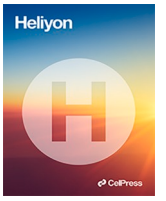
Heliyon 10 (2024) e36179

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon



Research article

Household cost of road traffic accident-related injuries: A case study of St. Joseph Hospital, Koforidua in Ghana

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ARTICLE INFO

Keywords:
Road traffic accident
Household cost
Burden
Road traffic injuries
Intangible cost

ABSTRACT

Road traffic accidents (RTAs) are a prominent contributor to both mortality and morbidity, particularly affecting individuals aged 5–29 years. Road traffic Injuries impose substantial physical and economic burden on individuals, households, and governments, particularly in African nations. Thus, our study focuses on assessing the economic cost of road traffic accidents within the context of St. Joseph Hospital, Koforidua.

A cross-sectional survey was conducted at the Emergency Unit of the St. Joseph Hospital with a sample size of 291 patients. A patient perspective was used in costing the management of RTAs. Data was descriptively analyzed with Microsoft Excel with means and standard deviations estimated for direct, indirect, and intangible costs to the patient.

Total direct and indirect cost of road traffic accidents were approximately GHS1,973,801.28 (US$164,483.44) and GHS520,309.46 (US$43,359.12) respectively which represents 79.1 % and 20.9 % of the total cost. The annual average economic cost for all cases was GHS8,570.83 (US $714.24). Intangible costs were also found to be high, with 54.2 % patients rating their RTA burden to be between mild to moderate, 10.8 % as moderate to severe and 1.4 % as severe.

RTA cost burden is huge for all households. Uninsured patients bear significantly higher costs than insured patients. Intangible costs were also high, prompting the need to provide psychological care to RTA victims and their families. Concerted efforts should be directed at strict enforcement, training, improvement of road infrastructure and legislation to reduce or curb road traffic accidents in LMICs.

1. Background

Road Traffic Accidents (RTAs) are one of the top neglected issues in public health despite their high contribution to mortality and morbidity globally. Road traffic accidents are considered the 8th cause of mortality worldwide [1,2] leading to deaths in children and adults ranking above tuberculosis and malaria in 2016 [1,2]. About 50 million road traffic injuries (RTIs) are reported yearly with over 1.3 million mortalities associated with these RTIs yearly [1,3]. While RTAs occur globally, developing countries, notably in South-East Asia and Africa, consistently report high numbers of RTAs. RTI-associated mortality in Africa is estimated as 26.6 per 100,000 population and considered the highest globally and is three times that of Europe [1].

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https://doi.org/10.1016/j.heliyon.2024.e36179
Received 9 February 2024; Received in revised form 24 July 2024; Accepted 12 August 2024
Available online 13 August 2024

List of abbreviations

CHAG	Christian Health Association of Ghana
DVLA	Driver and Vehicle Licensing Authority
LMICs	Low-and middle-income countries
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
PTSD	Post-Traumatic Stress Disorder
RTA	Road Traffic Accident
RTI	Road Traffic Injuries

The African continent accounts for about 3 % and 21.6 % of total RTIs associated with healthy life lost and disability-adjusted life years, respectively [2]. Expenses associated with RTIs are borne by individuals and their families [4]. In that regard, patients of RTIs and their families can become impoverished due to the exorbitant costs of medical care, and income loss due to RTIs [5]. These losses have negative effects on the household and national economic development. Many countries lose between 1 and 3% of their Gross Domestic Product (GDP) annually as a result of RTIs [6] with the burden more profound in developing sub-Saharan African countries with underdeveloped health systems [7]. Data on the financial burden suffered by individuals, their families, and society, in general, is under-reported [5,8].

In Ghana, the impact of RTIs is substantial, about 72 in 100,000 individuals suffer in one way or another from RTIs. Over 60 % of reported RTA injuries are found among children and young adults below the age of 35 years [9]. The economic burden of RTAs in Ghana is also noteworthy, with an annual expenditure exceeding 1.2 trillion cedis (equivalent to €94 million or US$128 million). This expenditure was reported by the Deputy Director of Research, Monitoring, and Evaluation at the National Road Safety Commission, as cited in a comparative analysis study of RTAs in Ghana [10]. Furthermore, the cost incurred in road traffic accidents mean that 1.6 % of the country's GDP annually is channeled into solving the road traffic injuries situation [11].

