

U-Turns and road safety — perspective from Karachi

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Abstract

U-turn is a complex driving manoeuvre entailing 180-degree turn to change the direction of travel towards the opposite direction. A cross-sectional survey based on convenience sampling was conducted at 120 U-turns in Karachi from February to October 2013. Shopkeepers operating in the close vicinity of U-turns were interviewed. Out of the 120 U-turns studied, 87(72.5%) were without median and 33(27.5%) were with median. Weekly average number of people getting injured or dying as a result of roadside traffic accidents was statistically significant ($p < 0.05$) between the two types of U-turns; with U-turns having median having more injured and dead roadside traffic accident victims. Results from our preliminary study indicate that U-turns with medians are more likely to contribute towards road traffic accident morbidity and mortality and hence compromise road safety. Public health and transportation professionals in the country need to work in concert for ensuring that roads are safe for travelling.

Keywords: U-Turns, Road safety, Karachi.

Introduction

A U-turn in driving implies performing a 180-degree turn to change the direction of travel towards the opposite direction. It is a complex manoeuvre entailing decrease in speed when approaching U-turn, diverging followed by an increase in speed when converging with the traffic flow in the opposite direction. On some U-turns a driver by necessity has to stop the vehicle and wait at the U-turn until an opening could be found in the oncoming traffic from the opposite direction so as to carefully merge with the traffic flow. Hence, negotiating U-turns requires patience, vigilance and undivided attention on the part of vehicle driver to avoid roadside accidents. Movement at U-turns tends to worsen traffic flow, resulting in congestion and impaired road safety.^{1,2} On average, Karachi city adds 450 new vehicles every day to an existing total number of 3.32 million vehicles in 2011.³ The city has primarily two types of non-signalised U-turns:

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those with a 'median' and the ones without. A 'median' (Figure-A) is a small — about six inches high — boundary line that demarcates the lanes from the ones going in the straight direction ahead and the lane in which every vehicle that enters would need to take a U-turn. This 'median' allows taking a U-turn from one's lane and merging onto the lane going in the opposite direction a much more efficient and safer way of taking a 180-degree turn, compared to roads where it does not exist.

A median exists on many multi-lane roads and highways in Karachi, but on most single-lane roads — which constitute the vast majority of U-turns — there is no median and consequently drivers driving all kinds of vehicles need to be extra vigilant while negotiating U-turns on such roads. We attempted to study both types of U-turns in various parts of Karachi to make a preliminary determination of which type of U-turns are safer in terms of number of accidents and the number of people being injured or dying as a result of roadside accidents at these U-turns.

Methods and Results

The cross-sectional survey, using a pre-tested, semi-structured and interviewer-administered questionnaire, based on convenience sampling was conducted at 120 U-turns in 11 townships of Karachi from February to October 2013. The questionnaire included questions on the number of roadside traffic accidents per week at the U-turn, the number of people being injured and killed per week, day and time of these roadside accidents, and type of vehicles involved in the roadside accidents at the U-turn. A team of three trained male interviewers interviewed shopkeepers, mobile juice/food cart vendors,



(A) U-Turn With Median

(B) U-Turn Without Median

Figure: U-Turns with and without median in Karachi.

Table: Profile of road safety disaggregated by type of U-turns.

Question	U-Turn with Median (N=33) Median/Frequency (IQR/Percent)	U-Turn without Median (N=87) Median/Frequency (IQR/Percent)	*P-Value
Average number of accidents per week	4.2 (3.6)	3.5 (4.2)	0.2702
Average number of people injured per week	4.0 (3.5)	2.3 (3.5)	0.0043
Average number of people dying per week	0.0 (1.0) @	0.0 (0.0) @	0.0047
Most frequent time of roadside accidents			
Morning	4 (12 %)	7 (8.1 %)	
Morning/Afternoon	1 (3 %)	0 (0 %)	
Morning/Evening & Night	3 (9.1 %)	27 (31 %)	
Afternoon	3 (9.1 %)	6 (6.9 %)	
Evening & Night	12 (36.4 %)	30 (34.5 %)	
Afternoon/Evening & Night	5 (15.2 %)	5 (5.7 %)	
Anytime (Morning/Afternoon/Evening & Night)	5 (15.2 %)	12 (13.8 %)	
Most frequent day of roadside accidents			
Working days of week	11 (33.3 %)	36 (41.4 %)	
Weekends	4 (12.1 %)	10 (11.5 %)	
Monday	1 (3 %)	1 (1.1 %)	
Wednesday	0 (0 %)	1 (1.1 %)	
Thursdays	1 (3 %)	0 (0 %)	
Friday	0 (0 %)	2 (2.3 %)	
Every day of week	16 (48.6 %)	35 (40.3 %)	
No answer	0 (0 %)	2 (2.3 %)	

