Powered two-wheelers (PTWs)
Background

Globally, Power two-wheelers (PTWs) accounted for more than 286,000 fatalities in 2013.

*In the African region, half of all road traffic deaths occur among vulnerable road users (pedestrians, cyclists and motorcyclists).*

2 or 3 wheeled vehicles represent 22.5% of all registered motorised vehicles in Africa.

7% of all road traffic deaths in the African region is motorised 2-3 wheelers

According to the Global status report on road safety (2015), While African countries, on average, had the lowest proportion of traffic-related fatalities among PTW users (7%), some countries in the region had a proportion of PTW fatalities as high as those of the South-East Asia Region and Western Pacific Region (34%). A comparison with the 2018 Global status report on road safety shows that the share of PTW occupant fatalities s increased to 9% in the six years period between analysis. PTW is an increasing road safety problem.
Safer roads for PTW

The interaction between PTWs and heavier vehicles in a mixed environment is a risk factor for PTW drivers and the cause of many accidents. Specific elements of roadway design can also be improved to reduce the probability and severity of accidents involving PTWs.

Potential Interventions

Engineering measures to reduce PTW exposure to heavier vehicles involve segregation between the vehicle classes and road design catering to PTW driver needs.

- Exclusive motorcycle lanes designed to separate PTWs from larger vehicles (via physical barrier or structure). By removing them from an environment where the interaction between motorcycles and heavier vehicles is frequent, the risk of collision or injury to motorcycle drivers can be reduced. This measure is especially beneficial when the proportion of road users using PTWs is higher than 20-30% of all vehicles (as is the case in many low and middle-income countries).

- Motorcyclists are particularly vulnerable to skidding accidents on curves, bends, slip roads and roundabouts. Improving road infrastructure design (road geometry, layout), namely by ensuring proper geometric design consistency and providing self-explaining and readable layouts, can influence the likelihood of an accident. Wider lanes and shoulders, road surface materials that provide better grip and the absence of wide variations in skidding resistance, as well as appropriate signing and measures to improve visibility help reduce motorcycle crashes.

- Traffic calming interventions and reduced speed limits can have a positive impact on crashes. However, the interventions should be designed to consider the motorcyclists’ needs (in areas of curvy trajectories speed bumps and other vertical objects are a hazard for motorcycles) and their ability to navigate them safely.

- Fixed roadside objects such as trees, sign posts, guardrails, utility poles and drainage structures are hazards for PTW occupants. Creating a “clear” (obstacle free) zone, by removing such objects, minimises the risk of motorcyclist impact and allows room for correcting errors. Barriers and guardrails should be designed in a way to minimise injury severity on impact.

Impact evidence

In Malaysia, where dedicated motorcycle lanes were implemented on Federal Highway route 2, it was reported that motorcycle crashes were reduced by up to 39%, and the benefit to cost ratio of providing dedicated lanes ranged from 3.3 to 5.2 (depending on assumptions).

A study of 36 intersections in Malaysia showed that exclusive or protected right-hand turn lanes (across opposing traffic) reduces rear-end accidents for motorcycles, 25% more crashes happen at intersections without shoulders than those with (paved) shoulders wider than 1m.
Safer PTW vehicles

Safety technology for PTWs is not as advanced as that for other types of vehicles, especially four-wheel passenger cars. The widespread introduction of some basic safety technology can help reduce the accident rates and severity for PTW occupants.

Potential Interventions

- Antilock Brake System (ABS) and stability control technology for PTWs help riders maintain control of the motorcycle when braking. The system prevents wheels from locking when braking, improving the handling and stability of PTWs and helping drivers take evasive action to avoid danger.

- Use of headlights, both during night and daytime, helps improve PTW visibility and driver Field of View, thus increasing safety. Always-on and tri-headlight formations help better assess PTW speed, especially during early-night and night conditions, when visibility is limited and PTW drivers are more prone to accidents.

- Motorcycle designs that feature safety cells for occupants offer increased protection against collisions and falls and reduce the effects of accidents. A design with a high-rising frame, shoulder bars and windshield such as the one seen below reduces the impact power on the driver in case of collision.

Impact Evidence

Studies on the efficacy of ABS on motorcycles have shown that PTWs equipped with optional ABS have a 37% lower fatal accident rate compared to non-ABS motorcycles.

In another study, the conclusion on the effect of ABS on upright crashes with PTWs was that ABS resulted in a reduction of 52% in fatal crashes.

Studies show that daytime running lights increase the visibility of PTWs so that the visibility-related crashes are reduced by between 29 and 40%. In Europe, PTW users using daytime lights have a 10% lower crash rate overall.

General interventions

General safety interventions that target all road users but have the potential to improve PTW safety and offer commuter safer travel options.

