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Automobile Crash Investigation Based on Vehicle System Related Causes: Systematic Literature Review

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Abstract

Automobile accidents are one of the leading causes of death worldwide. Every year, over 1.24 million people are killed in traffic accidents. Even though automobiles are designed to help people, they have been used to kill them in large numbers. Automobile accident research has primarily focused on past tragedies to develop and implement policies to combat this pandemic. The aim of this systematic review is to assess the different methods used to investigate the vehicle system-related cause factors of road traffic accidents. Police report reports have served as a foundation for providing historical facts about the causes of automobile accidents. It has been observed that police reports have limitations when it comes to reporting the involvement of vehicle systems in causing a traffic accident. The majority of the research was conducted on articles that investigated vehicle system risk factors using statistical data. Following articles that used statistical data to investigate vehicle system risk factors, the inclusion criteria were chosen. Articles on traffic accidents published in Cameroon were included on the condition that they studied at least one traffic accident risk factor. Two hundred twenty-five distinct records were identified, and 155 full texts were screened for inclusion, resulting in the inclusion of 25 studies in the review. According to the findings, failure to break the braking system, tyre puncture, poor driving, speeding, and overtaking are the leading causes of automobile crash reports reported by police. The majority of the study's conclusions lamented that accusing vehicle systems was based on assumptions and the reporter's judgment. It was determined that the use of stringent vetting procedures to investigate vehicle systems is the cause of a traffic accident. As a result, stakeholders will require accurate facts from a traffic crash investigation.

Keywords

Automobile Crash, Vehicle System, Cameroon, Traffic Accidents, Traffic Injuries

1. Introduction

An automobile calamity is one of the key causes of death all over the world. According to [1], automobile accidents are the 3rd cause of death in the world. Studies reveal that about 1.24 million individuals die each year as a result of traffic accidents. Majority of these deaths (85%) occur in poor countries. [2] predicted the high rate of Traffic injuries in the world, their report classified road accidents as the 3rd cause of death in the world. The Global status report on road safety launched by WHO in December 2018, highlighted the number of annual road traffic deaths that reached 1.35 million. According to [3], road traffic accidents were the leading killer of persons in 2018. At the moment with the present pandemic (coronavirus), the position of road accidents as one of the major causes of death may witness a little change. Though this might not prove that the rate of accidents will reduce in the following years, the pandemic has reduced the number of people traveling, caused by the barrier measures during the pandemic. Every day, about 3700 people are killed in automobile vehicles, bus, motorcycle, bicycle, truck, or pedestrian accidents around the world. WHO had predicted the position of traffic accidents between 1998 and 2020 (**Table 1**).

Table 1. Prediction of the range of traffic accidents.

No.	1998 Disease or Injury	2020 Disease or Injury
1	Lower respiratory contaminations	Ischaemic heart disease
2	HIV/AIDS	Unipolar major depression
3	Perinatal conditions	Road traffic accident
4	Diarrhoeal diseases	Cerebrovascular diseases
5	Unipolar major depression	Chronic obstructive pulmonary diseases
6	Ischaemic heart disease	Lower respiratory contaminations
7	Cerebrovascular diseases	tuberculosis
8	Malaria	War
9	Road traffic accident	Diarrhoeal diseases
10	Chronic obstructive pulmonary diseases	HIV/AIDS

According to the report of World Health Organization, Cameroon occupied the 29th position among countries with the highest number of accidents. They registered 758,145 accidents in 1879, with a mortality rate of 35.9. Considering the high rate of automobile crashes in the world, the sustainable development goals set by the WHO which calls for a 50% reduction in the number of road

traffic deaths by 2020, stills remain a worrying target to reach at.

According to [4], the United Nations General Assembly unanimously adopted a resolution declaring the Decade of Action for Road Safety from 2011 to 2020 in March 2010. The Decade's goal was to stabilize and reduce the global road death rates by 2020. This was to be achieved by strengthening road safety activities at the national, regional, and global levels. The resolution encourages all member states to set their own national road traffic casualties reduction goals for the decade and to carry out road safety activities, particularly in the areas of road safety management, road infrastructure, vehicle safety, road user behaviour, traffic safety education, and post-crash response.

Road traffic injuries (RTIs) are significant public health challenges and are projected to be the fifth leading contributor to the global burden of disease by 2030 [5] [6]. However, accidents are unfortunate and frequently occur on the road and cause death [7], infrastructures damage, and human health injuries [8]. RTI is a highly traumatic event, which can damage the body, spirit, and property. Majority of these road traffic deaths (93%) occur in low-and-middle-income countries [9]. The report of [10] shows that, in terms of road safety, Africa is not the example to follow. As per a WHO estimate, the continent's road traffic mortality rate was 26.6 deaths per 100,000 people in 2018. There is thus an urgent need to recognize the worsening situation in road deaths and injuries and to take appropriate action [11]. Majority of the countries lose 3% of their GDP due to road accidents. Besides having a huge emotional impact on the quality of life, road crashes also pose a very significant socio-economic burden [12] on the country. Medical costs, loss of productive capacity, property damage, administrative expenditures, and human costs are all achieved at the expense of traffic deaths.

