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Epidemiological perspective of facial trauma in Ecuador

Perspectiva epidemiológica del trauma facial en Ecuador

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ABSTRACT: Facial trauma (FT) due to vehicular accident is considered worldwide as a high impact event. The World Health Organization (WHO) in 2013, reports that every year 50 million people suffer from trauma due to a vehicle accident. The objective is to determine the prevalence of FT due to vehicular accident with the data obtained in the main hospitals of the largest population cities in Ecuador and carry out an epidemiological framework in 2017. Were included 762 patients with facial trauma admitted to the emergency area of the 11 most representative hospitals in 8 Cities of Ecuador in 2017. The prevalence of Facial trauma in Ecuador was 3%. There was a predominance of male with 77.60%. Regarding the age, young adults (20-44 years) with 61.81% was the most prevalent. According to the type of vehicle, there was a predominance in cars with 58%. The upper third was the most affected with 46%. In conclusion, Ecuador needs to take measures to strengthen road safety, in order to create strategies to reduce current statistics and avoid this serious problem that entails serious injuries, disability or even death.

KEY WORDS: Facial trauma, emergency, accident, Ecuador.

INTRODUCCIÓN

Facial trauma (FT) due to vehicular accident is considered as a high impact event. The World Health Organization (Peden *et al*., 2002), in the "Road Safety Report, carried out in 2013, reported that every year 50 million people suffer from trauma due to a vehicle accident in the world; in the same line, they show a 1.24 million deaths due to a vehicle accident, which means 3,500 to 3,600 people died per day. The traffic accident constituting the eighth cause of deaths in the world and the first in people between 15 and 29 years of age. 20 to 50 million people suffer non-fatal injuries, and many of those injuries cause disability (Peden *et al*., 2002). The WHO states that 50% of people under facial trauma as a result of vehicle accidents die annually (Morales Navarro & Vila Morales, 2016). The Pan American Health Organization (PAHO) reports that 154,089 people die every year due to a FT as a result of vehicular accidents, which represents 12% of deaths in the world (PAHO, 2016); with an adjusted rate vehicle traffic mortality of 15, 8 per 100,000 people is one of the main causes of morbidity and mortality worldwide (OPS, 2011).

In Ecuador, in recent years, the traffic accident mortality rate has increased, ranking fourth in the cause of deaths within the national territory. In Latin America, Ecuador is located as the second country with the highest number of accidents for this cause; according to data from the Road Justice in Ecuador, Ecuador shows a rate of 32 deaths per 100,000 inhabitants, data that are alarming for the Ecuadorian government (OPS, 2011).

According to the National Traffic Agency (ANT) in Ecuador, in 2017, an average of 28,967 vehicle accidents

were reported; In these accidents, 2,153 people were killed and 22,018 had facial injuries such as: multiple fractures, lacerations, bruises and burns (Agencia Nacional de Tránsito del Ecuador, 2022).

The current problem in Ecuador is that there is no study showing an epidemiological framework about facial trauma due to vehicular accident; if we add that it is a frequent cause of admission to the emergency in hospitals of Ecuador, it is a public health problem, due to the high economic impact, as well as the different degrees of disability, organ dysfunction (visual and smell loss, chewing problems), aesthetic involvement and days of hospitalization.

Therefore, the aim of this research was to determine the prevalence of facial trauma due to vehicular accidents in Ecuador in 2017, with the data obtained in the main hospitals of the cities with the largest population in Ecuador and to carry out an epidemiological framework.

MATERIAL AND METHOD

A documentary and observational strategy was performed in this research. The sample was non-probabilistic and consisted of 762 patients with FT admitted to the emergency in the 11 most representative hospitals in Ecuador in 2017. The health system in Ecuador is coordinated by the Ministry of Public Health, which categorizes care into 4 levels. The hospitals in which the investigations were carried out correspond to the third or fourth level, with specialists in all surgical areas including maxillofacial and craniofacial surgery.

All records of patients admitted to the emergency area following a facial trauma due to vehicular accident, vehicle drivers, motorcyclists that suffered an accident and their passengers were included. All patients with facial trauma who did not come from a vehicle accident, pedestrians, cyclists and public transport passengers were excluded.

