



A Comprehensive Analysis Of Global Safety Rating Standards For Vehicles

¹Pratik Jadhav, ²Soresh Yadav, ³Madhur Wagh, ⁴Balgopal Gaurav, ⁵Prof. Ashish Kumar Singh

¹²³⁴UG Student, ⁵Professor

School of Engineering, Mechanical Department,
Ajeenkya DY Patil University, Pune, India

Abstract

In India, more than 3.79 million cars, sedans and utility vehicles were sold in the year 2022. The number of sales increased to more than 4.1 million in the following year. Clearly, the number of sales in four wheelers will continue to increase for safer transportation. But the number of road accidents has also increased correspondingly. According to Ministry of Road Transport and Highways (MoRTH), 1,53,972 persons were killed in the road accidents in India, in the year 2021. The number has increased about 11.9% in the following year 2022, with an estimation of 1,68,419 casualties. Hence, to raise the safety standards for cars sold in India, the Bharat New Car Assessment Program has been taken as an Initiative to evaluate safety of vehicles sold in India. In this research, we will provide a comparative study based on safety rating criteria assessed by the New Car Assessment Program in India as well as the New Car Assessment Programs across the world.

Keywords: NCAP, Safety Criteria, Top Speed

1. Introduction

In India, car safety ratings are primarily determined by the Global New Car Assessment Program (Global NCAP). Global NCAP is an independent organization that conducts crash tests on vehicles to assess their safety performance. The safety ratings provided by Global NCAP are widely recognized and influential in the automotive industry. Global NCAP conducts two main types of tests: the Adult Occupant Protection Test and the Child Occupant Protection Test. These tests evaluate various aspects of a vehicle's safety features, including structural integrity, restraint systems (such as airbags and seat belts), and child seat provisions. The ratings provided by Global NCAP range from zero to five stars, with five stars representing the highest level of safety. A higher star rating indicates better performance in crash tests and overall safety. In addition to Global NCAP, the Bharat New Vehicle Safety Assessment Program (BNVSAP) is a government initiative in India aimed at improving vehicle safety standards. BNVSAP is responsible for setting safety regulations and standards for vehicles sold in India. However, as of April 2024, BNVSAP has just started its crash testing program is still in the development phase, and it was not conducting independent crash tests like Global NCAP. It's important to note that while Global NCAP tests provide valuable information about a vehicle's safety performance, they may not cover all aspects of safety, and real-world safety can depend on various factors such as driving behavior, road conditions, and maintenance. Consumers in India and elsewhere should consider a variety of factors, including safety ratings, when choosing a

vehicle. In today's automotive landscape, vehicle safety stands as a paramount concern for consumers, manufacturers, and regulatory bodies alike. Independent organizations such as Global NCAP have emerged to address these concerns by conducting thorough assessments of vehicle safety ratings. This paper delves into the methodologies and criteria employed by New Car Assessment Programs in evaluating vehicle safety across the globe, providing a comprehensive analysis across different regions and vehicle types.

