

# Epidemiology of Road Traffic Accidents and Injuries in Nigeria: A Protocol for Systematic Review and Meta-analysis

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## Protocol

**Keywords:** road traffic accident, road traffic injuries, crashes, RTA, fractures, accident, patterns of injury, epidemiology

**Posted Date:** February 10th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-215120/v1>

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# Abstract

**Background:** About 1.35 million people die annually worldwide due to road traffic accidents. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. About 93% of the world's fatalities on the roads occur in low-and middle-income countries, even though these countries have approximately 60% of the world's vehicles. Road Traffic Accidents constitute the third leading cause of trauma related deaths in Nigeria. It is a substantial public health problem that deserves a systematic review.

**Methods and Analysis:** We developed a search strategy using MeSH, text words and entry terms. Nine databases will be searched, including PubMed, African Journal Online, Embase, Google Scholar, Scopus, Cochrane Library, CINAHL, Web of Science and ResearchGate. Only observational studies, retrievable in the English language will be included. The primary outcome is prevalence of road traffic injuries in Nigeria. The secondary outcomes include proportion of road traffic accidents in Nigeria, patterns, predictors and consequences of road traffic accidents in Nigeria. Identified studies will be screened and selected based on inclusion criteria using Rayyan QCRI screening tool, by independent reviewers with dual blinding. Data items will be extracted into predefined forms in Microsoft Excel before exporting to CMA version 3 for analysis. Every selected study will have their NIH quality scores and Cochrane risk of bias reported. Studies will be assessed for methodological and statistical heterogeneity. Publication bias will be assessed using Funnel Plots and test of asymmetry. Results will include forest plots, pooled prevalence with standard error, variance, relative weights assigned to studies and heterogeneity test. Further analysis will include subgroup analysis and meta-regression using both categorical and quantitative variables.

**Discussion:** This protocol will enable a transparent, accurate and reliable method for determining pooled prevalence, standard error and 95% CI of road traffic injuries in Nigeria. Patterns and outcomes of RTA in Nigeria will also be assessed. Evidence generated by this protocol will likely inform policy on prevention of RTA in Nigeria

**Trial Registration Number.** This protocol is registered with PROSPERO, with registration number CRD42021226956.

## Background

The term accident refers to any incident, occurring suddenly, unpredictably and unintentionally usually under known or unknown circumstances. A Road Traffic Accident (RTA) can be defined as an accident, usually collisions of a vehicle, with another vehicle, pedestrian, cyclist, animal, road debris, or other stationary obstruction, such as a tree or utility pole which occurs on a way or street open to public traffic. Road Traffic Accidents usually result in injury, death and property damage. [1]

According to the Global burden of disease, road traffic accident is the 7<sup>th</sup> leading cause of Disease Adjusted Life Years in all ages and the topmost leading cause of road traffic accident among age 10-49

years in 2019.[2] Public health experts worldwide concede that there is a global epidemic of RTA. The incidence, however, is higher in developing countries. [3,4] The Low- and Middle-Income countries account for most of road traffic deaths.[1] The overall road traffic injury rate in Nigeria is about 41 per 1,000 population and mortality from road traffic injuries is about 1.6 per 1,000 population.[5] It is estimated by WHO that road traffic accidents cost most countries 3% of their gross domestic product.[6]

Despite Nigeria's high burden of RTAs, defining the full magnitude of the problem has been hampered by lack of robust data collection. There is paucity of pooled information on the epidemiology of road traffic accident in Nigeria. Many published studies relating to RTAs in Nigeria are limited to single hospital or urban settings. [7,8] Regrettably, the statistics of Nigerian deaths from RTAs provided by the WHO are largely approximated.

## Method And Design

### Objective

The overall objective of this study is to determine the pooled prevalence of road traffic injuries, patterns, predictors, and outcomes of road traffic accidents in Nigeria.

### Specific Objectives

1. To determine the pooled prevalence of road traffic injuries in Nigeria.
2. To determine the summary prevalence of road traffic accidents in Nigeria.
3. To delineate the patterns of RTA in Nigeria
4. To ascertain the predictors of RTA in Nigeria.
5. To assess the outcomes of RTA in Nigeria.

### Review Questions

Specific questions to be answered by this review include:

1. What is the pooled prevalence of road traffic injuries (RTI) in Nigeria?
2. What is the pooled prevalence of RTAs in Nigeria?
3. What are the patterns of RTA in Nigeria?
4. What are the predictors of RTA in Nigeria?
5. What are the outcomes of RTA in Nigeria?

**Design:** This is a protocol designed for a consistent and accurate systematic review and meta-analysis of road traffic accidents in Nigeria using observational studies published from 1988 to 2020.

