Disability and Quality of Life after a Traffic Accident in Medellín and its Metropolitan Area. Cohort Study*

Discapacidad y calidad de vida después de un accidente de tránsito en Medellín y su área metropolitana. Estudio de cohorte

Incapacidade e qualidade de vida após um acidente de trânsito em Medellín. Estudo de coorte

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Abstract

Objective. This work sought to compare after one year, functioning, quality of life (QoL), pain, and depression among adults over and under 60 years of age who suffered moderate and serious injuries in traffic accidents occurring in Medellín and its metropolitan area. **Methods:** Secondary analysis of two cohorts of patients with moderate and serious injuries occurring in Medellín and its metropolitan area in 2009-2010 and 2015-2016. Assessment was performed for functioning, QoL, depression, and pain, with instruments validated for such. Differences between the cohorts 12 months after the accident were compared with *Student's t.* A multiple linear regression analysis was conducted to determine the explanatory factors of disability and QoL. **Results: T**he study included 837 patients, of which 84.8% completed the follow up. Motorcycles were the principal vehicles involved (86.1% and 60.7%). Better functioning was observed in those > 60 years of age in personal care, and higher commitment in activities of daily living, work, and global functioning. Quality of life was significantly better in younger participants, on emotional performance, physical performance, and physical function. In the multivariate analysis, the higher commitment in functioning was explained by being women, with higher age, more serious injury, greater pain and depression. The best QoL was explained by being men, less age, lower severity of the lesion, pain, and depression symptoms. **Conclusions.** Age, sex, severity of the lesion, pain, and depression explain the disability and QoL dimensions 12 months after the traffic accident.

----------*Keywords:* traffic accidents, functioning, quality of life, pain, depression.

Resumen

Objetivo. Comparar al año, el funcionamiento, calidad de vida (CV), dolor y depresión entre adultos menores y mayores de 60 años que tuvieron lesiones moderadas y graves en accidentes de tránsito ocurridos en Medellín y su área metropolitana. **Métodos:** Análisis secundario de dos cohortes de pacientes con lesiones moderadas y graves ocurridas en Medellín y su área metropolitana en 2009-2010 y 2015-2016. Se evaluó para el funcionamiento, la CV, depresión y el dolor, con instrumentos validados para ello. Las diferencias entre las cohortes 12 meses después del accidente se compararon con *t-Student.* Se hizo un análisis de regresión lineal múltiple para determinar los factores explicativos de discapacidad y CV. **Resultados.** Se incluyeron 837 pacientes, de los cuales el 84,8 % completó el seguimiento. La motocicleta fue el principal vehículo involucrado (86,1 % y 60,7 %). Se observó mejor funcionamiento en mayores de 60 años en cuidado personal, y mayor compromiso en las actividades de la vida diaria, laborales y funcionamiento global. La CV fue significativamente mejor en menores, en desempeño emocional, desempeño físico y función física. En el análisis multivariado, el mayor compromiso en el funcionamiento fue explicado por ser mujer, tener más edad, lesión más grave, mayor dolor y depresión. La mejor CV fue explicada por ser hombre, menos edad, menor gravedad de la lesión, dolor y síntomas depresivos. **Conclusiones:** La edad, el sexo, la gravedad de la lesión, el dolor y la depresión explican la discapacidad y las dimensiones de la CV 12 meses después del accidente de tránsito.

----------*Palabras claves:* accidente de tránsito, calidad de vida, depresión, discapacidad, dolor, Medellín (Colombia).

