

An Integrative Approach towards Conceptual Frameworks for Injury Prevention.

Nikhil N. Tambe¹, Rajesh B. Goel²

{Intern¹, Associate Professor²} Department of Community Medicine, M.G.M. Medical College, Navi Mumbai (MS) INDIA.

Corresponding address:

rbg1971@gmail.com

Research Article

Abstract: Globally more than 9 people die every minute from injuries or violence. According to WHO's World Health Report, injury will be the third leading cause of death in India by year 2020. Many people accept injury as 'fate', 'destiny' or as 'part of life'; but the fact is most injuries are predictable hence preventable. Injury prevention is an effort to prevent or reduce severity of bodily injuries caused by external mechanisms such as accidents, before they occur. Injuries are preventable and do not occur randomly. This fact has enabled many researchers to create conceptual frameworks which can help describe magnitude of problem and groups at risk; identify factors that increase or decrease the risk for injury; explore ways to prevent them by designing, implementing and evaluating interventions and promote the wide spread adoption of effective strategies, programs, policies and practices. Ideas presented in 8 different conceptual frameworks for injury prevention were studied and integrated. A complimentary approach was maintained to understand the important risk factors and preventive strategies against all types of injuries. This integrative study will help us to create an action plan towards injury free environment.

Introduction:

There are different kinds of injuries we hear about in daily life - motor vehicle crashes, falls, homicides, domestic violence, child abuse and neglect, drug overdose, suicide, burns etc. Many people accept them as fate or 'as part of life', but the fact is most injuries are predictable hence preventable. Injury is defined as a body lesion resulting from acute exposure to sudden mechanical, electrical, thermal, chemical or radiation energy interacting with body in amounts that exceed the threshold of physiological tolerance¹. Injuries are non communicable diseases whose risk factors if known are predictable and preventable.

Globally more than 9 people die every minute from injuries or violence- that's 5.8 million people of all ages and economic groups who die each year from both unintentional and violence related injury². Nearly 80% of these deaths occur in developing countries like India, where health care resources are limited and prevention is still not undertaken. In India, injury mortality rate is 40/100000 with 2/3 of these occurring in younger age groups of 15-44 years with overall male

to female ratio of 3:1. It has also been noticed that for every single death, nearly 15 to 20 are hospitalized and more than 50 receive care in emergency department^{2,5}. Considering these grave figures in mind, it is the need of time to do an integrative study rather than a comparative study of conceptual frameworks of injury prevention throughout the world.

Aim:

This study was carried out with the aim of studying all the important conceptual frameworks in context of injury prevention throughout the world and consolidating the factors highlighted in each study.

Method:

Identification of frameworks took place through searches in databases and relevant literature. A keyword search for words like '*injury prevention*', '*framework for injury prevention*', '*conceptual framework for prevention*', '*injury prevention in India*' was carried out. In the analysis of concepts of prevention, research articles that have been published in academic indexed journals and reports published by scientific publishers and institutions were used. Altogether eight different conceptual frameworks in relation to injury prevention were studied and merged.

Observation:

1) **Conceptual framework 1:** Haddon W in 1980 analyzed injury event with respect to host, vehicle and environmental factors (physical and socio cultural) into 3 phases- Pre-event, Event and Post-event⁴.

Pre-event includes prevent existence of agent, release of agent, separate agent from host and provide protection from host. Event includes minimize extent of agent present, control pattern of release of agent to minimize damage, control interaction between agent and host to minimize damage and increase resilience of host. Post event includes provide rapid treatment response for host and provide rehabilitation.

Table 1. Haddon's Matrix

	AGENT	HOST	ENVIRONMENT
Pre-event			
Event			
Post- event			
Result			

Haddon's matrix was used for injury prevention by Runyan in 1998 and 2003. Haddon's Matrix has been used to conceptualize etiologic factors related to injury and to identify potential preventive strategies making it a useful tool for developing prevention interventions (Runyan, 2003). In fact, research has suggested that Haddon's Matrix is most useful when choosing where and when to conduct an intervention (Runyan, 1998).

