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ASSESSMENT OF THE CONTRASTING FACTORS IN THE SURVIVAL RATE OF ROAD INJURIES AT VARIOUS TERTIARY HEALTHCARE CENTERS

[1]Dr. Arsalan Nawaz, [2]Abdul Rehman Butt, [3]Dr. Muhammad Saad

[1]Jinnah Hospital Lahore, [2]DHQ Sheikhupura, [3]Punjab Medical College, Faisalabad

Abstract:

Objective: *Assessment of the contrasting factors in road injury survival including three tertiary care hospitals of an urban area.*

Methods: *We conducted this study-based survey in the timeframe of September 2017 to October 2018 at Services Hospital, Lahore on all road traffic injury victims representing the three-health care centres. In this survey complete record of the patient is maintained including gender, mode, age and any delay in approaching hospital. Data were stratified by the hospital of presentation. A logistic regression model was formed, and the survival possibility was evaluated after balancing different risk factors, comprising patient data and severity of the injury.*

Results: *The study comprised of 93,657 victims, but there is a lack of complete information in 6,458 (6.89%) study subjects, counting the information about survival. Generally, 83,837 (89.5%) were males; 64,269 (74%) were aged between 16 and 45 years; 84,016 (95%) had injury severity score of 15; however, the survival rate was 84,141 (96.5%).*

Conclusion: *Remarkable variations were found in risk-adjusted survival of road injury victims representing public hospitals. These variations underlined the differences in chances for improvement and the process of care.*

Keywords: *Surveillance, Survival, Road Traffic Injuries, Trauma System, Outcome.*

Corresponding author:

Dr. Arsalan Nawaz,

Jinnah Hospital Lahore.

QR code

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INTRODUCTION:

The rate of traffic accidents is accelerating in Countries with low or middle economy termed as (LMICs) and as a resultant, it acts as a great threat to the social and economic progress of the country [1, 2]. Moreover, the rising load of trauma and lack of medical facilities indicating death and disability resulting from road injury are confronting their delicate medical systems [3]. Developed countries having high income termed as (HICs) have enhanced their consequences resulting from road injury through evolving integrated systems of trauma directing the care spectrum from roadside rescue to social therapy [4 – 6]. Among these healthcare involvements, distinguishable developments have been made in trauma care based on facilities which proved that patients suffering trauma have a high rate of survival at selected trauma centres than in case of non-selected centres [4, 5]. The variation exists in results of equally selected centres of trauma which presents a considerable difference in quality concerning the delivery of trauma care [7, 8]. The obligation of occurrence of quality cleft would act as a crucial step in the direction of minimizing the gap through computing and determining variances in results of risk familiar injuries in the trauma centres and then utilizing these variances for repairing the deficits of the system [9, 10]. There is a lack of proper record for such evaluations in underdeveloped countries [10]. The present study was deliberated to determine the variation in the survival rate of patients with road injuries that were reported to three urban health care medical centres.

SUBJECTS AND METHODS:

We conducted this study-based survey in the timeframe of September 2017 to October 2018 at Services Hospital, Lahore on all road traffic injury victims representing the three health care centres. The patients that were found to be Dead on Arrival (DOA) were not included. The study utilized the observatory data of the Road Traffic Injury Research & Prevention Center (RTIR&PC). This signifies the major RTI observatory system of the country, including 5 largest centres of trauma 24 hours a day. These are the 5 tertiary healthcare centres providing basic facilities. Government is supporting 3 centres while the other 2 were funded by private trusts. These institutions have less defined catchment areas containing variable facility services depending on the type and nature of injury in order to direct the patients with head injuries to centre 1 having an efficient neurosurgical unit.