2 Overview of vehicle safety programs across the world

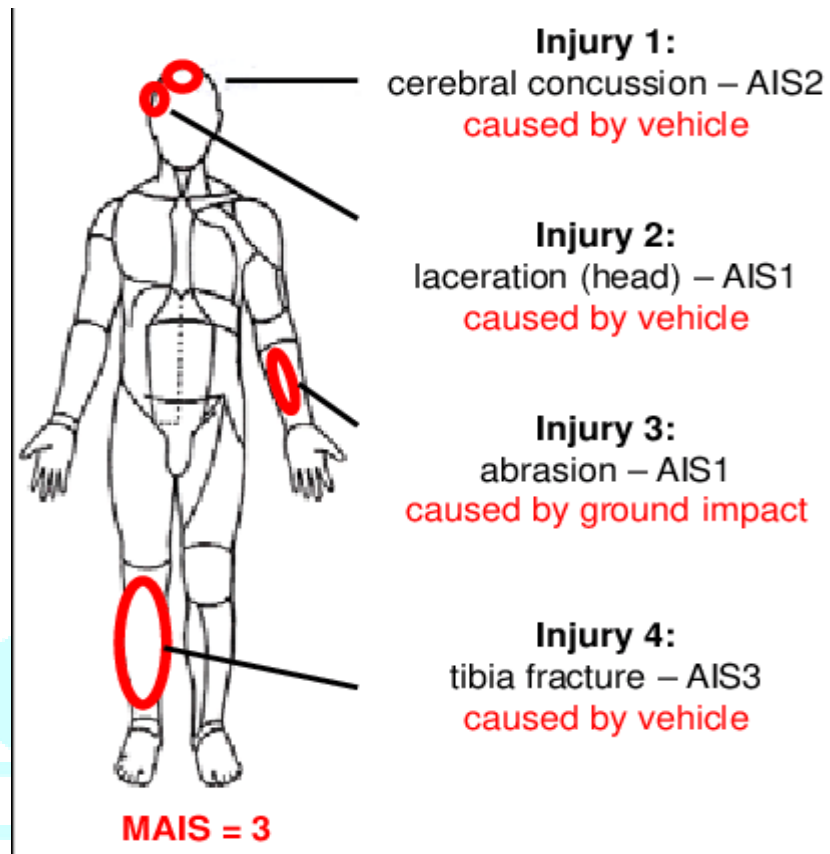
2.1 Global NCAP-

The Global New Car Assessment Program (Global NCAP) is an independent organization dedicated to evaluating the safety of vehicles worldwide. Here's an overview of Global NCAP. Global NCAP's primary mission is to promote vehicle safety worldwide by encouraging the adoption of higher safety standards among automakers and advocating for safer vehicles on the roads. Global NCAP was established in 2009 as a collaboration between several national and regional NCAP organizations from around the world, with the goal of extending the NCAP model to regions where it did not yet exist and promoting harmonized safety standards globally. Global NCAP develops and maintains standardized testing protocols for evaluating vehicle safety across different regions and markets. These protocols typically involve conducting crash tests to assess a vehicle's performance in various impact scenarios, such as frontal crashes, side crashes, and pedestrian protection. Like other NCAP programs, Global NCAP assigns star ratings to vehicles based on their safety performance in crash tests. The star rating system provides consumers with easily understandable information about the safety level of different vehicle models.

2.2 Safety Assessment of cars in Global NCAP:

The Global NCAP follows different protocols based on different countries or regions. The Global NCAP uses star rating based on the Adult Occupant Protection and Child Occupant Protection scores resulting from the crash test. These scores are mainly evaluated from the readings of the crash-test dummies, but additional points may be awarded for the presence of certain safety features. The organization also mandates a driver's side airbag as the minimum requirement to qualify for a 1-star rating. The 17-point Adult Occupant Protection consider driver injury readings from four body regions – head and neck; chest, knee, femur and pelvis, and leg and foot. An additional point is given to cars with a seatbelt reminder, four-channel ABS and some form of side-impact protection, tested by a relevant authority. For child occupant protection, 49- points are scored as readings from the 18- month-old and 3-year-old-sized dummies placed in manufacturer-recommended child seats. Additional points are given for child restraint system markings, provision of three-point seat belts, Isofix, and so on.

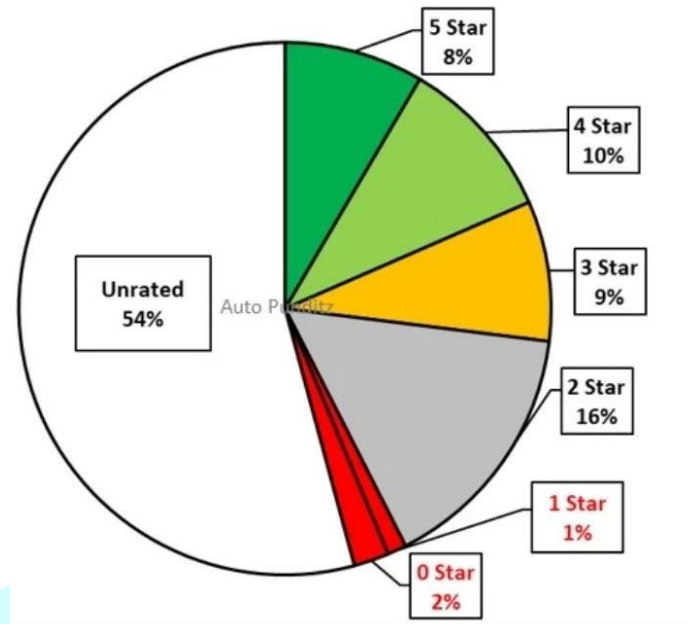
Figure 1: Injury information



2.3 Selection of cars for global NCAP test:

Safer Cars for India initiative mainly focus on the most mass-produced cars in the market for testing. The cars to be tested are bought by the agency from a showroom. Global NCAP mostly uses the base variant of these models for the test so to create a baseline level of safety a consumer gets on the most affordable version of a car. On the other hand, carmakers are allowed to send an improved or higher-spec car with more safety features for an additional crash test and rating.

