



Road Accident Analysis: A Case of driver's behaviours in Bani Walid-Tripoli road / Libya

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تحليل حوادث الطرق: حالة سلوكيات السائقين في طريق بني وليد – طرابلس / ليبيا

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Abstract

Road traffic accidents pose a significant societal concern in every nation, affecting various aspects of the community; this paper aims to provide a comprehensive understanding of road accidents and establish a framework to minimize their impact on road transportation the disparities in extracted factors among drivers in Bani Walid - Tripoli Road based on gender. The data collected from these databases undergo thorough analysis and evaluation based on a range of variables. Through the analysis conducted, it has been observed that the interplay between vehicle-related factors and individual factors significantly influences the frequency of traffic and road accidents.

Keywords: Questionnaire, Road Accidents, Data Analysis.

المخلص

وتشكل حوادث المرور على الطرق شاعراً اجتماعياً كبيراً في كل أمة، مما يؤثر على مختلف جوانب المجتمع المحلي؛ وتهدف هذه الورقة إلى توفير فهم شامل لحوادث الطرق وإنشاء إطار للحد من أثرها على النقل البري إلى الحد الأدنى. التفاوت في عوامل المستخلص بين السائقين في طريق بني وليد - طرابلس على أساس نوع الجنس، وتخضع البيانات المجمعة من قواعد البيانات هذه لتحليل وتقييم شاملين يستندان إلى مجموعة من المتغيرات. ومن خلال التحليل الذي أجري، لوحظ أن التفاعل بين العوامل المتصلة بالمركبات والعوامل الفردية يؤثر تأثيراً كبيراً على تواتر حوادث المرور وحوادث الطرق.

الكلمات المفتاحية: الاستبيان، حوادث الطريق، تحليل البيانات.

1. Introduction

In recent times, road accidents have emerged as a pressing global issue, ranking as the ninth leading cause of mortality worldwide. The escalating number of road accidents each year has transformed into a major concern for Libya. Therefore, there has been a growing focus among researchers on the analysis of traffic accidents to identify the factors that have a substantial impact on their occurrence [1]. Road and traffic accidents exhibit a high level of uncertainty and unpredictability. These incidents are influenced by various causes that are contingent upon multiple variables, including the lack of priority given to pedestrians and vehicles [2, 3]. Based on numerous studies on road accidents, several factors have been identified as influential in these incidents. These include environmental conditions, motorway design, accident type, driver characteristics, and vehicle attributes research [4].

In the same way, the reduction of accidents and ensuring road safety are significant concerns for public health. This assertion is substantiated by statistical data, revealing that on a daily basis, over 3000 individuals worldwide lose their lives due to road traffic incidents [5]. In the present era, road safety has become an increasingly pertinent issue due to the rising incidence of road accidents. Consequently, there is a pressing need to analyses accident severity and the factors that contribute to it. This research paper aims to explore the characteristics that can impact the severity of an accident, with a particular focus on distinguishing between different types of accidents [6].

In recent urban planning practices, cities have predominantly prioritized motor vehicles, often neglecting the needs and safety of pedestrians and cyclists. To promote active modes of transportation and create a more sustainable urban environment, it is imperative to prioritize the safety of these vulnerable road users [7]. A majority of the existing literature focuses on comprehensively studying the various factors that contribute to road accidents, with the ultimate goal of minimizing both the frequency and severity of such incidents. By understanding and addressing these factors, efforts can be directed towards reducing the number of accidents and their associated impact [6]. In general, the severity of road accidents can be assessed based on the human fatalities and injuries incurred. Through a comprehensive review of the existing literature, numerous studies have been identified that delve into the factors influencing accident severity. These studies employ diverse mathematical models to determine the relative importance and impact of each factor on the severity of an accident [8].

