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Research Article

Accident Causation Theories and Tax Implication to Road Traffic Accidents in Nepal

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Abstract

This editorial is to highlight how accident theories can provide insights into the contributing factors to accidents and inform the development of targeted interventions and comprehensive safety strategies and tax implication. The article discusses several accident causation theories, including Domino Theory, Human Factors Theory, Accident/Incident Theory, Epidemiological Theory, Systems Theory, Energy Release Theory, and Combination Theory. Each theory is analyzed in the context of Nepal's transportation sector, with an emphasis on their relevance to the unique challenges faced in the country. Additionally, the editorial incorporates insights from social media, which garnered substantial community engagement and responses. The analysis reveals that heavy taxation on vehicles in Nepal significantly contributes to road and aviation accidents by creating a financial burden on vehicle owners. This burden deters regular maintenance, compels reliance on emergency repairs, and shifts focus from safety to productivity, ultimately increasing accident risks. The editorial argues for the necessity of reducing taxes to alleviate this burden, thereby encouraging regular maintenance and enhancing safety measures through maintenance insurance. The editorial emphasizes the need for policy reforms aimed at reducing vehicle taxes and improving public transport reliability to ensure a safer environment for all road users. It underscores the importance of addressing the financial aspects of vehicle ownership in conjunction with safety measures to reduce accident rates effectively.

Keywords: accident causation theories, road traffic accidents, aviation accidents, Nepal, vehicle taxation, safety strategies

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Introduction

Nepal's transportation sector faces significant challenges, particularly concerning road traffic and aviation safety. The country has witnessed a troubling rise in road traffic accidents (RTAs) and aviation incidents, which have become critical public health issues. Transportation systems are inherently complex, involving numerous interrelated components such as vehicles, roadways, traffic signals, and human behavior. Understanding the underlying causes of accidents is crucial for implementing effective safety measures and policies (Manandhar, 2022). In recent years, the number of registered vehicles in Nepal has surged, with statistics indicating a 325% increase from 2000 to 2011 alone. As of the current fiscal year 2024/25, there are over 6 million registered vehicles in the country. This rapid increase in vehicle numbers, coupled with inadequate infrastructure and enforcement of safety regulations, has exacerbated the incidence of accidents. According to the Traffic Police Office, an average of 65 traffic accidents occur daily, resulting in approximately seven fatalities and 83 injuries (Aawaaj News,2024, March 29: My Republica,2024, March 29: Rising Nepal,2024, April 7). Motorcycles account for over 80% of these accidents, underscoring the urgent need for targeted interventions to improve road safety (Nepal Road Safety Action Plan, 2013-2020.).

Various accident causation theories have been developed over the years, each offering a unique perspective on the factors contributing to accidents. Theories such as Domino Theory, Human Factors Theory, Systems Theory, and others provide frameworks for understanding the complex interactions that lead to accidents (Karkee, 2020). In the context of RTAs in Nepal, these theories can help identify the root causes of accidents, which can be categorized into unsafe acts and unsafe conditions. Unsafe acts include behaviors such as reckless driving and failure to wear helmets, while unsafe conditions encompass factors like poor road infrastructure and inadequate vehicle maintenance. The concepts of PROaction and REaction are particularly relevant in addressing the high incidence of traffic-related injuries and fatalities in Nepal. PROaction refers to proactive measures aimed at preventing accidents, such as driver education and improved road safety management. In contrast, REaction involves reactive measures focused on improving emergency response and trauma care for accident victims. Both approaches are essential for developing effective strategies to mitigate road traffic incidents (Karkee, 2020).Another critical aspect affecting vehicle maintenance and safety in Nepal is the taxation structure for vehicles, which is complex and encompasses various fees and duties. While these taxes serve to generate revenue for infrastructure development and regulation, they also impose a financial burden on vehicle owners. High vehicle taxes deter regular maintenance, compel reliance on emergency repairs, and shift focus from safety to productivity. This financial strain can lead to unsafe vehicle conditions, ultimately increasing the risk of accidents (Kathmandu Post, 2024). This article analyzes the impact of heavy taxation on vehicle maintenance in Nepal, focusing on the implications for road safety and accident rates. By examining the interplay between taxation, vehicle maintenance, and accident causation theories, this research aims to provide insights into how policy reforms can enhance safety in Nepal's transportation sector. Addressing these issues holistically is essential for developing targeted interventions and comprehensive safety strategies to reduce accident rates in Nepal.

