Role of Road User and Roadway Geometrics in Road Accidents in Jordan

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Jordan's road network has been one of the fastest growing systems in the area and promises to continue developing in the years to come. In order to continue this road development, the state of Jordan is searching for means to improve road safety and management practices. Following numerous requests made by public officials for aid and guidance in the road safety field, several research teams were formed. The aim of these teams is to undertake research in Jordan with a view to establishing the nature and extent of its traffic accident problems, and in the longer term to assess the effectiveness of remedial measures. Some of the major findings of these research teams are described. Special emphasis is given to the effect of road users and geometrics on road accidents. Road users were found to be responsible for about 95 percent of all accidents.

Statistics in every part of the world have shown that economic losses and human suffering resulting from road accidents can be large and difficult to bear by some countries. In the past few years, Jordan has experienced an accelerated stage of economic growth that resulted in a large increase in car ownership, consequently resulting in an increase in accident rates (*1*).

Figure 1 shows accident rates and associated human losses for the period between 1970 and 1985. Statistics shown indicate large losses for a small country like Jordan with a population of about 3 million. An increase of 464 percent in the number of accidents is observed for 1985 over 1970. This increase was mainly because of car ownership, which increased 908 percent.

In 1979, road accidents were the fourth most important cause of death, causing over 5 percent of all deaths recorded. However, in 1962 road accidents ranked 11th in importance and accounted for only 1.3 percent of recorded deaths. Excluding the very young and elderly, road accidents were the second most important cause of death and have become a serious social problem. Preliminary analysis indicated that road accidents cost the country 34 million Jordanian Dinars (about $86 million in 1985 dollars) in 1985. This amount represents about 5.6 percent of Jordan's gross national income.

Half the accidents in Jordan occur in the capital city of Amman and its suburbs. This statistic may be related to economic and population concentration in Amman. Analysis of accident records indicates that there is a high proportion of pedestrian casualties and a high proportion of children pedestrian casualties. An increase in number of accidents is also observed during summer months because of the influx of drivers from other countries.

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ASSESSMENT OF THE MAIN REASONS OF ROAD ACCIDENTS

The growth in road accidents results from many reasons, besides the increase in population and car ownership. These explanations range from poor traffic management, inadequate road design, and poor road user behavior to lack of coordination among concerned parties.

A study (*3*) conducted by Jordan's Ministry of Transport reviewed the geometric design elements of some hazardous locations. Data collected in this study did not permit the assessment of accident rates related to various geometric design elements because the part of the accident form relevant to road geometrics was not filled by the police officer in most of the records. However, comparisons were made between the number of accidents occurring in 1 year on roads of different geometric features. Roads were selected such that all other characteristics were similar except for one geometric feature. Major findings are shown in Figure 2.

The behavior of road users is generally considered to be the major cause of road accidents in Jordan. Although accidents are unlikely to arise from a single cause, the road user is a predominant influence. Figure 3 shows the rates associated with some common human errors averaged over a period of 5 years (1979 through 1983). The most frequent road user

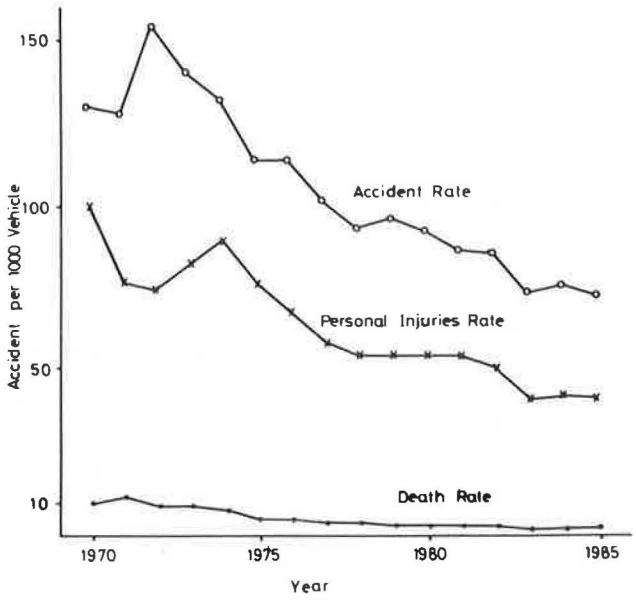

FIGURE 1 Accident rates in Jordan (*2*).