**Inclusion criteria** are

- a. Observational studies e.g cross-sectional studies, cohort studies, case control studies and historical cohort studies
- b. Study must report primary outcome, which is the prevalence of road traffic injuries in Nigeria.
- c. Secondary outcomes: patterns, predictors and outcomes of RTAs in Nigeria
- d. Study must be retrievable in the English Language.
- e. Studies that are available in electronic databases and Grey Literature

**Exclusion criteria** are

- a. Letters to editors, narrative reviews, commentaries and editorials.
- b. duplicates of same studies,
- c. studies that are not retrievable in English language

**PICOs**

**Participants:** People in Nigeria involved in RTA

**Intervention:** None

**Comparator:** None

**Outcomes (Measurable Outcome):** The primary outcome is proportion of road traffic injuries in Nigeria.

Secondary outcomes: the proportion of road traffic accidents in Nigeria, patterns, predictors; and outcomes of road traffic accidents in Nigeria.

These studies will be reported in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2015.

**Information sources**

The search will use sensitive topic-based strategies designed for each database. The following databases will be searched: CINAHL, EMBASE, MEDLINE, Cochrane Library and PubMed web of science, google scholar, African journal online and Scopus and annual reports of the Federal Road Safety Corps (Nigeria).

**Search strategy**

The search strategy will include MeSH terms, text words, and entry terms. The search strategies used for the databases are shown in Table 1.

**Data Extraction and Management**

**a. Data Extraction**

Three main tools will be used for data extraction and management: a) Rayyan QCRI systematic review screening tool, b) Microsoft Excel c) CMA Version 3 Software

Five levels of data screening will be used for searched studies:

- i. Level 1: Screening of identified studies based on study characteristics using study design, inclusion and exclusion criteria
- ii. Level 2: Screening of studies based on the titles and abstracts using the search strategy
- iii. Level 3: studies will be screened by reading the full text of articles.
- iv. Level 4: Outcome level: identify primary and secondary outcomes present in identified studies.
- v. Level 5: Snowballing of literature on references from included studies.
- vi. Level 6: Screening of grey literature

**b. Reviewers:** Sixteen reviewers are involved in this study. A pair of reviewers will independently screen the search articles of a database for eligibility using Rayyan QCRI systematic review screening tool. It is a blind review. Conflict between the paired reviewers shall be resolved by a third reviewer who would server as a tiebreaker.

### **c. Selection process**

Studies will be deduplicated in Rayyan QCRI. Eligible studies will be selected on the basis of predefined criteria, which includes study characteristics and measurable outcomes. Authors of eligible studies with any missing data will be contacted via email and telephone.

### **d. Data collection**

Data items from eligible studies will be extracted into a predefined template in Microsoft Excel. The data items to be extracted include:

- i). Surname of first author and year of publication
- ii) Proportion of road traffic injuries in Nigeria
- iii) Proportion of road traffic accidents in Nigeria
- iv) Geographical location (State in Nigeria)
- v) Gender of RTA victims
- vi) Age of RTA victims
- vii) Patterns of road traffic accidents including types of vehicles and persons involved, e.g motorists, pedestrians, cyclists, horse riders etc.

viii) Predictors of RTA including substance use, speed, age of driver/rider, road conditions, weather conditions, time of the day/night, vehicle road worthiness and road regulations

ix) Accident outcomes: number of deaths, severity and types of injuries sustained, cost of treatment, and length of hospital admission.

### **Data items (Measurable outcomes)**

- a. Proportion of RTIs and RTAs in Nigeria, the effect size is prevalence
- b. Geographical distribution of RTA in Nigeria, data is categorical
- c. RTA related outcomes in Nigeria: number of deaths, severity of injury, cost of treatment and length of hospital stay. They are all numerical variables.
- d. Patterns of RTA: types of vehicles involved (this is categorical)
- e. Predictors of RTA: substance use, speed, age, driver/rider, road, weather conditions, time of the day/night, vehicle road worthiness and road regulations. These are categorical.

### **Risk of bias**

The risk of bias for each eligible study will be assessed using the National Institute of Health (NIH) Quality assessment tool for observational cohort and cross-sectional studies. This will be cross-checked with the Cochrane tool of risk of bias assessment. Both NIH Quality scores and the Cochrane ROB (risk of bias) outcome will be reported in a table. Two independent reviewers will do the scoring for the selected studies. Conflicts in scoring will be reviewed by a tiebreaker (a third independent reviewer).

### **Assessment of Meta-bias**

Meta-bias for each study will be assessed as follows:

1. Method of reporting RTIs and RTAs at the outcome level.
2. Studies reported in different indexes but with similar outcomes and designs will be converted to the primary effect size at the study level using the CMA software version 3.
3. Heterogeneity will be assessed at the study level using the CMA software: To test for heterogeneity Cochran's Q value and its p value,  $I^2$ ,  $\tau^2$  will be used. The effect size to be used is prevalence at 95% confidence Interval (CI, 95%). As a rule of thumb,  $I^2$  values of less than 40% will be considered low heterogeneity while values > 40 but < 75 % will be considered moderate and values > 75% are high.
4. Publication bias will be assessed at the study level using the CMA software.
5. Sensitivity test will be performed at the study level using the CMA software.