Object of the Research

The objective is to highlight how accident theories can provide insights into the contributing factors to accidents and inform the development of targeted interventions and comprehensive safety strategies along heavy tax implication.

Methodology

This study utilizes a qualitative approach, analyzing Dr. Anjay Mishra's Facebook status, which highlights the relationship between vehicle taxation and road safety. The analysis is based

on 200 responses to the post, with the majority expressing strong agreement with Mishra's assertions. Additionally, the article reviews relevant literature and statistics to support the claims made in the Facebook discussion.

PROaction versus REaction

PROaction: Preventive Measures

PROaction refers to proactive strategies and measures aimed at preventing road traffic accidents before they occur. In Nepal, several factors contribute to the high rate of RTAs, including reckless driving, poor road conditions, and inadequate emergency response systems. For instance, the majority of fatal accidents involve buses, often due to rollovers or collisions on poorly maintained roads, particularly in hilly areas where the risk of landslides is significant (Karkee, 2020).

To combat these issues, Nepal has implemented road safety strategies that focus on five pillars: road safety management, safer roads and mobility, safer vehicles, safer road users, and post-crash response. However, the enforcement of these regulations remains a significant challenge. Educational initiatives, such as training programs for drivers, have shown promise in reducing accidents. For example, a one-hour class aimed at modifying drunk driving behavior resulted in a 23% decrease in RTAs in the Kathmandu Valley within a year (Karkee, 2020).

REaction: Response to Accidents

REaction encompasses the responses and measures taken after an accident has occurred. This includes emergency medical services, trauma care, and the actions of bystanders. Unfortunately, the response to accidents in Nepal is often inadequate. For example, in one incident, a motorcyclist bled to death while waiting for police assistance, which took an hour to arrive, highlighting the inefficiencies in emergency response systems (Nepali Times, 2023).

Moreover, untrained bystanders frequently attempt to assist the injured, sometimes exacerbating their injuries due to a lack of knowledge in proper first aid techniques. The centralization of specialized medical care in urban areas further complicates the situation, as many victims do not receive timely treatment due to the high costs and logistical challenges involved in accessing medical facilities (Nepali Times, 2023).

Causes of Accidents

Accidents caused not happened due to hardware causes and Knowledge based or software causes. Let's discuss some of the theories.

Unsafe Acts

Unsafe acts refer to behaviors that increase the likelihood of accidents. In Nepal, several unsafe acts contribute significantly to road traffic accidents:

Using Equipment in the Wrong Way or for the Wrong Task

Many drivers misuse vehicles, such as overloading them or driving without proper training. This misuse can lead to loss of control and accidents, especially on Nepal's challenging terrain (Karkee, 2020).

Failure to Wear Protective Equipment

The lack of helmet use among motorcyclists and seatbelt use among passengers is prevalent in Nepal. Studies indicate that wearing helmets can significantly reduce the risk of fatal injuries in motorcycle accidents, yet compliance remains low due to insufficient enforcement of safety regulations (Kathmandu Post, 2024).

Horseplay

Reckless behavior among drivers, such as racing or engaging in distracting activities while driving, contributes to accidents. This behavior is often exacerbated by a lack of awareness of the dangers posed by such actions (Nepali Times, 2024).

Failure to Warn Others of Danger

Inadequate signaling and communication among road users can lead to misunderstandings and accidents. Drivers often fail to use indicators or horns to alert others of their intentions, increasing the risk of collisions (Karkee, 2020).

Unsafe Conditions

Unsafe conditions refer to environmental factors that contribute to accidents. In Nepal, the following unsafe conditions are prevalent:

Fire Hazards and Excessive Amounts of Flammable Materials

Poorly managed roadside fuel stations and storage of flammable materials near roadways can lead to catastrophic accidents, especially in the event of a vehicle fire (Kathmandu Post, 2024).

Defective Tools or Equipment

Many vehicles on Nepalese roads are old and poorly maintained, leading to mechanical failures that can cause accidents. The lack of regular inspections and maintenance contributes to this problem (Nepali Times, 2024).

Inadequate Housekeeping

Blocked walkways and improperly stored materials can create hazards for both vehicles and pedestrians. Poorly maintained roads with debris and obstacles increase the risk of accidents, particularly in urban areas where traffic is dense (Karkee, 2020).

Domino Theory

The Domino Theory, developed by Heinrich in 1980, posits that accidents result from a chain of events, where one factor leads to another, similar to a line of falling dominos. In the context of Nepal, this theory is relevant as it highlights how unsafe human behavior (e.g., drunk driving, speeding) can trigger a series of events leading to accidents. A study in Kathmandu found that poor road conditions and driver negligence are significant contributors to road traffic accidents, illustrating the domino effect where one unsafe condition leads to another, ultimately resulting in an accident (Manandhar, 2022).