Resumo

Objetivo: Comparar a funcionalidade, qualidade de vida (QV), dor e depressão entre adultos com menos e mais de 60 anos de idade que sofreram lesões moderadas e graves em acidentes de trânsito ocorridos em Medellín e sua região metropolitana. **Métodos:** Análise secundária de duas coortes de pacientes com lesões moderadas e graves que ocorreram em Medellín e sua área metropolitana em 2009-2010 e 2015-2016. Foi feita avaliação funcional, cv, depressão e dor, com instrumentos validados para isso. As diferenças entre as coortes 12 meses após o acidente foram comparadas com o teste t de Student. Uma análise de regressão linear múltipla foi realizada para determinar os fatores explicativos para deficiência e cv. **Resultados:** foram incluídos 837 pacientes, dos quais 84,8% completaram o seguimento. A motocicleta foi o principal veículo envolvido (86,1 e 60,7%). Melhor funcionamento foi observado em pessoas com mais de 60 anos nos cuidados pessoais e maior comprometimento nas atividades de vida diária, trabalho e funcionamento global. A QV foi significativamente melhor nos menores, no desempenho emocional, no desempenho físico e na função física. Na análise multivariada, o maior comprometimento funcional foi explicado por ser mulher, ser mais velho, lesão mais grave, maior dor e depressão. A melhor QV foi explicada por ser homem, menor idade, menor gravidade da lesão, dor e sintomas depressivos. **Conclusões:** Idade, sexo, gravidade da lesão, dor e depressão explicam as dimensões de incapacidade e QV 12 meses após o acidente de trânsito.

----------Palavras-chave: acidente de trânsito, qualidade de vida, depressão, incapacidade, dor, Medellín (Colômbia)

ntroduction

In 2016, the number of deaths due to traffic accidents in the world was of 1.35-million people [1].† Low- and medium-income countries have approximately 60% of the world's vehicles and in them occur > 93% of the deaths due to traffic accidents (TA) [2]. Between 2009 and 2018, the characteristics of those injured and dead in TA remained similar, with greater affectation of men and of "vulnerable road users" (World Health Organization): pedestrians, bicycle riders and motorcycle occupants [2,3].

In Colombia, these TA represent 50% of traumatic injuries and are the second cause of violent death [3]. According to the National Institute of Legal Medicine and Forensic Sciences, in Colombia, in 2019, there were 36,832 injured in TA, with a rate of 74.51 per 100.000 inhabitants and 6,885 fatal injuries, with a rate of 13.94 deaths per 100.000. Those > 60 years of age contributed with 11% of those injured and 21.4% of the deaths for the year [cited in 3].

Medellín was the country's third city with higher number injured, 2,582 (104.04 per 100.000), and dead, 250 (10.07 per 100.000), in 2019 [3]. In 2019, the city of Medellín adopted the Vision Zero approach through Decree 261 of 2019 and implemented it as part of the "2020-2023 Development Plan 'Future Medellín'" [4]. This Safe Mobility approach in Medellín has the purpose to ensure that the acceptable number of deaths and injuries of victims on the roads is zero.

Proportionally, for every death due to a TA, tens of people injured acquire some limitation in their functioning and quality of life (QoL) [2,5]. These effects have been related with age, environment, characteristics of the accident, type and severity of the lesion, associated morbidities, information received by the patient, medical care, and the rehabilitation process provided [5-8]. "*Functioning* is a general term for bodily functions and structures, activities and participation. It denotes the positive aspects of the interaction between an individual with a health condition and the contextual, environmental, and personal factors of this individual" [9, p. 8]. "*Disability* is a general term for deficiencies, limitations in activity or restrictions in participation, and denotes the negative aspects of the interaction of an individual with a health condition and the contextual, environmental, and personal factors of this interaction" [9, p. 8]. In turn, the World Health Organization defines *quality of life* as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [10].

Age is one of the determining factors of disability and QoL after a lesion due to a TA, given that older individuals have lower recovery capacity, physiological changes related with age, higher probability of preexisting comorbidities, and greater incidence of post-traumatic complications. However, studies are heterogeneous and evidence needs to be consolidated to determine which are the most important factors in these outcomes in older people and what makes them more vulnerable compared to young people [2,11].

Thus, the aim of the study was to compare, after one year, functioning, QoL, pain and depression among adults over and under 60 years of age who suffered moderate and serious injuries in TA occurring in Medellín and its metropolitan area.