2) **Conceptual framework 2:** Dahlberg et al, 2002 suggested that prevention strategies should include a continuum of activities that address multiple levels of the framework, developing programs that address risk at different levels is challenging at best⁴.

- a) Individual level: - biological and personal factors that increase the likelihood of becoming victim or perpetrator of violence. Factors like age, education, income, substance use or history of abuse.
Prevention: - promote attitude, belief and behavioural change.
- b) Relationship level: - person's closest circle, peers partners and family members influence their behaviour and contribute to range of experience.
Prevention:-monitoring and peer program designed to reduce conflict, foster problem solving skills and promote healthy relationship.
- c) Community level: - schools, workplace, neighbourhood in which social relations occur.
Prevention: - social norms and marketing campaigns designed to foster community climate that promote healthy relationship.
- d) Societal level: - help to create climate in which violence is encouraged or inhibited.
Prevention: - health, economic, educational and social policies.

3) **Conceptual framework 3:** The **socio-ecological model** was developed by Dahlberg et al in 2007⁶. This model takes into consideration the complex interplay between individual, relationship, community, and society and the determinants of health. The social ecologic model focuses on the several interfaces among the individual, physical environment and the social environment acting at five levels (intrapersonal, interpersonal, organizational, community and societal) (Allegriante et al., 2006).

4) **Conceptual framework 4:** Haddon W. devised 10 strategies for prevention in 1970⁴.

- i) Prevent creation of hazard
- ii) Reduce amount of hazard brought into being.
- iii) Prevent release of hazard that already exists.
- iv) Modify rate or spatial distribution of release of hazard from its source
- v) Separate in time and space, the hazard and that this is to be protected.
- vi) Separate the hazard and that which is to be protected by interposition of material barrier.
- vii) Modify relevant basic qualities of hazards.
- viii) Make what is to be protected more resistant to damage from the hazard.
- ix) Begin to counter damage already done by environmental hazard.
- x) Stabilize, repair and rehabilitate object of damage.

5) **Conceptual framework 5:** The three E's model was developed by McCallum & McKay, 2003 and was used in relation to injury prevention by Gielen & Sleet, 2006. The three E's consist of education, engineering and enforcement. **Education** focuses on injury prevention through individual behaviour change. **Engineering** consists of modification of built environment, equipment, homes and toys to lead to injury prevention. **Enforcement** includes safety legislations and regulations used to positively affect products, environments and individual behaviour. The fourth E –**economic incentive and disincentive** involves providing financial benefit to people who take specific injury prevention measures whereas disincentives involves using economic punishments such as fines for traffic violations or workplace safety violations.

6) **Conceptual framework 6:** Haddon W later dichotomized prevention into active and passive approach⁴. Certain measures require active participation of the person in question in order to have an effect, active prevention, eg. Use of safety belts. Measures built into environment having an effect regardless of human activation is passive prevention, eg. Air bags built in motor vehicle.

7) **Conceptual framework 7:** Spectrum of prevention tool is a multi faceted systems approach to injury prevention targeting the individual, family, community and policy makers (Cohen and Swift, 1999)⁴. It closely parallels the socio ecological model, providing prevention initiatives which address the various individual, relationship, community and societal levels.

It consists of 6 levels:-

Definition of Level	
1. Strengthening individual knowledge and skills	Enhancing an individual's capacity of preventing illness and injury and promoting safety
2. Promoting Community Education	Reaching groups of people with information and resources to promote health and safety
3. Education Providers	Informing providers who will transmit skills and knowledge to others
4. Fostering Coalitions and Networks	Bringing together groups and individuals for broader goals and greater impact
5. Changing Organizational Practices	Adopting regulations and shaping norms to improve health and safety
6. Influencing Policy and Legislation	Developing strategies to change laws and policies and influence outcomes

8) Conceptual framework 8: Gielen and Sleet in 2002 used Haddon's active and passive prevention strategies to develop role of behavior change in injury prevention⁷. According to them it is rarely feasible to achieve injury prevention or reduction without some element of behavior change. In fact, while structural intervention paradigm seems straightforward, there is rarely an environmental change that does not require human adaptation.