For data procurement, patients along with their visitors, accident observers, police, ambulance and health centre records act as main resources of information. The information was gathered by the department in EDs of all the health centres while information of patients admitted in the hospital is collected to conclude their 30-day outcome. The information gathered comprised of patient background, details of crash concerning injured people, types of vehicle affected by crash, reason an area of the accident. The structural and biological specifications of injuries were determined through Abbreviated injury scores (AIS), the respiratory rate (RR), Systolic blood pressure (SBP) and Glasgow coma score (GCS) [11]. The data were collected from health centre records, doctors treating victims, Scores of injuries severity and scores of revised trauma to evaluate the extent of accidental damage. The data regarding vehicle used and the time interval during accident and arrival at the health centre was also noted. The information about health centers comprised of all the procedure from start till end. It elaborates the patient condition, type of treatment given, duration of stay and discharge from the hospital.

For study determination, the result was explained as death in 30 days or successful discharge from the hospital. For detailed analysis, the patients were divided into 3 age groups. The patients having age above 45 were subdivided in order to clarify the variations in case of survival. Codes were used to recognize health centres to confirm secrecy. The arrival of patients at health centres was characterized on a transport basis either through rescue teams, police or public transport like a taxi or any other vehicle. The time interval between accident and appearance at the hospital was also divided into groups representing arrival in 1 hour after the accident and after 1 hour. The evaluation of victims injured and categorization of injuries depending on the area of the body was performed by ISS. The extent of injury severity was grouped as 1 – 15, 16 – 25, and > 25.

The assessment of risky results concerning survival was performed among public health care centres, that provide sources for care regarding trauma than other 2 private health care centres. Logistic reversion was utilized to evaluate the relationship among variables for study and their results, leading to the survival of the patient after the accident. For inquiry of the variation among results of three health centres, two situations were formed using a logistic reversion model; 1 having a greater possibility of survival in comparison to the other. The first situation defined a patient of age 15 – 25 years, RTS>7 and ISS <15, reached health centre in one hour after the accident in

a taxi. The 2nd situation describes a patient of greater than 65 years of age, RTS<4 and ISS>25, reached the health care centre in a police van after one hour of the accident. These situations were accustomed for the severity of injuries depending upon which body part is affected. Data analysis is performed by utilizing SPSS.

RESULTS:

The system collected information for a period of 38 months on 93,657 patients suffered road accident to 3 hospitals which were utilized for further analysis. There was a lack of proper information in 6,458 (6.89%) subjects which consists of information about survival. Centre 1 has a huge number of victims of about 40,903 (43.6%). The study has 83,837 (89%) male victims and 64,0269 (74%) of them have ages between 16-45 years. The injuries of the first group (ISS score ≤15) contributes 84,016 in the total. The victims that reached hospital by means of private vehicles are 65,148 (74.7) cases; while 70,046 (74.8) RTI patients reached in 1 hour after accident irrespective of the transport. Total 156,024 injuries were reported, 78,236 (50.14%) were cured at Center 1. Center 2 & 3 took care of 40.746 (26.1%) and 37,042(23.8%). The rate of external injuries is higher about 46,174 (29.6%) including facial and head injuries of about 23,920 (15.3%) and 25,605 (16.4%). The extremity and pelvic injuries represent a huge population of about 1,28788(36.8%) and 3,16008 (43.2%) directed towards the first centre. Center 2 monitor 16098 (39.5%) patients with external injuries. Ignoring the non-reported data, the result of the survival rate is 84141 (96.5%) patients.

Through regression analysis, evaluation of survival variance in elder patients is made. Patients above the age of 45 years were further grouped into 45-64 and greater than 65 years. Center 2 & 3 possesses greater survival chances (Odds Ratio [OR]:1.7; Confidence Interval [CI] 1.5 – 1.8) than first center. This variation improved after alteration for severity of the injury, age, gender, structural regions and mode of transport to reach hospital and time interval and survival chance was 4.4 times improved (CI:3.4 – 5.7) for the 2nd centre and 4.2 (CI:3.3 – 5.4) for 3rd centre than Center 1. Age and mode of transport to reach hospital are some factors that determine the survival chances. Neglecting other factors, patients of the age group (1 – 15 years) than (16 – 25) gave a 1.3 times higher survival rate. The survival rate is lesser in all other groups. The survival rate is greater in victims arriving through taxis or other private transports (OR 10.9; CI: 10.1 – 11.9) than using an ambulance. Time duration to reach the Emergency Department is not linked directly to the survival rate by ignoring other differences (p=0.359). During this study duration, 3,058(3.5%) deaths occurred their circulation design among differences were considered.