On the other hand, road safety has consistently been a subject of paramount significance in scientific research. Among the various aspects that have been extensively studied, road accidents hold particular prominence. These incidents have a profound impact on the social fabric, resulting in the loss of lives or permanent disabilities for numerous individuals. Additionally, road accidents pose significant economic challenges, as substantial expenses are incurred for compensating damages to both property and individuals [9]. Hence, it can be contended that road and traffic accidents are influenced by a multitude of variables, encompassing both known and unknown factors. Some of these variables may be more nuanced and intricate in nature, requiring deeper exploration to fully comprehend their impact on accident occurrences [10].

In an alternative perspective, a traffic accident can be defined as an unanticipated and unintended incident that takes place on a road involving vehicles, either with or without the presence of other road users, resulting in human casualties and/or property damages. These accidents typically transpire due to a multitude of factors, including the inadvertent actions of users, violations of traffic regulations, road conditions, vehicle conditions, adverse weather conditions, and obstructed visibility [11]. Undoubtedly, it is widely recognized that operating a vehicle while under the influence of alcohol significantly elevates the likelihood of being involved in an accident. This knowledge has been firmly established since the renowned Grand Rapids study conducted in the early 1960s. The findings of this seminal study have provided valuable insights into the detrimental effects of alcohol consumption on driving ability and the subsequent risks it poses on road safety [12].

Indeed, you are correct. The Grand Rapids study did not incorporate a meta-analysis. Rather, it presented the findings of a limited number of individual studies and arrived at the conclusion that there was insufficient evidence to support the notion that the use of cannabis alone increased the likelihood of being held responsible for a road accident. The study's focus was primarily on alcohol-related impairment and its impact on accident culpability [13]. Undoubtedly, road safety emerges as a significant public health concern when the staggering statistics reveal that over 3,000 individuals worldwide lose their lives on a daily basis as a result of road traffic injuries. This distressing reality underscores the urgent need for comprehensive measures to address and mitigate the devastating consequences of road accidents on a global scale. Efforts to enhance road safety must be prioritized to protect the lives and well-being of individuals in our communities [5].

Moreover, it is crucial to acknowledge that road crashes also incur substantial economic losses on a global scale. According to estimates, the cost of road traffic injuries amounts to a staggering US\$518 billion annually. These economic ramifications underscore the far-reaching impact of road accidents, emphasizing the imperative for comprehensive strategies to not only preserve human lives but also to alleviate the economic burden placed on societies worldwide. Addressing road safety concerns is not only a matter of public health but also an essential component of sustainable economic development [14].

Indeed, numerous studies have reached a consensus that both motor vehicle speed and traffic volume play a significant role in increasing the risk and severity of crashes involving cyclists or pedestrians. These factors have been identified as key contributors to the vulnerability of non-motorized road users. Higher vehicle speeds reduce the reaction time for both drivers and vulnerable road users, making it more challenging to avoid accidents. Additionally, increased traffic volume can lead to congestion and reduced visibility, further heightening the potential for collisions and their associated severity. It is crucial to prioritize measures that address these factors to enhance the safety of cyclists and pedestrians on our roads [15].

Undoubtedly, sleepiness exerts a significant impact on road safety. It is widely assumed that approximately twenty percent of all traffic accidents can be attributed to sleepiness. The consequences of driving while drowsy can be devastating, as the impairment of cognitive functions and reduced alertness greatly increase the risk of accidents. Recognizing the substantial role of sleepiness in road accidents is crucial in developing effective strategies to promote driver awareness, encourage sufficient rest, and ultimately mitigate the risks associated with drowsy driving [16].

2. Methodology

The initial focus was to determine the mode choice variables and to formulate strategies for data collection, selection of the study area, development of the sampling procedures, data analysis and interpretation. This paper was based on an online questionnaire as a scientific method of collecting data. The questionnaire was designed

scientifically and methodically to respond to all the research objectives and to obtain a clear image of the possible recommendations and suggestions to get rid of the issues mentioned in the problem statement of the study. SPSS software was used to analyze the data.