Methods

This research included two cohorts of individuals who suffered traffic accidents in Medellín. The first had not included those over 60 years of age and due to this, the second cohort was carried out; thereafter, it was found that important differences existed between both cohorts, which is why it was decided to undertake this new project, comparing both cohorts to try to explain similarities and differences.

This section, then, states the type of study, participants, how the sample was selected, evaluation of the participants, and the evaluation instruments for both cohorts, as well as the statistical analysis developed to achieve the results expected.

Type of study

Secondary analysis of data from people included in two cohort investigations with follow up after one year; carried out, the first, with individuals from 18 to 60 years of age who had a TA between 2009 and 2010, and the second, in those over 60 years of age with TA taking place between 2015 and 2016 in Medellín and its metropolitan area [5,12].

Participants

Both studies included patients who had, according with the scale New Injury Severity Score (NISS), moderate injuries (NISS between 4 and 15) or serious injuries (NISS > 15) (this evaluation is introduced later), caused by TA, residing in Medellín or its metropolitan area, attended in hospitals of the city and who accepted to participate in the studies.

Patients who presented a cognitive or state of consciousness compromise that prevented them from answering the interview questions during the first 30 days after TA were not included.

† Translations of texts cited are by the authors.

Sample

Information from all the patients who entered the studies was used: 590 < 60 years of age and 247 > 60 years of age. One year after the TA, data were obtained from 480 (57.3%) of the younger patients and 230 (27.5%) of the older patients.

The patients were attended in the following health provider institutions (IPS): CES Clinic, Conquistadores Clinic, Las Américas Clinic, SOMA Clinic, Bolivariana University Clinic, Empresa Social del Estado La María Hospital, Empresa Social del Estado Metrosalud, General Hospital of Medellín, Pablo Tobón Uribe Hospital, University Hospital San Vicente Fundación, and University IPS.

The sample was collected consecutively in the participating institutions. Each IPS delivered the weekly registry of patients attended in their emergency service. If the subjects met the inclusion criteria, they were contacted via telephone by a research aide.

During the call, they were explained the aim of the research and were informed that their personal data would be safeguarded by Legislation 1581 of Personal Data Protection [13]. If they accepted to participate, they were scheduled for an interview in the University Research Headquarters at Universidad de Antioquia; if the patient was unable to travel, the interview was conducted in their home. Again, they were invited to participate and if they accepted, they were required to sign an informed consent.

The professional who carried out the interviews in both investigations were from the health area, trained in the application of these instruments. An initial evaluation was made, and two others at 3 and 12 months.

Both studies were approved by the Bioethics Committee of the Faculty of Medicine at Universidad de Antioquia (minutes 221 of 25 June 2008 and 007 of 26 May 2014) and complied with the standards in Resolution 8430 of 1993 by the Colombian Ministry of Health [14] and the Declaration of Helsinki [15].

Evaluation of the participants

The evaluation included sociodemographic variables, employment status, presence of disability prior to the lesion, characteristics of the accident, protection measures used, clinical and attention characteristics, disability, QoL, pain, anxiety, and depression.

Both cohorts used the same patient evaluation instruments, as described ahead.

Severity of the lesion

This was scored with the NISS, which generates a global score in patients with multiple trauma. It is based on the *abbreviated trauma scale,* which assigns scores from 1 to 6 in relation with the severity of the trauma, with 1 being a minor lesion and 6 being a lesion incompatible with life.

With the three highest scores, regardless of the body area affected, a sum of squares is performed to obtain the NISS score. Based on this scale, patients were classified with slight injuries (< 4), moderate injuries (4 to 15), and serious injuries (> 15) [16].

Disability

This was evaluated with the World Health Organization's Disability Assessment Scale II, WHO-DAS II), a 36-item scale for working people (which includes 4 items from work-life activities) and 32 items for unemployed people, grouped into six domains: comprehension and communication (CC), capacity to move in their environment (CM), personal care (PC), relationship with other people (RP), activities of daily living (ADL), and participation in society (PS).

