. Nigeria's road network had increased to 65,704kms, out of which 8,694km were surfaced with asphalt. The phenomenal growth in the length of roads surfaced with bitumen occurred with roads under the responsibility of the central Government and those under the Western region between 1960 and 1975, the Nation's roads network recorded an impressive growth of about 96,000kms. They were beginning from the Mid 1970s, with the oil boom essential steps were taken in the building of new roads and the upgrading of existing ones. It was during this period that Lagos-Ibadan expressway, Shagamu-Benin, Benin-Asaba, Onitsha-Enugu, Enugu Port Harcourt, and Abuja - Kaduna and Kaduna- Kano were built. Within this period the whole network of roads rose to about 193,000kms, and the Federal roads accounted for 34,300km of this total. Today Nigeria has the largest road network in West Africa and the 2nd largest, south of the Sahara with over 200,000km of roads out of which the Federal roadways constitute only 17% but carrying over 80% of the vehicular traffic in the hinterland.

The investment of the Government on road infrastructure has been increasing since independence. The current value of Nigeria road asset is considerably high at an estimated cost of about N3.4 trillion as of March 2018 [1]. It is foolhardy to allow this value of an asset to be destroyed by all manners of abuse most typified by overloading of vehicles. There is, therefore, an urgent need to see the roads as a national asset that should be managed appropriately by deploying International best practices models for road asset management. In the wake of increasing destruction of roads, maintenance backlog and accelerating loss of asset value, the Federal Government in 2016 established the Road Asset Management System (RAMS). It assisted the Federal Ministry of Works in rationalizing decision making in planning, programming, funding, procurement and allocation of scarce resources in the road sector. The World Bank is funding the RAMS.

Table 1. *Funding Profile of Highway Construction & Rehabilitation Projects (2005-2017).*

Year	Amount Required	Amount Budgeted	Actual Funds Released
2005	143,650,000,000	82,519,373,423	61,390,288,947
2006	165,560,000,000	67,854,363,765	61,074,107,804
2007	202,000,000,000	134,665,481,922	108,641,539,716
2008	258,720,896,105	142,885,032,521	127,892,820,865
2009	197,522,317,618	182,622,818,424	168,850,759,251
2010	262,213,145,782	214,876,056,048	86,624,577,055
2011	164,600,000,000	130,013,949,780	84,965,912,485
2012	167,794,147,306	133,697,103,470	92,817,759,653
2013	171,294,667,671	134,427,651,813	58,350,534,632
2014	218,897,654,879	98,669,008,704	34,879,660,947
2015	239,043,204,053	20,646,000,000.00	12,539,550,984.80
2016	445,580,952,908	251,220,169,985	169,528,000,122
2017	500,000,000,000	305,952,920,752	N/A
Total	3,136,876,986,321	1,900,049,930,607	1,067,555,512,464

Source: [8].

Freight transport demand has snowballed and will grow further as our economies recover from the current downturn, particularly road freight transport. It puts pressure on several players such as truck industry, transport operators, governments, road owners, road designers, environmentalists and citizens in general. The use of bigger vehicles, the increase of vehicle load factors and the decrease of empty running (unload trips) may lead to greater efficiency, higher productivity and lesser fuel consumption for the same demand. However, it can also lead to more pavement damage. The cost of running a road transport system consists of the operating cost of a vehicle fleet using the facility and the cost of constructing and maintaining the roads. It is now a well-known fact that the transport cost of a particular freight tonnage decreases quite rapidly with increase in the amount of freight carried by vehicles and also the cost of constructing the roads increases as the vehicle axle load increases. Traffic data is a crucial element for the design and analysis of a road structure. Also, the traffic loading is one of the main factors to cause bending and shearing load stresses on the road pavement, so the load distribution data required through traffic census is of significant importance for the engineering design of roads. Nigeria roads are designed to carry a maximum total load of 51.0 tonnes and a maximum load of 11.5 tonnes per axle. It is pertinent to note that the maximum design speed of Nigerian Roads is 100km/hr.