The causes of RTAs are multifaceted and can be divided into three categories: driver factors, vehicle factors, and highway factors [13]. The term "driver factors" refers to all proximal events linked with the driver's behaviour that may result in serious injury. Josephine *et al.* arose attention to the impact of RTIs on Pacific peoples. They stress problems that needed to be addressed, such as drinking, poor driving, no seatbelt usage, and poorly maintained vehicles and roads. Vehicles running at excessive speeds and/or drivers disregarding traffic signals usually cause traffic accidents [14] [15]. Overloading is a frequent action among motorists, and it is the cause of many traffic incidents on our highways, especially in developing countries. It is critical to comprehend the numerous factors that contribute to traffic accidents [16]. Numerous elements have been identified through empirical research, most of which are connected to drivers, vehicles, roads, and the environment. These results were obtained from the research carried out by Batamag *et al.*

Thorough traffic accident investigation identified multiplicity factors that may or may not have contributed to an accident. Frequently occurring elements may indicate a common accident type or trend at a specific location. Published literature suggests that RTIs and their attendant risks are significant though the

causes of death and disability are poorly quantified. Road traffic accidents are predictable and preventable but good data is important to understand the ways in which road safety interventions can be effective. Cost-effective preventive measures can be designed to address this global problem. Aldegheishem *et al.* [7] proposed the need to develop a protocol to avoid or prevent traffic accidents at the extreme level in order to reduce human loss. Minimizing the number of road accidents, will decrease the death rate caused by road accidents. Among the causes of accidents, driver's behaviourial mistakes are the highest causinmg factors. Accidents caused by faulty vehicles system are ranked the last category of accident cause factors. The number of road accidents caused by vehicle systems is far from being negligible [17]. Existing studies of automobile accidents had focused primarily on injuries caused by driver's error and road-related factors.

Surprisingly, limited effort has been devoted to identifying factors that increase the rate of accidents caused by vehicle systems. These systems may not directly be the cause of the accident but, can indirectly influence the causation of an accident. Most accident researchers are based on post-data to analyse the situations of traffic accidents. The fact that most researchers or reporters don't say much about their contribution may stem from the fact that, they lack adequate information on how they might have caused or influence the accident. Panagiota *et al.* [18] evaluated accident causation models overtime which showed that there has been a shift from the sequence of events to the representation of the whole system. In terms of accident investigation procedures, there has been a steady shift from hunting for a single immediate cause to recognizing numerous causes overtime.

Since different models approach accident causation in different ways, methods linked to accident investigation models provide fragmented information regarding the cause of accidents. It is suggested that using a combination of model-method pairs could provide a more reliable Platform for accident analyses. The aim of this systematic review is to identify the different methods used to investigate the vehicle system-related cause factors of road traffic accidents. It assesses the opinion of researchers on how they often investigate the vehicle system cause factor which is in most cases very sensitive to investigate. Most vehicle systems that can participate in the causation of an accident always have temporal evidence that if not captured or properly investigated disappears overtime. This work samples the frequently used methods of analysing the causes of traffic accidents and exposes the common vehicle system factor that can cause an accident. Furthermore, it reveals the gaps that exist between the crash investigation methods. This review will help to develop better means of investigating and reporting vehicle system cause factors.

2. Materials and Methods

2.1. Research Design

A systematic approach to literature review was adopted to identify the different methods used to investigate the vehicle system-related cause factors. Scientific

electronic databases from 2000 to 2021 were searched. Search terms were "car crash", "vehicle system/car crash", "causes of car crashes, and "investigation of car crash causes". Two hundred and twenty-five unique records were identified; 155 full texts were screened for inclusion. Articles were rejected if it was found that the study did not fit the inclusion criteria based on the title and abstract. Any questions about how the selection criteria should be applied were resolved through talks among all of the researchers participating. An online web-based literature search was conducted using frequently updated databases such as; Google, springer, PubMed, safety science, open-source journals like Elsevier, Scopus, Google scholar, etc. The main research keywords included; Automobile accidents, road traffic accidents, accident investigation, vehicle system, and Cameroon. Only studies published in English were derived from the database. In this review, we had grouped the articles studied in two categories; global causes of RTA (looking at the general factors that contribute to road traffic accidents including the three factors; human error, road infrastructures, and vehicle system failures), vehicle system-related causes of RTA (this dwell on the which vehicle systems and how they can contribute to the causation of RTA) and the RTA investigation methods (the different method used to analyse or investigate the cause of an accident). Article selected ranges between 2000 and 2021. Consulting articles from 2000 to 2021 enable a cross-examination of all possible contributing automobile crash caused factors studied overtime.