Data on costs associated with RTIs are valuable for implementing road safety policies and justifying the need for more investment in road safety [12]. Several international reviews have assessed the cost of RTIs in developed countries [4,13] with few studies conducted in Africa [14,15]. In Ghana, studies conducted on RTIs have mainly focused on epidemiology and associated outcomes of RTIs without the need to focus on the household burden and the well-being of sufferers of RTIs [9,16]. This study sought to determine the economic burden to households and the expected well-being of individuals involved in RTAs in a trauma and orthopaedic hospital in Ghana.

2. Materials and methods

2.1. Study design and setting

This was a descriptive cross-sectional study involving a survey among patients and review of patient records. The study was conducted at the St. Joseph Hospital in Koforidua, Ghana. The hospital is an orthopaedic facility that operates as a member of the Christian Health Association of Ghana (CHAG) and serves as the major referral facility for orthopaedics and trauma cases often sustained through RTAs. This hospital has an estimated 200 beds and serves a population of about 250,000. It is a major referral centre for major orthopaedic and trauma cases and serves several regions including countries in the sub-region such as Ivory Coast, Nigeria, Burkina Faso and Togo.

2.2. Sample size estimation

The single sample for infinite population formula was used to estimate the sample size at a 95 % confidence level. Mock et al. [10], approximated the household mean out-of-pocket cost of injuries as US$11 ± 58 in rural areas in Ghana [10].

$$Sample\ Size = \frac{(z^2 \times \sigma^2)}{d^2}$$

where Z = z-value (e.g., 1.96 for 95 % confidence level).

σ = Standard Deviation

d = distance on either side of the mean in the confidence interval.

Using the estimated SD of ±58 with an assumed d = 7, sample size was to be calculated as:

$$Sample\ Size = \frac{(1.96^2 \times 58^2)}{7^2} = 263.74 \approx 264$$

with a non-response rate of 10 %, the minimum sample size = (264 ×0.10) + 264 = 291. Hence the minimum number of participants for the study was 291.

2.3. Sampling

For this study, we conducted a comprehensive review of accident cases within the emergency unit, focusing on records from January 2021 to December 2021. We extracted essential data points related to the cost breakdown, encompassing registration fees, consultation charges, relevant surgical interventions, laboratory services and investigations, medication expenses, and other diagnostic services. In instances where we encountered incomplete or insufficient data, we retrieved the corresponding patient folders to ensure data accuracy and completeness.

As for participant selection, individuals who were required to attend regular follow-up appointments at the healthcare center were chosen using a random sampling approach. We executed this selection process in both the outpatient department (OPD) and the theater waiting area, particularly for those individuals requiring wound inspections. To ensure a randomized and unbiased selection, we employed the balloting method. In this procedure, pieces of paper were prepared, each bearing either a 'yes' or 'no.' Patients were then requested to draw a piece of paper from a container. Those who drew 'yes' were included in the study after providing informed consent, while those who drew 'no' were excluded from participation. We repeated this process on each clinic day until we reached our predetermined sample size of 291 participants, thus ensuring a representative cohort for our analysis.

2.4. Inclusion criteria

Injured patients who have been managed for RTA at the Emergency Unit of Saint Joseph Hospital and who have willingly demonstrated their consent to participate in this research.

2.5. Exclusion criteria

Patients who were involved in RTA but whose health conditions could not permit them to communicate effectively.

2.6. Data collection/extraction

A data extraction form was used to collect the medical records of patients involved in road traffic accidents. Also, a structured questionnaire with both close and open-ended questions designed in Kobo-Collect software was used in collecting data on the kind of cost patients incurred. Data collection was done using the processes outlined under the sampling section. After the selection of respondents, questionnaires were administered by the researcher and 3 assistants. The questionnaire gave further enlightenment on the degree of emotional suffering, pain, and level of fear the patients were subjected to, leading to the measurement of the intangible cost. For absolute assurance of the quality of the data, tools that were used for the data collection were pre-tested. Three (3) Research Assistants (RAs) were trained by the Principal Investigator a week before data collection. After pre-testing, questions were modified to ensure the same interpretation across the board. Ambiguous questions were modified.