From the study carried out by [13], the overloaded vehicle normally dominates by truck. An overloaded truck has a load or gross weight exceed their maximum legal loads. In Indonesia, main factor behind the overloaded trucks is economic issues, for example, the owner of commodities or truck owner attempt to minimize transportation cost by carrying an overload. On the other hand, law enforcement has not been optimal yet. Overload truck restrictions through weigh station failed to prevent it. Without further intervention by the government, the continuous use of overloaded trucks causes a serious problem on pavement preservation and planning policy in Indonesia. Main reasons that caused this problem is overloaded vehicles. A study by INDII (The Indonesia Infrastructure Initiative) stated that overloading is the main factor (nearly 50%) that contributed to pavement failure [6].

The fact vehicle overloading causes road pavement structural distress and decrease in service life has also been reported by [14] and an analysis of lost cost of road pavement distress due to overloading freight transportation was also presented. [15] quantified incremental pavement damage caused by overweight trucks in Saskatchewan, Canada and reported that accelerated damage from truck overloading has decreased the expected performance life of many of the roads and also increased maintenance and rehabilitation requirements and costs. Some failures are real as a result of substandard construction and other road abuses, but studies have shown that the significant crashes on our roads could be as a result of overloading. Overloading here simply means the imposition of an axle load of an amount above the maximum permissible on the roadway and the imposition of more vehicles on the road than the average annual daily traffic. It is believed that structural damage to road pavements is mainly caused by commercial traffic and pavement damage increase very steeply with excessive axle loading. Road damages are quite noticeable on Nigerian roads, and this is a source of concern to all. Many factors could be responsible for this. This paper is to examine the degree to which overloading leads to road deterioration. It is opined globally that heavy and overweight trucks are a significant cause of road pavement damage and that their depleting effects make it clear that lorries are the principal cause of traffic-related deterioration of the highways. In the era of deteriorating highway infrastructure and declining budgets for road upgrades and repairs, the sensible thing to do to lengthen the lifespan of our roadways would be to shift even more cargo transport from truck to rail and enforcement of weight and Axle load controls on the existing road infrastructure.

It is vital for those managing for the maintenance and operation of highway infrastructures to monitor and prevent truck overloading. The additional weight carried by overloaded trucks accelerates the deterioration of the roadway, leading to rutting, fatigue cracking, and in some instances pavement failure [16, 17] conducted a study to quantify state highway damage based on the impacts of overweight vehicles. Each year, millions of dollars of loss related to life span, design, and maintenance of state highways and structures are attributed to vehicles that exceed state weight limits. They found that for every dollar invested in motor carrier enforcement efforts, there would be $4.50 in pavement damage avoided. It is possible to develop a system that would increase the proportion of noncompliant vehicles subjected to inspection relative to compliant vehicles. The fact that vehicle overloading causes road pavement failures and decrease in service life has also been noted by [14] and an analysis of lost road pavement due to overloading freight transportation was also presented. [15] estimated incremental pavement damage caused by overweight trucks in Saskatchewan, Canada and reported that accelerated damage from truck overloading has decreased the expected performance life of many of the roads and also increased maintenance and rehabilitation requirements and costs. All things being equal, significant increases in gross vehicle weight (GVW) would increase the probabilities of the vehicle being involved in a fatal rearward amplification crash. Fatal involvement rates in rollover and ramp-related crashes also increased with increased GVWs. For curve related crashes and crashes in which trucks rear-ended other vehicles, increased GVWs may increase fatal involvement rates. Three performance measures were used to assess and characterise vehicle performance, namely, dynamic stability, braking and handling gradient. Vehicle performance characteristics were obtained using ADAMS multi-body simulation software. Based on the lane encroachment information and dynamic stability tests for 3.7m wheelbase truck towing a five-axle tractor-trailer with a 5.6m wheelbase both fitted with steel suspensions and coupled with a 3m drawbar, it was concluded that mass ratios up to 1:1.6 would compromise safety. One of pavement condition indicator that used as a parameter in pavement management system in Indonesia is International Roughness Index (IRI). As an International standard, IRI is practically used in pavement management system. Traffic conditions, especially ESAL, have the highest significance in contributing to the IRI value because of ESAL numbers greatly affect the changes in the surface conditions of flexible pavements [1]. As stated in the previous study of overloaded vehicles and their damage on pavement, show that they have a significant role on reducing the service life of pavement structures [12].