2.2. Data Collection

Given the frequency of automobile accidents, the selection criteria sought to locate research that included cross-examination of the reasons for an accident including vehicle systems. The following publications were being chosen based on their use of statistical data to analyse vehicle system risk factors. Articles about traffic accidents in Cameroon were accepted on the condition that they study at least one traffic accident risk factor. Non-systematic reviews and clinical practice guidelines were excluded, as well as articles that reported changes in knowledge, attitudes, or other surrogate variables. Market studies, polls, survey data, and research papers with poor methodological rigor according to the critical analysis criteria of this study were rejected (Figure 1).
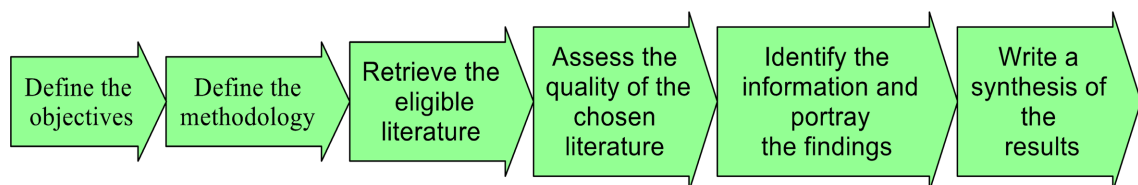
Define the objectives → Define the methodology → Retrieve the eligible literature → Assess the quality of the chosen literature → Identify the information and portray the findings → Write a synthesis of the results

Figure 1. Research design.

2.3. Data Extraction and Analysis

A web-based literature search was undertaken utilizing constantly updated databases such as Google, Springer, PubMed, Safety Science, and open-source jour-

nals such as Elsevier, Scopus, and Google Scholar, among others. Included are the most important research keywords. Accidents involve automobiles, traffic accidents, and accident investigations, Cameroon and vehicle system. Articles selected, had something to say the concern the participation of vehicle system (tyres, braking system, suspension, steering system seatbelt, etc.) in the causation of an accident. Each article adopted a particular methodology to analyse the situation of automobile accidents. The publications chosen ranged between 2000 and 2021. This range was used to cross-examine publications that had assessed and reported on the participation of vehicle systems in accident causation.

2.4. Results and Discussions

From the start, 150 studies were evaluated. Among them, 47 were from Elsevier, 18 from Research gate, 10 from PubMed, 23 from Google Scholar. 37 from science direct. Science direct had a lot of journals that are concerned with traffic accidents or automobile crashes. We equally consulted 15 websites that deal with traffic accidents. In the end, 25 articles were returned for studies following the PRISMA flow diagram and the reasons for exclusion (**Figure 2**).
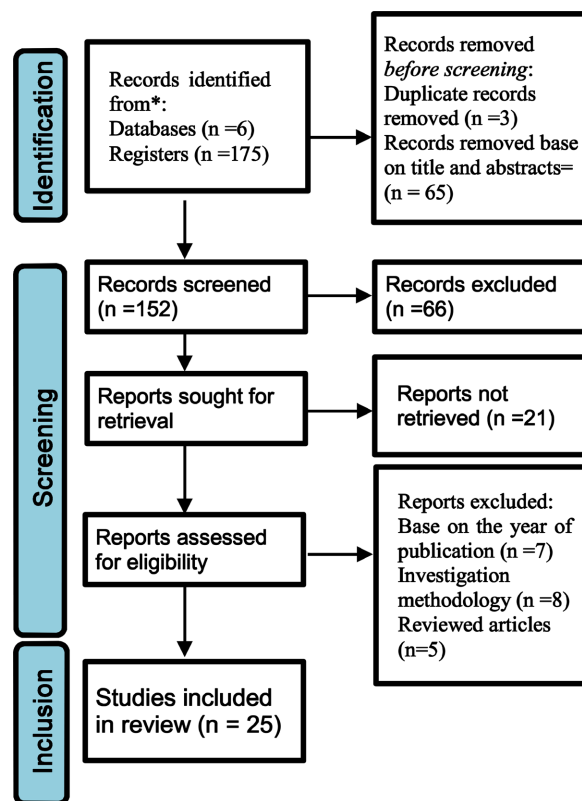

Figure 2. Flow chart of article selection.

Articles that deliberated on any vehicle system factor were adopted for studies. More to that, the selected articles must be published from 2000 to 2021. Any article out of this range was excluded. All reviewed articles were equally excluded.

The year of publication of every studied material was stated ranging between

Table 2. Articles reviewed.

