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Evaluation of the relationship with quality and disability adjusted life years, pertaining to road traffic injuries and maxillofacial trauma associated with risky driving behavior among adult population in trichy district: A hospital-based cross-sectional study

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***Abstract*---**To determine the influence of risky driving behaviour on road traffic injuries and maxillofacial injuries. In addition, to assess the quality-adjusted life years (QALY) among the adult population. A hospital-based cross-sectional study was conducted among 504 patients using a multiphase random sampling technique to determine road traffic accident cases among the adult population across different government hospitals in Trichy. The Manchester driving behaviour questionnaire were used to collect the data for risky driving behaviour. The quality-adjusted life years was evaluated with 15D questionnaire. Based on the formula for calculating the QALY, it is obtained from the scores. Principal component analysis was used for the reduction factor for the questionnaire, and it was reduced to a 15-D questionnaire. Chisquare test and Pearson correlation test were used to found out the statistical analysis between the variables. The correlation between quality-adjusted life-years questionnaire among the two and four-wheeler riders. P-value was found to be statistically significant for maximum variables recorded in the study, which includes hearing (0.025), breathing (0.015), sleeping (0.035), discomfort and symptoms (0.023), distress (0.012), depression (0.034), vitality (0.031). The present study concluded that subjects with maxillofacial injuries and other bodily injuries were affected the patient's quality of life. To avoid the collision of road accidents, public should follow the safety measures ensured by the government.

***Keywords*---**drivers, trauma, maxillofacial trauma, quality-adjusted life years, disability adjusted life years, road traffic accidents.

Introduction

Road traffic accidents can cause significant health problems throughout the world. Road traffic accidents involve at least one vehicle in motion on a public or a private road that results in at least one person being injured or killed. Road traffic crashes are increasing every year at an alarming rate, making it a global concern. This is because (1) road safety is measured every year by taking the fatality rates into account, leaving the country's nonfatal injuries that account for substantial economic and human costs. (2). As a result of the rise in road traffic accidents, the mortality and morbidity rate has increased among the younger and working-age groups. In India, almost two-thirds of road traffic accidents have been reported between 15-44 years of age in the age group. Males were affected 5.7 times more in road traffic accidents than females (3). There has been a steady increase in road traffic accidents for the past 10years, where 22% of people who met with road accidents ended up with fatalities due to inadequate road safety measures(4). The risky driving behaviour such as exceeding speed limits, driving under the influence of alcohol, use of cellular phones while driving has led to various road traffic accidents. These behaviours can be a potential predictor of road traffic accidents(5). The specific personality of the driver has been attributed to the accident risk, namely the attention deficit disorder, conduct disorder and substance dependence. (6)

The questionnaire is always considered the most appropriate way of assessing the behaviour of a person. It can typically assess the behaviour of an individual and aids in effectively monitoring one's attitude and principles. Reason, Manstead, Stradling, Baxter, and Campbell developed the Manchester driver behaviour questionnaire in the year 1990 in the United Kingdom, which aimed to measure the aberrant driving behaviours(7). The driver behaviour questionnaire differs in every country with the variations in the formulation of the questions and requires modifications according to the need(8). Maxillofacial injuries are generally quite common following trauma associated with various causes. It is always essential to manage these injuries to prevent their detrimental effects, affecting the patients both psychologically and functionally. The maxillofacial injuries can occur in both the skeletal and the soft tissue components of the facial region, which often causes the injury. (9)

The major contributing factor for maxillofacial fracture in developing countries is road traffic accidents. Other than road traffic accidents, assault also accounts for maxillofacial fractures. The quality-adjusted life years are considered one of the most widely used approaches for estimating the quality of life benefits in economic evaluations(10). It primarily aims at measuring the disease burden and also helps to measure the outcome in economic evaluation. Disability-adjusted life years (DALY) are drafted to quantify the acute and chronic or long term burden about health and the total years of life lost due to premature mortality or Disability associated with various factors(11). The present study aims to determine the influence of risky driving behaviour on road traffic injuries and maxillofacial injuries, to assess the quality-adjusted life years (QALY) and disability adjusted life years.

