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THE ACCIDENT PROBLEM IN RURAL HIGHWAYS

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ABSTRACT : Road accidents in Bangladesh are increasing taking heavy toll of human lives. Personal injuries and property damages are common daily phenomenon. A total of about 8,500 persons were killed and 18,000 injuried in over 22,000 reported road accidents in the five year period 1983-1988. About 80 percent of these fatalities occurred in the rural sections of main highways. This paper discusses the key aspects relating to the rural road accident problem with particular reference to Dhaka-Aricha highway. A scientific approach for identifying hazardous road sections of rural highways is also discussed.

BACKGROUND

The role of road transport in the movements of both passengers and freight in Bangladesh is quite significant. With the increasing shift of traffic from other modes (viz. rail, water) to road, the road safety problems have been growing alarmingly. A total of about 8500 persons were killed and 18,000 injured in over 22,000 reported road accidents in the five year period 1983-1988. Personal injuries and property damages are common daily phenomenon.

Such unsafe conditions as prevailing in roads in Bangladesh dictate urgent need for research and investigations aimed at alleviating road distresses and improving overall road safety. Detailed and sophisticated analysis of accidents at both macro and micro level with emphasis on sub-categorisation of accidents by location, type, severity, user groups etc. are needed in order to provide a way for systematic understanding of the problems involved in road movements and devising countermeasures and strategies which might significantly improve overall traffic movement and enhance road safety.

In Bangladesh, until recently, very little work has been done to focus on a detailed spectrum of analyses of road accidents for a reasonably full understanding of the accident problems and thereby developing effective countermeasures. The only scientific and modern study to provide valuable and factual information towards assessing the extent and nature of reported accidents was that undertaken by the author in 1981(Hoque 1981). Accident data recorded by the police for the Dhaka Metropolitan Area (DMA) was used as the basis for that study. Similar research and investigations are needed to understand the accident problems in rural roads. This task can be accomplished by carrying out studies of accidents on specific highways. In view of these facts, a study was conducted which focused on accidents on Dhaka Aricha highway. It

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aimed at studying the distribution of accidents by types with Particular emphasis on identification of hazardous locations for the development of an effective and low cost programme for improvement of safety on Dhaka-Aricha highway. This paper presents only a part of the results and anslyses of the main study (Hoque 1991).

THE ACCIDENT PROBLEM IN RURAL HIGHWAYS

Accidents in rural areas (which generally include small rural towns) are more severe than accidents in big towns and the metropolitan areas. Sixty three percent of 6140 reported rural accidents were fatal accidents during 1982-85 compared with 12 percent of those in the metropolitan areas. Overall, more than eighty percent of the fatalities occurred in rural sections of main highways (Table 1).

Table 1. Trends of Road Fatalities in Bangladesh (1982-1985) (Metropolitan vs. Non-metropolitan)

Year	Road Fatalities					
	Metropolitan*		Non-Metropolitan**		Total	
	n	%	n	%	n	%
1982	188	18.6	821	81.4	1009	100
1983	219	19.6	897	80.4	1116	100
1984	230	18.5	1012	81.5	1242	100
1985	286	19.5	1177	80.5	1463	100
Total	923	19.1	3907	80.9	4830	100

* Dhaka, Chittagong, Khulna.
** Mainly Rural Highways.

Source : Data Conpiled from Statistical Year Book of Bangladesh 1987.

The split of accidents which occurred in the metropolitan areas of Dhaka, Chittagong. and khulna and in non-metropolitan areas (mainly rural highways) in the period 1982-1985 is given in Table 2. Data in this table show that the proportion of rural road accidents had been consistently increasing from 42 percent in 1982 to 48 percent in 1985.