2.7. Data analysis

Data collected was exported to Microsoft Excel for cleaning. Data analysis was done with Microsoft Excel 2016 and STATA 17/MP. The data was cleaned and checked for response appropriateness in Microsoft Excel 2016. Multiple imputation techniques were used to handle missing data. Means, standard deviation, frequency, and proportions were used to summarize data.

2.8. Cost estimation

Direct cost estimation: Direct costs consisted of medical and non-medical costs. Direct medical cost comprised registration, consultation, laboratory & diagnostic test, medicines/drugs, surgery, and cost of the specific tool was estimated by summing and dividing by the total number of participants that incurred this cost.

Indirect cost estimation: Concerning indirect cost estimation, the Human Capital Approach was employed with a daily minimum wage. Key parameters were: days lost at work, loss of productivity as a result of traveling, loss of productivity as a result of waiting time, and days lost by relatives when taking care of patients. Days lost at work by the patient were defined by adding all working days lost by employed patients for the period of diagnosis and management. Loss of productivity as a result of traveling was obtained by the accumulation of lost hours by participants and families who accompanied them during the hospital stay. Lastly, the loss of productivity as a result of waiting time was obtained by summing all hours spent whiles awaiting consultation. The overall indirect cost was then estimated as the entire loss of participants' resources. Moreso, the assessment of standard indirect cost and the total sum were divided by the total of participants. All values were calculated in both Ghanaian Cedis (GHS) and US dollars (US$) with the conversion rate for US$1 taken as GHS12 (Bank of Ghana interbank exchange rate, December 13, 2022).

Intangible cost estimation: Intangible cost was estimated using a structured questionnaire. Respondents were asked to rate their level of pain, fear and suffering due to the injury sustained from "not at all" to 'extremely".

Sensitivity analysis (SA): SA was conducted by determining the robustness of estimated costs. Values of key variables such as wage and medicines/drugs were subjected to variation to see if they had any significant effect on the results; total, direct, and indirect cost estimates. A one-way sensitivity analyses (SA) was conducted to change the cost of medicines/drugs. Variations at three percent (3 %), five percent (5 %), and seven percent (7 %) rise in cost were considered in the entire estimated cost. This key variable was

identified and included in the sensitivity analyses due to the uncertainty associated with it.

2.9. Ethical consideration

This study was reviewed and approved by the Ghana Health Service (GHS) Ethics Review Committee (ERC) with the approval number: GHS-ERC:034/09/22, dated November 16, 2022. All participants provided written informed consent to participate in the study and for their data to be published.

3. Results

3.1. Background characteristics of patients

Table 1 shows a summary of the background characteristics of the participants. More than half (66.0 %) of the participants were males. 72 (24.8 %) of the participants were between the ages of 30–39 years. Over half 153 (52.6 %) of the participants were married and 61.5 % of the participants were employed. Finally, 60.5 % of the participants were beneficiaries of the National Health Insurance Scheme (NHIS) and 43.3 % of the participants were pedestrians who were involved in an RTA. (Table 1).

3.2. Direct cost of road traffic accident

Table 2 presents the estimated direct cost of RTAs. The total direct cost for RTA was approximately GHS1,973,801.28 (US $164,483.44). The direct cost comprises medical cost, which was estimated at GHS1,130,617.92 (US$94,218.16), and the cost of non-medicals estimated at GHS843,183.36 (US$70,265.28). On average, for direct medical costs, registration cost was GHS123.28 (US $10.27), consultation cost was GHS346.43 (US$28.87), laboratory and other diagnostic tests cost was GHS110.47 (US$9.21), medicines/drugs cost was GHS681.09 (US$56.76), other diagnostics cost was GHS144.94 (US$12.08) and the surgical cost was GHS2,479.07 (US$206.59). On average, for direct non-medical costs, the cost of hospital stay was GHS1,067.75 (US$88.98), transportation was GHS212.76 (US$17.73), food and drinks were GHS596.60 (US$49.72), water was GHS475.33 (US$39.61), and other non-medical costs including toiletries, recharge cards etc. was GHS545.11 (US$45.43). On average, a patient spends an estimated, GHS6,782.82 (US$565.24) as a total direct cost on a road traffic accident, of which the medical cost consumes approximately 57.3 % whereas the non-medical cost covers 42.7 % of all the cost involved. (Table 2).