Materials and Method

A cross-sectional study was conducted among 504 patients using a multiphase random sampling technique to found out the road traffic accident cases among the adult population across different government hospitals in Trichy. The selection for the study was based on the pattern of maxillofacial trauma, with other injuries due to road traffic accidents. Details of the questions were collected using participants guardians or attendees if participants were unable to give answers. The approval of this study was obtained from the institutional review board of SRM Dental College, Ramapuram, Chennai and ethical clearance was obtained with ethical approval number SRMDC/IRB/2019/MDS/No.702.The impairment that occurs due to injury was assessed using the evaluation of permanent impairment, the AAOMS (American Association Of Oral surgeons) classification and rating the person's impairment. The Manchester driving behaviour questionnaire were used to collect the data for risky driving behaviour. To evaluate the quality-adjusted life years with 15D questionnaire. Based on the formula for calculating the QALY, it is obtained from the scores. In addition, information regarding the demographic status and insurance schemes of the patient were collected. The questionnaire comprises various items, a total of 50 referring to the driver's aberrations. The assessment was based on the quality of life was estimated by measuring the health gained from the various health care interventions given. Quality-adjusted life-years provides the basis for the development of many health care measures. The final scores were calculated

based on the formula for calculating the QALY and DALY. Descriptive statistics for demographic data and type of maxillofacial injuries. Among 55 validated risky driving behaviour questionnaires, 15 questions were chosen according to the principal component analysis.Pearson's correlation analysis was used. The collected questionnaire was tabulated and analyzed using principal component analysis,the Kolmogorov-smirnov and Shapiro wilks test used for normal distribution and pearson correlation.To analyze the data SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) was used. P-value <0.05 was considered to be statistically significant.

Inclusion criteria

- Road traffic injury cases reporting to government hospitals under the revenue division of Trichy were included.
- Persons with any type of bodily injury due to self-driving are included because the study aimed to assess risky driving behaviour.
- Conscious patients who were willing to participate in the study were included.
- Patients admitted to the ward for at least three days due to injury were included. (in-patient basis)

Exclusion criteria

- Patients with maxillofacial injuries from other causes like assault, interpersonal injuries, sports-related injuries, suicidal attempts were excluded
- Participants who were not willing to participate in this study were excluded
- Patients below the age group of 18 years were excluded.
- Outpatient attending the causality were excluded.

Results

Table 1
Distribution of demographic details of the study participants

GENDER DISTRIBUTION	Frequency (n=504)	Percentage (%)
MALES	431	85.5
FEMALES	73	14.5
AGE DISTRIBUTION		
18-25 YEARS	67	13.3
25-44 YEARS	333	66.1
45-65 YEARS	104	20.6

Table 1 shows the demographic details of the study participants, the patients who were more prone to an accident due to rash driving was among the age group of 25-44 years n=333 (66.1%). While assessing the gender difference, males were more prone to accidents n=431 (85.5%).

Table 2
Correlation between clinical assessment of the patient among two and four wheeler riders

TYPE OF INJURIES	Two-wheeler Riders	Four-wheeler Riders	P-value
LACERATION	0	0	>0.05
ABRASION	15.3	13.5	
SUTURED WOUND	84.7	86.5	
TYPE OF FACIAL FRACTURE			>0.05
LE FORT 1	11.2	10.3	
LE FORT 2	32.0	44.0	
LE FORT 3	42.3	35.4	
MANDIBULAR FRACTURE	14.5	10.3	
DISFIGUREMENT DUE TO MAXILLOFACIAL FRACTURE.			<0.01*
Class 1	22.6	48.6	
Class 2	26.2	20.0	
Class 3	24.6	14.8	
Class 4	26.6	16.6	
			0.026*
OCCLUSION DERANGED	22.8	40.7	
AVULSION	77.2	59.3	
SOFT TISSUE INJURY			0.035*
YES	72.5	95.4	
NO	27.5	4.6	

Table 2 shows the correlation between clinical assessment of the patient among two and four-wheeler riders. P-values less than 0.05 were considered to be statistically significant. P-value was found to be statistically significant for maximum variables recorded in the study, which includes disfigurement due to maxillofacial fracture (<0.01), dentition status (0.026), soft tissue injury (0.035).