Table 2 : Trends Reported Accidents in Bangladesh (1982-1985) (Metropolitan vs. Non-metropolitan)

Year	Reported Accidents					
	Metropolitan*		Non-Metropolitan**		Total	
	n	%	n	%	n	%
1982	1617	58.1	1165	41.9	2782	100
1983	1816	56.9	1374	43.1	3190	100
1984	2054	54.2	1733	45.8	3787	100
1985	2054	52.4	1869	47.6	3923	100
Total	5741	55.1	6141	44.9	13,682	100

* Dhaka, Chittagong, Khulna.
** Mainly Rural Highways.

Source : Data Conpiled from Statistical Year Book of Bangladesh 1987.

Thus it is important and imperative that greater emphasis should be given through road safety initiatives in combating the increasing trends of accidents in rural highways.

ACCIDENT DATA COLLECTION

Accident analysis is only as good as the data on which it is based. The source of accident data was the accident records as collected by the Police Department.

The present-day accident reporting system as followed by the police has considerable deficiencies and weaknesses with respect to information on accident variables. It is envisaged that major revisions of the existing accident report form be made to provide accurate, informative and useful data for use in accident analysis and in the evaluation of road safety initiatives. Notwithstanding these deficiencies, efforts were made to glean factual information from narratives in the accident report forms.

The specific accident data items that were available included the following:

* accident location (intersection, link, others)
* accident severity (fatal, injury, property damage)
* time of accident (hour, daylight/dark time)
* date of accident (month of the year, day of week)
* vehicle type (car, bus, trucks, minibus, rickshaws etc.)
* accident type (determining specific types using road user movement (RUM) Codes from narratives)
* number of persons killed
* number of persons injured
* objects hit (tree, electric pole, bridges, ditches etc.)
* damage costs (vehicle, property damages)
* age and sex of casualties
* direction of vehicular travel

The above information was extracted from the accident report forms and the associated documents and the collected data were trasmitted to the accident transcription sheets and subsequently processed by Computer.

ACCIDENT ANALYSIS

Road Inventory

This study was made on Dhaka-Aricha highway.The study location envisaged a total length of 81.4 km, starting from km 0.0 at Asad gate in Dhaka to 81.4 km at Aricha. The highway under study encompasses varied geometrical and environmental conditions. For accident analysis

purpose, the entire highway was divided into 76 locational codes comprising of 38 intersections and 38 links (mid-block locations) to locate accidents by locations. Apart from these specific individual locations, the highway was further divided into 9 major sections (extended links) by examining consistency in geometric features and traffic characteristics. These sections are shows in Fig. 1. Separate inventories of bridges and culverts were also made.

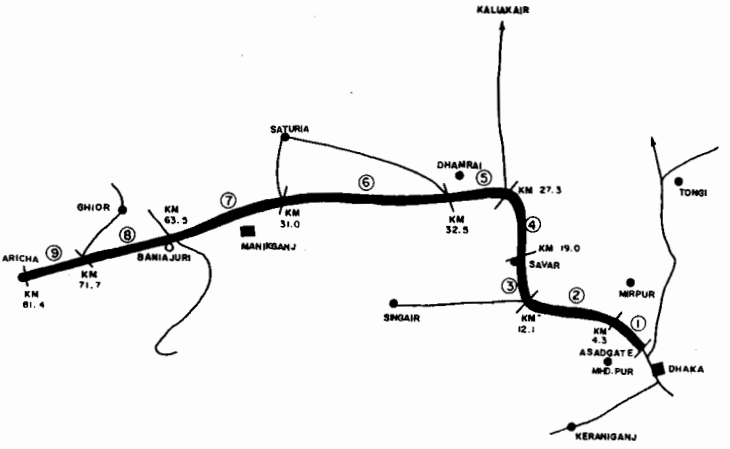


Fig 1. The Study Highway Showing Main Sections (9 Sections)

Total Accident Statistics

In this study accidents reported by the police for the period 1985-1989 were used. In total, there were 965 reported accidents relating to eight police stations namely Mohammadpur, Mirpur, Saver, Dhamrai, Saturia, Manikganj, Ghior and Shibaloy. There were 192, 211, 170, 183, and 209 accidents in 1985, 1986, 1987, 1988 and 1989 respectively. There were were 419 (43%) fatal, 524 (55%) injury and 22 (2%) property-damage only accidents. This indicates that almost all reported accidents on the highway were of casualty types.

