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Analysing the Public Health Implications of Road Traffic Accidents: An Epidemiological Perspective

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ABSTRACT

Background: Road Traffic Accidents (RTAs) pose a significant public health challenge globally, particularly in developing regions like the Sargodha area of Pakistan. High incidences of RTAs often result in fatalities and long-term disabilities, impacting young and economically active populations.

Objective: This study aimed to analyse the incidence and outcomes of RTAs in the Sargodha region, focusing on understanding the public health implications and identifying areas for intervention.

Methods: A retrospective case report, descriptive epidemiological analysis was conducted using data from the Police Department of the Sargodha region, spanning from January 2021 to October 2023. The data encompassed total RTAs, victims, fatalities, and survivor conditions across seven localities. The study involved descriptive and comparative analyses, rate calculations, and a contextual examination of the contributing factors.

Results: The region recorded 28,404 RTAs with 28,241 victims. Sargodha city reported the highest number of RTAs (23,442) and victims (23,044). Overall, there were 330 fatalities and a significant number of individuals left disabled. The results indicated a high concentration of RTAs and severe outcomes in Sargodha city.

Conclusion: The study highlights the need for targeted public health interventions in the Sargodha region. Enhancing road safety measures, increasing awareness about safe driving, improving emergency responses, and providing better post-accident care are crucial to mitigating the impact of RTAs.

Keywords: Road Traffic Accidents, Public Health, Sargodha, Epidemiology, Traffic Safety, Rehabilitation.

INTRODUCTION

Road Traffic Accidents (RTAs) stand as a significant and complex public health challenge, one that reverberates across the globe with profound impacts on health systems and societies (1). Historically, the World Health Organization (WHO) has recognized RTAs as a leading cause of death and disability, particularly affecting the young and economically active populations (2). The staggering figures, with approximately 1.3 million fatalities and 20 to 50 million non-fatal injuries annually, underscore the urgency of this issue (3). The impact is felt most heavily in low- and middle-income countries, where over 80% of these deaths occur (4). Vulnerable road users such as pedestrians, cyclists, and motorcyclists bear a disproportionately high burden of these fatalities, a trend notably pronounced in regions like Asia (5).

The economic implications of RTAs are colossal, with countries like Pakistan incurring costs upwards of nine billion dollars annually, a figure that eclipses even national defense budgets (6, 7). This financial burden encompasses a broad spectrum of costs, from vehicle repairs and medical treatment to the loss of productivity and long-term care (8-10). The psychological toll, including trauma and depression, further exacerbates the public health challenges, leading to increased medical costs and extended hospitalizations (11).

Diving into the specifics, the regional disparities in RTA incidence and outcomes are stark, with developing countries bearing a disproportionately higher burden. South Asia, for instance, ranks second after Africa in RTA ratios (12-14). In Pakistan alone, RTAs account for a significant percentage of total deaths, with tens of thousands of fatalities and an even greater number of individuals left disabled or injured annually (15). These statistics not only highlight the public health crisis but also underscore the need for targeted interventions and policy decisions (14, 16).

The complex nature of RTAs, influenced by a multitude of factors, requires a comprehensive approach for mitigation. Environmental conditions such as adverse weather, the time of day, and street lighting significantly influence RTA occurrence. Vehicle characteristics, including age and mechanical integrity, along with road infrastructure, such as road design and surface conditions, play critical roles in the severity and frequency of these accidents.

Human factors, however, emerge as the most crucial contributors to RTAs. Driver behavior, encompassing aspects like distraction, aggression, impairment due to substances, and lack of experience, significantly elevates the risk of accidents (17, 18). Psychological factors, including risk perception and decision-making abilities, are pivotal in understanding the human element in RTAs (19).

This study, focusing on the Sargodha region, aims to provide a detailed analysis of RTAs within this specific locality. By examining various local factors, the research intends to offer a nuanced understanding of the incidence, outcomes, and broader implications of RTAs in this region. This localized study is instrumental in informing targeted interventions and policies tailored to the unique challenges of the region, contributing significantly to the broader effort of mitigating the impact of RTAs on public health (20).