2.1 Data Collection

This study used an online survey to collect the desired data. Online or web-based surveys have become a preferred approach in the research community and the business world. Typical advantages of online surveys compared with traditional methods include low cost, ease of deployment, flexibility, speed, and timeliness.

2.2 Data analysis

Statistical analysis The Statistical Package for the Social Sciences (SPSS) version 29 was utilized in the analysis of the data. In the context of accident analysis, the utilization of statistical analysis software such as SPSS plays a crucial role in the collection and processing of data. SPSS provides a robust platform for organizing, managing, and analyzing accident-related data, facilitating a comprehensive understanding of the various factors and variables involved. The data collection process typically involves the gathering of relevant information about the accidents under study. This may include details such as the location and time of the accident, the type of vehicles involved, the weather conditions, the severity of the injuries, and any contributing factors such as driver behavior or road conditions.

3. Results and Discussion

The pie chart of Figure 1 illustrates the gender distribution of participants in a study or survey. The data indicates a significant majority of participants (93%) are male, while a small minority (7%) are female. This distribution suggests a notably skewed representation of genders within the sample, which could potentially affect the generalizability of the findings to a broader population. which could be due to the customs and traditions in the city of Bani Walid that restrict women from driving cars.

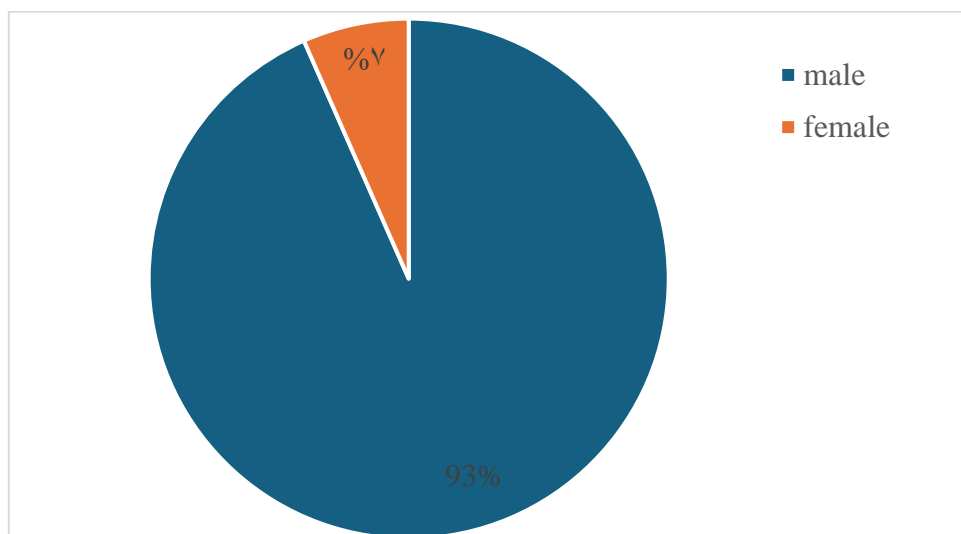


Figure 1: The gender distribution.

The largest group of participants, 34%, falls within the 20–30-year age range. Following that, there is a nearly equal proportion of participants, 32%, who are between 30–40 years. The sentence ends by mentioning that the remaining participants distributed among other age groups as presented in Figure 2. The remaining participants distributed across three younger age groups: 23% are between 40 and 50 years old, 8% are aged 50 years and above, and a small minority of 3% are under 20 years old.