Attempts were made to asscertain the number of persons killed and injured in accidents on the highway. On the average there were 114 fatalities and 968 injuries per year on the highway which resulted in 5.74 casualties per accident.

Intersection vs Link Accidents

It should be mentioned that the entire highway under study can be viewed as two distinct types of areas viz. predominatly urban (section 1) and perdominatly rural (sections 2-9). Intersectiion and link accident distributions are shown in Table 3. It can be seen that overall a greater number of accidents occurred on links (63%) than at intersections (37%).

The proportions of intersection versus link accidents were found to vary considerabley according to areas as follows : Predominantly urban 60/40 percent and perdominantly rural 23/77 percent (Table 3).

Table 3. Distribution of All Accidents by Location and Type of Area.

Area	Intersection		Link		Total	
	n	%	n	%	n	%
Predominantly* Urban	215	60	146	40	361	100
Predominantly** Rural	137	23	460	77	597	100
Total	352	37	606	63	958	100

* Upto Gabtali (location code 1-41)

** Beyond Gabtali (location Code 42-76) upto Aricha.

Most Frequent Accident Types

The most frequent accident types for the whole highway were identified. Table 4 shows these accident types as described by the road user movement (RUM) codes (Fig. 2). It can be seen that accidents involving "pedesestrian", (RUM 00-08) have by far the greatest number (34%) on the highway. This is followed by "Rear end" (RUM 51,37,33) (14%), "head on" (RUM 85,36) (9%) and "running off-road on straight (RUM 81-84) (7%). These four accident types accounted for 64 percent of the total accidents.

Table 4. Frequency of Accident Types (RUM Codes) on Dhaka-Aricha (1985-1989)

Accident Type (RUM Code)	Frequency	Percent
00-09 (Pedestrian)	326	33.8
51,37,33 (Rear end)	132	13.7
85,36 (head on)	91	9.4
81-84 (off-path, Straight)	67	7.0
20-28 (Vehicles from two streets)	30	3.1
63, 65,66, 61, 62 (overtaking)	34	3.5
86 (out of control on carriageway)	26	2.7
91 (Fell in/from Vehicle)	19	2.0
52 (Parked Vehicle)	17	1.8
10-19 (Pedal Cyclist)	16	1.7
Sub-total	728	78.5
Rest	207	21.5
Total	965	100.0