Figure 1. *Pavement Damage on Lokoja-Abuja Expressway due to Overloading.*

Heavy vehicle drivers are also prone to driver fatigue especially if it involves long working hours and long distance trips with limited recovery time [10]. Arbitrary increases in gross weight should not be allowed because they would allow the overloading of existing vehicles and thereby promote a decrease in the intrinsic safety of the high-grade vehicle fleet. Heavy trucks are more susceptible than light vehicles to rollover accidents caused directly by inadvertently operating the truck beyond the rollover threshold. If vehicle dimensions, number of axles, and other aspects of the vehicle and component designs were unchanged, the considerable increase in gross vehicle weight would lower rollover resistance in steady turns for all trucks, which may lead to more rollover accidents. For existing five-axle doubles, the increased pressure would also downgrade the rearward amplification behaviours, which may boost the probabilities of rear-trailer overturns during obstacle avoidance or sudden lane change manoeuvres. Besides, the high gross weight would require brakes with a higher torque capacity, which, if not provided, would result in trucks that were deceleration limited by brake torque capacity rather than by tire friction levels and fore-aft brake balance. Without modifications of engines and drive trains, increased truck weights would lead to more significant speed reductions on upgrades and more considerable stress for trucks to merge, weave and change lanes on freeways. Other things being equal, increased gross weights may also increase the probabilities of brake overheating on long, steep downhill runs. Any one of these scenarios can have adverse traffic (delays and congestion) and accident implications [9].

Furthermore, most of the time, vehicle dynamics influence driver behaviour in steering their vehicles [18]. The study by [19, 20] has also shown that heavy vehicle GVW has a direct influence on speed, whether the vehicle travel in a vehicle following situation or free-flow condition. An overloaded high-grade vehicle is more likely to be involved in an accident and has a damaging effect than a legally loaded truck. The heavier the vehicle, the higher its kinetic energy resulting in greater impact forces and damage – to other vehicles or the road infrastructure – in the event of a crash. An overloaded vehicle is less stable because of the increased height at the centre of gravity and more inertia of the vehicle bodies. An overloaded truck will experience loss of motility and manoeuvrability [4]. The overloaded truck becomes under-powered resulting in lower speeds on up-hill slopes as well as the risk of congestion, inefficient engine braking and over-speeding on descent slopes. Overtaking also takes longer, and thus incurs additional risks for the other road. Heavy vehicle drivers are also prone to driver fatigue especially if it involves long working hours and long-distance trips with limited recovery time [10]. The monotony of long-distance driving responsibility may also increase the effects of fatigue on the driving performance and safety of heavy vehicle drivers ([17] Fatigued drivers face higher distraction, are less alert, and tend to overestimate the distance to roadside traffic signs. Fatigue caused by driving in complex road environment had the most significant negative impact on driving behaviour and visual distance estimation. The fatigue effect worsened significantly but differently on both driving behaviour and overall productivity of fatigued drivers when switching from a complex to a monotonous road environment and vice versa. In situations when heavy vehicle drivers experience fatigue due to the factors mentioned above, the traffic safety level on the road may be compromised. It can only get worse if the heavy vehicles are overloaded because the safe handling of an overloaded truck will be more difficult as compared to a non-overloaded truck. Thus, truck overloading, in combination with driver fatigue, will jeopardize the safety of road users in a traffic stream. As such, the need to identify the occurrence and extent of vehicle overloading, particularly in a developing country has to be acknowledged. Based on a clear understanding of the situation on vehicle overloading, decision-makers will be in a better position to formulate more comprehensive and useful policy measures to mitigate the problem.