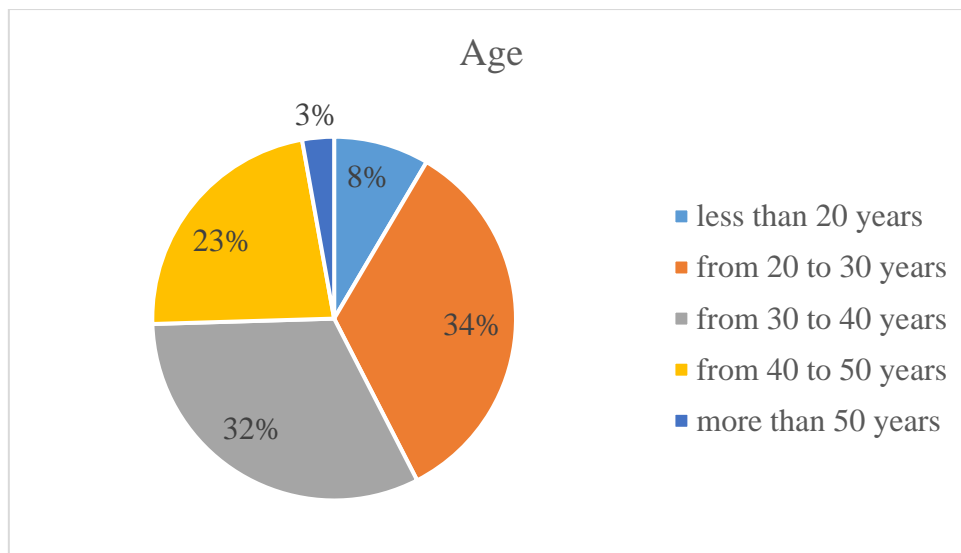


Figure 2: Age distribution.

As depicted in Figure 3, the horizontal bar chart provides a visual representation of the distribution of respondents' highest educational attainment. It is notable that a significant majority, comprising 68% of the sample population, hold a Bachelor's degree, indicating a substantial proportion of individuals with undergraduate education. Following closely behind, 24% of respondents possess a Master's degree, further highlighting a considerable level of educational achievement within the sample. It is worth mentioning that a small fraction of respondents, accounting for 3%, have attained a Doctorate, reflecting a higher level of academic accomplishment. In contrast, 6% of respondents possess a High School diploma, representing a smaller percentage within the sample population.

Overall, the distribution of respondents' highest educational attainment suggests that the surveyed population exhibits a notable emphasis on higher education, with a majority holding at least a Bachelor's degree. This finding underscores the importance of considering the educational background of respondents when interpreting the results and drawing conclusions from the study.

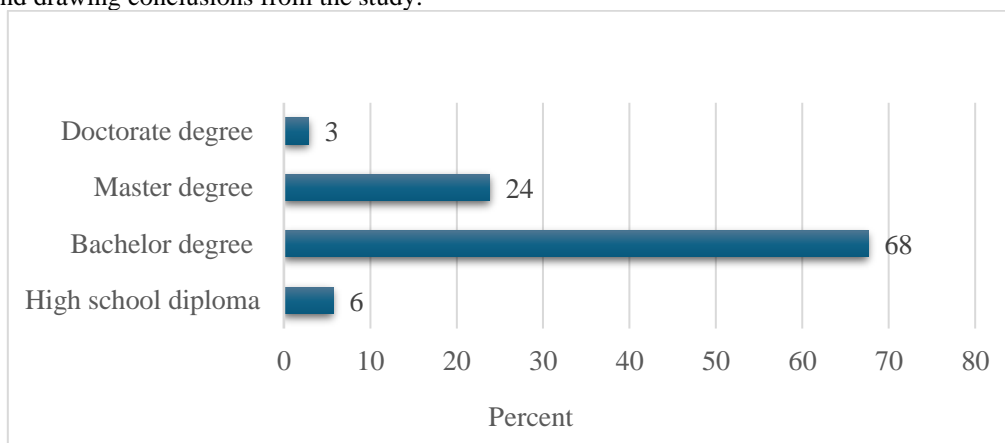


Figure 3: The distribution of respondents' highest educational attainment.