The questions have a scale of five response options, which range from no difficulty to extreme difficulty in the last 30 days. The scores obtained in each item are added to generate a total score for each domain, and the 36-item global scores (GS36) and 32-item global scores (GS32) are transformed into a standard scale from 0 to 100, ranging from minor to major disability [17].

Quality of life

The Short Form-36 Health Survey was used, which is a 36-item generic scale of QoL that includes eight domains: physical function (PF), physical performance (PP), body pain (BP), general health (GH), vitality (VT), social function (SF), emotional performance (EP), and mental health (MH). Each domain is scored from 0 (worst) to 100 (best QoL) [18].

Depression

Evaluated through the Patient Health Questionnaire-9 (PHQ-9) to detect symptoms of depression in the last two weeks, based on the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders – 4th edition (DSM-IV).

The scores range from 0 to 27 and are categorized, thus: minimum depression symptoms, 0-4; slight, 5-9; moderate, 10-14; moderately severe, 15-19, and severe, 20-27 [19].

Pain

Evaluated through the visual analog scale (VAS), which allows patients to score their pain within a range from 0 to 10 capacity to move (cm), with 0 being absence of pain and 10 being the worst pain possible.

In patients with acute pain, values < 3 cm correspond to slight pain; between 3 and 6.5 cm, to moderate pain; and > 6.5 cm, to severe pain [20].

Statistical analysis

To describe, in both age groups, the sociodemographic, clinical, and accident variables, means and standard deviation (SD) were used or If the variable did not have a normal distribution, the medians and the interquartile range or absolute and relative frequencies were used.

For each participant, the difference between disability and QOL values at one year was calculated, except the beginning, and the averages of those differences were compared between both age groups through Student's t test.

A multiple linear regression analysis was made to determine the factors related with the disability and QoL, 12 months after the accident in both cohorts. The following were entered as categorized independent variables: sex, age, education, coexistence, socioeconomic level, vehicle involved, type of accident, NISS, PHQ-9 and VAS; and as dependent variable, the 32- and 36-item global scores and the scores of the domains CM, PC, ADL, and PS of the WHO-DAS II; and those of the domains of the SF-36: PF, PP, EP, and MH.

The estimates were made with 95% confidence interval (95% CI), and hypothesis tests, with 5% significance level.

All the statistical analyses were executed in the IBM SPSS-25® software, under license to Universidad de Antioquia.

Results

The results present the sociodemographic variables, functioning, and their differences, evaluated in both cohorts with the WHO-DAS II at initial mean (im) and 12 months after (m12), quality of life and its differences in both cohorts at im and 12 months after (m12), as well as the evaluation of depression (PHQ-9) and pain 12 months after the road incidents. Lastly, the study analyzed in the entire population over and under 18 years of age, the factors associated with disability according with each WHO-DAS II domain and factors associated with quality of life.

Sociodemographic description of the cohorts under and over 60 years of age

Of the 590 patients from the cohort 18-60 years of age, 344 (58.3%) had moderate injuries, and of the 247 from the cohort > 60 years of age, 229 (92.7%) had moderate injuries. At 12 months, 480 (81.4%) participants < 60 years of age were evaluated, with 271 (56.5%) having moderate injuries, and 230 (93.1%) > 60 years of age, with 214 (93.0%) with the same type of injury.

In the younger cohort, men were predominant (82.2%), with schooling of 10.4 years (SD: 3.9); 70.5% of those injured were drivers, and the most-frequent type of accident was a collision (54.4%). In the older cohort, 51.0% of the men had schooling of 5.5 years (SD: 4.2); 70.9% were pedestrians and the most-common type of accident was getting run over (73.7%) (Table 1).