Figure 2: 2021 - GNCAP Rated passenger vehicles sold in India



2.2 EURO-NCAP -

The European New Car Assessment Program (Euro NCAP) is a European car safety performance assessment program formed in 1996, in Leuven, Belgium. Euro NCAP is a voluntary vehicle safety rating system created by the Swedish Road Administration, the Fédération Internationale de l'Automobile and International Consumer Research & Testing, backed by fourteen members, and motoring and consumer organization in several EU countries. The organization provides European consumers with information regarding the safety of passenger vehicles. The program is modelled after the New Car Assessment Program introduced in 1979 by the US National Highway Traffic Safety Administration. Euro NCAP publishes safety reports on new cars, and awards 'star ratings' based on the performance of the vehicles in a variety of crash tests, including front, side and pole impacts, and impacts with pedestrians.

2.2.1 Safety Assessment of Euro-NCAP -

The Euro-NCAP covers four important areas of safety assessment-

Adult Occupant Protection

The Adult Occupant Protection score is determined from frontal impact, lateral impact and whiplash tests, which are done to evaluate the protection of adult driver and passengers offered by the vehicle

A) Child Occupant Protection

The assessment of Child Occupant Protection covers three aspects: the protection offered by the child restraint systems in the frontal and side impact tests; the vehicle's ability to accommodate child restraints of various sizes and designs; and the availability of provisions for safe transport of children in the car

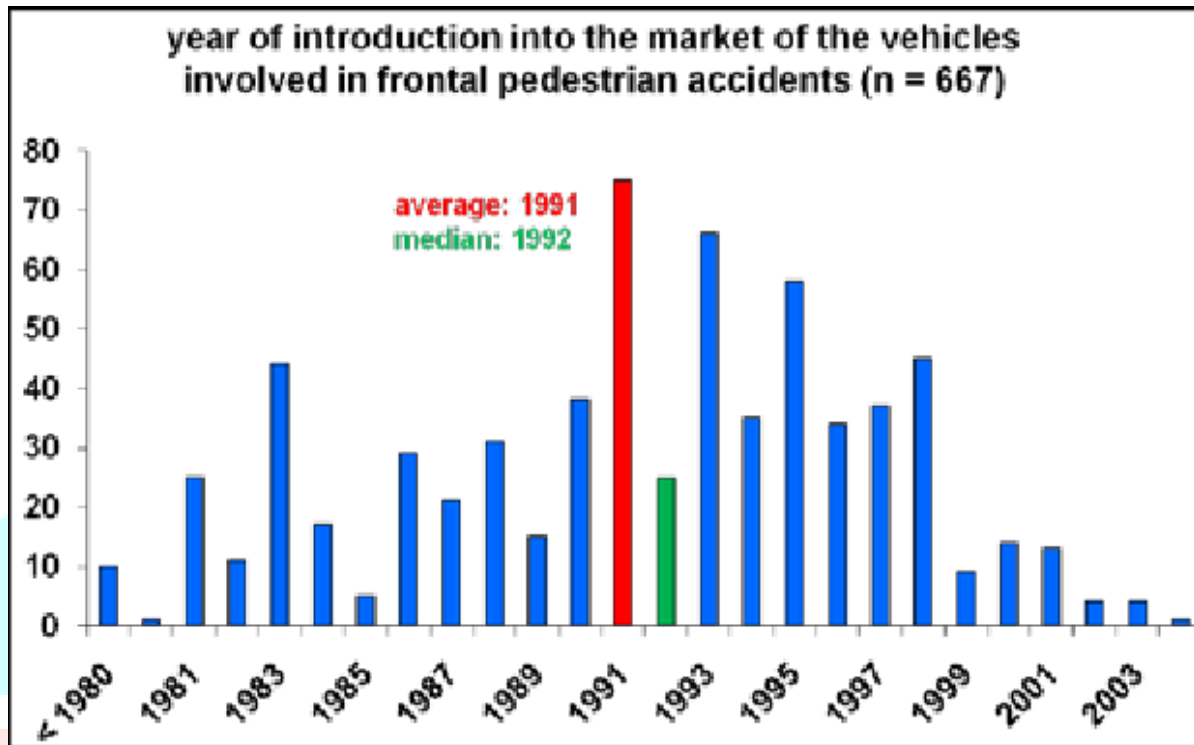
B) Vulnerable Road User (VRU) protection

In these tests, the potential risks of injuries to a pedestrian's head, pelvis, upper and lower leg are assessed. Cars which perform well can gain additional points if they have an autonomous emergency braking (AEB) system which recognizes pedestrians and cyclists

C) Safety Assist

The Safety Assist score is determined from tests to the most important driver assist technologies that support safe driving to avoid and mitigate accidents. In these tests, Euro NCAP tests system functionality and/or performance during normal driving and in typical accident scenarios.