The creation of safer products and environments require behavior change on the part of manufacturers of motor vehicles, toys etc that pose environmental hazards, as well as action by policy makers- who

regulate exposure to hazards or mandate safety behaviors such as use of auto-restraints. Cataldo et al. emphasize this point with regards to childhood injury prevention.

Integrated Result:

The concept of prevention frameworks dates back to 1950s. The use of this framework for prevention of injuries came into being in 1980. Following table assimilates various frameworks by keeping the epidemiological triad of Agent, Host and Environment as foundation, into one.

RESEARCHER	MODEL	AGENT	HOST	ENVIRONMENT
HADDON W Jr.	HADDON'S MATRIX		PRE-EVENT, EVENT, POST-EVENT	
DAHLBERG et al	SOCIO-ECOLOGICAL MODEL		Complex interplay at various inter and intra-personal level.	
HADDON W Jr.	Haddon's 10 strategies		Reducing the quality and quantity of hazard, reduction of contact between hazard and host in time, space, material barrier and making the host resistant towards hazard. Rehabilitate and repair the damage done by the hazard	
Gielen and Sleet	THE 3 E MODEL		EDUCATION, ENGINEERING AND ENFORCEMENT	
Cohen and Swift	SPECTRUM OF INJURY PREVENTION		COMBINATION OF 3 E MODEL AND SOCIO-ECOLOGICAL MODEL. 6 Levels of intervention	
Gielen and Sleet, 2002	Behavioural change theory		USE OF ACTIVE AND PASSIVE APPROACH TOWARDS INJURY PREVENTION AS PER HADDON'S STUDIES Sensitise the host to become an ally in efforts to make products and environments safer by behavioural science approach.	

Conclusion:

After studying the conceptual frameworks for injury prevention it came to light that a complementary approach will help us to integrate all the important domains highlighted in various frameworks and creating a new framework with tripartite classification of agent, host and environment. The models by

Haddon W formed the structural framework for future studies. Many of the effective injury countermeasures in India are policy-oriented in nature; it may be helpful to consider the host's role as a promoter for change in injury prevention at the community level.

The effectiveness of conceptual studies like Haddon's Matrix, Haddon's 10 strategies, the 3 E model, socio-

ecological model, behavior change theories have been proven by various research and interventional studies. There have been many studies in this regard throughout the world but very few in India due to

References:

- [1] Sethi D, Habibula S, McGee K, Peden M. Guidelines for conducting community surveys on injuries and violence, Int j inj contrsaf prom 2004, <http://www.informaworld.com/index/713817814.pdf>, 3 March 2010.
- [2] <http://www.cdc.gov/injury/global/index.html>
- [3] Gururaj G. Injuries in India: A national perspective. In: Burden of Disease in India: Equitable development- Healthy future. New Delhi: National Commission on Macroeconomics and Health. Ministry of health and family welfare, Government of India, 2005
- [4] Anderson R, Menckel E. On the prevention of accidents and injuries A comparative analysis of conceptual frameworks. Accid. Anal and Prev, Vol 27 No. 6 737-768, 1995
- [5] National Crime Records Bureau, Accidental deaths and suicides in India. Ministry of home affairs. New Delhi:Government of India, 2009a
- [6] Dahlberg LL, Krug EG. Violence-a global public health problem. In: Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. World Report on Violence and Health. Geneva, Switzerland: World Health Organization;1-56,2002.
- [7] Gielen A, Sleet D. Application of behavior change theories and methods to injury prevention. Epidemiol Rev 25(1) 65-76, Feb 2003.
- [8] Cataldo MF, Dershewitz RA, Wilson M, et al. Childhood injury control. In: Krasnegor NA, Arasteh JD, Cataldo MF, eds. Child health behavior: a behavioral pediatrics perspective. New York, NY: John Wiley and Sons, Inc, 1986.

decrease awareness about injury prevention. This integrative study will help us chalk out an effective, unique model to create an injury free India.