Human Factors Theory

Human Factors Theory emphasizes the role of human behavior and decision-making in accidents. In Nepal, factors such as driver fatigue, distraction, and poor training significantly contribute to road traffic and aviation accidents. Research indicates that human error accounts for a substantial portion of accidents, particularly in aviation, where pilot decision-making under stress can lead to critical failures (Giri et al., 2023). Understanding these human factors is essential for developing training programs and interventions aimed at reducing accidents.

Accident/Incident Theory

Accident/Incident Theory focuses on identifying the immediate causes of accidents and the conditions that lead to them. In Nepal, this theory can be applied to analyze specific incidents, such as road crashes or aviation mishaps, by examining the direct causes (e.g., mechanical failure, adverse weather conditions) and the systemic issues (e.g., lack of maintenance, inadequate infrastructure) that contribute to these incidents. This approach allows for targeted interventions to address the root causes of accidents.

Epidemiological Theory

Epidemiological Theory applies principles from public health to understand the distribution and determinants of accidents. In Nepal, this theory can be used to analyze accident data across different demographics, locations, and times to identify patterns and risk factors. For instance, studies have shown that certain areas in Nepal, particularly those with poor road infrastructure, have higher accident rates. By understanding these patterns, policymakers can implement targeted safety measures in high-risk areas.

Systems Theory

Systems Theory provides a holistic approach to analyze these interactions, enabling engineers to optimize the performance of transportation networks. By viewing transportation as a system composed of various elements that interact dynamically, Systems Theory facilitates a comprehensive understanding of traffic flow, safety, and infrastructure development.

The Role of Systems Theory in Transportation Engineering

Holistic Analysis

Systems Theory emphasizes the importance of analyzing transportation systems as a whole rather

than focusing on individual components. This holistic view allows engineers to understand how changes in one part of the system can affect other parts, leading to more effective solutions for traffic congestion and safety issues. For instance, the integration of traffic signal systems with real-time traffic data can significantly enhance traffic flow and reduce delays (Research on the Application of System Theory in Traffic Engineering, 2024).

Dynamic Interactions

Transportation systems are dynamic and subject to various external influences, including weather, human behavior, and economic factors. Systems Theory aids in modeling these dynamic interactions, allowing for better predictions of traffic patterns and behaviors. By employing methodologies such as graph theory and operations research, engineers can simulate different scenarios and assess the potential impacts of various interventions (Cascetta, 2013).

Safety and Risk Management

The application of Systems Theory in transportation engineering also extends to safety management. By understanding the complex interactions between various factors that influence road traffic, engineers can develop more effective safety measures. For example, analyzing driver behavior, vehicle performance, and environmental conditions collectively can lead to the identification of high-risk areas and the implementation of targeted safety interventions (System theory and transportation, 2006).

Policy and Planning

Systems Theory provides a framework for transportation policy and planning by identifying the key components and relationships within transportation systems. This approach enables policymakers to make informed decisions that consider the broader implications of their actions. For instance, the development of public transportation systems can be optimized by analyzing the interdependencies between different modes of transport and land use patterns (The Evolving Systems View of Transportation, n.d.).

Energy Release Theory

Energy Release Theory focuses on the concept that accidents occur when energy is released in an uncontrolled manner. In road traffic accidents, this could refer to the kinetic energy of vehicles during collisions. In aviation, it may relate to the release of energy during mechanical failures or crashes. Understanding how energy dynamics contribute to the severity of accidents can inform safety designs, such as better crash barriers on roads or improved aircraft safety features.

Combination Theory

Combination Theory suggests that accidents result from a combination of various factors rather than a single cause. This is particularly relevant in Nepal, where road traffic and aviation accidents often arise from multiple interrelated issues, such as poor vehicle maintenance, inadequate infrastructure, and human error. Recognizing the multifaceted nature of accidents can aid in developing comprehensive safety strategies that address all contributing factors.