3.3. Indirect cost of road traffic accident management

Table 3 presents the estimated indirect cost of RTAs. The total indirect cost was GHS520,309.46 (US$43,359.12). Total productivity lost regarding the victims and their close family members was GHS433,185.82 (US$36,098.82) and GHS87,123.64 (US $7260.30) respectively. Also, on average, the estimated cost of days lost for being absent from work was GHS622.63 (US$51.89), the

Table 1
Background characteristics of patients (N = 291).

Characteristics	Frequency	Percentage (%)
Sex		
Male	192	66.0
Female	99	34.0
Age group (years)		
<18	28	9.6
18–29	55	18.9
30–39	72	24.8
40–49	52	17.9
50–59	35	12.0
60+	49	16.8
Marital status		
Single	138	47.4
Married	153	52.6
Employment status		
Employed	179	61.5
Unemployed	24	8.2
Student/Apprentice	57	19.6
Retiree	31	10.7
NHIS beneficiary		
Yes	176	60.5
No	115	39.5
Cause of the injury sustained		
RTA- Motorist	51	17.5
RTA- Passenger	114	39.2
RTA- Pedestrian	126	43.3

Table 2
Direct cost estimates.

Costs	Sum GHS (US$)	Mean GHS (US $)	SD GHS (US$)	Min GHS (US $)	Max. GHS (US$)	Cost profile (%)
Direct Medical						
Registration	35,875.08 (2989.59)	123.28 (10.27)	72.19 (6.02)	11.00 (0.92)	501.00 (41.75)	1.8
Consultation	100,811.80 (8400.98)	346.43 (28.87)	198.63 (16.55)	30.00 (2.50)	1000.00 (83.33)	5.1
Laboratory & other diagnostic tests	32,146.71 (2678.89)	110.47 (9.21)	82.14 (6.85)	3.00 (0.25)	690.00 (57.50)	1.6
Medicines/drugs	198,196.20 (16,516.35)	681.09 (56.76)	566.10 (47.18)	6.00 (0.50)	690.00 (57.50)	10.1
Other diagnostics	42,177.83 (3514.82)	144.94 (12.08)	103.10 (8.59)	15.00 (1.25)	1000.00 (83.33)	2.1
Surgical	721,410.30 (60,117.53)	2479.07 (206.59)	1104.29 (92.02)	100.00 (8.33)	18,600.00 (1550.00)	36.6
Total direct medical	**1,130,617.92 (94,218.16)**	**3885.28 (323.77)**	**2126.45 (177.20)**	**3.00 (0.25)**	**18,600.00 (1550.00)**	**57.3**
Direct non-medical						
Number of days on admission	310,715.52 (25,892.96)	1067.75 (88.98)	596.18 (49.68)	207.00 (17.25)	5748.00 (479.00)	15.8
Transportation	61,912.32 (5159.36)	212.76 (17.73)	182.33 (15.19)	23.00 (1.92)	1100.00 (91.67)	3.1
Food & drink	173,609.28 (14,467.44)	596.60 (49.72)	419.70 (34.98)	30.00 (2.50)	4000.00 (333.33)	8.8
Water	138,319.68 (11,526.64)	475.33 (39.61)	392.17 (32.68)	30.00 (2.50)	2800.00 (233.33)	7.0
Other non-medical	158,626.56 (13,218.88)	545.11 (45.43)	398.40 (33.20)	8.00 (0.67)	1252.00 (104.33)	8.0
Total direct non-medical	**843,183.36 (70,265.28)**	**2897.54 (241.46)**	**1988.78 (165.73)**	**8.00 (0.67)**	**5748.00 (479.00)**	**42.7**
Total direct	**1,973,801.28 (164,483.44)**	**6782.82 (565.24)**	**4115.23 (342.94)**	**3.00 (0.25)**	**18,600.00 (1550.00)**	**100.0**

Note: SD=Standard Deviation, Min = Minimum Value, Max. = Maximum Value.