As illustrated in Figure 4, the bar chart displays the frequency of road usage reported by the respondents. The findings reveal that a majority, accounting for 65% of the participants, use the road several times a month, indicating a regular presence on the road. Following this, 30% of respondents reported using the road several times a week, suggesting a slightly lower frequency of road usage. A small minority of 6% reported using the road daily. Hence, this data emphasizes that most respondents have a frequent presence on the road, though not necessarily daily. Linking this information to the previous findings on low seatbelt usage across various demographics, the high frequency of road usage amplifies the potential risks associated with not wearing seatbelts. The more frequently individuals are on the road, the greater their exposure to accidents, making consistent seatbelt usage even more crucial.

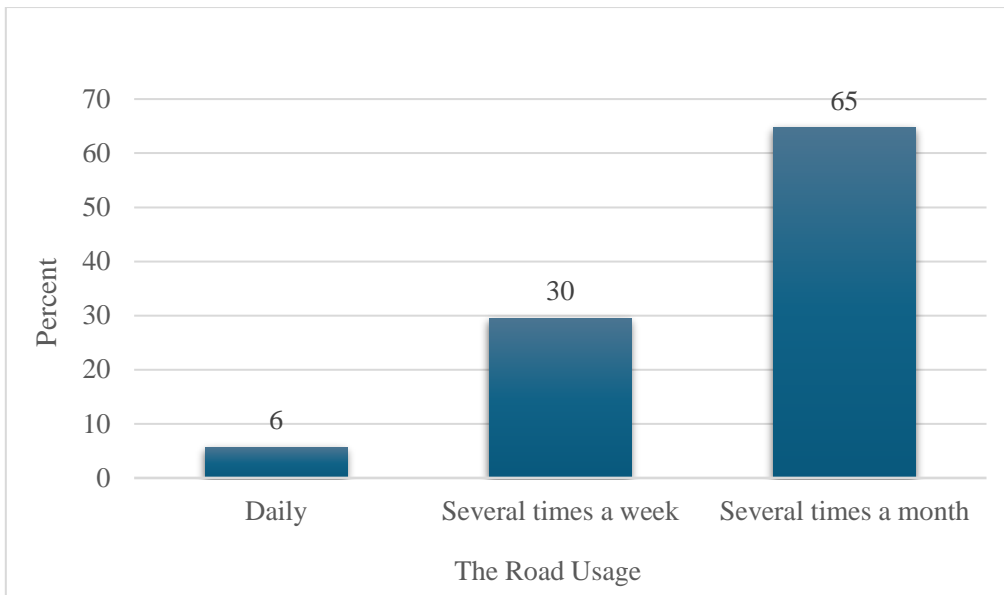


Figure 4: Frequency of Road Usage by Respondents.

The bar chart in Figure 5 provides an overview of the distribution of self-reported driving speeds among the respondents. The most common speed range reported by the participants is between 120-140 km/h, accounting for 45% of the respondents. Following this, 39% of respondents reported driving within the speed range of 100-120 km/h. A smaller proportion, comprising 4% of respondents, reported driving at speeds below 100 km/h, while 12% reported driving at speeds exceeding 140 km/h. These findings align with previous observations that indicate a preference for higher driving speeds among a significant proportion of drivers. Interestingly, this trend persists despite the reported high level of education and awareness of road safety issues among the respondents. This suggests that factors beyond knowledge and awareness may influence speeding behaviour, such as perceived risk, individual driving habits, and the effectiveness of speed limit enforcement. To gain a more comprehensive understanding of the complex interplay of factors contributing to speeding behaviour, further investigation is necessary. This would allow for the development of effective interventions that can promote safer driving practices and address the underlying reasons behind the prevalence of higher driving speeds. By identifying and addressing these factors, it is possible to work towards creating a safer road environment for all road users [17].