Figure 3: Euro-NCAP pedestrian protection testing



2.3 ASEAN NCAP

The New Car Assessment Program for Southeast Asia, or the ASEAN NCAP, is an automobile safety rating program created by the Malaysian Institute of Road Safety Research (MIROS) and Global New Car Assessment Program (Global NCAP) during the FIA (Fédération Internationale de l'Automobile) Foundation Annual General Assembly in New Delhi, India on 7 December 2011. In January 2013, ASEAN NCAP published the program's first phase results involving seven popular models in the ASEAN region's market.

2.4 ANCAP

The Australasian New Car Assessment Program (ANCAP) is a car safety performance assessment program founded in Australia in the year 1993. ANCAP specializes in the crash testing of automobiles sold in Australia and the publishing of these results for the benefit of consumers. ANCAP provides consumers with transparent advice and information on the level of occupant and pedestrian protection provided by different vehicle models in the most common types of crashes, as well as their ability—through technology—to avoid a crash. Vehicles are awarded an ANCAP safety rating of between one and five stars indicating the level of safety they provide in a crash. The more stars, the better the vehicle performed in ANCAP tests. To achieve the maximum five-star ANCAP safety rating, a vehicle must achieve the highest standards in all tests and feature advanced safety assist technologies.

2.4.1 Safety Assessment of ANCAP -

Like Euro-NCAP, Australasian NCAP provides safety ratings based on the assessment of adult occupant protection, child occupant protection, pedestrian and vulnerable road users' protection and safety assist systems offered by the car model. As for the year 2023-2025, following is the data for maximum score in all the four safety rating areas-

Table 1: Safety Assessment Score of ANCAP

Sr. No.	Safety Assessment Areas	Maximum Score
1.	Adult occupant protection	40
2.	Child occupant protection	49
3.	Pedestrian and vulnerable road users' protection	63
4.	Safety assist systems	18

2.5 US-NCAP.

The first NCAP was created in 1979, by the United States National Highway Traffic Safety Administration. This program was established in response to Title II of the Motor Vehicle Information and Cost Savings Act of 1972, to encourage manufacturers to build safer vehicles and consumers to buy them. Over time, the agency improved the program by adding rating programs, facilitating access to test results, and revising the format of the information to make it easier for consumers to understand. NHTSA asserts the program has influenced manufacturers to build vehicles that consistently achieve high ratings.

2.5.1 Safety Assessment of US-NCAP -

NHTSA chooses crash test vehicles from passenger cars, light trucks, sport utility vehicles, and van models, redesigned with structural changes, or have improved safety equipment, such as an air bag. The NHTSA uses four contractors for its NCAP testing. The NCAP Testing mainly consists of Crash Testing for Frontal Collisions, Crash Testing for Side Collisions and the test for Rollover Resistance.

2.6 Latin NCAP

The Latin New Car Assessment Program (Latin NCAP) is an automobile safety assessment program for Latin America and the Caribbean, founded in 2010. It offers independent information to consumers about the safety levels of new cars in the market. Latin NCAP tests are based internationally renowned methodologies, with vehicles awarded a safety rating between 0 and 5 stars, indicating the protection the cars offer to adult and child occupants. The program started as a joint initiative and in 2014 it was established as an association under a legal entity framework.

2.6.2 Safety Assessment of Latin-NCAP -

Like Euro-NCAP, Latin NCAP provides safety ratings based on the assessment of adult occupant protection, child occupant protection, pedestrian and vulnerable road users' protection and safety assist systems offered by the car model. Latin NCAP awards the car model with a single star rating from zero to five stars

2.7 Bharat New Vehicle Safety Assessment Program

Bharat New Vehicle Safety Assessment Program, is the official New Car Assessment Program for India, launched in December 2023, in Pune. Cars sold in the country will now be assessed by star ratings based on their safety performance. Bharat NCAP is the 10th NCAP in the world, set by the government of India. Within two years of

implementation, new cars sold in India will need to comply with voluntary star ratings based on crash safety performance tests. Critical safety features such as airbags, ABS, and seat belt reminders will become standard in cars sold in India resulting from rankings and mandatory crash testing. Offset front crash, side, and rear impact tests.