Table 3
Indirect cost estimates.

Costs	Sum GHS (US$)	Mean GHS (US $)	SD GHS (US$)	Min GHS (US $)	Max. GHS (US$)	Cost profile (%)
Absenteeism	181,184.03 (15,098.67)	622.63 (51.89)	390.01 (32.50)	0.00 (0.00)	2451.00 (204.25)	34.8
Travel	122,096.13 (10,174.68)	419.57 (34.96)	389.37 (32.45)	0.00 (0.00)	2331.00 (194.25)	23.5
Waiting	129,905.66 (10,825.47)	446.41 (37.20)	319.69 (26.64)	0.00 (0.00)	18,121.00 (1510.08)	25.0
Patient total indirect	**433,185.82 (36,098.82)**	**1488.61 (124.05)**	**1099.07 (91.59)**	**0.00 (0.00)**	**18,121.00 (1510.08)**	**83.3**
Another person accompanying the person	87,123.64 (7260.30)	299.39 (24.95)	149.00 (12.42)	39.50 (3.29)	4539.50 (378.29)	16.7
Total indirect	**520,309.46 (43,359.12)**	**1788.01 (149.00)**	**1248.07 (104.01)**	**0.00 (0.00)**	**18,121.00 (1510.08)**	**100.00**

Note: SD=Standard Deviation, Min = Minimum Value, Max. = Maximum Value.

period of traveling from the health facility was GHS419.57 (US$34.96), and the waiting time before being attended to by a doctor or health officer was GHS446.41 (US$37.20). Averagely, a patient spends an estimated GHS1,788.01 (US$149.00) as total indirect cost on RTA, of which productivity lost consumes approximately 83.3 %. (Table 3).

3.4. Economic cost of RTA management

The estimated annual total cost of RTA is GHS2,494,110.74 (US$207,842.56), with an average economic cost of GHS8,570.83 (US $714.24) The direct and indirect cost estimates for road traffic accidents were 79.2 % and 20.8 % respectively.

Table 4
Sensitivity analysis of the cost of road traffic accident.

	Cost component	% change in parameter	Total cost GHS(US$)	% change in the total cost
Base case Scenario			2,494,110.74 (207,842.56)	
Variation (One-way sensitivity analysis)	**Medicines/drugs**			
		3	2,500,056.63 (208,338.05)	0.24
		5	2,504,020.55 (208,668.38)	0.40
		7	2,507,984.47 (208,998.71)	0.56

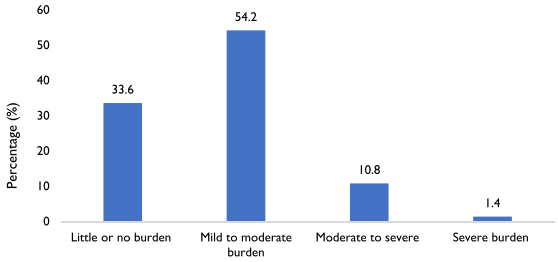

Fig. 1. Intangible burden on patient.

3.5. Sensitivity analysis of the cost of road traffic accident

Table 4 provides details of sensitivity analysis of the cost of managing road traffic accidents. The one-way sensitivity analysis of cost was done using the cost of medication. The cost of medication incurred by patients and relatives during management was selected due to its high volatility. A definite increase in the cost of medication leads to a rise in total cost. As shown in Table 4, an increase in medication by 3 % leads to a 0.24 % increase in total cost. Similarly, an increase in medication cost by 5 % and 7 % leads to an increase in total cost by 0.40 % and 0.56 % respectively.