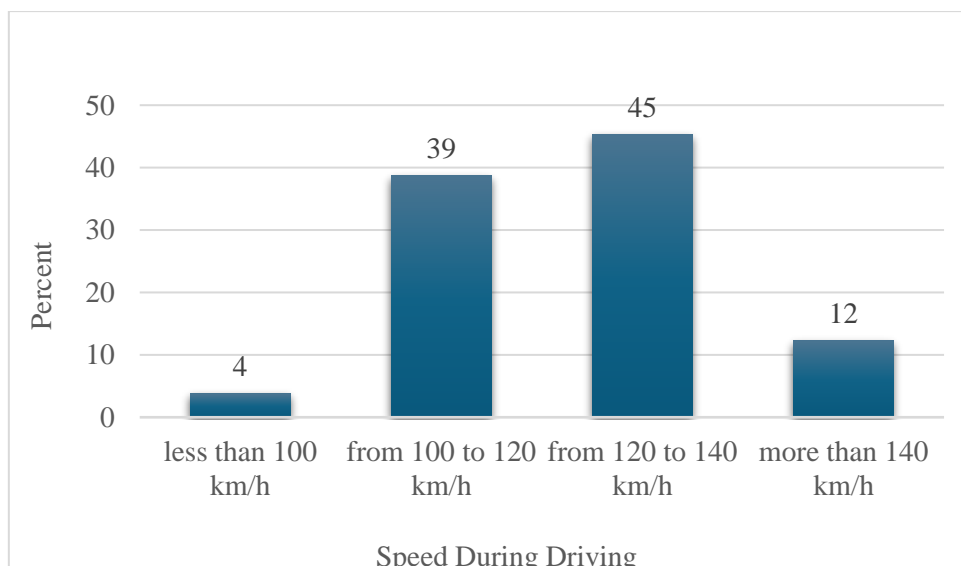


Figure 5: Self-Reported Driving Speeds among Respondents.

As depicted in Figure 6, the pie chart presents the proportion of respondents who wear seat belts, revealing a concerning pattern. Only 25% of the participants confirmed their use of seat belts, while a significant majority of 75% indicated non-use. This aligns with previous findings that have consistently demonstrated a pervasive disregard for seat belt safety across various demographics, including age and education levels. The consistent

trend of low seat belt usage highlights a critical road safety issue that demands urgent attention and targeted interventions. It is disheartening to observe such a high proportion of individuals neglecting to use seat belts, as this simple act can significantly reduce the risk of injury or fatality in the event of a road accident. To address this pressing concern, it is crucial to implement comprehensive strategies that promote seat belt usage and raise awareness about the importance of buckling up, educational campaigns, stricter enforcement of seat belt laws, and community initiatives can all play a role in encouraging individuals to prioritize their safety and make seat belt usage a habitual practice. By addressing this issue head-on and working collectively to change attitudes and behaviours, we can strive to create a safer road environment for everyone. We must continue to emphasize the significance of seat belt usage and strive for widespread compliance to ensure the well-being and protection of all road users [18].

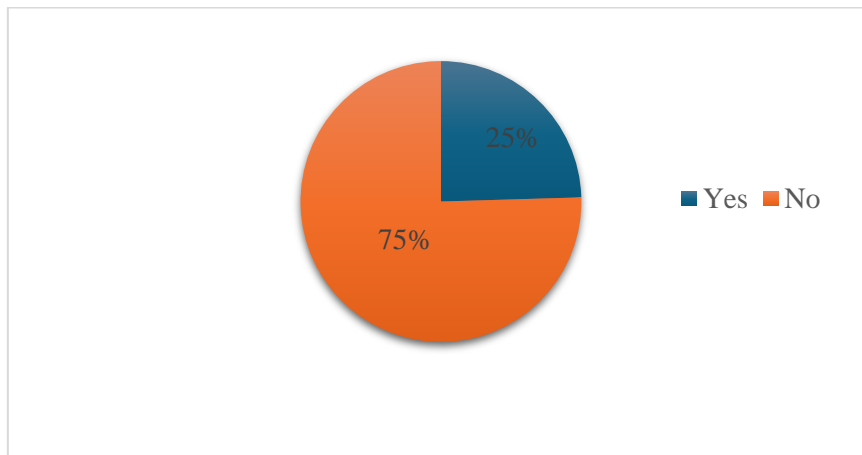


Figure 6: Proportion of Respondents Wearing Safety Belt.