The analysis of the hospital database was performed using the Microsoft Excel version 2010 program. The data was refined and demographic variables such as age, sex, vehicle and specific variables were selected. Through the same Excel version 2010 program, descriptive measures such as frequencies, percentages were made.

The prevalence was evaluated using the formula:

$$\text{Eq. (A. 1)}\ p = \frac{\text{Total of facial trauma due to vehicular accident}}{\text{Total of facial trauma (others causes)}}$$

A confidentiality agreement was signed by the board of directors of the Academic Unit of Health and Welfare of the Catholic University of Cuenca and by the bioethics committee of the San Francisco of Quito University approved this research under the protocol 23155744.

RESULTS

Were admitted 25537 patients who presented FT in the 11 hospitals of Ecuador included in this research; (n = 762) (3%) presented FT due to vehicle accident (Table I). The HCAM, HGA and HGDA hospitals had the highest number of patients with FT due to a vehicle accident (n = 120), on the other hand, the HDL showed the lowest admission (n = 14) (Table II).

There was a predominance of male individuals with 77.60% (n = 591). Regarding the age, the young adults (20-44 years) with 61.81% (n = 471) was the most prevalent group. According to the type of vehicle, there was a predominance in cars with 58% (n = 442). The upper third was the most affected with 46% (n = 351) (Table III).

The male group was the most frequent in a car accident 79% (n = 349), the lowest number of accidents occurred in the female and was related mainly to motorcycle 24% (n = 76). Table IV show the facial trauma observed in this research, comparing with another research observed in different countries.

Table I. Prevalence of facial trauma by vehicle accident in Ecuador.

	Nº	%
FT by vehicle accident	762	3
FT by other causes	24775	97
TOTAL	25537	100

DISCUSSION

The results obtained in the present study related to the prevalence, sex, age group, type of vehicle and third affected in a FT can vary according to the amount of population, geographic region, culture, economy. Table II show an analysis related to other countries

The prevalence of FT due to vehicle accident was 3% (n = 762) in this study. There is a difference with other

Table II. List of Ecuadorian Hospitals included in this research.

Hospital	Institution	City	Province	Inclusion
Hospital Regional José Carrasco Arteaga	IESS	Cuenca	Azuay	9% (n=21)
Hospital Regional Verdi Ceballos Balda	MSP	Porto viejo	Manabí	37% (n=21)
Hospital Carlos Andrade Marín	IESS/ MSP/SSC	Quito	Pichincha	4% (n=120)
Hospitales General Ambato y Hospital General Docente Ambato	IESS	Ambato	Tungurahua	1.08% (n=120)
Hospital General de Machala	IESS	Machala	El oro	32% (n=23)
Hospital de Especialidades Albert Gilbert Pontón	MSP	Guayaquil	Guayas	36.4% (n=78)
Hospital Vicente Corral Moscoso	MSP	Cuenca	Azuay	3% (n=151)
Hospital del Día	IESS	Loja	Loja	2.63% (n=14)
Hospital los Ceibos	IESS	Guayaquil	Guayas	2.39% (n=91)
Hospital Isidro Ayora	MSP	Loja	Loja	20.3% (n=91)
Hospital Provincial General Docente de Riobamba	MSP	Riobamba	Chimborazo	18% (n=32)

Table III. Distribution of the sample by age, sex and vehicle involved.

Age	Nº	%
First childhood (0-5)	25	3.28
Childhood (6-9)	18	2.36
Early adolescence (10-14)	26	3.41
Late adolescence (15-19)	90	11.81
Young adult (20-44)	471	61.81
Middle adult (45-64)	98	12.86
Adult major (>64)	34	4.46
Total	762	100
Sex		
Male	591	77.60
Female	171	22.40
Total	762	100
Vehicle		
Car	442	58
Motocycle	312	41
Otros	8	1
Third affected		
Upper third	351	46
Middle third	161	21.10
Lower tertium	94	12.30
Combined	39	5.11
Panfacial	117	15.35
Total	762	100

studies carried out in countries of Latin America and the world. In Chile (González *et al*., 2015), a study was carried out that showing the car accidents as the first cause of FT (39.2%). In a study conducted in Brazil (Sawazaki *et al*., 2010), it showed that the main cause of fractures of the mandibular condyle was due to vehicle accidents with 57.8%.