The direct cost with regards to the component of the overall cost increased by 0.3 % (thus from 79 % to 79.3 %) as shown in Table 4. The results of the sensitivity analysis showed that the cost estimates in this study were sensitive to changes in medicines/drugs and wages cost variables. (Table 4).

3.6. Intangible cost

Fig. 1 shows the overall intangible burden among patients. More than half (54.2 %) of patients had mild to moderate burden. The rest had little or no burden (33.6 %), moderate to severe burden (10.8 %), and severe burden (1.4 %).

4. Discussion

This study found that, with so much economic burden on affected individuals and household, Ghanaian households spend an average of US$565.24 (GHS6,782.82) on the direct cost of injuries sustained through RTAs. This represents 79.2 % of the total cost of managing road traffic accidents. The direct cost comprises medical cost, which was estimated at US$94,218.16 (GHS1,130,617.92) and the cost of non-medicals which was estimated at US$70,265.28 (GHS843,183.36). The average direct cost of RTA in this study (US $565.24) is lower than the average direct cost of RTA of US$1289.40 reported in a previous study in Ghana [17]. The main reason why this average direct cost is relatively lower than the previous study could mainly be due to the previous being conducted in a tertiary facility (Korle-Bu Teaching Hospital) in Accra as compared to the district level hospital in this study where the cost of living, hospital charges and implants were relatively cheaper. However, the mean direct cost of road traffic accidents in this study was higher than what was reported in Iran, where the median was estimated at US$214 for direct costs [18]. This disparity in the average direct cost could be because, in the Iran study, the authors limited their data to non-fatal road traffic injuries whereas in the current study, data on all types of accident injuries were used.

The indirect cost of RTA was estimated at US$43,359.12 (GHS520,309.46) representing 20.8 % of the total cost of managing road traffic accidents. Thus, on average the indirect cost of RTA was estimated at US$149.00 (GHS1,788.01). Also, on average, the estimated cost of days lost for being absent from work was US$51.89 (GHS622.63), the transport cost was US$34.96 (GHS419.57), and the waiting time before being attended to by a doctor or health officer was US$37.20 (GHS446.41). The average indirect cost is lower than the average indirect cost of RTA of US$398.25 in Ghana [17]. Further, the total productivity loss to patients was about twice that of an accompanying relative. In addition, the estimated cost associated with traveling was also higher than the productivity loss to the accompanying relative.

Furthermore, the study has shown that most of the victims of RTA had to undergo surgery as definitive treatment. Implants that are mostly used in this regard to fix or stabilize fractures are quite expensive, which results in an increase in the direct cost as compared to the indirect cost. We also found that the number of days spent at the ward facility largely depended upon the severity of the cases whereby respondents with multiple fractures or polytraumas stayed longer as compared to those with simple fractures. This is due to the fact that they had to undergo a series of surgeries for absolute stabilization of their fractures, and then at the end needed to engage in rehabilitation or physiotherapy in order to regain their lost functions prior to discharge. All these treatments contributed to the high direct costs incurred by patients and their families.

The study also revealed that children, and RTA victims below the age of 18 years responded to treatments faster as compared to the adults leading to a reduction in their hospital stay as well as reduction in indirect cost. Moreso, it was established that those who had open fractures spent more days in the facility since they had to undergo open reduction and external fixation to stabilize the fractures

and the repair of the soft tissue by the process referred to as skin grafting which is another direct cost. Meanwhile, others who had closed fractures without complications or co-morbidities had a short admission stay often a successful surgery leading to a reduction in both the indirect and direct costs. So comparatively, the increase in the direct cost as compared to indirect cost largely depends on the severity of the case, especially those associated with open fractures who had to undergo surgeries or series of interventions with use of implants. Another study conducted in Croatia found out that road traffic accident survivors reported substantial rates of Post-Traumatic Stress Disorder (PTSD) (32.3 %) depression symptoms (17.4 %), and with low rates of anxiety (5.8 %) [19].