Table 1. Sociodemographic clinical, and accident characteristics in people over and under 60 years of age in Medellín and its metropolitan area

Base line characteristics		18-60 years of age n = 590 # (%)	> 60 years of age n = 247 # (%)
Age*		32.2 (11.0)	71.4 (7.1)
Men		485 (82.2)	126 (51.0)
Education in years *		10.4 (3.9)	5.5 (4.2)
Coexistence	Alone	40 (6.8)	37 (15.0)
	Family, friends/others	550 (93.3)	210 (85.0)
Condition of the injured party	Pedestrian	101 (17.2)	175 (70.9)
	Cyclist	12 (2.1)	4 (1.6)
	Motorcycle driver	380 (64.7)	21 (8.5)
	Motorcycle Passenger	60 (10.2)	16 (6.5)
	Vehicle driver or Passenger	34 (5.8)	31 (12.5)

Vehicle involved	Motorcycle	508 (86.1)	150 (61.5)
	Automobile	48 (8.1)	56 (23.0)
	Bus	24 (4.1)	32 (13.1)
	Truck. van. station wagon. camper	0 (0.0)	6 (2.4)
	Bicycle	9 (1.5)	0 (0.0)
Type of accident	run over	149 (25.3)	182 (73.7)
	Fall of occupant	88 (14.9)	30 (12.1)
	Collision or crash	321 (54.4)	23 (9.3)
	Overturning	30 (5.1)	9 (3.6)
PHQ-9	Without depression	276 (46.8)	90 (36.4)
	Moderate depression	270 (45.8)	129 (52.2)
	Severe depression	44 (7.5)	28 (11.3)

* Average (standard deviation).

PHQ-9: Patient Health Questionnaire-9.

In both cohorts, most of the patients belonged to the low socioeconomic level (39.1% and 38.1%) and medium-low (38.0% and 36.4%), and the principal vehicle involved were motorcycles (86.1% vs. 60.7%, respectively).

Description of functioning in people under and over 60 years of age, one year after the traffic accident

During follow up after one year, improvement was evidenced in al the WHO-DAS II domains, except in CC in both cohorts (Table 2 and Figure 1).

The CC and RP domains were the least affected initially and, in turn, the ones with the lowest changes 12 months later.

Those > 60 years of age had better score than those younger in the PC domain ($p = 0.004$).

In the older cohort, ADL were more compromised and one year later continued with a compromise of 24.6 (30.3) in the scale from 0 to 100 ($p = 0.032$), and the GS36 items 12 months later, with higher compromise in the older cohort 40.5 (20.7) vs. 16.4 (18.9) in the younger cohort ($p < 0.001$).

Table 2. Differences in disability (WHO-DAS II) in people under and over 60 years of age, 12 months after the TA.

Domains	18-60 years of age			> 60 years of age			p value
WHO-DAS II	im	m12	m12 – im	im	m12	m12 – im	
	Mean (SD)						
Comprehension and communication (CC)	11.0 (14.9)	11.8 (18.3)	0.7 (21.7)	8.3 (15.4)	8.3 (13.5)	0.1 (16.5)	0.686
Capacity to move in their environment (CM)	52.3 (37.2)	23.8 (27.1)	−28.4 (39.7)	54.0 (38.5)	24.1 (27.59)	−29.9 (36.1)	0.614
Personal care (PC)	39.5 (27.0)	7.8 (17.8)	−31.4 (30.3)	44.3 (30.6)	6.2 (14.9)	−38.2 (30.4)	0.004*
Relationships with other people (RP)	11.2 (16.0)	7.2 (16.2)	−4.0 (20.4)	4.2 (10.0)	1.2 (4.8)	−3.0 (11.0)	0.448
Activities of daily living (ADL)	60.0 (38.0)	15.5 (26.3)	−43.0 (45.5)	62.1 (42.5)	24.6 (30.3)	−37.5 (47.5)	0.131
Work-life activities	68.0 (37.1)	22.3 (32.9)	−45.2 (47.8)	75.5 (38.1)	40.1 (40.2)	−34.5 (47.1)	0.032*
Participation in society (PS)	46.3 (22.1)	22.4 (25.2)	−23.3 (29.5)	45.7 (26.8)	22.9 (23.4)	−22.8 (32.0)	0.806
Global score 36 (GS36)	39.8 (19.6)	16.4 (18.9)	−23.6 (24.5)	39.1 (20.6)	40.5 (20.7)	−0.5(24.4)	0.000*
Global score 32 (GS32)	35.6 (18.3)	16.0 (18.3)	−19.3 (23.4)	35.2 (19.7)	14.5 (14.5)	−21.0 (21.0)	0.369

SD: Standard deviation; im: initial mean of the evaluation; m12: mean of the evaluation at 12 months; m12-im: Difference of the average m12 and im within each cohort; WHO-DAS II: World Health Organization's Disability Assessment Scale II.