Author	Journal	Participants	Causes examined	Key findings relevant to review and method used to investigate
Moodley *et al.* (2008) [19]	Southern African Conference (SATC 2008)	226 car accidents Pretoria, South Africa	• Car Tyres • Vehicle Windscreen • Headlights	Study of the influence of tyre and windscreen in causing an automobile crash. (They used the statistical method to correlate the vehicle system defects and the rate of accidents in Pretoria)
Bureika *et al.* (2012) [20]	Research Gate	5000 traffic accidents Republic of Lithuania	• Tyre • Brakes • Suspension System • Lighting System • Steering System	Correlation of vehicle system defect and its impact on the causes of accidents (Statistical analysis of police Republic of Lithuania)
Yan *et al.* (2001) [21]	Int. J. Environ. Res. Public Health	commercial vehicles in China	• Unsafe acts and unsafe conditions of commercial vehicles	This study investigated major accidents involving commercial vehicles in China and performed analysis on accident characteristics regarding the time, location, types of vehicles, and accident causation at different levels (Statistical analysis)
Hoque and Hasan (2006) [22]	Journal of Civil Engineering	1011 Vehicle Accidents Involving 1410 Bangladesh	• Tyre burst • Braking failure system • Defective lighting system • Axle failure	Identify the common vehicular defects and their influence on road accidents on a typical national highway of Bangladesh (statistical analysis)
Matthew *et al.* (2015) [23]	Journal of Transport System Engineering	439 cases of accident Malaysia	Mechanical failures	Identify major cause of mechanical failure among all types of buses (statistical analysis)
Ockert *et al.* (2001) [24]	Accident Analysis and Prevention	82 vehicles were stopped and tested over a period of 2 days between Pretoria and Pietersburg South Africa	Mechanical failure	Identification of the most prevalent mechanical defect causes (statistical analysis)
Goniewicz *et al.* (2015) [25]	*Journal of Transport System Engineering*	Accident analysis from 2003-2012 Malaysia	Vehicle mechanical failures	The trends and causes of commercial bus accident referred from database (statistical analysis)
Nangana *et al.* (2016) [26]	Environ Health Prev Med	144 motor vehicle-related RTA Lubumbashi, Democratic Republic of Congo.	Drivers risk factor Overspeeding Overtaking The use of seat belt	The aim of this study was to determine the frequency, causes and human impact of motor vehicle-related RTA (they interviewed declared guilty by road safety agents)
Liu, Chen, Zeng, *et al.* (2018) [27]	PLoS ONE	346 road accidents China	Professional driver, driving under influence (alcohol or drug), fatigue, vehicle type, overload, brake problem, weather, road classification, terrain, and region	This study investigates risk factors contributing to extremely serious road accidents, which will be crucial for accident prevention (statistical analysis)

Continued

Fan (2018) [28]	Open Access Library Journal	Shanghai, China	Causation of factors of a traffic incident	Logical relationship between the occurrence of the intersection car accident and the factors such as human, car, road and environment is summarized from the top down to the fault tree model. (fault tree analysis method to perform a logical analysis)
Tsala *et al.* (2016) [29]	Journal of Transportation Technologies	569 Accidents recorded along a section of 114 km Yaoundé-Douala Cameroon	Signposting along	Highlights the typology of road accidents related to the default of signing for many accidents that have occurred due to imperfect signposting along roads in Cameroon (statistical analysis)
Tsala *et al.* (2021) [30]	Journal of Transportation Technologies	Douala-Dschang Cameroon (382) road accidents reports were collected	Causes of accidents related to speed and carelessness, location of the accident, type of vehicle at fault, day the accident occurred, time of the accident and the age of drivers involved	Aimed at identifying the risk factors that mainly contribute to reckless driving and other related causes of road accidents along the Douala-Dschang highway of Cameroon (statistical analysis)
Adhikari (2016) [31]	Open Journal of Civil Engineering	1530 Accidents were recorded Kathmandu-Bhaktapur road China	Locations with high accident numbers, Causes of accidents	Identify locations with high accident numbers, to investigate possible causes of accidents due to the increase of the Kathmandu-Bhaktapur road (statistical analysis)
Okafor *et al.* (April 2018) [32]		315 questionnaires from long commercial drivers of Benin city Nigeria.	• Ages of drivers and common causes of road traffic accidents examined include careless driving, speed violation, brake failure, traffic violations, faulty overtaking, burst tyre, bad roads, alcohol use	Sampling was done between January to October, 2013 Study instrument used Were; structured interviewer-administered questionnaires and focus group discussion guide
Hendricks *et al.* (2001) [33]	National Highway Traffic Safety Administration (Washington, DC 20590)	Sample of 723 crashes involving 1284 drivers	• Driver behaviours and • Unsafe driving acts	Investigated from four different sites in the country, information collected and evaluated included; condition of the vehicles, the crash scene, roadway conditions, driver behaviours and situational factors at the time of the crash (statistical analysis)
Min and Ando (2020) [34]	Transportation Research Procedia	A total of 178 residents in Aichi Prefecture who drive for at least 3 hours a day and more than 3 days a week, participated in the research as subjects. Japan	Driving behaviour and drivers behaviour	Focus on dangerous driving events or behaviors which can lead to fatal accidents and analyze their occurrence characteristics and correlation with driver attributes (EDR/IVDR)