Impact of Heavy Taxation on Vehicle Maintenance in Nepal: A Comprehensive Analysis

'Heavy taxation on vehicles in Nepal significantly contributes to road and aviation accidents, primarily due to the financial burden it places on vehicle owners. This article employs root cause analysis to explore how high vehicle taxes deter regular maintenance, compel reliance on emergency repairs, and shift focus from safety to productivity, ultimately increasing accident risks. Additionally, it discusses the potential benefits of reducing administrative expenditures to lower taxes, thereby improving public transport reliability and safety standards.' is a Facebook status of Dr. Anjay Mishra also assessed by media (https://janachasonews.com/archives/2409) on 29 July. Let's analyze. Anjay Mishra's Facebook status highlights a significant concern regarding the impact of high vehicle taxation on road and aviation accidents in Nepal. His analysis suggests that elevated taxes lead to increased vehicle prices,

which in turn discourage vehicle owners from conducting regular maintenance. This neglect results in deteriorating vehicle conditions, creating a reliance on emergency repairs that heighten the risk of accidents.

Economic Burden of Vehicle Taxes

High vehicle taxes create a substantial financial burden for vehicle owners. Mishra argues that elevated taxes lead to increased vehicle prices, discouraging regular maintenance. Vehicle owners may prioritize immediate financial obligations over necessary maintenance, resulting in unsafe vehicle conditions that heighten the risk of accidents (Karkee, 2020). The reliance on emergency repairs rather than proactive maintenance exacerbates this issue, as owners may delay necessary repairs until a breakdown occurs, further compromising safety (Nepali Times, 2024).

Shift from Safety to Productivity

The pressure of high taxation often shifts the focus of vehicle owners from safety to productivity. Many drivers engage in riskier behaviors, such as overloading vehicles or ignoring safety regulations, to maximize their earnings. This shift can lead to an increase in unsafe driving practices, further heightening the risk of accidents (Kathmandu Post, 2024). The prioritization of productivity over safety creates a dangerous cycle where vehicle maintenance is neglected, ultimately resulting in a higher incidence of road traffic accidents.

Need for Policy Reform

Mishra advocates for government intervention to reduce administrative costs and lower vehicle taxes. Such reforms could decrease vehicle prices and encourage regular maintenance, thereby improving overall road safety. By alleviating the financial burden on vehicle owners, the government can promote a culture of proactive vehicle maintenance, which is essential for reducing accident risks.

Potential Benefits of Reducing Taxes

Reducing vehicle taxes could yield several benefits. Lower taxes may enable vehicle owners to allocate more resources toward regular maintenance and safety improvements. Improved financial conditions could encourage better compliance with safety regulations and enhance the overall reliability of public transport systems (Karkee, 2020). By fostering a safer driving environment, the incidence of road traffic accidents could be reduced.

Public Transport Improvement

Enhancing public transportation systems is another critical aspect of addressing the impact of heavy taxation on vehicle maintenance. By providing reliable and safe alternatives for commuters, the government can reduce the number of vehicles on the road, which could lead to a decrease in traffic accidents. Improved public transport can also alleviate the financial burden on individuals who may otherwise rely on personal vehicles, promoting a safer and more efficient transportation system.

Holistic Approach

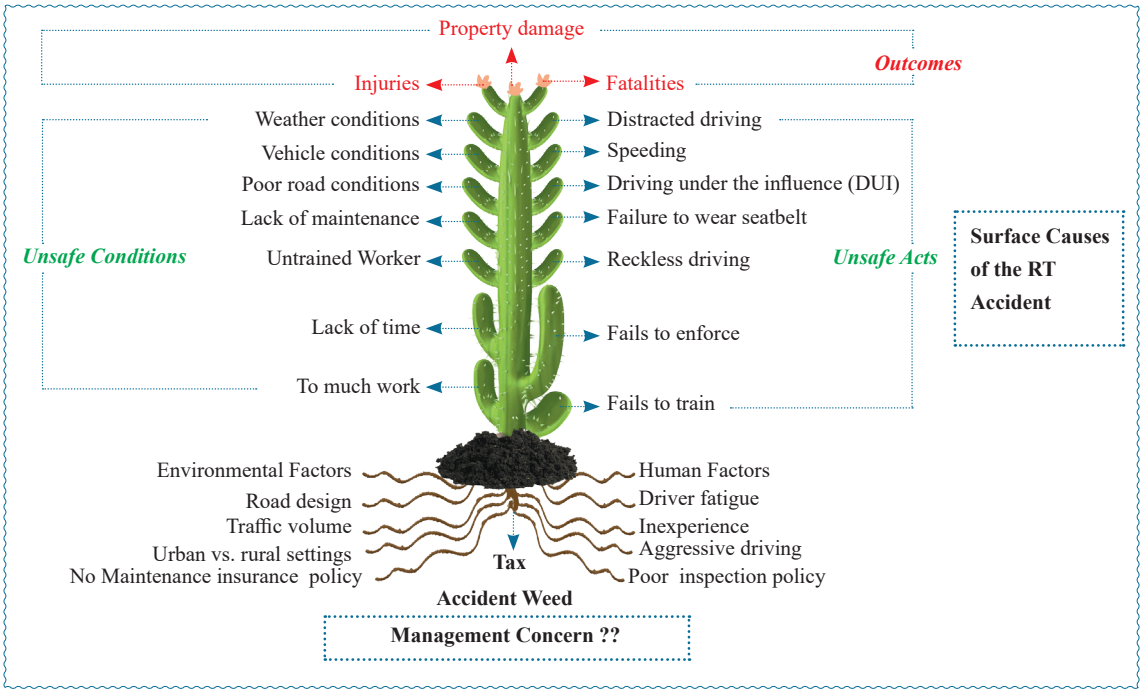
Mishra's analysis calls for a comprehensive approach to address the root causes of road accidents. This includes not only tax reform but also improvements in road safety measures, vehicle maintenance standards, and public transportation reliability. A holistic strategy that encompasses these elements is essential for creating a safer road environment and reducing the incidence of accidents in Nepal.