ROAD SAFETY AND TRAFFIC AUTHORITY

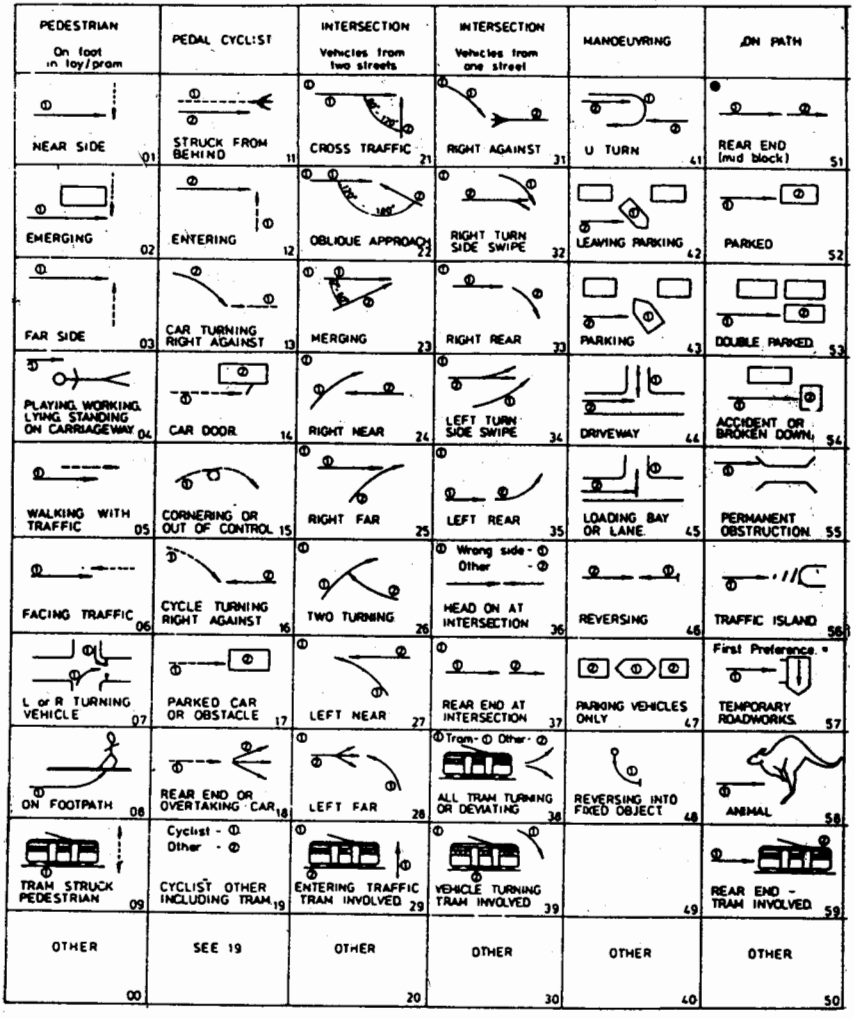
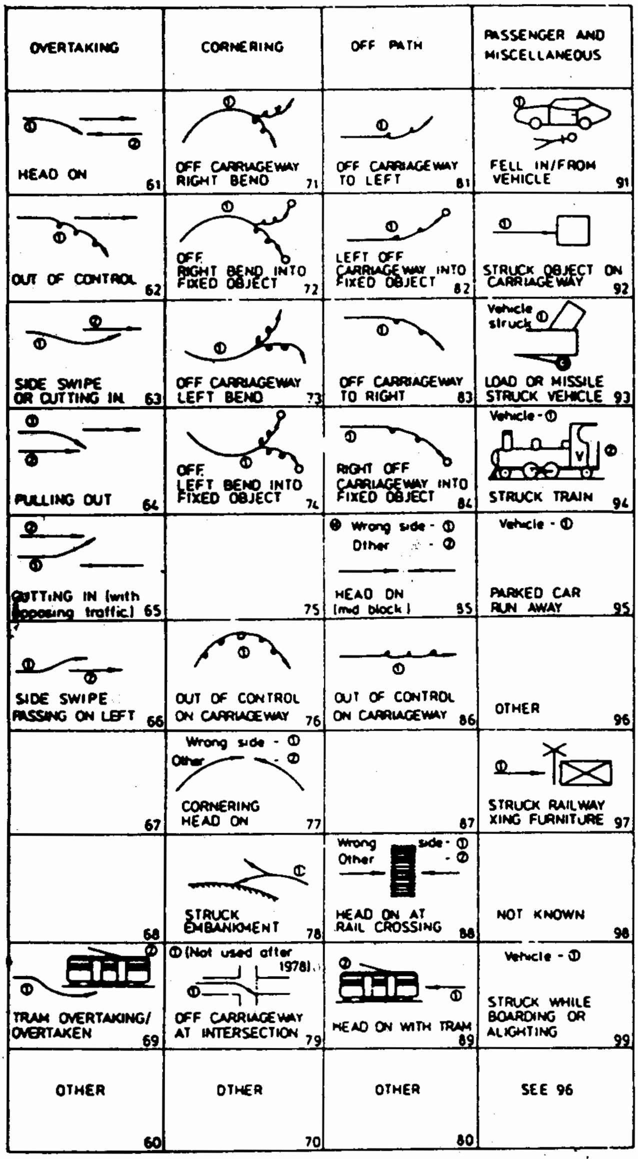