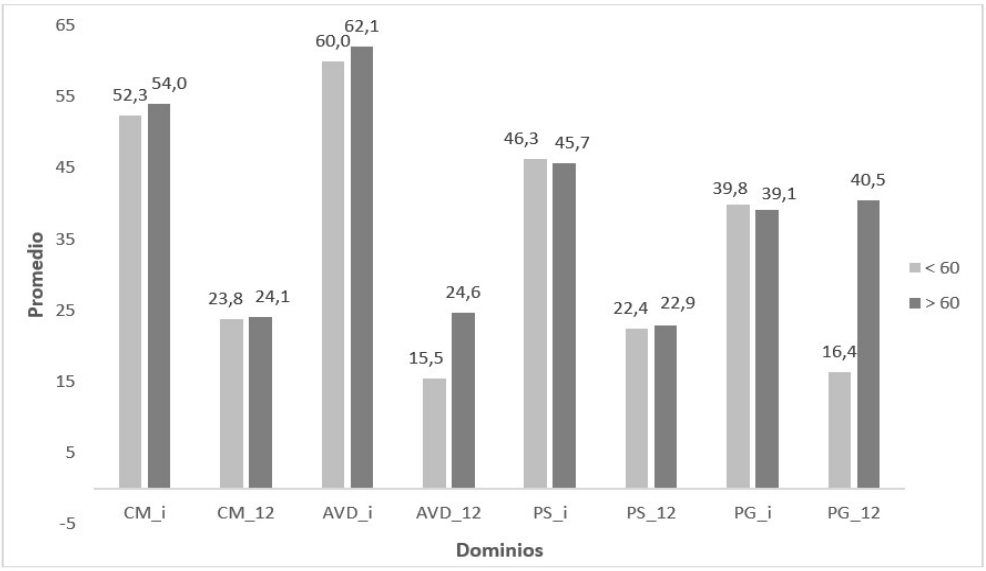

Figure 1. Comparison of disability (WHO-DAS II), initially and after 12 months, among people with TA over and under 60 years of age. CM_i: Capacity to move in their environment, initial; CM_12: Capacity to move in their environment, after 12 months; ADL_i: Activities of daily living, initial; ADL_12: Activities of daily living, after 12 months; PS_i: Participation in society, initial; PS_12: Participation in society, after 12 months; PG_i: Global score 36 items, initial; PG_12: Global score 36 items, after 12 months*.

* Statistically significant differences.

Quality of life in people under and over 60 years of age, one year after the traffic accident

In the SF-36, the domains most affected in both cohorts initially were PP, PF and BP, followed by EP in the younger cohort, and PF, PP, BP and SF in the older cohort. Upon comparing both after one year, all SF-36 domains improved, with the biggest change in the younger cohort in EP, PP and PF; change in the older cohort was in PF, PP, BP and SF. The domains with significant differences between those under and over 60 years of age were EP 71.3 (41.0) vs. 65.5 (34.7) ($p < 0.000$), PP 58.7 (46.8) vs. 50.6 (38.0) ($p = 0.001$), and PF: 69.6 (29.1) vs. 66.6 (29.3) ($p < 0.031$) (Table 3 and Figure 2).