Continued

Wu *et al.* (2013) [35]	IET Intelligent Transport Systems	A DBEDR was used equipped with a GPS, camera and a USB Taiwan	Behaviours and a danger level	The study used prototype of a driving behaviour-based event data recorder (DBEDR), which provides the information of driving behaviours and a danger level (the use of (DBEDR) method)
Plainis *et al.* (2006) [36]	www.injurypre vention.com	United kingdom	Luminance of the Traffic road at night and Day	Investigating the role of lumination in the causation of an accident
Laure *et al.* (2016) [37]	Traffic Injury Prevention	783 professional drivers on the Douala-Yaoundé Cameroon	Consumption of alcohol	The influence of alcohol in professional drivers
Wang *et al.* (2015) [38]	Network of Scientific Journals	Car speed	Overspeeding	Study the internal relation between speed limit and environment constraints
Vangi and Virga (2007) [39]	Vehicle System Dynamics	Car tyres	Tyre adhesion on the road wheels	Evaluation of the: coefficient of friction and the stopping capability of a car
Shamsul and Rafiqul (2006) [40]	Journal of Civil Engineering	1011 accidents of a 39km major in Bangladesh	The study of vehicle defects	Identify the common vehicular defects and their influence on road accidents

2000 to 2021 (Table 2). The journal all indicated for onward consultation. The participant indicated the quantity of data studied and the country or town of the participant. Automobile systems factors were sorted out and treated as variables during the analyses. Key findings and methods used to analyze the variables were assessed as well. In the end, we appreciated the analysis effectuated by each study.

3. Analysis

There is evidence that the occurrence of a traffic crash is the result of multiple contributory factors [41]. As addressed in this literature review, driver's behaviour, geometrical and environmental conditions all contribute to traffic crashes and collisions. Statistically significant differences between the distribution of causes or factors contributing to the accident occurrence have been proven depending on the driver's behaviour, environmental factors, and vehicle system [32] [42]. Hendricks *et al.* [33] classified the following contributing factors as follows: driver inattention 22.7%, vehicle speed 18.7%, alcohol impairment 18.2%, perceptual errors 15.1%, decision errors 10.1%, and incapacitation 6.4% [43]. Traffic accident statistics suggest that human errors contribute to major crash types. Long duration of driving is a substantial cause of fatigue-related accidents on motorways or major roadways [44]. Fatigue caused by driving for extended periods acutely impairs driver alertness and performance and can compromise trans-

portation safety [45].

Limiting to one factor of accident causation sounds vague as improper overtaking, improper cutting in, improper turning right or left, improper parking or stopping, following too close, drunk driving, careless driving, passing prohibited roads, failure to stop at the crossing, failure to use a seatbelt, aiding and abetting of violation, etc., always accompany over-speeding in crash occurrence and injuries. This information is essential to the understanding of the causes and the ultimate means of preventing automobile crashes. Crash data in most cases have been used just for mitigation of traffic accidents, but can be used as a basis to set insurance premiums laws and to formulate licensing policies. The initial evidence to collect or visualize an automobile crash at the incident is to monitor the nature of the crash. The nature of the crash results in the gravity of injury sustained. Road construction and traffic policy-making depend on the types of accidents recorded overtime, to propose solutions that will prevent the future occurrence of a crash.

3.1. Frequency of Methods Used to Study the Related Variables

A common factor of central importance in road safety management is the collection and use of accurate and comprehensive data related to road accidents. The interpretation of these data can lead to a better understanding of operational problems. it is a prerequisite for an accurate diagnosis of accident problems, assists in the development of remedial measures, and permit the evaluation of the effectiveness of road safety programs [46]. A comprehensive database is a basic prerequisite for any effective road safety initiative to be undertaken. Each agency, whether it is government or non-government, involved in road safety activity, should have a clear understanding of the nature, scale, and distribution pattern of the road accident difficulties they want to address. Figure 3 shows the investigating methods that were used to study the variables sorted from the selected articles. These methods include statistical analysis, interview/questionnaires, and EVD (event vehicle data) and DBEDR (driver behaviour event data recorder).