Road failure is a significant problem in both developing and developed countries. Because of the high cost of maintenance and reconstruction, Researchers are anxious to investigate the causes of these failures. A review of the significant causes of road failure by various researchers identified road abuse and overloading as one of the primary reasons [2]. Excessive traffic volume on the road can be regarded as overloading and may not necessarily cause significant damage to the road. It will cause congestions, especially at intersections (junctions). Overloading, which is most critical to the life span of a highway is the Excessive axle load, and this is the focus of this study. There is no single enforcement of axle load regulations in Nigeria today. The most unfortunate and disheartening is that the roads give way as soon as construction is completed. The only agency of Government enforcing overloading regulations in Nigeria today is the Federal Roads Safety Corp whose interest is seen only in passenger car and commercial vehicle overload. They have no capacity to enforce excessive Axle load regulations. Weigh bridges are presently not in operation in Nigeria but the Federal Ministry of Works is in the process of returning weigh bridges along the Federal Road network.

2. Methodology

The number of trucks subjected to axle load survey out of the total volume passed for the study locations was summarized. For the current study, each type of vehicle and its corresponding number of overloaded trucks will be filtered based on the surveyed data. The Total load exceeding the legal limit, the number of additional trucks required to satisfy the freight transport demand in each category was computed. Considering both the directions together, the severity of overloading on that location was analyzed for the study stretches.

There have been several studies on vehicle overloading in developed countries and the use of weigh-in-motion (WIM) technology to monitor the occurrence of vehicle overloading for various purposes. However, there has not been much discussion on the extent and degree of damage done by vehicle overloading in Nigeria. Due to lack of advanced facilities such as the WIM system and the corresponding static weigh stations and weight enforcement mechanisms, the problem of vehicle overloading in Nigeria may not have been achieved to enable appropriate and effective mitigation measures to be employed.

In this study, traffic data was collected within a week in April 2019 using weigh-in-motion facilities and automatic traffic counter (ATC) operated by Exosphere Nig. Ltd. Regular traffic and vehicular data, including the gross vehicle weight (GVW) of all vehicle categories, were also obtained from a WIM system customized and installed on site. To ensure the accuracy of weight data collected from the weigh-in-motion system, proper calibration of the WIM system and validation of the WIM data were conducted. A thorough analysis of the vehicle weight data, namely the GVW, was done to determine the vehicle overloading characteristics at the study location. The GVW permit is categorized based on the vehicle class, and the summary was shown in a table. For this study, the focus will be given to the 1-axle, 2-axle, 3-axle, 4-axle trucks, 5-axle and 6-axle.

Table 2. *Summary of Automatic traffic count indicating the number of each category of vehicle counted within each day of the week for Lokoja-Abuja.*

Day	AV	MC	LV	HGV's	% HGV
2/4/19	6,128	307	4,006	1,815	31.18%
3/4/19	6,181	432	3,872	1,877	32.65%
4/4/19	6,762	415	4,217	2,130	33.56%
5/4/19	7,139	550	4,508	2,081	31.58%
6/4/19	6,920	533	4,459	1,928	30.19%
7/4/19	7,603	519	5,217	1,867	26.36%
8/4/19	6,041	504	3,969	1,568	28.32%
Total	46,774	3,260	30,248	13,266	
Total (minus MC)	43,514				
ADT A>B		6,216			
% of HGV'S		30.49%			
Total Average ADT (both directions)		6,216			

Note: AV-All Vehicles, MC-Motorcycles, LV-Light vehicles, HGV-High Grade Vehicles, ADT- Average daily Traffic.

3. Results and Discussion

A common sight on Lokoja-Abuja road is illustrated in Table 4. In this paper, a total of more than 43,514 commercial vehicle data obtained during a week (2nd April 2019 to 8th April 2019) from a weigh-in-motion (WIM) system was analyzed. Table 2 shows a summary of Automatic traffic count indicating the number of each category of vehicle counted within each day of the week for Lokoja-Abuja. Table 3 indicates the outline of Automatic Traffic Count showing axle load distribution for Lokoja-Abuja. Table 3 shows the number of GVW violations (based on maximum permissible GVW of ECOWAS standard). I, the rate of GVW violation is found to range between 20% and 94% of the axle load distribution.