Community Engagement

The response to Mishra's Facebook post reflects a strong resonance with his arguments. Over 200 users expressed strong agreement with his analysis, while 20 users partially agreed, highlighting a collective concern regarding the implications of taxation on vehicle safety and maintenance. Many users shared personal experiences that illustrate the high costs of vehicle repairs in Nepal compared to neighboring countries, further emphasizing the need for reform. Let's prepare an accident weed.

Figure 1

Root Causes of the Accident



Primary Causes

Unsafe Acts

Distracted driving, Speeding, Driving under the influence (DUI), Reckless driving, Failure to wear seatbelts and many more. Driving under the influence (DUI) may be like Increased risk of accidents due to impaired cognitive function and delayed reaction times (Page, 2023).Drivers under the influence of cannabis are 1.65 times more likely to be responsible for causing a fatal accident (Martin et al., 2017).Misconceptions about safety lead to increased incidents of driving while stoned (Page, 2023).Alcohol remains a significant contributor to traffic accidents, often in combination with marijuana use (Martin et al., 2017). Similar cases are found in CNN, 2023, September 6 Narcononus. org, 2023: and NHTSA, 2024 also.

Unsafe Conditions

Poor road conditions (Potholes, Lack of signage &Poor lighting), Weather conditions (Rain, Fog, Snow/Ice), Vehicle conditions (Mechanical failure, Lack of maintenance,& Defective parts). City buses, particularly older models or those that run on diesel can emit significant amounts of exhaust fumes and particulate matter. When a biker is traveling behind a bus, the pollution can accumulate on their helmet visor, making it difficult to see clearly might be the cause of accident.

Contributing Factors

Human Factors

Driver fatigue, Inexperience, Aggressive driving and others may be caused for profitability to sustain under pressure of heavy tax. It may be observed through the behavior analysis of private vehicle operator and government vehicle operator.

Environmental Factors

Road design (Intersections, Curves and Lane width), Traffic volume and Urban vs. rural settings are few environmental factors.

Outcomes

Let's stop Injuries (Minor injuries, serious injuries and Fatalities) and Property Damage (Vehicle damage, Infrastructure damage and Economic costs) according to Banstola, A., Kigozi,

J., Barton, P., & Mytton, J. (2020) causes' economic burden.

The Accident Weed diagram illustrates the multifaceted nature of road traffic accidents involving marijuana. As legalization increases, understanding the risks associated with marijuana-impaired driving becomes crucial for developing effective safety measures. Addressing misconceptions about cannabis, improving public awareness, and implementing policy reforms are essential steps in reducing the incidence of accidents related to marijuana use. This may be caused for high concern of earning by driving for longer periods in Nepal with a view to sustain though we do not have evidence need further research. Incorporating road safety education into the school curriculum is a vital strategy for preventing road traffic accidents. By providing students with the knowledge, skills, and practical experiences necessary to navigate road environments safely, schools can play a crucial role in reducing accident rates and promoting a culture of safety. A collaborative approach involving teachers, parents, and local authorities will enhance the effectiveness of these educational initiatives (Saadati, Razzaghi, & Najafi, 2024).