RTAs represent a multifaceted public health issue, where the interplay of environmental, vehicular, infrastructural, and human factors culminates in a significant global health challenge (21).. Understanding these contributing factors and their regional nuances is vital in crafting effective interventions and policies aimed at reducing the incidence and severity of RTAs globally. This study aimed to analyse the incidence and outcomes of RTAs in the Sargodha region, focusing on understanding the public health implications and identifying areas for intervention.

MATERIAL AND METHODS

In the study of the public health implications of road traffic accidents (RTAs) in the Sargodha region, a comprehensive and methodical approach was adopted to analyse the incidence and outcomes of these incidents (22). The primary source of data was the official records from the Police Department of the Sargodha region, which provided a detailed account of RTAs across various localities including Bhalwal, Bhera, Kot-Momin, Sargodha, Sahiwal, Shahpur, and Sillanwali (23). These records comprised information on the total number of RTAs, the number of victims, fatalities, and a classification of survivors based on their post-accident condition, categorizing them as either stable or disabled (23).

The data, encompassing the period from January 2021 to October 2023, offered a comprehensive view of the temporal trends in road traffic accidents within the region. This timeframe was critical in understanding the patterns and fluctuations in RTA incidents over a significant duration. Upon collection, the data underwent a rigorous verification process to ensure its accuracy and reliability, a crucial step given the study's reliance on reported data and the potential limitations therein, such as the possibility of unreported incidents and the dependability of the local police departments' reporting practices (24).

The analysis of this data was multi-faceted. Initially, a descriptive analysis quantified the total number of RTAs and victims in each locality, along with detailing the breakdown of fatalities and survivor conditions. Following this, a comparative analysis was conducted, contrasting the RTA statistics across different localities to pinpoint areas with higher incidences of accidents or more severe outcomes. Rate calculations were then performed to ascertain the fatality and disability rates, achieved by dividing the number of fatalities and disabled victims by the total number of RTA victims, respectively. This step was pivotal in assessing regional disparities within the Sargodha region. Additionally, a contextual analysis was undertaken to comprehend the circumstances surrounding these accidents, considering factors like road conditions, traffic density, and prevalent safety measures, based on available secondary data and relevant literature.

Ethical considerations were paramount in this study. All data utilized were anonymized and aggregated, ensuring the privacy and confidentiality of individuals involved in the RTAs. The research protocol was meticulously designed to adhere to the ethical standards for research involving human subjects, notwithstanding the use of secondary data.

This methodology, with its systematic approach to data collection, detailed analysis, and stringent ethical considerations, provided a robust framework for assessing the public health impact of RTAs in the Sargodha region.

The findings derived from this study are anticipated to offer valuable insights, potentially guiding future public health interventions and policy-making in the region.

RESULTS

The detailed analysis of the road traffic accidents (RTAs) in the Sargodha region, based on the data obtained, presents a comprehensive picture of the prevalence and outcomes of these incidents. The study encompassed seven localities: Bhalwal, Bhera, Kot-Momin, Sargodha, Sahiwal, Shahpur, and Sillanwali.

In total, the Sargodha region experienced 28,404 RTAs during the study period. Among these, the highest number was reported in Sargodha city itself, with a staggering 23,442 accidents, constituting approximately 82.5% of the total accidents in the region. This figure vastly overshadowed the numbers from other localities, with the second-highest being Bhalwal, recording 1,060 accidents. The locality with the least number of RTAs was Kot-Momin, with 536 incidents, underscoring significant regional disparities within the Sargodha region.

The total number of victims from these accidents amounted to 28,241. In line with the high number of RTAs, Sargodha also had the highest number of victims at 23,044. Comparatively, Kot-Momin had the lowest number of victims at 482. These figures point to a correlation between the frequency of accidents and the number of victims in each area.