### **Data synthesis**

#### **Criteria for data synthesis:**

- a. Eligible studies that reported primary outcomes would be included for systematic review.
- b. Studies with high/critical bias (NIH quality score of < 7, Cochrane ROB outcome of critical bias) will be considered on individual basis for inclusion by using Sensitivity testing on the CMA software.
- c. Eligible studies that reported primary outcomes with or without secondary outcomes and have acceptable quality score will be included for meta-analysis.
- d. Quantitative analysis will be done using the Comprehensive Meta-analysis CMA Software Version 3 (BioStat, USA). For each reported prevalence of road traffic injury, standard error, variance and assigned relative weight for each specific eligible study will be calculated by the CMA software.
- e. Subgroup analysis will be done using several categorical variables including substance use, speed, age, driver/rider, road, weather conditions, time of the day/night, vehicle road worthiness and road regulations.
- f. Random computational model will be used for the meta-analysis.
- g. Meta-regression will be performed using quantitative data such as number of deaths, severity of injury, cost of treatment, number RTAs and length of hospital admission as explanatory variables and number of RTIs per annum as outcome variable
- h. A cumulative meta-analysis for trend will be performed to check for trend if any from 1988 to 2020.

## **Presentation and Reporting of Results**

The study selection process will be summarized in a Prisma flow chart according to the PRISMA 2015 Statement and PRISMA-P Checklist. A table of search strategy in various databases showing text words, MeSH and entry terms will be included. List of included studies will be summarized in a table. Quantitative data such as effect size (prevalence), standard error, variance, 95 % CI, P values, relative weights assigned to studies and heterogeneity tests will be included in the forest plots. A table of quality scores and risk of bias of each eligible study will be included. Forest plots to show sub-group analysis will be presented. Data on patterns, predictors and outcomes of RTAs will be presented in tables and graphs. Regression plots and graphs for trend will be presented.

## **Discussion**

The distribution, determinants and deterrents of RTA in Nigeria will be discussed extensively. The patterns of RTI and RTA will be explored in relation to various factors/predictors of RTA in Nigeria. The predictive model using numerical variables will be discussed against the background of growing epidemic of RTAs in Nigeria. The findings of this study will be made available to relevant authorities to inform road safety policies.

**Grades of Recommendation, Assessment, Development and Evaluation:** The strength of evidence for this study will be evaluated using the NIH Quality assessment for systematic reviews and meta-analysis.

## **Abbreviations**

RTA: Road Traffic Accident

RTI: Road Traffic Injury

ROB: Risk of Bias

QCRI: Qatar Computer Research Institute

CI: Confidence Interval

WHO: World Health Organization

GRADE: Grades of Recommendation, Assessment, Development and Evaluation.

PRISMA-P: Preferred Reporting Items for Systematic reviews and Meta-analyses Protocols

NIH: National Institute of Health

CMA: Comprehensive Meta-Analysis Software

PROSPERO: International Prospective Register for Systematic Reviews

## Declarations

### **Ethics and Dissemination:**

The study will use published data; thus, no ethical approval is required. The final report of this study will be published in a peer-reviewed scientific journal and made available to medical experts in the field of kidney transplantation.

**Authors' Contributions:** NS and EN conceived the project, NS, DA, HO, CU and IO designed the study, PI, NS and IC did PubMed searches, screening and review; JD and CT did AJOL and Embase searches and review; OC and CO did Google scholar searches and review; AD and IO did searches and review for CINAHL, Cochrane Database while HO did review of Researchgate. All authors read and approved the manuscript for publication.

### **Funding**

The study is funded by the authors.

### **Support**

The study is funded by the authors.

**Guarantor of the review:** Dr. Emamnuel Nna

**Informed Consent:** Not applicable

**Consent for publication:** All authors consented for the manuscript to be published.

**Competing interest**

The authors declare no competing interest

**Acknowledgments:**

Not applicable

**Amendments:**

Important protocol amendments post registration will be recorded and included in dissemination.

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# Tables

Table 1

S/No	Database	Search strategy
1	PubMed	((("Epidemiology"[Mesh]) OR ("Prevalence"[Mesh])) OR ("Incidence"[Mesh])) AND ((Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accidents) AND "Accidents, Traffic" [Mesh])) AND ("Nigeria"[Mesh])
2	AJOL	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria
3	Google Scholar	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria
4	Cochrane library	(Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria)
5	Embase	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria
6	CINAHL	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria
7	WEB OF SCIENCE	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria
8	Research Gate	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria
9.	Scopus	Epidemiology OR Prevalence OR Incidence AND Accident, Traffic OR Traffic Accident OR Traffic Accidents OR Traffic Collisions OR Collision, Traffic OR Collisions, Traffic OR Traffic Collision OR Traffic Crashes OR Crashes, Traffic OR Accident* AND Nigeria

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [PRISMAPchecklistforRTAstudy.docx](#)