Fig 2. Road User Movement (RUM) Codes

CODING OF ROAD USER MOVEMENTS



1. Road User Movement should be classified first by the written divisions along the top of the page and then by the diagrammatic subdivisions
2. The subdivision chosen should describe as accurately as possible the general movement executed by the vehicles having initial collision. It should not describe the cause of the accident. If the car collided with other vehicle when cutting in it should be coded as 65. Cutting in.
3. Priority should be given to 57, then subdivisions in numerical order.
4. Road User Movements marked (1) must be used only at intersections or midblocks respectively.
5. The numbers (1) and (2) identify individual vehicles involved in the initial event when RUM is linked with other driver/vehicle information

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Fig 2. (Contd).

Of the total pedestrian accidents, 51% involved "while crossing the highway", 29% "walking with and facing traffic" and 17% "working, playing and standing on the highway".

The distribution of pedestrian accident types demonstrated the behaviour of pedestrains in traffic and thus identified the mostvulnerable movements involved. It was found that walking with traffic is much more dangerous than walking against the traffic, 26 percent vs. 3 percent.

HIGH ACCIDENT FREQUENCY LOCATIONS

In order a to determine if any "bad" links (accident blackspots) existed, consideration had to be given to the variation in the length of each link. The unit chosen was accidents per kilometre, defined as the number of accidents within the link (intersection accidents excluded) divided by its length (in kilometres) and is termed as the accident rate.

The accident rates for each section for all accident types are shown in Table 5. The average accident rate for the highway was 7.4 accidents per

Table 5. Accident Rates : Extended Links (All Accidents)

Section* Extended link	Length (Km)	Total No. of Accidents	Rate Acc/Km
1	4.3	146	33.95
2	7.7	73	9.48
3	6.9	48	6.95
4	8.4	45	5.35
5	5.2	38	7.30
6	18.5	62	3.35
7	12.5	109	8.72
8	8.2	39	4.75
9	9.7	46	4.74
Total :	81.4	606	7.40

* See Fig. 1 for definition

kilometre. The sections with above average accident rates were 1 (Asadgate to Mirpur Mazar Road), 2 (Mirpur Mazar road to Hemayetpur road), 5 (Kaliakoir road to Dhamrai road) and 7 (Golora road to Harirampur road).The accidents rates for these locations were 34.0, 9.5, 7.3 and 8.7 accidents per kilometre respectively. Using the statistical quality control techniques, (Hoque and Andreassend, 1980) Sections 2 and 7 were found to be noticeably "bad" (hazardous locations) (see Table 6).

Table 6. Accident Rates and Control Limits : All Accident Types

Extended* Link	No. of Accidents	Accident Rate (Acc/Km)	UCL	LCL	Remarks
2	73	9.48*	8.21	4.01	Hig h rate
3	48	6.95	8.35	3.89	Mid range
4	45	5.35	8.09	4.09	Mid range
5	38	7.30	8.72	3.58	Mid range
6	62	3.35	7.36	4.72	Low rate
7	109	8.72*	7.70	4.42	High rate
8	39	4.75	8.13	4.07	Mid range
9	46	4.74	7.94	4.22	Mid range
Total	460	5.96	-	-	-

* See Fig. 1 for definition

The proportion of fatal vs injury accidents by sections was examined. The representation of fatal accidents is much above average in sections 2, 3, 5 and 9.

The high accident frequency intersections were also indentified. There were about 9 intersections (5 within city and 4 outside city) on the highway with an average of three or more accidents per year.

CONCLUDING COMMENTS

This paper has made an attempt to highlight the accident problem in rural highways in Bangladesh. The rural highway accident problem is characterised by a disproportionately high number of casually accidents. A study has been carried out on the accidents on Dhaka-Aricha highway. Some preliminary results of the study presented in this paper provide useful insights into the characteristics of the accidents and these would of value in developing effective road safety countermeasures. Further studies are required towards full understanding of the rural road accident problem.

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