The study also delved into the severity of these accidents in terms of fatalities and injuries. There were a total of 330 fatalities reported across the region. Sargodha, again, had the highest number of deaths at 250, which was about 75.8% of the total fatalities. Sillanwali, despite having a lower total number of RTAs (870), reported a relatively high number of deaths at 22.

Regarding the survivors of these accidents, a total of 11,946 victims were reported as alive and stable, while 15,965 were categorized as alive but disabled. In Sargodha, 10,920 victims were reported as stable, and 11,874 were alive but disabled. These numbers are reflective of the severity of the accidents in this area. Conversely, in Kot-Momin, where the least number of RTAs was recorded, 97 victims were stable post-accident, and 380 were alive but disabled.

Locality	Total RTAs	Total Victims	Dead	Alive & Stable	Alive but Disabled
Bhalwal	1,060	985	15	216	754
Bhera	707	782	12	121	649
Kot-Momin	536	482	5	97	380
Sargodha	23,442	23,044	250	10,920	11,874
Sahiwal	917	1,047	16	175	856
Shahpur	872	963	10	222	731
Sillanwali	870	938	22	195	721
Total	28,404	28,241	330	11,946	15,965

The detailed results underscore a high incidence and severity of road traffic accidents in the Sargodha region, particularly in the Sargodha city area. The data reveals not just the prevalence of RTAs but also highlights the significant number of individuals left disabled following these incidents, an aspect that adds to the public health burden in the region. This comprehensive data analysis offers vital insights into the regional patterns of road traffic accidents and their outcomes, forming a crucial basis for targeted public health interventions and policy-making.

DISCUSSION

The analysis of road traffic accidents (RTAs) and victim outcomes in selected regions of Pakistan provides a comprehensive understanding of the public health impact of these accidents. To enrich this analysis, it is beneficial to compare it with recent research in similar contexts.

The NHTSA data from the first half of 2023 indicates a decline in traffic fatalities for the fifth consecutive quarter in the United States. There were 19,515 deaths, a 3.3% decrease from the previous year, despite an increase in vehicle miles traveled. This reflects a fatality rate of 1.24 per 100 million vehicle miles traveled, down from 1.31 (25, 26). The NHTSA's safety initiatives, such as proposing rulemakings for automatic emergency braking systems

and seat belt warning systems, along with substantial investments in roadway safety, highlight the importance of proactive measures in reducing traffic accidents and fatalities (27).

A study in Uganda focused on the 24-hour mortality of RTA victims and its predictors, revealing a 14.69% mortality rate. It was observed that motorcycle riders were significantly more likely to die compared to pedestrians, and patients with severe injuries were more likely to die than those with moderate injuries (28). The study highlighted the demographic profile of RTA victims, with a majority being male and young (15-45 years). This aligns with the pattern observed in Pakistan, where young males are predominantly affected by RTAs (28). The study's findings on the severity of injuries and their impact on mortality rates emphasize the critical role of emergency medical care and post-accident management in reducing fatalities (28).

A study focusing on Pakistan's national highways identified several factors affecting injury severity in crashes, including overspeeding, driver dozing, carelessness, age of the driver, type of vehicle involved, and road and environmental conditions (29). The study's emphasis on young drivers' involvement in crashes, particularly those under 25 years of age, resonates with the general demographic trends observed in RTA studies (29). This research also underscored the higher risk of severe injuries or fatalities when crashes involve heavy vehicles like trucks, occur at night without road lights, or during peak morning hours, and in specific weather conditions such as fog or clear weather (29).

CONCLUSION

The disproportionate number of RTAs and their severe outcomes in Sargodha city suggests a need for targeted interventions. This includes enhancing road safety measures, improving traffic law enforcement, and increasing public awareness about road safety. The high rate of disabilities following these accidents also calls for better emergency response systems and post-accident care, including rehabilitation services for the disabled.

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