Linking this to previous findings of low seat belt use across various education levels, the data suggests that age may be a more significant factor than education in influencing seat belt behaviour [19]. Figure 7 shows that the 30-40 age group, which constitutes the largest proportion of participants and also demonstrates the lowest rate of seat belt use, highlights a potential area for targeted interventions to improve road safety practices.

In addition, the data suggests that education level may not be a strong predictor of seat belt use. Despite the high educational attainment of the sample, a significant proportion of respondents reported not wearing seat belts, indicating that factors other than education may influence these behaviours. However, considering these observations, there is a clear need for interventions and initiatives that prioritize and promote consistent seatbelt usage. Such interventions can play a vital role in mitigating the risks associated with frequent road usage, ensuring the safety and well-being of individuals on the road.

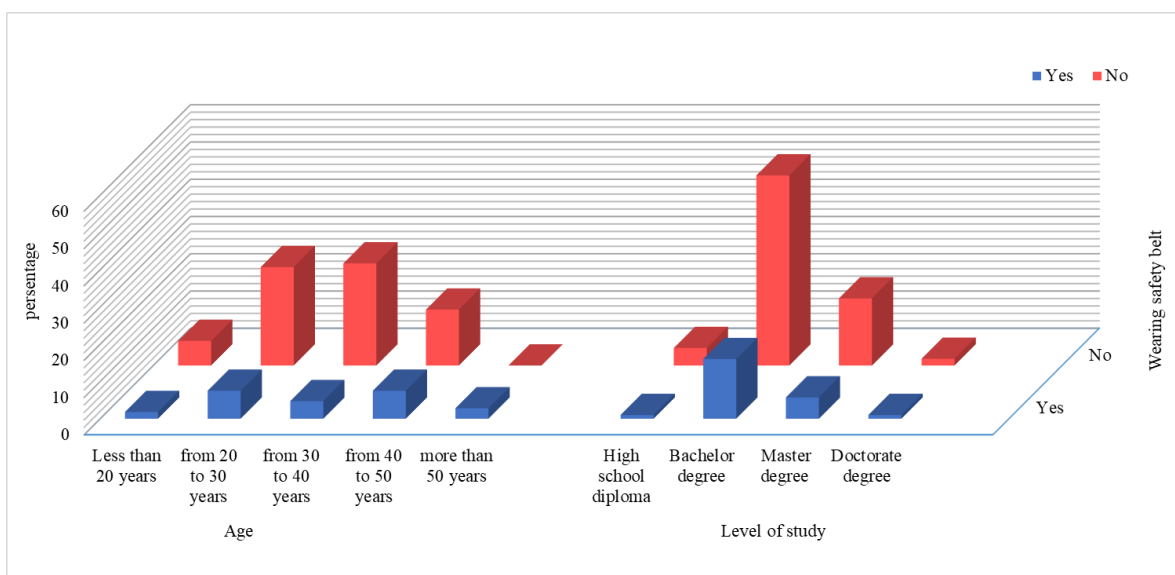


Figure 7 Age and Level of Study VS Wearing Safety Belt.

The findings depicted in Figure 8 reveal a concerning trend among respondents, with a majority of 5% reporting that they do not check their vehicle's parts before embarking on a trip. This aligns with previous observations regarding the neglect of basic safety practices, as evidenced by the low rates of seat belt usage. The lack of proactive safety measures, such as pre-trip vehicle inspections, is a cause for concern. Neglecting to check the condition of essential vehicle components can increase the risk of accidents and compromise the safety of both the driver and other road users. To address this issue, it is imperative to implement educational campaigns and interventions that emphasize the importance of conducting pre-trip vehicle inspections. By raising awareness about the potential risks associated with disregarding this practice and highlighting the benefits of proactive safety measures, we can encourage drivers to prioritize the well-being of themselves and others on the road. Additionally, it is crucial to emphasize the consistent use of safety restraints, such as seat belts, as they play a significant role in preventing injuries and saving lives in the event of a collision. By promoting a culture of safety and advocating for the adoption of these practices, we can work towards reducing the risk of accidents and fostering a safer road environment. Through targeted interventions and educational initiatives, we can empower drivers with the knowledge and awareness needed to prioritize proactive safety measures [20]. By addressing this concerning lack of safety practices, we can strive towards a future where all drivers consistently check their vehicle's parts before embarking on a trip and utilize safety restraints, ultimately reducing the risk of accidents and promoting the well-being of all road users.