Discrepancy was found with a study conducted in New Zealand (Lee, 2012), where the first cause of FT was Interpersonal Violence (45%) and traffic injuries of FT are attributed only to 14%; a study conducted in Mexico (Gamboa Montes de Oca *et al*., 2013), shows that the main cause of FT was personal violence with 50% and in the second place was attributed to vehicle accidents with 21%. Differences between countries can be related to the social life conditions and the develop in their transport systems, road education and traffic laws.

In Ecuador, the male was the most affected of FT due to a vehicle accident with 77.60% (n = 591); the studies in different countries of Latin American show the same trend as Colombia (82.1% to 62.1%) (Agudelo *et al*., 2015); Mexico (93% to 83.6%) (Gamboa Montes de Oca, 2013; Morales-Olivera, 2017), Chile (91.5% to 83%) (González *et al*., 2015; Faille Horwood & Badillo-Coloma, 2018); Brazil (74%, 78.1%, 79.7%) (Carvalho *et al*., 2010; Andrade Lins *et al*., 2011; Morales-Olivera, 2017), the same results are found in other

Table IV. Distribution of facial trauma in different countries.

Study / Author	Country / Year	Prevalence FT/ Sample	Age	Sex	Vehicle type	Facial Third affected
Present study	Ecuador	3% n=762	20-44 years 61.81% n=471	Male 77.60% n=591	Car 58% n=442	Upper third 46% n=351
Lee *et al.,* 2012	New Zeland	14% n= 2,563	16-30 years 52.8% n=1,330	Male 8:2 (81.3%) n=2,094	NA	Lower third 40% NA
Agudelo *et al.,* 2015	Colombia	60% n=1,609	≤ 24 years 49.8% n=801	Male 82,1% n= 1,321	Motorcycle 57,9% n=932	Lower third 56,2% n=904
Gamboa Montes de Oca *et al.*, 2013	México	21% n= 409	NA	Male 93% n =382	Motorcycle 46% NA	Lower third 61% n= 351
Luna *et al.*, 2017	Colombia	NA n= 21,286	14-29 years 47.2% NA	Male 62,1% NA	Motorcycle 85.8% NA	NA
González *et al.*, 2015	Chile	39.2% n=283	40-49 years 25.44% n=72	Male 91.5% n=259	Car 16.6% n=47	Middle third 77.7% n=220
Faille Horwood & Badillo-Coloma, 2018	Chile	19,64% n=230	20-29 years 30% n=69	Male 83% n=192	NA	Lower third 47.8%
Andrade Lins *et al.,* 2011	Brasil	26% n=300	20-30 years 45% n=135	Male 74% n=222	Car 26% n=80	Middle third 15% n=45
Morales-Olivera *et al.*, 2017	México	18.1% n=4,814	36 years NA	Male 83.6% n=4,025	Car 18.1% n=871	Lower third NA
Agnihotri *et al.*, 2014	India Burhanpur	100% n= 350	21 a 50 years 68.85% n= 241	Proportion man - woman 6.3/1 NA	Motorcycle 53.71% n=188	Nasal bone (middle third) 23.7% n= 102
Nóbrega *et al.,* 2014	Brasil	16,4% n=2,570	35 a 59 years 47.7% n=1,112	Male 78.1% n= 2003	Motorcycle 67.8% n = 1,689	Politrauma 44,3% n=186
Carvalho *et al.*, 2010	Brasil	16.6% n=355	young adult (18 a 40 years) 69.5%	Male 79.7% n=283	Car 16.6% n=59	Lower third 44.2% n = 157
Sawazaki *et al.*, 2010	Brasil	57.8%	Middle Ages 28.4 years NA	Proportion man - woman de 3.05: 1 NA	Motorcycle 86.8% NA	Condylar apophysis
Allareddy *et al.*, 2011	EEUU	12.1% n = 49,121	37.9 años NA	Male 68% n = 277,086	NA	Nasal bones, closed 55.8% n = 27,024

countries of the world such as New Zealand (81.3%, with a male-female ratio of 8:2); and India (male to female ratio 6.3:1) (Agnihotri *et al*., 2014). It is evident that men are more likely to suffer FT due to a vehicle accident.