Table 3
Correlation between quality-adjusted life years questionnaire among the two and four wheeler riders

S.No	Questionnaire	Options	Two wheelers(n=375)	Four wheelers(n=129)	P-value
			Percentage	Percentage	
1.	MOBILITY	Normal	34.5	32.3	>0.05
		Very mild	19.3	26.6	
		Mild	33.1	36.9	
		Moderate	10.5	3.2	
		Severe	2.6	1.0	
2.	VISION	Normal	44.3	42.6	>0.05
		Very mild	41.5	48.0	
		Mild	14.2	9.3	

		Moderate	0	0	
		Severe	0	0	
3.	HEARING	Normal	66.9	78.8	0.025*
		Very mild	25,1	14.7	
		Mild	8.0	6.6	
		Moderate	0	0	
		Severe	0	0	
4.	BREATHING	Normal	70.9	60.4	0.015*
		Very mild	22.0	27.9	
		Mild	5.1	10.1	
		Moderate	2.0	1.6	
		Severe	0	0	
5.	SLEEPING	Normal	0	0	0.035*
		Very mild	10.5	17.7	
		Mild	81.5	74.4	
		Moderate	8.0	7.9	
		Severe	0	0	
6.	EATING	Normal	0	0	>0.05
		Very mild	13.7	13.9	
		Mild	63.1	63.0	
		Moderate	20.9	22.1	
		Severe	2.3	1.0	
7.	SPEECH	Normal	0	0	>0.05
		Very mild	15.5	17.7	
		Mild	70.5	70.6	
		Moderate	14.0	11.7	
		Severe	0	0	
8.	EXCRETION	Normal	94.2	92.4	>0.05
		Very mild	4.4	5.6	
		Mild	1.4	2.0	
		Moderate	0	0	
		Severe	0	0	
9.	USUAL ACTIVITIES	Normal	2.8	1.8	>0.05
		Very mild	18.5	16.1	
		Mild	76	77.2	
		Moderate	4.5	5.0	
		Severe	0	0	
10	MENTAL FUNCTION	Normal	0	0	>0.05
		Very mild	14.8	17.9	
		Mild	57.8	56.3	

		Moderate	27.4	25.8	
		Severe	0	0	
11	DISCOMFORT AND SYMPTOMS	Normal	0	0	0.023*
		Very mild	34.5	30.9	
		Mild	62.5	65.5	
		Moderate	3.0	3.6	
		Severe	0	0	
12	DEPRESSION	Normal	0	0	0.034*
		Very mild	41.5	45.9	
		Mild	55.5	49.0	
		Moderate	3.0	5.2	
		Severe	0	0	
13	DISTRESS	Normal	0	0	0.012*
		Very mild	42.4	50.1	
		Mild	57.6	49.9	
		Moderate	0	0	
		Severe	0	0	
14	VITALITY	Normal	8.8	7.1	0.031*
		Very mild	54.2	54.5	
		Mild	29.0	35.0	
		Moderate	8.0	3.4	
		Severe	0	0	
15	SEXUAL ACTIVITY	Normal	5.0	4.4	0.035*
		Very mild	36.2	45.2	
		Mild	53.8	45.4	
		Moderate	5.0	5.0	
		Severe	0	0	

Table 3 shows the correlation between the quality-adjusted life years questionnaire among the two and four-wheeler riders. P-value was found to be statistically significant for maximum variables recorded in the study, which includes hearing (0.025), breathing (0.015), sleeping (0.035), discomfort and symptoms (0.023), distress (0.012), depression (0.034), vitality (0.031).

Table 4
Correlation of variables for risky driving behavior questionnaire between the two and four wheeler riders

S.No	Questionnaire	Options	Two wheelers (n-375) Percentage (%)	Four wheelers (n-129) Percentage (%)	P-value
1.	Do you check the speedometer	Never	8.8	11.9	>0.05
		Hardly ever	1.2	1.2	
		Occasionally	50,4	59.3	