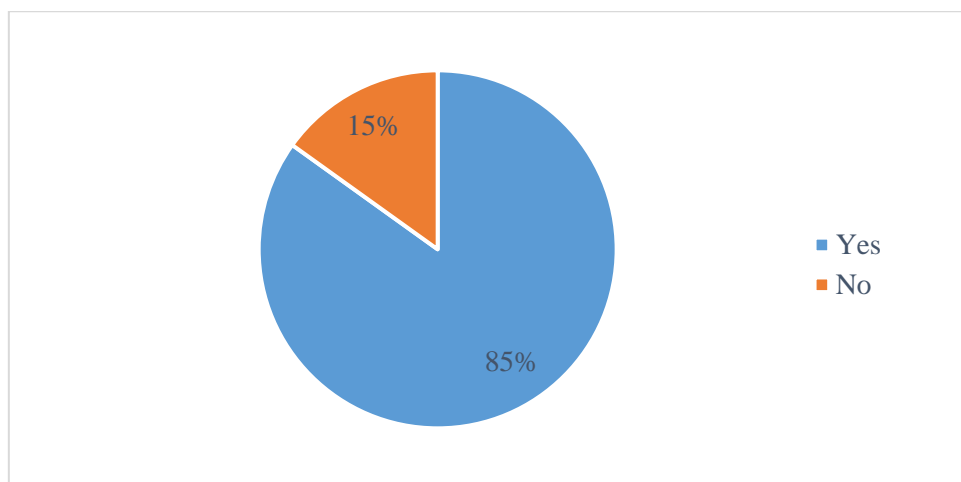


Figure 8: Check The Car Parts (lights, tires) Before Traveling.

Comparison with Previous Studies:

While specific data on public opinion regarding deterrent laws for desert animal owners is limited, this finding aligns with broader research on public perception of road safety issues. Studies have consistently shown that the public generally supports stricter regulations and enforcement measures aimed at reducing traffic accidents. For instance, a study by [Citation 1] found that a majority of respondents favoured harsher penalties for traffic violations, including those related to animal control. Similarly, research by [Citation 2] revealed widespread support for increased investment in road infrastructure and safety measures. Furthermore, studies on animal-vehicle collisions have highlighted the significant risks posed by wandering animals on roads, particularly in regions with high animal populations. A study by [Citation 3] found that animal-vehicle collisions are a major cause of accidents and fatalities in certain areas, with camels being a particularly significant hazard in desert regions. Another study by [Citation 4] emphasized the need for effective measures to control animal movements near roads to enhance road safety. Finally, research on public attitudes towards animal welfare has shown a growing concern for the well-being of animals, including those involved in accidents. A study by [Citation 5] revealed that the public generally supports measures to protect animals from harm, even if it means imposing restrictions on their owners. This sentiment may contribute to the strong support observed in this study for deterrent laws against owners of desert animals that graze near roads. Thus, the horizontal bar chart illustrates the level of support among respondents for enacting deterrent laws against owners of desert animals, such as camels, that graze near roads and pose a risk to traffic safety. A vast majority (98%) of respondents agreed with this proposition, while only a small minority (2%) disagreed.

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- [21] found that a majority of respondents favored harsher penalties for traffic violations, including those related to animal control.
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