The types of heavy vehicles in Nigeria is conventionally classified by the number of axles, namely from the 2-axle up to the 6-axle trucks. 20% of the 2-axle trucks are found to be overloaded followed by 3-axle lorries, 50% and 4-axle lorries, 86%. Three axles articulated were 50% overloaded, four axles articulated 86%, five axles articulated 73%, while 6-axle articulated were predominantly overloaded at 94%.

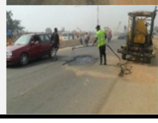
Table 3. *Summary of Automatic Traffic Count showing axle load distribution for Lokoja-Abuja in 2019.*

	2aR	3a R	4aR	3aA	4aA	5aA	6aA
2/4/19	705	148	134	3	303	165	357
3/4/19	634	113	133	0	392	186	419
4/4/19	751	122	173	3	390	186	505
5/4/19	746	124	161	3	382	216	449
6/4/19	723	112	173	3	396	156	365
7/4/19	692	112	161	2	325	193	382
8/4/19	502	93	149	0	330	166	328
Total k	4753	824	1084	14	2518	1268	2805
% overloaded	20%	50%	86%	50%	86%	73%	94%
Number of HGV's overloaded	951	412	932	7	2165	926	2637

Note: a-axle, R- Rigid Vehicles, A-Articulated Vehicles.

Table 4. *Evidence of road failure along Lokoja-Abuja road'.*

S/N	Type of failure	Location	Photograph	Remark
1.	Alligator cracks, Peeling	KM18+800		Failure on the centre of RHS carriageway

S/N	Type of failure	Location	Photograph	Remark
2.	Pothole	KM19+050		Failure on the centre of RHS carriageway
3.	Alligator cracks, Peeling	KM19+800		Failure on the centre of RHS carriageway
4.	Rut	KM25+750		Repair of Failure on RHS carriageway
5.	Alligator cracks, Pothole	KM27+300		Repair of Failure on RHS carriageway

The number of trucks subjected to axle load survey out of the total volume passed for the current study in Lokoja-Abuja is summarized in Table 5. Data on gross vehicle weight violations amongst the different truck types revealed that 20% of the 2-axle trucks are overloaded, about a half of the 3-axle lorries (50%) are also overloaded, the 4-axle, 5-axle and 6-axle vehicles may be considered as the main contributors to truck overloading occurrences in Lokoja-Abuja road, Nigeria with 86%, 73% and 94% overloaded respectively. This pattern is consistent throughout the study. As such, more excellent monitoring and weight enforcement actions and measures should be directed towards this category of trucks in the case of Lokoja-Abuja road, Nigeria. Compared to other countries, this number is extremely high. Other study in Poland, the percentage of overloaded vehicles vary between 6% to 16.5% which is quite low when compared to this results [5].

Table 5. *Summary of axle load survey indicating axle load distribution.*

VT	TNV	ETW	NV<	NV>	% of Overloaded Vehicles
2A	10	21	8	2	20%
3A	6	26	3	3	50%
4A	74	38	10	64	86%
5A	15	46	4	11	73%
6A	69	51	4	65	94%
Total	174		29	145	

Note: A-axle, VT-Vehicle Type, TNV-Total Number of Vehicles, ESW-ECOWAS Standard Weight (tonnes), NV<-Number of Vehicles within limit, NV>- No. of Vehicles Above Tolerance limit.

It can be seen from Table 5 that out of 174 vehicles surveyed; approximately more than 83.3% (145 numbers) of the trucks were found to be overloaded. Six axle trucks contribute a considerable amount of overloaded truck which is followed by four-axle and five-axle vehicles. Also, all the multi-axle trucks passing through this section are found to be overloaded.