Most articles used statistical data analysis (Table 2) to investigate the various automobile crash parameters. The data analysed were secondary data collected
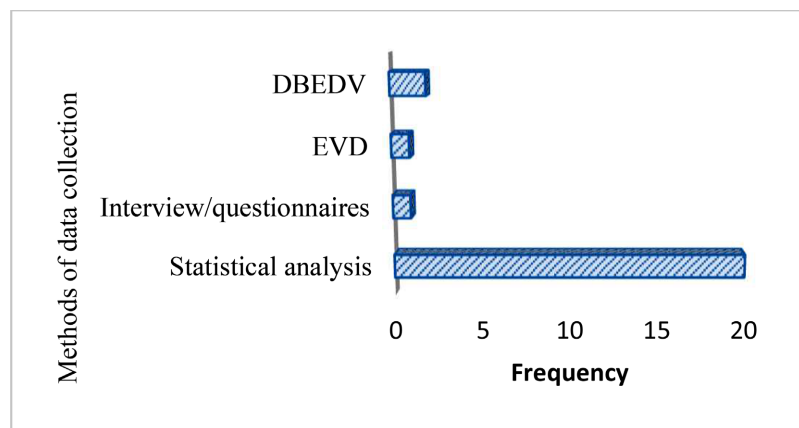

Figure 3. Frequency of investigatory method.

from police stations, government structures, and organizations, etc. These data were reported from individual traffic accidents over a period of time. Researchers use this information to judge which factors significantly influence the cause of an automobile crash overtime. Upon reporting an accident, the reporter is exposed to multiple factors, but it is left for him to judge and report what information is at his disposal. The data reported is kept for further exploitation by the concerned authorities, researchers, associations, or organizations.

Many methodologies and strategies have been exploited by reports to assess a crash incident. Among these tools are questionnaires. These tools are greatly used in data acquisition in the psychometric domain. With this method, a respondent is given an opportunity to report his own side of the story. Self-report can't guarantee an absolute truth of the evidence. The respondent cannot give an answer that will go against his favour. In another case, the respondent may not want to expose certain information concerning him/herself. They may consider that reporting the truth will inquire heavy fines on them. Nangana *et al.* ranked some of the factors leading to vehicle crash including attending overspeeding (32%), distracted driving (22%), overtaking (16%), and careless driving/risky manoeuvre (15%).

Driver behavioural event data recorder (DBEDR) and event data recorders (EDR/IVDR) are car-based technical solutions that report on what's going on within the vehicle in the vehicle during and after a crash. They are very much in charge of vehicle system monitoring. A general event data recorder is a device that is fitted in cars to record information on vehicle collisions or accidents. The feedback from this equipment offers an overview of how particular accidents took place [35]. Unlike previous studies that focused on detecting dangerous places and spots on the road or a specific driving behaviour (e.g., sudden braking) or driving behaviour confined to testing environments, this method captures and analyses a wide range of dangerous driving behaviours or traffic violations in real-life situations in the comfort of the driver's own car using full-duration recording data from a drive recorder.

According to the graph (Figure 3), majority of articles investigated numerous automotive crash factors using statistical data analysis. The majority (20) of the data used in the articles came from police stations, government structures, organizations, and other sources; this information was obtained from individual traffic accidents throughout time. As a result, researchers examine this data overtime to determine which elements had the highest impact on the cause of a car accident. The reporter is exposed to various information when reporting an accident, but it is up to him to judge and convey what information he has. We can assume that some data can be missing or misidentified during secondary data reporting. According to this premise, severe traffic safety laws cannot be implemented solely on the conclusion of secondary data results. It should not be forgotten that a single traffic event can have an impact on the occurrence of a subsequent traffic incident.

3.2. Accident-Related Factor Based on Studied Article Sample

To predict, suggest, analyse, or solve a problem, a clear and defined methodology for gathering information, processing it, and presenting the results is necessary. Organizing and categorizing the diverse data and methods of analysis are very important. There are numerous aspects that contribute to the cause of an accident, and it would be impossible to list them all. The focus of the sample articles examined was on vehicle-related system factors. The majority of the variables are interdependent or linked to a number of factors (Figure 4).
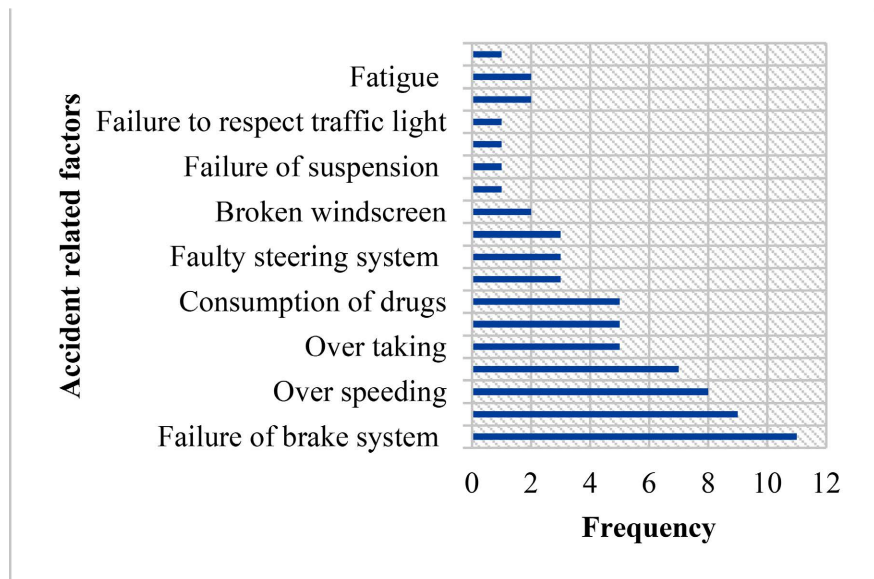

Figure 4. Prominent accident-related factors.