Intangible burden was considered as those costs associated with injury-related changes in pain and suffering [20]. These elements are often captured through a patient-reported questionnaire. This current study has found that most victims of road traffic accidents experienced mild to moderate burden or pain depending upon the cause of the road traffic accident and the severity of the injury. Polytrauma and multiple fractured patients experienced more pain as compared to those with simple fractures. However, a study on the intangible cost of RTAs found that unplanned and unexpected expenditure with diminished income has severe repercussions in the long run which may adversely affect the economies and consequently induced families deeply into perpetual hardship [21].

5. Limitation

The study used data from a single facility in Ghana. Nevertheless, the facility is the main trauma facility in the Eastern region of Ghana and its environs. It receives cases from different facilities in and out of the region. Hence could provide a good reflection of the costs of RTAs. The random sampling method may have been impacted by potential factors related to accident occurrences and outpatient visits, but this bias does not significantly detract from the study's objectives. Future studies with larger sample sizes could enrich the findings, perhaps through subgroup analyses.

6. Conclusion

The study revealed substantial direct and indirect costs associated with the management of road traffic injuries within trauma and orthopaedic healthcare facilities in Ghana. Furthermore, a considerable intangible cost was linked to road traffic injuries, collectively imposing a substantial economic burden on Ghanaian households. Although the National Health Insurance Scheme (NHIS) plays a vital role in alleviating this financial burden for families, a significant proportion of patients lacked active NHIS subscriptions.

In light of these findings, it is imperative for stakeholders, including the Ghana Health Service and the National Health Insurance Authority (NHIA), to take proactive measures to reduce cost of treatment. Encouraging and facilitating enrollment into health insurance schemes holds the potential to significantly mitigate the catastrophic healthcare cost patients and their families incur. We propose that the health insurance schemes expand their coverage to encompass RTA patients with open fractures necessitating emergency external fixator stabilization. Additionally, incorporating counseling services for psychological support into the NHIS benefit package can play a pivotal role in promoting holistic healing among RTA patients. These concerted efforts can contribute to the overall well-being of affected individuals and the sustainability of the healthcare system.

Ministries in charge of Roads and Transport, Highways, Road Safety Authorities and Driver and Vehicle Licensing Authorities globally must make conscious efforts to reduce or curb RTAs. These include enforcement of speed limits, building pedestrian and cyclist lanes, putting up speed ramps, training and educating drivers and motorists, deployment of more enforcement officers, proper roadworthy examination of vehicles, prosecuting offending drivers and making legislation to regulate the use of vehicles especially tricycles in low-and-middle-income countries (LMICs).

Ethics statement

This study was reviewed and approved by the Ghana Health Service (GHS) Ethics Review Committee (ERC) with the approval number: GHS-ERC:034/09/22, dated November 16, 2022. All participants provided written informed consent to participate in the study and for their data to be published.

Data availability statement

Data will be made available on request.

Funding

The authors declare that no financial support was received for the research, authorship and/or publication of the article.

CRediT authorship contribution statement

Petit Amenuveve Kpe: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Desmond Dzidzornu Otoo:** Writing – review & editing, Writing – original draft, Data curation. **Richmond Owusu:** Writing – review & editing, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Serwaa Akoto Bawua:** Writing – review & editing, Validation, Supervision, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors are grateful to all participants, the management, and staff of the St. Joseph Hospital for their kindness and encouragement and support in carrying out this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e36179.