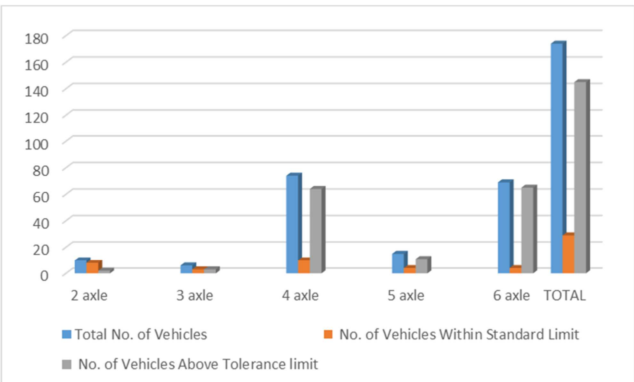


Figure 2. *Analysis of Trucks loaded concerning ECOWAS standard weight.*

Figures 2 and 3 provide a pictorial representation of percentage share of overloaded vehicles plying in the Lokoja-Abuja route. It can be observed that the trucks in the Lokoja-Abuja route are heavily overloaded. The six-axle and four-axle trucks constitute a more considerable bulk of overloaded vehicles along with this study location.

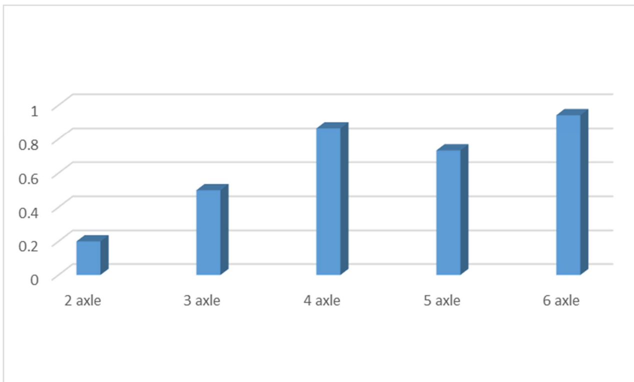


Figure 3. *Percentage of Overloaded Vehicles.*

Table 6. *Summary of axle load survey indicating axle load distribution with a gross weight along Lokoja-Abuja road.*

S/N	NoA	TNT	<STL	>STL	TGW	AGW
1	2A	10	5	5	158,490	15,849
2	3A	6	2	4	172,300	28,717
3	4A	74	11	63	3,444,860	44,738
4	5A	15	5	10	815,040	50,940
5	6A	69	4	65	4,728,340	68,527
	Total	174	27	147		

A-axle, NoA-Number of axles, TNT-Total Number of trucks, <STL- Within standard limit, >STL- Above standard limit, TGW- Total Gross Weight, AGW- Average Gross Weight.

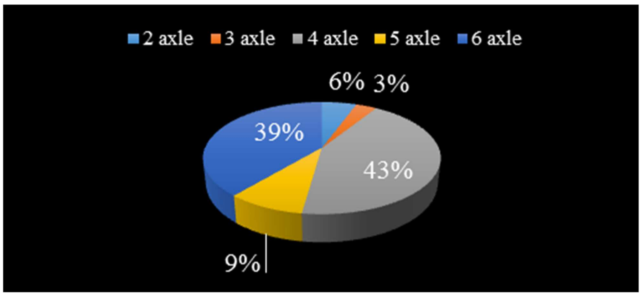


Figure 4. *Total number of trucks.*

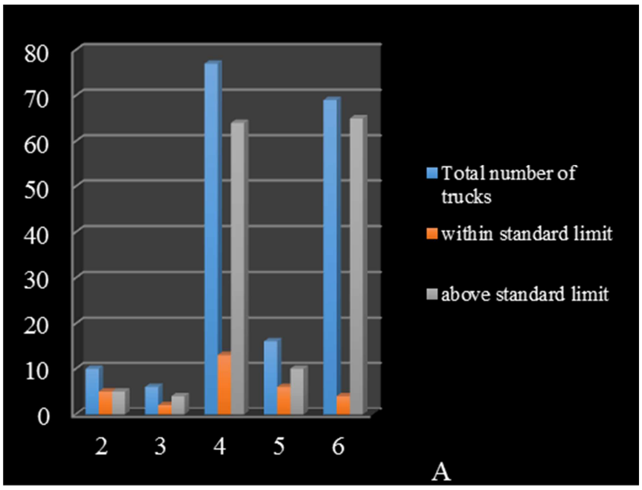


Figure 5. *Chart showing the volume of trucks within and above the ECOWAS standard limit.*