Table – I: Basic characteristics of road traffic victims

Centre		Centre – I		Centre – II		Centre – III	
		Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Total registered		40903	43.60	28302	30.20	24452	26.10
Gender	Males	36740	89.80	24784	87.60	22313	91.30
	Females	4163	10.20	3518	12.40	2139	8.70
Age	0 to 15 Years	4448	11.90	3280	12.50	2639	11.50
	16 to 45 Years	27493	73.80	19135	72.90	17398	75.50
	Above 45 Years	5308	14.25	3830	14.60	2937	12.80
Injury Severity Score	1 to 15	35732	95.30	25835	97.20	22449	97.20
	16 to 25	803	2.10	248	0.90	169	0.70
	Above 25	974	2.60	500	1.90	489	2.10
Arrival Mode	Ambulance	8107	21.60	3564	13.40	5862	25.40
	Police	797	2.10	388	1.50	345	1.50
	Private	27349	72.90	21517	80.90	16282	70.50
	Public & Others	1256	3.30	1114	4.20	618	2.70
Presentation Time	Under 1 Hr	28648	76.40	22672	85.30	18726	81.00
	Above 1 Hr	8861	23.60	3911	14.70	4381	19.00
Injuries Distribution	Head Injury	13759	17.50	6287	15.40	5649	15.30
	Facial Injury	11967	15.30	6287	15.40	5657	15.30
	Chest Injury	882	1.10	479	1.20	707	1.90
	Abdominal Injury	1164	1.40	379	0.90	621	1.70
	External Injury	21676	27.70	16098	39.50	8400	22.70
	Extremity/ pelvic Injury	28788	36.80	11306	27.70	16008	43.20
Survival	Expired	1693	4.50	730	2.70	635	2.70
	Survived	35816	95.50	25853	97.30	22472	97.30