The system of human, vehicle, road components and road traffic are inextricably linked. When these relationships meet certain natural regulated boundaries, road safety is actually maintained. Despite the fact that a specific job for guaranteeing safe traffic is assigned to a person, a system for objectively evaluating other types of elements should be established [20]. Many accidents have occurred as a result of drivers' or vehicle owners' failure to perform preventive maintenance. A large percentage of accidents occur as a result of poor maintenance, which includes failed brake systems, faulty wheel alignment, mechanical difficulties with wheels, and headlamp failure.

The vehicle comes with an active and passive security system that ensures the vehicle's safety. While the car is in motion, active safety systems are always on. The main indicated vehicle risk factor in the study sample is brake failure (15.71 percent). Because it is the vehicle's primary safety system, any malfunction while it is in motion will result in an accident. Any of these safety systems failures will result in a tragic accident with irreversible consequences. Tyre puncture (12.86 percent) is the second most common cause of accidents, according to the data collected from the samples. A driver will lose control of his vehicle if the tyre bursts while the vehicle is moving. Poor driving habits of drivers who disregard

traffic signs and safety measures contributed to overspeeding (11.43 percent). Drivers will always want to reach their destination as soon as possible, especially if the roads are terrible. Radars are used to capture speeding at certain points on the road. Vehicle failures are classified according to relevant vehicle features on the justification of traffic safety and causes of road traffic accidents for a better understanding of the differences between research efforts and outcomes. The cars are initially classified based on the impact of technical failure. During a technical inspection, vehicle categorization is used to determine the state of the vehicle's technical condition. According to road safety standards, each vehicle must visit an inspection centre after a certain period of time. The inspection centre is in charge of checking vehicle's safety systems, such as braking, lighting, and engine pollution. If the vehicle does not meet the required safety specifications, they are expected to carry out necessary repairs. The nature of repairs might be either curative or preventative. Failure might occur when the car is in displacement if the guidelines are not followed. Consider what would happen if the vehicle's safety system failed while the vehicle is in motion. It will be evident that the car will be involved in a collision. These questions must be asked before or after any investigations: Did any failure in the vehicle system cause the driver to lose control and/or contribute to a fatal road accident? If that's the case, what precise mechanism went wrong and why? Was this system badly designed, was there a manufacturing issue, was there inadequate maintenance, or was it something else entirely? Before putting a vehicle on the road, it should be thoroughly checked or inspected for road safety.

With a few notable exceptions, automobile accidents are usually examined to a greater or lesser extent to assign blame to defaulters. Only a few investigations have been conducted with the purpose of increasing road traffic safety. Many have been investigated in order to assign blame or accountability [47]. While safety suggestions are frequently given, they regularly fail to address the root cause of whatever went wrong [48]. An accident is not produced by a single element; rather, it is created by a series of events that can be linked together or considered separately. Even while human error causes the majority of accidents, when one occurs, it is almost always the result of one or more flaws in the automobile safety system.

It has been established that a greater understanding of real-world crashes is required in order to offer the automotive industry more reliable statistical data for various crash types. It's worth noting that accurate statistical data is essential to guide future improvements aimed at lowering the causes of car accidents. The evidence gathered at a car accident site is transient and time-sensitive. Some of this temporary evidence, such as tire traces, gouge marks, debris, paint or other materials, will fade or vanish altogether overtime. As a result, it's critical that a qualified forensic specialist inspects the scene as quickly as possible following the accident.

This will reduce reliance on police reporting for data collection and inquiry.

When a police officer does not belong to the same class as the RTA victim, his or her reporting may be skewed. According to Lindquist *et al.* [49], police officers in the United States of America issued much more traffic penalties to drivers of different races than themselves. When it comes to tribal matters, this becomes even worse. To draw cuttings, bring in appropriate defaulters, and charge the proper sanctions, adequate reporting is essential. Assuming that the information entered in RTR (road traffic record) forms is a thorough inquiry that may be used in accident reconstruction is mistaken [48]. The road traffic officers at the site do not conduct an investigation into the collision; instead, they just record the information on the RTR. In order to learn from previous disasters and prevent future ones, a thorough accident investigation is essential [50]. The contribution of vehicle flaws to road accidents would remain unknown unless a thorough accident investigation is done.