Table 3. Differences in quality of life (SF-36) in those under and over 60 years of age, 12 months after the TA

Domains	18-60 years of age			> 60 years of age			p value
SF-36	im	m12	m12 – im	im	m12	m12 – im	
	Mean (SD)						
Body pain (BP)	32.2 (24.1)	67.5 (29.0)	35.8 (33.5)	43.2 (29.4)	73.7 (26.0)	31.2 (33.0)	0.089
Emotional performance (EP)	40.3 (44.2)	71.3 (41.0)	29.5 (55.7)	57.1 (38.5)	65.5 (34.7)	7.0 (48.5)	* 0.000
Physical performance (PP)	8.7 (25.9)	58.7 (46.8)	50.0 (51.4)	13.9 (24.7)	50.6 (38.0)	36.6 (40.8)	* 0.001
Physical function (PF)	22.0 (28.5)	69.6 (29.1)	48.3 (32.6)	23.6 (28.5)	66.6 (29.3)	42.7 (31.1)	* 0.031
Social function (SF)	50.6 (28.8)	79.7 (25.7)	28.3 (34.7)	43.4 (33.5)	71.8 (28.8)	28.7 (40.5)	0.089

General health (GH)	67.3 (19.7)	69.6 (23.1)	2.7 (26.4)	64.6 (17.8)	66.5 (18.2)	2.5 (20.3)	0.908
Mental health (MH)	65.4 (20.7)	73.3 (21.3)	7.4 (23.6)	63.8 (21.7)	69.6 (21.8)	6.2 (26.2)	0.576
Vitality (VT)	63.4 (20.2)	67.7 (20.2)	3.8 (24.3)	63.0 (20.3)	69.6 (19.8)	6.7 (23.4)	0.369

*Statistically significant difference (< 0.05) of the comparison of the m12-im differences between both cohorts (18-60 and over 60 years of age).

SD: Standard deviation; im: Initial mean of the evaluation; m12: Mean of the evaluation at 12 months; m12-im: Difference of the m12 averages and im within each cohort; SF-36: Short Form-36 Health Survey.

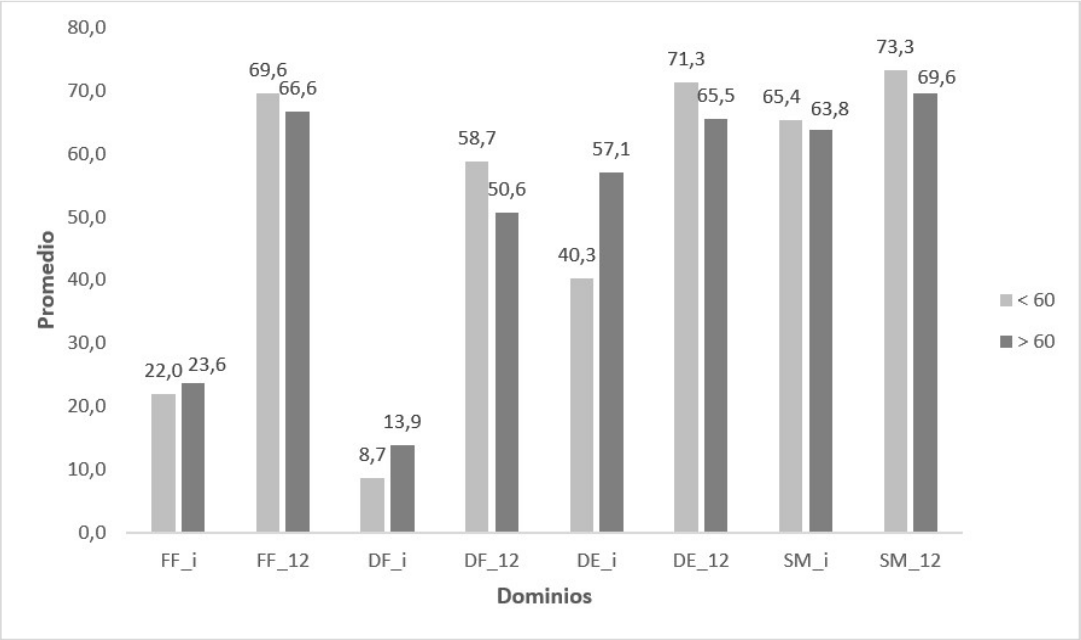

Figure 2. Comparison of quality of life (SF-36) initially and at 12 months among people with TA over and under 60 years of age. PF_i: Physical function, initially; PF_12*: Physical function, after 12 months; PP_i, Physical performance, initially; PP_12*, Physical performance, after 12 months; EP_i, Emotional performance, initially; EP_12, Emotional performance, after 12 months; MH_i, Mental health, initially; MH_12, Mental health, after 12 months.