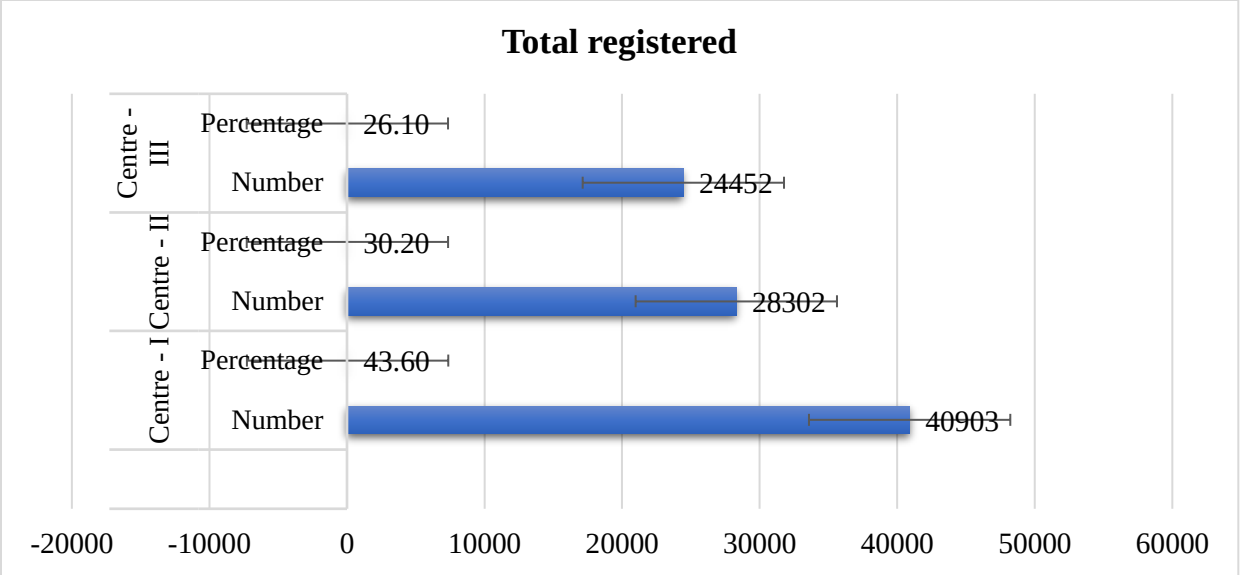

Table – II: Regression model- Survival Probability in Public-sector hospitals.

		Unadjusted OR (95% CI)	P-Value	Adjusted OR (95% CI)	P-Value
Centre	1	(ref)		(ref)	
	2	1.7 (1.5-1.8)	<0.001	4.4 (3.4-5.7)	<0.001
	3	1.7 (1.5-1.8)	<0.001	4.2 (3.3-5.4)	<0.001
Age (Years)	0 to 14	(ref)		(ref)	
	15 to 25	1.3 (1.2-1.5)	<0.001	0.98 (0.71-1.4)	0.92
	26 to 45	0.75 (0.66-0.85)	<0.001	0.62(0.45-0.85)	0.003
	46 to 65	0.43 (0.37-0.49)	<0.001	0.36 (0.25-0.51)	<0.001
	Above 65	0.27 (0.22-0.34)	<0.001	0.16 (0.09-0.26)	<0.001
Arrival Mode	Ambulance	(ref)		(ref)	
	Police Vehicle	0.8 (0.68-0.93)	<0.001	1.1 (0.74-1.7)	0.585
	Private Vehicle	10.9 (10.1-11.9)	<0.001	1.5 (91.2-1.8)	<0.001
	Public & Others	1.4 (1.2-1.6)	<0.001	0.95 (0.66-1.4)	0.797
Presentation Time	Under 1 Hr	(ref)		(ref)	
	Above 1 Hr	0.64 (0.59-0.69)	<0.001	0.91 (0.74-1.11)	0.359

Table – III: Characteristics of patients who died in public sector hospitals with a probability of survival (Trauma Injury Severity score) >50%

Details		Total	Centre 1		Centre 2		Centre 3	
			N	%	N	%	N	%
Distribution among public sector hospitals		457	352	77%	53	11.60%	52	11.30%
Age (Years)	1 to 15	42	35	9.90%	1	1.90%	6	11.50%
	16 to 45	289	218	61.90%	32	60.30%	39	75.00%
	Above 45	126	99	28.10%	20	37.70%	7	13.40%
Head Injury	No	54	31	8.80%	11	20.80%	12	23.10%
	Yes	403	321	91.20%	42	79.20%	40	76.90%
Facial Injury	No	201	142	40.30%	30	56.60%	29	55.80%
	Yes	256	210	59.70%	23	43.40%	23	44.20%
Chest Injury	No	421	328	93.20%	46	86.80%	47	90.40%
	Yes	36	24	6.80%	7	13.20%	5	9.60%
Abdominal Injury	No	427	331	94.00%	51	96.20%	45	86.50%
	Yes	30	21	6.00%	2	3.80%	7	13.50%
Extremity/Pelvic Injury	No	255	200	56.80%	21	39.60%	34	65.40%
	Yes	202	152	43.20%	32	60.40%	18	34.60%
External Energy	No	174	114	32.40%	32	60.40%	28	53.80%
	Yes	283	238	67.60%	21	39.60%	24	46.20%