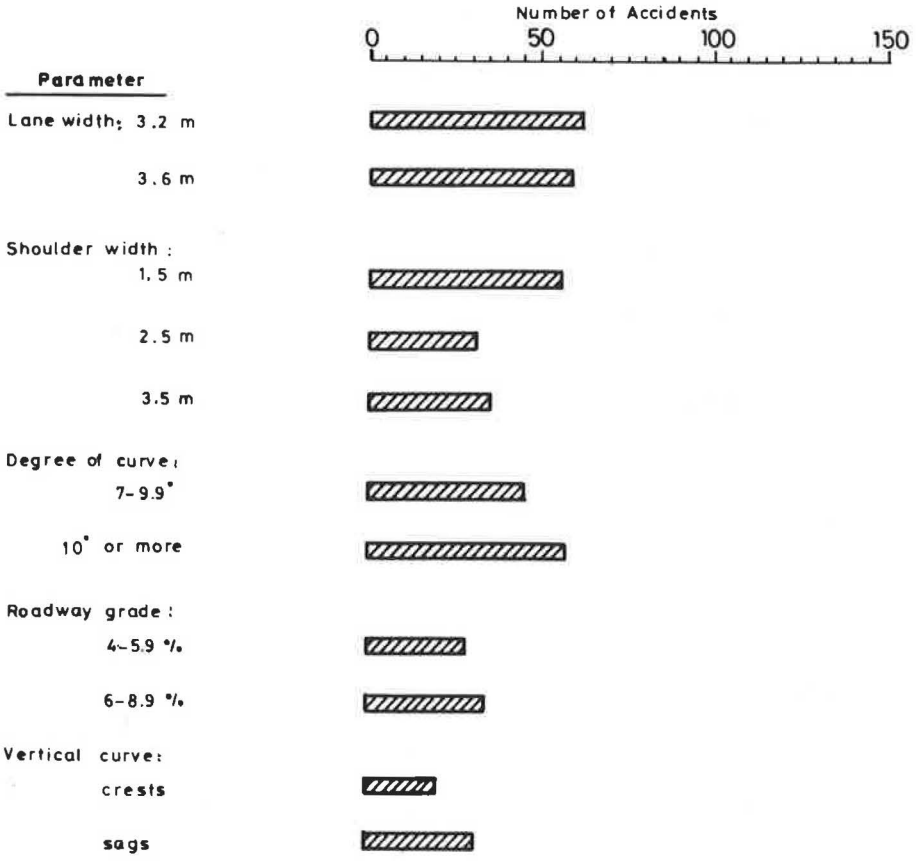

FIGURE 2 Accident frequencies related to geometric design elements (*2*).