The age group with the highest percentage was the young adult (20-44 years) with 61.81% (n = 471) in this research; this is because the people over 18 years old have the chance to drive and young and young adult group are more involved in the FT due to vehicular accident (Carvalho *et al*., 2010; Lee, 2012; Agnihotri *et al*., 2014; Agudelo *et al*., 2015; Luna *et al*., 2017), as showed in table 1. This data is in disagreed with a study conducted in Chile (González *et al*., 2015), where they showed that the highest percentage occurred in people aged 40-49 years (25.44%), probably because the differences in the criteria for inclusion of subjects.

The car was the most common vehicle involved in FT (58%, n = 442). The same trend was observed in countries like Chile and Mexico with 16.6% and 18.1% respectively (González *et al*., 2015; Morales-Olivera, 2017). Interesting, there is a difference with the experience in India where motorcycles show a higher percentage of 53.71% (Agnithotri), also in Latin America there is a discrepancy in this trend, like in Colombia and Brazil (Sawazaki *et al*., 2010; Nóbrega *et al*., 2014; Agudelo *et al*., 2015; Luna *et al*., 2017). The sociodemopraghical conditions in countries are related to differences in the cause and type of facial trauma; even within the same countries there is a difference, because some cities can use the motorcycle or bicycle as the main system for transport.

Geographical variations, the energy of trauma, the vehicle involved, and the mechanism of the lesion may be responsible for difference in the main area of the face involved in the trauma. In the present study, the upper third 46% (n = 351) was the most affected. Most studies from different places of the world show different results, with the lower third (jaw) being the area with the greater number of fractures. The middle third is also frequently affected.

CONCLUSIONS

In the eleven most concurred hospitals of Ecuador, 762 patients were admitted to the emergency area with facial trauma due to vehicular accident, which constituted a prevalence of 3%. The male was 77.60%, the age group was mainly young adult (20-44 years) and the car was the most prevalent vehicle.

Ecuador, like other world populations, needs to take measures to strengthen road safety, including the government, public and private entities; the transport system, police, health and education systems, users and the general population look for solutions in order to create or strengthen strategies or action plans and that help to reduce these annual statistics. In the same line, all the responsible must improve the planning of care, allocation of funds, training, health education and trauma prevention.

Competing interests. The authors declare that they have no competing interests. Institutional resources were used to carry out the study (11 Hospitals of Ecuador). There was no conflict of interest at the time of data collection in each hospital.

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RESUMEN: El trauma facial (FT) debido a accidentes vehiculares es considerado mundialmente un evento de alto impacto. La Organización Mundial de la Salud (OMS) en 2013 reportó que cada año 50 millones de personas sufren de trauma debido a accidentes vehiculares. El objetivo fue determinar la prevalencia de FT debido a accidente vehicular con datos obtenidos de los principales hospitales en las ciudades más pobladas en Ecuador y, organizar la visión epidemiológica de 2017. Fueron incluidos 762 pacientes con trauma facial admitidos en la emergencia de 11 hospitales representativos en 8 ciudades del ecuador en el año 2017. La prevalencia de trauma facial en Ecuador fue de 3%: Hubo un predominio de hombres con un 77,6%. En relación a la edad, los adultos jóvenes (20-44 años) con 61,81% fueron los más prevalentes. De acuerdo con el tipo de vehículo hubo un predominio de automóviles (58%). El tercio superior fue el más afetado (46%). En conclusión, Ecuador necesita de cuidados para organizar la seguridad vial a fin de crear estrategias para reducir las estadísticas actuales y evitar problemas serios en lesiones, invalidez e incluso muerte.

PALABRAS CLAVE: Trauma facial, emergencia, accidente, Ecuador.

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