	while driving?	Quite often	39.6	27.6	
		All the time	0	0	
2.	Do you use a radio or use a map while riding?	Never	6.9	9.9	0.022*
		Hardly ever	34.1	47.0	
		Occasionally	48.3	34.3	
		Quite often	10.7	10.7	
		All the time	0	0	
3.	Have you become impatient with slower riders?	Never	8.1	4.1	0.034*
		Hardly ever	52.6	48.6	
		Occasionally	20.2	39.2	
		Quite often	19.1m	12.1	
		All the time	0	0	
4.	Forget about the routes?	Never	21.3	30.3	0.013*
		Hardly ever	31.2	22.2	
		Occasionally	30.1	38.1	
		Quite often	14.7	6.7	
		All the time	2.6	2.6	
5.	Have you avoided signals to reach the destination?	Never	14.9	10.9	>0.05
		Hardly ever	27.4	31.4	
		Occasionally	50.4	50.4	
		Quite often	7.3	7.3	
		All the time	0	0	
6.	Have you failed to notice pedestrians?	Never	53.4	64.4	0.042*
		Hardly ever	14.1	13.1	
		Occasionally	12.5	8.5	
		Quite often	20.0	14.0	
		All the time	0	0	
7.	Have you dashed in a hurry?	Never	32.8	44.8	0.031*
		Hardly ever	28.3	16.3	
		Occasionally	30.3	35.3	
		Quite often	8.6	3.6	
		All the time	0	0	
8.	Have you misjudged the gaps in the road?	Never	33.3	43.3	0.042*
		Hardly ever	30.0	20.0	
		Occasionally	17.3	17.3	
		Quite often	19.4	19.4	
		All the time	0	0	
9.	Have you raced with the ongoing vehicle?	Never	48.0	28.0	
		Hardly ever	31.7	41.7	<0.01*
		Occasionally	8.8	18.8	
		Quite often	11.5	11.5	
		All the time	0	0	
10	Have you failed to check the mirror while driving?	Never	12.4	22.4	0.046*
		Hardly ever	49.7	39.7	
		Occasionally	23.4	26.4	
		Quite often	11.9	8.9	
		All the time	2.6	2.6	
11	Have you	Never	12.9	10.9	>0.05

	forgotten about the gear?	Hardly ever	40.7	40.7	
		Occasionally	30.1	35.1	
		Quite often	18.3	13.3	
		All the time	0	0	
12	Have you checked the sudden brake in a slippery road?	Never	21.8	26.8	>0.05
		Hardly ever	40.5	35.5	
		Occasionally	22.0	26.0	
		Quite often	15.7	11.7	
		All the time	0	0	
13	Have you forgotten the insurance?	Never	40.1	40.1	>0.05
		Hardly ever	17.1	17.1	
		Occasionally	30.5	35.5	
		Quite often	9.7	6.7	
		All the time	2.6	0.6	
14	Have you felt angry with other drivers while riding?	Never	21.8	20.8	>0.05
		Hardly ever	26.6	27.6	
		Occasionally	24.4	26.4	
		Quite often	26.4	24.4	
		All the time	0.8	0.8	
15	Have you paid a fine for parking in the wrong place?	Never	10.3	10.3	>0.05
		Hardly ever	0.4	0.4	
		Occasionally	32.7	31.7	
		Quite often	25.2	26.2	
		All the time	31.4	31.4	

Table 4 shows the correlation between the risky driving behaviour questionnaire among the two and four-wheeler riders. P-value <0.05 indicates that a statistically significant difference was found among the two and four-wheelers.

Table 5
Years of life lost due to disability, as a consequence of road traffic accident based on disability adjusted life years

YEARS OF LIFE LOST DUE TO DISABILITY AS A CONSEQUENCE OF ROAD TRAFFIC ACCIDENT	FREQUENCY (n)	PERCENTAGE (%)
10-20 YEARS	4	6.8
21-30 YEARS	23	38.9
31-40 YEARS	25	42.3
>41 YEARS	7	11.8

Table 5 shows the years of life lost due to disability as a consequence of road traffic accident based on disability adjusted life years among the study participants. 31-40 years of life was lost by the greater number of patients n=25 (42.3%) due to road traffic accident.

Table 6
Association between quality-adjusted life years and type of maxillofacial fracture

		Fracture					
		Lefort 1	Lefort 2	Lefort 3	Mandibular fracture	Total	P-value
QALY Range	0.7-1.1	3	2	0	2	7	0.01*
	1.2-1.7	9	47	54	7	117	
	1.8-2.0	0	5	2	0	7	
	2.1-4.0	36	128	168	41	373	
Total		48	182	224	50	504	

Table 6 shows the association between quality-adjusted life years and type of fracture among the study participants. The p-value was found to be < 0.01, which was statistically significant.