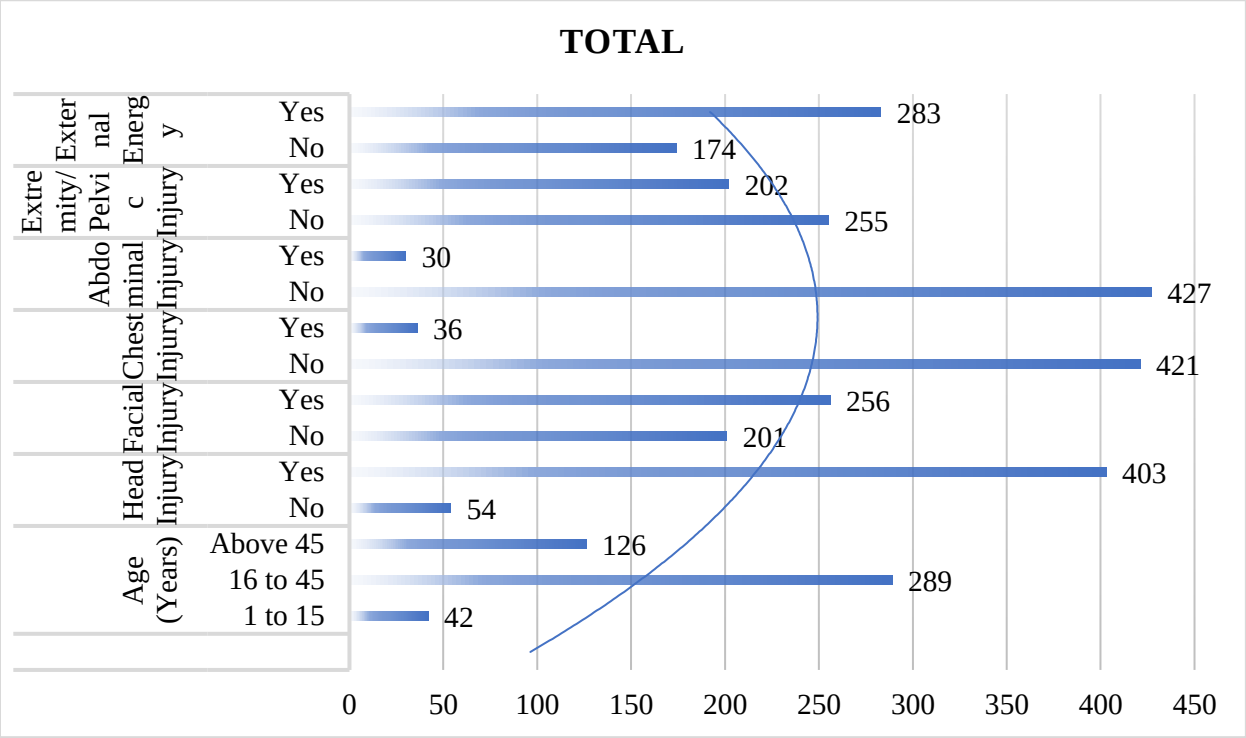

Table – IV: Difference of survival in public-sector hospitals. Survival prediction model

Centre	Probability of survival in favorable case scenario *	Probability of survival in non-favorable case scenario *
Centre – I	0.9936	0.058
Centre – II	0.9986	0.219
Centre – III	0.9985	0.21

Through utilizing the model of survival prediction, it was observed that a victim of age group 15 – 25 years, having RTS greater than 7 and ISS less than 15, arrived at hospital in 1 hour of accident using a taxi (Case 1) has greater chances of survival than victim of age greater than 65 years, having RTS <4 and ISS >25, reached at hospital by police in 1 hour after accident (Case 2). This perception was found to be the same in the case of head injuries. In a comparison of this model to 3 public health care centres, the results obtained highlighted that survival of young victims having fewer injuries was equal among all, having the possibility of survival greater than 99%. In Case 2, the chances of survival found to be less in a hospital with more patients. The expected rate of survival was 5%, 22%, and 21% for 1st, 2nd ,3rd Centers.