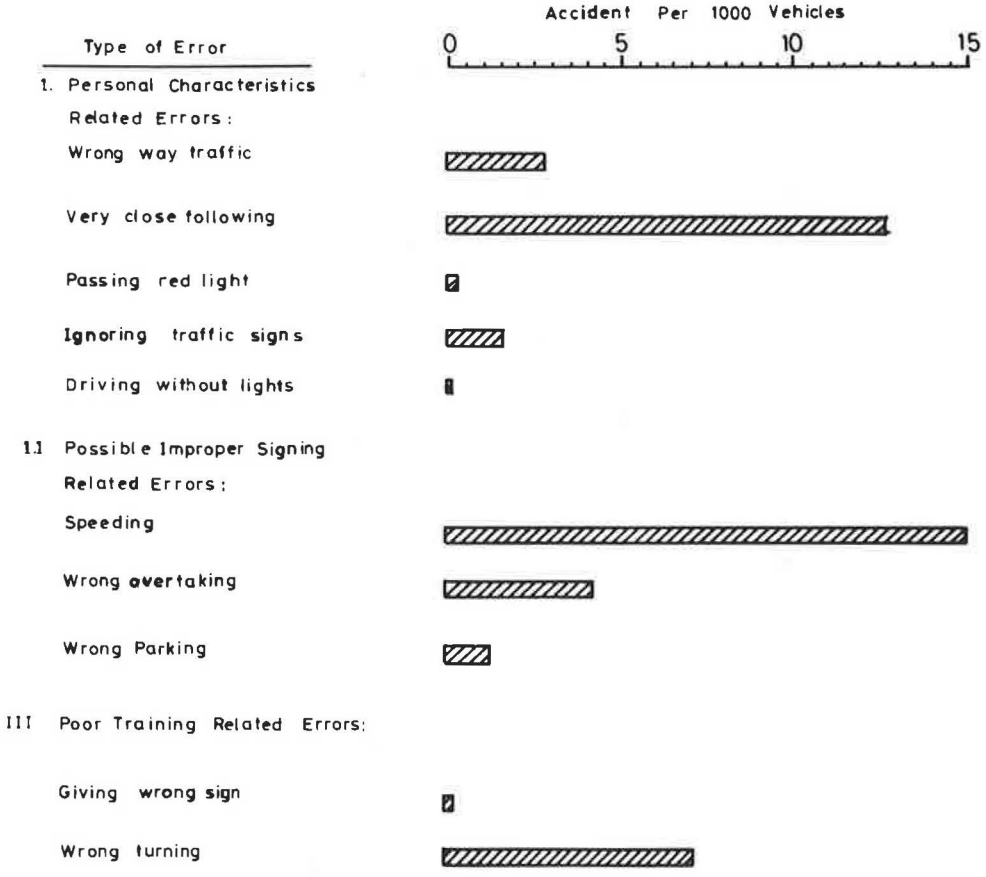

FIGURE 3 Accident rates caused by common human errors (*2*).

TABLE 1 ROLE OF DIFFERENT REASONS IN ROAD ACCIDENTS (*1*)

Reason of Accident	Percentage of Total Accidents Averaged over 5 years
Human Errors	65.00%
Combined human and road elements	24.00%
Combined human, and vehicle elements	4.50%
Combined human, road, and vehicle elements	1.25%
Road elements	2.50%
Road and vehicle elements	0.25%
Vehicle elements	2.50%

TABLE 2 PERCENTAGE OF DIFFERENT ACCIDENT TYPES (*1*)

Accident	Year						
Type	1980	1981	1982	1983	1984	1985	Ave.
Two Cars Collision	55	55	57	57	59	58	56.8
One Car	9	10	10	10	8	9	9.3
Pedestrian	28	27	25	25	24	24	25.5
Fixed object	5	5	5	6	6	7	5.7
Others	3	3	3	2	3	2	3.0

TABLE 3 NUMBER OF CASUALTIES BY PERSON INVOLVED (*1*)

Year	Driver	Passenger	Pedestrian
1980	1715	2381	3609
1981	2046	2869	3979
1982	2346	3084	4014
1983	2063	2758	3799
1984	2316	3025	4097
1985	2409	3109	4115

TABLE 4 ESTIMATED ROAD ACCIDENT COST

Year	Population (million)	Car owner-Ship (Veh/ capita)	Number of Accidents	Annual Income (JD/ capita)	Annual Accident Cost (Million JD)	Percentage of Gross National Income
1980	2.23	0.06	12433	171.7	12.66	1.4
1985	2.63	0.12	16078	234.0	34.38	5.6
1990	3.09	0.20	37527	306.0	82.51	8.7
1995	3.62	0.30	57093	402.2	184.45	12.7
2000	4.22	0.41	78559	507.4	372.91	17.4

Current equivalence: one JD = 1.5 U.S. Dollar

errors are speeding, tailgating, and turning wrong. Table 1 presents the role of the different reasons in contributing to road accidents. Violation of traffic rules by most drivers and pedestrians is one of the major reasons for the increase in the number of road accidents. Generally, accident data for Jordan reveal that pedestrians and children are at particular risk. Drivers frequently display a lack of courtesy toward children and pedestrians and this probably contributes to the high accident rate. Table 2 presents the percentage of different accident types between 1980 and 1985. These statistics reveal that two-car collisions have the highest percentage among all types for all years. Although this statistic is a common finding, it is attributed mainly to the high rate of traffic violations. Table 2 also indicates that pedestrian accidents rank second as a percentage of all accidents, whereas in fact it ranks first as an injury- or death-causing accident. This statistic is attributable to bad pedestrian practices mainly and to the lack of proper pedestrian facilities to a lesser degree. The problem of pedestrian accidents is further presented in Table 3, which indicates that pedestrians hit by vehicles constitute about 40 to 45 percent of all casualties. Passengers constitute about 30 to 35 percent and drivers about 25 to 30 percent of all casualties. Bad road user behaviors are observed particularly in the ignorance of priority rules, wrong turning procedures, wrong overtaking, and lack of experience.

Therefore, poor road user behavior can be attributed to several reasons, which may include:

1. Poor understanding of road safety regulations,
2. Insufficient law enforcement, and
3. Insufficient driver training program.

CONCLUSION AND RECOMMENDATIONS

A combination of geometric design elements and road user behaviors are generally considered to be the major causes of road accidents in Jordan. The losses incurred by this problem are believed to be too burdensome for a country of the size of Jordan. Table 4 presents estimated road accident cost through the year 2000. Highway engineering techniques can be implemented to improve geometric design problems. However, in order to prevent human errors, two general approaches can be used:

1. Directly influencing road user behavior through education, training, publicity, and police enforcement, and
2. Using highway and traffic engineering techniques to avoid circumstances in which road users are found to make accident-causing errors.

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