Heavy taxation on vehicles in Nepal significantly impacts vehicle maintenance and road safety. By advocating for policy changes and improvements in public transport, Anjay Mishra underscores the need for a multifaceted approach to reduce the incidence of road and aviation accidents. The community's response to his analysis emphasizes the urgency of addressing these issues to enhance the safety and reliability of Nepal's transportation systems. Reducing vehicle taxes and improving public transport can foster a safer driving environment, ultimately leading to a decrease in road traffic accidents and improved quality of life for citizens urges to implement maintenance insurance immediately including Proactive Strategies (Driver education programs, Regular vehicle maintenance, improved road infrastructure maintenance) and Reactive Strategies (Emergency response improvements, Trauma care enhancements and Accident investigation and analysis) as a complete package by public and private partnership. The coverage of insurance needs further analysis.

Conclusion

The high incidence of road traffic accidents in Nepal underscores the need for a multifaceted approach that combines proactive and reactive strategies. While proactive measures aim to prevent accidents through better road safety management and education, reactive measures focus on improving emergency response and trauma care to mitigate the consequences of accidents when they do occur. Addressing these issues holistically is essential for reducing the toll of RTAs in Nepal (Karkee, 2020).The application of accident causation theories, such as the Swiss cheese model, provides a valuable framework for understanding the complex interplay of factors contributing to road traffic accidents in Nepal. By recognizing the various layers of defense and the holes within them, stakeholders can develop targeted interventions to strengthen road safety. This includes enhancing driver education, improving vehicle maintenance standards, enforcing traffic regulations, and investing in better road infrastructure. Ultimately, a comprehensive approach that addresses both human behavior and systemic weaknesses is essential for reducing the incidence of road traffic accidents in Nepal (Reason, 1990).The application of Systems Theory in transportation engineering is crucial for addressing the complexities of modern transportation systems. By adopting a holistic and dynamic approach, engineers and policymakers can enhance traffic management, improve safety, and develop more efficient transportation infrastructures. As transportation systems continue to evolve, the principles of Systems Theory will remain crucial in guiding effective engineering practices and policy decisions (Cascetta, 2013). While the financial burden of vehicle taxes may contribute to unsafe driving conditions and practices, it is essential to recognize that the root causes of road accidents in Nepal are multifaceted. Addressing high vehicle taxes could be part of a broader strategy to improve road safety, but it must be complemented by efforts to enhance vehicle maintenance, enforce traffic regulations, and promote driver education (Nepali Times, 2024).

In conclusion, reducing the high incidence of road traffic accidents in Nepal requires a holistic and multifaceted approach that addresses both human behavior and systemic factors. By leveraging insights from accident causation theories and applying the principles of Systems Theory, stakeholders can develop targeted interventions to create a safer road environment for all users. This approach should be complemented by efforts to address the financial burden on vehicle owners, while prioritizing safety as the primary concern in transportation policy and planning. Maintenance insurance is a most though its coverage's need further analysis.

Limitations

The study is perspective analysis considering limited variables only.

Acknowledgments From the Editor-in-Chief

I would like to express my sincere gratitude to all those who have contributed to the success of this journal over the past years and those who reacted on Facebook status and news for conducting this work.

First and foremost, I want to thank our authors for entrusting us with their valuable research and for their patience and cooperation throughout the publication process. Your high-quality submissions have been instrumental in maintaining the academic rigor and reputation of our journal.

I am deeply grateful to our dedicated team of Associate Editors and Editorial Board members. Your insightful feedback, constructive criticism, and tireless efforts in reviewing manuscripts have been crucial in upholding the standards of the journal. Your voluntary service and commitment to advancing research in our field is truly commendable.

I would also like to acknowledge the hard work and diligence of our Editorial Assistants and Publications Coordinators. Your attention to detail, efficient management of the peer review process, and meticulous copyediting have significantly contributed to the timely publication of our issues.

To our peer reviewers, I extend my heartfelt appreciation. Your valuable time and expertise in providing thorough and thoughtful reviews have been instrumental in shaping the final quality of the published articles. Your contributions, often unsung, are vital to the success of any academic journal.

Finally, I would like to express my gratitude to our readers for their continued support and interest in the research published in the Intellectual Journal of Academic Research. It is for you that we strive to bring together cutting-edge research and thought-provoking ideas.

As I have taken associate editor in chief, I am confident that the journal will continue to thrive under the leadership of the associate Editor-in-Chief and the dedicated team of editors, reviewers, and staff. I wish you all the best in your future endeavors and thank you once again for your invaluable contributions to the journal and I will not be involved in operational activities of the journal. This is a fight against mental colonization as described by Mishra (2023) in different articles.

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