DISCUSSION:

IN spite of the division of trauma care centres into various regions, improved quality in health care centres gave better results of trauma in HICs [5, 12, 13]. The absence of proper information minimizes the judgement trauma care in countries having greater injury load [10, 14, 15]. This survey of 3-year duration represents the primary RTI result of an urban area health centre in underdeveloped country.

In Pakistan, healthcare is not expensive and a huge amount of RTI patients (>93,000) receive medication in public health care centres, while 43% were found at public tertiary health care station (Center 1). The discussion represents that the load of RT is representing tertiary health care centres to the maximum and also highlights the drawbacks. According to researchers, trauma care based on facility act as one of the essential causes of survival [5, 6, 16]. This survey showed that health care centres are the essential factors for survival after regulating time duration after the accident, age, injury type and extent of severity and type of vehicle used to bring victims in the hospital. By evaluating the possibility of survival, it was observed that results are poor for hospitals having a huge number of patients. This variation is highlighted in victims having a minimum possibility of existence.

This data lack proper trauma care procedures for further analysis. Survey of HICs recommend that differences exist in method of care and results of minor injuries among health care centres which might be the outcome of variation from standard of care and unnecessary errors [8, 17, 18] Various factors were thought to play a part in variations among results of subjects for study representing various contributing centres. The greatest death rate due to severe injuries was found in the center having a huge number of patients. These centres of trauma play a vital part in its description and certification, improvement in survival among victims suffering from severe injuries. This survey showed that a heavy load of patients in hospitals affect their ability to perform successfully. This difference was observed prior to a survey that better results were obtained from centres having a normal number of patients whereas death rate was greater in centres having a maximum or very smaller number of victims [18, 19].

The survival rate was found to be minimum in victims having head injuries. This factor was considered as the leading cause of deaths [20]. This survey showed that a maximum number of victims having head and facial injuries were found at Center 1, as it acts as the main section for the cure of neuro-spinal trauma. This centre acts on the "non-rejection" criteria and has to admit all the victims that suffered from major injuries which in turn leads to an increased load of victims there [21]. This situation creates an environment of favouritism among victims leading to bad results. This situation highlighted that good survival results can be obtained with a reasonable number of victims in the hospitals [22].

The survival model form two perceptions, that clearly highlighted the variations between public health care centres, particularly for victims having uncomplimentary risk factors. The main cause for

deprived survival at health centre could be diverse, but time duration to reach the hospital, inappropriate first aid facilities, lack of expert doctors and improper supervision are considered the primary factors for lower survival results of victims [20, 23]. Few studies suggested the application of in-house treatments for better care of the victims, regulating efficient work of the housing medical staff reducing intervals for critical risk stages. But this suggestion still needs attention to be applied properly [24].

The variation among health centres should be observed under the light of greater cases, a huge number of ISS score, and major head injuries. This suggests the results among hospitals rely upon health care facilities, the severity of injuries in patients. The severity of the injury and the area of the body affected should coordinate with the health care resources available at the hospital. There are a huge number of policy suggestions for our survey concerning this history. Distribution of appropriate care facilities among hospitals and hiring well-experienced staff are the most important factors for the successful survival of patients in the hospital which must be complemented by the progress of the health care systems. Application of cohesive systems for trauma is much efficient than improving the skills of workers [25].

A repeated series of assessment with a steady calculation to determine the worth of trauma care executed with effective trauma care is necessary. More emphasis is required for detailed evaluation of quality displays, as the record of trauma care gives a good evaluation of the quality. Observatory data was utilized due to restriction issues that do not contain quality parameters concerning quality. This survey does not represent the data for those victims who left the Emergency Department.

CONCLUSION:

Notable variation is found in the survival of victims faced road accidents that were arrived at three main public health centres. These variations highlight the procedure of cure and treatment, moreover, the trauma centre due to a huge number of patients might become less effective in representing the survivors. The survival rate can have enhanced by improving health care facilities and an effective approach of RTI in main hospitals. Incorporating the factors of trauma care instead of emphasis on care facilities gave better results in weak health care systems.

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