2.7.1 Safety Assessment of BNVSAP -

The BNVSAP focuses on offset frontal impact, full frontal impact, side impact, and pole side impact tests. The BNVSAP covers four important areas of safety assessment-

- A) Adult Occupant Protection
- B) Child Occupant Protection
- C) Safety Assist Technology

Table 2: Bharat NCAP Star Rating

Star Rating	Adult Occupant Protection Points	Child Occupant Protection Points
5-star	27	41
4-star	22	35
3-star	16	27
2-star	10	18
1-star	4	9

2.8 Key Differences between Bharat NCAP and Global NCAP

2.8.1 Safety Rating Categories: In Global NCAP, a vehicle must get a minimum of 34 points – 16 points for the front crash test, 16 for the side impact, and 2 points for seatbelt reminders to get a 5-star safety rating for adult occupant protection. However, in Bharat NCAP, to receive a 5-star rating, a vehicle needs at least 27 points in adult occupant protection and requires 41 points in child occupant protection.

2.8.2 Top Speed: The third criterion is top speed. For Bharat NCAP, the frontal crash test will be conducted at a speed of 64km/h. However, the side and pole-side impact tests will be done at 50km/h and 29km/h, respectively. It is like Global NCAP with slight changes.

2.8.3 Variety of Cars: The Bharat NCAP norms will also be applicable for testing and rate CNG and EVs based on their performance.

2.9 Similarities in safety assessment of Global NCAP and Bharat NCAP

2.9.1 Protocols: Bharat NCAP shares its standardized crash testing protocols with Global NCAP to assess the safety performance of four wheelers. Like Global NCAP, Bharat NCAP tests simulate real-world accident scenarios, considering factors like adult occupant protection, child occupant protection, structural integrity, and the effectiveness of safety features like ABS, drive assist system, airbags and seatbelts.

2.9.2 Rating System: Both Bharat NCAP and Global NCAP have chosen a star rating system as the evaluation results of the safety levels of four-wheeler to consumers. Higher star ratings indicate better safety performance, with a five-star rating signifying the highest level of safety.

2.9.3 Consumer Awareness: Bharat NCAP and Global NCAP are committed to promoting transparency and consumer awareness regarding vehicle safety. By publishing detailed crash test results and ratings, they empower consumers to make informed decisions when purchasing vehicles, prioritizing safety alongside other factors.

2.10 Global Safety Performance Criteria:

Worldwide, NCAP is established in ten different countries and regions for evaluating the safety test of four wheelers. Following is the data of collision tests at different speeds according to different NCAP organizations.

Table 3: Global Speed collision Criteria

Country/Region	Program	Frontal Collision		Side Collision		Rear Collision
		Full-lap collision	Offset collision	Moving Deformable Barrier Collision	Pole Collision	
US	US NCAP	56 km/h	64 km/h	62 km/h	32 km/h	-
Europe	Euro NCAP	50 km/h	64 km/h	50 km/h	32 km/h	24.5 km/h
Japan	JNCAP	55 km/h	64 km/h	55 km/h	-	20 km/h
Australia	ANCAP	-	64 km/h	50 km/h	29 km/h	
Korea	KNCAP	56 km/h	64 km/h	55 km/h	32 km/h	16 km/h
China	CNCAP	50 km/h	64 km/h	50 km/h	-	-
Latin America	Latin NCAP	-	64 km/h	-	-	-
ASEAN	ASEAN NCAP	-	64 km/h	-	-	-
India	BNVSAP	-	64 km/h	50 km/h	29 km/h	-

3. Conclusion-

Global NCAP has certainly helped to improve and standardize vehicle safety standards in the developing nations. It has also created an impact on the consumer to factorize the safety features and built quality while purchasing a new vehicle. The initiative of Bharat New Vehicle Safety Assessment Program will raise awareness about vehicle safety among Indian consumers. By providing safety ratings for vehicles and disseminating information about safety features and crash test results, Bharat NCAP will empower consumers to make informed decisions when purchasing vehicles. To create a positive impact on the Indian Automobile market, Bharat NCAP will regularly update its safety rating criteria to the global safety standards.

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