Discussion

Road traffic injury has become a major problem interfering with the quality of life of an individual[12,13]. The most common injury which occurs is the maxillofacial trauma, which causes a major loss of functioning in our day to day life. The likelihood of a person succumbing to road traffic accidents is higher for those who indulge in risky driving behaviour[14]. There are a plethora of factors contributing to risky driving behaviour, namely violating traffic rules, use of mobile phone, use of alcohol before driving, use of taking wrong or shortcut route to reach the destination, and not using the mirror while crossing the signals[15]. The youngsters were more prone to violate the traffic rules than the other age groups[16]. The demographic details were assessed among the individuals included in the study. In the current study, 85.5% of males and 14.5% of females were included. This shows that males were more prone to road traffic accidents and violated traffic rules compared to females. Therefore, the present study findings were similar to the study done by Arangio et al. [17] in which 83% of males met with the road traffic accidents, who seemed to be reluctant to follow traffic rules and consumed alcohol while driving predominantly on weekend nights.

The majority of the individual (66.1%) who met with road traffic accidents were in the age group of 25-44 years. Similarly, Zhou et al. [18]. Reported that the highest occurrence of road traffic accidents were in the third and fourth decades of life, had the tendency to be more irresponsible drivers, rendering them more vulnerable to injuries. In a study conducted by Al Ahmed et al. [19]. Concluded that maximum fractures were seen among males in the third decade. On the assessment of the facial fracture, the majority of the individuals had Lefort 3 fracture (44%), followed by Lefort 2 fracture (35.4%). The present study was similar to the findings of the study conducted by Arangio et al. 17, in which the most prevalent site of the fracture was zygomatic bone. More sutured wounds

were found in study subjects compared to other injuries like laceration and abrasion. Although, the Lefort III fracture was found mostly in two-wheeler drivers, whereas Lefort II fracture was found more in four-wheeler drivers. No statistically significant difference was obtained among the two and four-wheeler drivers in the variables which include the type of injuries and Lefort fracture (P-value >0.05), whereas there was a statistically significant difference in dentition status and soft tissue injury among the two and four-wheeler riders (P-value <0.05), the reason may be attributed to the fact that two-wheeler drivers are more vulnerable to injuries than that of four-wheelers drivers[20]

In a study conducted by Tainio et al[21] the disability adjusted life years was calculated for all the study participants. Among them 31% of the patients, who had severe injuries, lost 14.7 years of their lifetime. In the current study, after calculating the Disability adjusted life years, calculated years lost was 31-40 years due to disability, as a consequence of road traffic accident by significant number of patients (42.3%). Disability adjusted life years denoted the health impact which had severe dysfunction in the physical body due to road traffic accidents. It reveals that the patients normal life expectancy was reduced due to nature of injuries after the road traffic accidents. A quality-adjusted life-years questionnaire was recorded among the study participants. The 15-D questionnaire was based on the physical, psychosocial, functional and disability. All fifteen variables of a 15-D questionnaire, namely hearing, breathing, discomfort and symptoms, depression, distress, and vitality, were statistically significant among two-wheelers and four-wheeler drivers who drove the vehicle at the time of the accident. This may be due to the fact that in the present study, the extent and severity of the injury among two-wheelers drivers were significantly more than that of four-wheeler drivers.

The maximum mean QALY value of the combined 15 variables of the 15-D questionnaire for an individual was 4.8 in the study conducted by Tsauo et al[22]. In the present study, after calculating QALY, it was found that maximum mean QALY value was 4.0.Similarity in the maximum mean QALY value of the current study , with the findings of the study conducted by Tsauo et al[22] may be attributed to the fact that both studies emphasized that the type of injuries was a crucial factor which determined the individuals quality of life. The strength of this study included, both objective and subjective measurement were analyzed among the patients who met with road traffic accident.

Limitations

The limitations being the possibility of measurement bias while recording the questionnaire of risky driving behaviour from the patient who had met with a road traffic accident. In addition, while assessing their behaviour via questionnaire, memory recall bias would have been encountered.

Conclusion

The present study concluded that subjects with maxillofacial injuries and other bodily injuries were affected the patient's quality of life. Majority of road traffic accidents was caused by distraction, failed to notice the pedestrians, rash driving,

failed to check the mirror. Proper measures should be taken by the Government to enforce strict traffic laws and actions.

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