4. Discussion

Eyong [51] conducted research to find out the influence of road safety and accident prevention in Cameroon. Traffic safety and accident prevention play a critical role in reducing and protecting human life and property on the roadway. It was established that accidents were a result of more human factors like speed, overloading, non-respect of road signs. Their findings show the overall relationship between improving road safety and accident prevention in Cameroon. They gave three categories of proposals to the stakeholders; Identification of black spots/accidents prone spots, the need for a lead agency on road safety, Creation of a data bank in ascertaining the magnitude and characteristics of the road safety problem, this included implementation of better sensitization techniques through the media outlets, and better strategies for preventing overspeeding. Laure *et al.* [37] conducted a pilot study of police reports on the Yaoundé-Douala high, finding 73 deaths per million kilometres between 2004 and 2007. The researchers wanted to assess road morbidity and mortality, as well as define the key characteristics of road traffic crashes on a busy Cameroonian road. The most serious collisions involved vulnerable road users and cars travelling in opposite directions, and the leading causes of fatal collisions were dangerous overtaking, excessive speed, and mechanical breakdowns, with tyre difficulties accounting for two-thirds of the latter.

Tsala [29] carried out research to better understand accident-related approaches on Cameroonian highways. Their findings showed a correlation between traffic accidents and signalling. Their case study focused on the Yaoundé-Douala roadway, which runs for around 242 kilometres. They created accident scenarios based on crashes on one hand, and road signalling on the other, using the qualitative method. There were eight scenarios identified for collision-related accidents. These include violations of the highway law, failure to signal a construction zone, driver indifference, poor parking, improper overtaking, the lack of a slightly higher bump, failure to signal damaged work, and no crossroads sign-

posting.

Tsala *et al.* [30] studied the Douala-Dschang roadway. The purpose of their study was to look into the risk factors that lead to reckless driving and other related causes of road accidents on the Douala-Dschang highway in Cameroon. They uncovered six factors that influenced an accident's causes. Accidents were caused by speed and negligence, as well as the accident's location, the type of vehicle to blame, the day of the accident, the hour of the accident, and the drivers' ages. All previous study was based on secondary data obtained overtime from police records.

In the event of an accident, police authorities have particular tasks and functions that are routinely prescribed by law. Because of their position and purpose in society, police officers must perform exactly what is required of them and nothing more. As a result, there is a rigidly structured process that does not adjust to the individual scenario. Although the standards are generally relevant and sufficient, some key data may be overlooked in unique instances. The level of detail in police reports about the accident circumstances is frequently insufficient for in-depth analysis. The quality of reports is typically determined by the staffing resources available in police units, resources that must be shared among the various responsibilities of police agencies: criminal prosecution, public security, and supporting the judiciary through criminal proceedings. Therefore, the police staff report should not be the only dependent evidence expected factors of importance for the understanding of the accident occurrence.

5. Conclusion

The last group, as a cause of automobile accidents, is the vehicle system, which accounts for 1% - 15% of all accidents in most nations. The aim of this systematic review was to assess the different methods used to investigate the vehicle system cause-related factors of road traffic accidents. There is evidence that the occurrence of a traffic crash is the result of multiple contributing factors. Driver's behaviour, road geometries, and environmental conditions all contribute to traffic crashes and collisions. Statistically significant differences between the distribution of causes or factors contributing to the accident occurrence have been proven depending on the driver's behaviour, environmental factors, and vehicle system. Furthermore, the cross-examination of studied samples evaluated the cause factor investigated and the method used to scrutinize these factors. The research work was largely restricted to studies that looked into the role of vehicle systems as a causal factor of an accident. The other risk variables were not taken into account. Despite the fact that several samples looked into certain parts of driver and vehicle system-related issues, defective vehicle systems (brake (15.71), tyre (12.86), overloading (11.43), and other factors are among the 25 causes of accidents identified in the study sample size. Others are intertwined in the accident's cause. Majority of the people in the study group were speeding. The articles that were looked at were mostly from underdeveloped countries. This reveals the

limitations of this research in terms of advanced systems and policy implementation. There are virtual, limited policies on how to execute transportation policies targeted at reducing the high accident rate. Vehicle systems and road infrastructures are rarely included in reviews from developed countries. This is because they may be in charge of creating and enforcing transportation legislation that governs the industry. The inspection of a vehicle is not something to be taken lightly. If found to be faulty, the concern pays a hefty fine. High-Income Countries (HIC) are currently concentrating their efforts on examining driver behaviour and driving altitude. Owners and drivers of automobiles are required to respect road traffic regulation. To preclude the shortcomings of the existing reviews, we are proposing included reporting samples and technological solutions that will monitor and better report the participation of vehicle system in the causation of an accident. This will enhance the investigation and reporting of the causes of automobile crash causes including all the risk factors.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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