Potential Interventions

- Improve urban planning to be inclusive to PTW users and cater to their needs, instead of only focusing on four-wheeled vehicles.

- Improve public transport infrastructure. In many countries, especially low and middle income, there is limited choice for commuters which forces them into using unsafe means to travel, especially in urban and suburban areas.

- Improved post-crash response results in reduced KSI rates after road accidents.

Impact Evidence

Results from a study in Sri Lanka show the accident risk ratio is double for commuters travelling with privately run buses or three-wheelers over public bus users. Encouraging people to use public transportation will reduce the number of accidents.

Studies suggest that a 10 minute reduction in medical response time results in an average decrease in the probability of death after an accident by one third.
Safer road users

A large number of accidents involving PTWs is related to motorcycle user behaviour. Encouraging responsible driving through education and law enforcement while at the same time improving driving skills can have a serious impact on the number and severity of accidents.

Potential Interventions

- Helmet use. The non-use of helmets by PTW users is an important factor influencing the risk of road traffic crash-associated head injuries and fatalities. Injuries to the head and neck are among the main causes of death, severe injury and disability among PTW users. Helmet use can increase by introducing relevant laws and enforcing them and also from educating riders. Also important is the use of helmets that are standardised to provide a minimum level of safety. The MS1-1:2011 (Malaysia), ECE standard 22.05 and UNECE R22 are examples of suitable standards for motorcyclist helmets.

- Alcohol/drug use. Impaired driving due to alcohol consumption or drug use is an important factor influencing both the risk of a road crash as well as the severity of the injuries that may result from it.

- Speeding. Excessive and inappropriate speed is the leading cause of road trauma in many countries. The stopping distance increases as the vehicle travels at higher speeds. PTW users are more vulnerable to severe injury in high speeds due to the lack of protection. Speed is also implicated in a higher proportion of fatal crashes compared to other road users (In the USA, speed is involved in 34% of fatal accidents for motorcycles, compared to 21% for car drivers).

- Level of experience and age are associated to crash risk. Both young and older riders have a higher risk of injury. For young riders, the risk is predominantly associated with their lack of experience and greater propensity to adopt risky behaviours (including very high speeds, lane splitting or “zigzagging”, competing etc.), while for older riders, the increased injury risk and severity is associated with physical fragility and decrease in riding practice (distance ridden per year).

- Basic braking skills. Riders often fail to use full braking capacity in emergency situations or make braking errors that lead to loss of control, putting both the rider and any passengers at an increased risk of serious injury.

- PTW riders can take measures to increase their visibility from large distances so that other road users are more careful and avoid creating potentially dangerous situations.

Impact Evidence

In Vietnam, the introduction of mandatory helmet law and its enforcement led to an increase in use from 46% in 2012 to 70% in 2015. In one of the country’s provinces, the increase was 99% up from 27%. In the first 3 months after introducing the law, hospitals reported a decrease in road traffic head injuries and deaths of 16% and 18% respectively. The Asia Injury Prevention Foundation (AIP) estimates that since the introduction of the helmet law, around 15,000 lives have been saved.

In Uganda, a campaign called ‘helmet vaccines’ (UHVI) helped increase helmet use for PTW (Bodaboda) drivers from 49% to 77% within two years.

In Italy, the revision of the law to make helmet use mandatory led to a decrease of traumatic brain injury for motorcycle and moped drivers by 77% (2 admissions for 100,000 population down from 7).

In Colombia, a similar law managed to reduce the rate of motorcyclist deaths from 9.7 (per 100,000) in 1995 to 2.6 in 2001.

In Kenya, a combination of law enforcement and campaigning for helmet use led to an reduction of head injuries by 70% and deaths by 40%.

The use of reflective and protective clothing is a means to increase rider visibility and reduce the likelihood of injury respectively. A study in New Zealand has shown that increased visibility contributes to reduced risk of motorcycle crashes by approximately one third (37%). Protective clothing, on the other hand, has shown to reduce soft tissue injuries, hospitalisation and the likelihood of impaired function post-crash.
Safer road users

The implementation of a graduated licence (GDLS) system for novice drivers, where size and engine restrictions are imposed until a rider gains experience. In New Zealand, the introduction of GDLS for car drivers and motorcyclists has proven to contribute to a significant reduction (22%) in PTW crash-related hospitalisation for the 15-19 age group.

Compulsory training and skills test before obtaining a licence, a common practice in high-income countries, has proven to be an effective way to reduce crash risk.

Drink/drug driving control, where the effects of setting alcohol limits apply to all drivers. For motorcycle riders, the introduction of even lower limits compared to vehicle drivers can reduce the number of driver errors.
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