*P-values are based on two-sample Wilcoxon rank-sum (Mann-Whitney) test.

@Wide variation was observed with mean and standard deviation (SD) of 0.47 (SD: 0.78) and 0.12 (SD: 0.36) for U-Turns with and without median, respectively.

IQR: Inter-quartile range.

workshop mechanics, tea-stall operators, and kiosk operators in close vicinity of U-turns, and administered the questionnaire. At each U-turn at least two people were interviewed. Data was analysed using STATA 12, by applying two-sample Wilcoxon rank-sum (Mann-Whitney) test to assess the relationships between the average number of weekly roadside accidents, average number of people getting injured weekly, average number of people dying weekly, and the two types of U-turns. Statistical significance was defined by two-sided P values of <0.05.

Out of the 120 U-turns studied, 87(72.5%) were without median and 33(27.5%) were with median. For 98(81.7%) U-turns, three people each were interviewed, and for the remaining 22(18.3%), two each were interviewed. For quantitative indices, the responses were averaged, while for categorical data i.e. time and day of roadside accidents, and the involvement of the type of vehicle in these accidents, were simply aggregated and frequencies worked out. Shapiro-Wilk test was used to check for the normality assumption of weekly average number of accidents, number of injured, and the number of deaths at the two types of U-turns. None of these variables met the normality assumption. The responses to the questions asked were disaggregated by two types of U-turns, and the p-values were noted (Table). The weekly average number

of accidents was not found to be statistically significant between the two types of U-turns ($p>0.05$), while weekly average number of people getting injured or dying as a result of roadside traffic accidents were statistically significant ($p<0.05$) between the two types of U-turns; with U-turns having median accounting for more injured and dead roadside traffic accident victims. Evening and night time were reported to be the most frequent times of roadside traffic accidents at both types of U-turns ($n=42$; 35%), while working days of the week i.e. Monday through Friday, were reported to be days on which most roadside traffic accidents occurred on U-turns without median ($n=36$; 41.4%). However, for U-turns with median, all seven days of the week were reported to be equally susceptible to roadside traffic accidents ($n=16$; 48.6%).

Discussion

Focusing on driver behaviour alone for the complex problem of securing road safety would blur the distinction between infrastructure design and its impact on vehicle drivers. Globally road traffic accidents kill 1.24 million individuals every day, and rank as the eighth leading cause of mortality among the 15-29-year-olds. These numbers are slated to get even worse.⁴ In 2010, there were 5192 road traffic deaths in 2010 in Pakistan, based on police records.⁴

However, not every road traffic accident gets registered by the police, owing to parties involved in such accidents working out arrangements on their own.⁵ Results from our preliminary, and very first study of U-turns and their impact in terms of road safety in the country, indicate that U-turns with medians are more likely to contribute towards road traffic accident morbidity and mortality and hence compromise road safety. Our preliminary results seem counterintuitive, as U-turns with medians have empirically been shown to be safer modality for negotiating 180-degree turns, compared to ones without medians. However, in Karachi almost all the U-turns with medians are primarily located on busier roads that receive heavy traffic compared to roads with U-turns without medians. Less busy roads in terms of volume of traffic tend not to have medians in Karachi. We posit that heavy volume of traffic has confounded the relationship between morbidity and mortality burden owing to traffic accidents at the two types of U-turns in this preliminary study.

Conclusion

Ensuring safety of roads requires multidisciplinary approach. Public health and transportation professionals in the country need to work in concert so as to choreograph the optimal solutions for solving the ever-increasing travel needs of growing population in Karachi as well as in the country by ensuring that roads are safe for travelling.

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