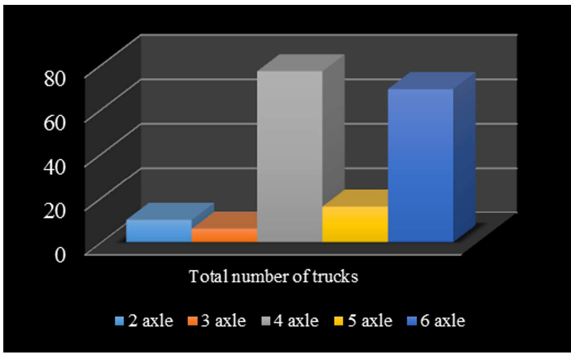


Figure 6. *Chart showing the classification of axles moving along Abuja – Lokoja.*

It is quite clear that the pattern of overloading for each truck category is varied and with the 6-axle trucks recording the highest number of violations. This finding could assist in the regulation of weight enforcement program priorities. Although the GVW violation rate may be considered rather high, what is more, alarming is the range of GVW values and degree of overloading beyond the allowable limit for each category of heavy commercial vehicles (see table 5). It can be seen that there are cases that the actual GVW is almost double the permissible GVW allowed by law for the particular commercial vehicle category. This situation is probably non-existent in developed countries, but in Nigeria, this could be quite common. The significantly high GVW beyond the permissible level for each commercial vehicle category would be a cause of primary concern, especially in terms of the capability of handling the extra-heavy commercial vehicle in emergencies. As such, the new heavy commercial vehicle may be hazardous and could compromise the safety of other road users should such situations arise. Besides, the fuel consumption of the new heavy commercial vehicle will increase significantly, and the final carbon footprint attributed to this new heavy commercial vehicle will be higher than what it should be if the permissible GVW were adhered to. The extra-heavy commercial vehicle would also have significantly higher axle loads beyond the allowable axle load (which is usually used in pavement design). This trend would increase the pavement deterioration significantly and shorten the pavement life well below the designed life.

Table 7. *Correlations between axle load configuration and gross weight.*

		Number of Axles	Gross Weight
Number of Axles	Pearson Correlation	1	.855**
	Sig. (2-tailed)		.000
	N	174	174
Gross Weight	Pearson Correlation	.855**	1
	Sig. (2-tailed)	.000	
	N	174	174

**. Correlation is significant at the 0.01 level (2-tailed).

The outcome of this paper has highlighted the magnitude of the problem of vehicle overloading in Lokoja-Abuja road, Nigeria. What is more worrisome is the degree of overloading is exceptionally high, particularly for the 4-axle, 5-axle and 6-axle trucks. Apart from the impact on pavement damage and carbon emission, vehicle overloading would lead to a more hazardous road environment because of the limitations in vehicle dynamics and braking performance of the trucks to cope with the higher demands from the excess payload.

This is illustrated by studying the relationship between the numbers of axles in a truck category (travelling at a certain speed) and changes in gross vehicle weight. It was discovered that the correlation coefficient was 0.855 at it was significant at 0.01 level, indicating a dominant contribution of the number axle to overloading on the Nigerian road.

4. Conclusion

Vehicle overloading increases the stopping distance beyond the usual case when the truck is not overloaded. If the truck driver is not aware (or unconcerned) with the need to adjust his/her driving habit, the driver may not be able to handle or manoeuvre the truck safely in an emergency. Also, if the truck is not in good condition or the road surface is wet/slippery, the high degree of overloading may result in a fatality in case of a crash. In a developing country, efforts to reduce deaths from traffic accidents have should be intensified. There are substantial incidences of accidents, continuous and proper monitoring of the heavy vehicle traffic and truck overloading need to be seriously considered. Occasional manual weight enforcement actions have proven to be insufficient to curb the vehicle overloading problem. A more comprehensive strategy which includes real-time monitoring using appropriate technology (such as the WIM system) and more efficient weight enforcement program has to be formulated by the relevant agencies. The occurrence of a high degree of vehicle overloading in Lokoja-Abuja road, Nigeria, a situation which may not be found in the more developed countries. It has to be dealt with to prevent unnecessary economic loss to the nation; as a result, recurring budgetary allocations to the same road.

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