References

[1] World Health Organization, Global status report on road safety, Geneva, Switzerland, https://www.who.int/publications/i/item/9789241565684, 2018. (Accessed 17 September 2023).
[2] World Health Organization, Global Health Estimates: life expectancy and leading causes of death and disability 2017. https://www.who.int/data/gho/data/themes/theme-details/GHO/mortality-and-global-health-estimates. (Accessed 17 September 2023).
[3] United Nations Development Programme, Ending the high toll of road deaths. https://www.undp.org/stories/ending-high-toll-road-deaths, 2021. (Accessed 28 June 2024).
[4] W. Wijnen, W. Weijermars, A. Schoeters, W. van den Berghe, R. Bauer, L. Carnis, et al., An analysis of official road crash cost estimates in European countries, Saf. Sci. 113 (2019) 318–327, https://doi.org/10.1016/j.ssci.2018.12.004.
[5] M.F.D. Ryan-Coker, J. Davies, G. Rinaldi, M. Hasselberg, D.H. Marke, M. Necchi, et al., Economic burden of road traffic injuries in sub-Saharan Africa: a systematic review of existing literature, BMJ Open 11 (2021) 1–10, https://doi.org/10.1136/bmjopen-2020-048231.
[6] World Health Organization, Road traffic injuries 2023. https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries. (Accessed 2 January 2024).
[7] R. Rissanen, J. Ifver, M. Hasselberg, H.Y. Berg, Quality of life following road traffic injury: the impact of age and gender, Qual. Life Res. 29 (2020) 1587–1596, https://doi.org/10.1007/s11136-020-02427-3.
[8] World Road Association, Socio-economic cost of road traffic crashes: evaluating costs and the value of injury prevention. https://roadsafety.piarc.org/en/strategic-global-perspective-scope-road-safety-problem/socio-economic-costs, 2019. (Accessed 17 September 2023).
[9] C. Hesse, J. Ofosu, Epidemiology of road traffic accidents in Ghana, Eur. Sci. J. 19 (2014) 370–381.
[10] C.N. Mock, S. Gloyd, S. Adjei, F. Acheampong, O. Gish, Economic consequences of injury and resulting family coping strategies in Ghana, Accid. Anal. Prev. 35 (2003) 81–90.
[11] M. Hayes, Road incidents cost Ghana 1.6% of GDP, Inj. Prev. 13 (2007) 408.
[12] W. Wijnen, Socio-economic costs of road crashes in middle-income countries: applying a hybrid approach to Kazakhstan, IATSS Res. 45 (2021) 293–302, https://doi.org/10.1016/j.iatssr.2020.12.006.
[13] W. Wijnen, H. Stipdonk, Social costs of road crashes: an international analysis, Accid. Anal. Prev. 94 (2016) 97–106, https://doi.org/10.1016/j.aap.2016.05.005.
[14] N.M. Abdallah, A.S. El Hakim, A.H. Wahdan, M.A. El Refaeye, Analysis of accidents cost in Egypt using the willingness-to-pay method, Int. J. Traffic Transport. Eng. 2016 (2016) 10–18, https://doi.org/10.5923/j.ijtte.20160501.02.
[15] A.I.A. Mofadal, K. Kanitpong, Analysis of road traffic accident costs in Sudan using the human capital method keywords road traffic accident, accident costs, human capital, loss in quality of life, Sudan, accident severity level, Open J. Civ. Eng. 6 (2016) 203–216.
[16] P.K. Blankson, M. Lartey, Road traffic accidents in Ghana: contributing factors and economic consequences, Ghana Med. J. 54 (2020) 131, https://doi.org/10.4314/gmj.v54i3.1.
[17] P.-K. Blankson, J. Nonvignon, G. Aryeetey, M. Aikins, Injuries and their related household costs in a tertiary hospital in Ghana, African Journal of Emergency Medicine 10 (2020) S44–S49.
[18] H. Karimi, S. Soleyman-Jahi, N. Hafezi-Nejad, A. Rahimi-Movaghar, M. Amin-Esmaeili, V. Sharifi, et al., Direct and indirect costs of nonfatal road traffic injuries in Iran: a population-based study, Traffic Inj. Prev. 18 (2017) 393–397.
[19] J. Kovacevic, M. Miskulin, D. Degmecic, A. Vcev, D. Leovic, V. Sisljagic, et al., Predictors of mental health outcomes in road traffic accident survivors, J. Clin. Med. 9 (2020) 309.
[20] S. Umar, A. Fusheini, M.A. Ayanore, The shared experiences of insured members and the uninsured in health care access and utilization under Ghana's national health insurance scheme: evidence from the Hohoe Municipality, PLoS One 15 (2020) e0244155.
[21] R. Pérez-Núñez, B. Pelcastre-Villafuerte, M. Híjar, L. Ávila-Burgos, A. Celis, A qualitative approach to the intangible cost of road traffic injuries, Int. J. Inj. Control Saf. Promot. 19 (2012) 69–79.