*** Statistically significant differences.**

Depression and pain in people under and over 60 years of age, one year after the traffic accident

Diminished depression was noted in the PHQ-9 score, in the 12-month follow up: in those < 60 years of age, from 5.9 (5.0) to 4.5 (5.7); and in the older cohort, from 7.5 (5.8) to 4.7 (7.8). This difference between both cohorts was significant (p = 0.000). Thus, at one year, depression was slight in both cohorts.

Pain, in the younger cohort, went from 5.9 (5.0) to 4.5 (5.7) cm, and in the older cohort from 7.5 (5.8) to 4.7 (7.8). The difference in both cohorts was significant (p = 0.000). Thus, 12 months later, pain was moderate in both cohorts.

Factors associated with disability and quality of life 12 months after the traffic accident

In the multivariate analysis, one year after the TA, the CM domain of the WHO-DAS II is explained in 42% by sex, higher in men, and by living accompanied. This same domain is worse for older people, with greater severity of the lesion, greater pain, and greater depression symptoms (Table 4).

Table 4. Factors associated with the disability (WHO-DAS II), in the 12-month follow up after the TA

WHO-DAS II Domains		β coefficient	95% CI		p value*	R^2
Capacity to move in their environment (CM)	Sex (M/W)	−3.83	−7.58	−0.085	0.045	0.423
	Coexistence (A/S)	−7.44	−13.18	−1.69	0.011	
	NISS	0.675	0.44	0.91	0.000	
	VAS	4.06	3.48	4.64	0.000	
	PHQ-9	0.981	0.711	1.25	0.000	
	Age	0.144	0.055	0.233	0.002	
Personal care (PC)	Sex M/W	−3.03	−5.38	−0.69	0.011	0.272
	NISS	0.24	0.095	0.38	0.001	
	VAS	1.58	1.19	1.97	0.000	
	PHQ-9	0.68	0.5	0.86	0.000	
Activities of daily living (ADL)	Sex M/W	−8.49	−12.62	−4.35	0.000	0.309
	VAS	3.22	2.57	3.86	0.000	
	PHQ-9	0.828	0.53	1.13	0.000	
	Age	0.247	0.15	0.35	0.000	
	Coexistence (A/S)	−12.79	−19.1	−6.48	0.000	
	NISS	0.329	0.07	0.587	0.013	
Participation in society (PS)	Age	0.126	0.06	0.19	0.001	0.453
	NISS	0.448	0.248	0.648	0.000	
	VAS	3.87	3.37	4.36	0.000	
	PHQ-9	1.03	0.8	1.26	0.000	
Global score 36 items (GS36)	Age	0.584	0.52	0.65	0.000	0.562
	Sex M/W	−3.46	−6.3	−0.63	0.017	
	VAS	2.56	2.12	3	0.000	
	PHQ-9	0.86	0.68	1.08	0.000	
	NISS	0.194	0.018	0.37	0.031	
Global score 32 items (GS32)	Sex M/W	−3.26	−5.6	−0.92	0.006	0.383
	Education	−0.44	−0.67	−0.208	0.000	
	Coexistence (A/S)	−4.14	−7.8	0.473	0.027	
	NISS	0.464	0.321	0.608	0.000	
	PHQ-9	1.39	1.23	1.55	0.000	

* The table includes variables with statistical significance $p < 0.005$.

VAS: Visual analog scale; M/W: Man/Woman; CI: Confidence interval; NISS: New Injury Severity Score; PHQ-9: Patient Health Questionnaire; R^2: Determination coefficient. A: Accompanied, S: alone

The PS in both cohorts was determined in 45.3% by age, and was worse for those who were older, had greater severity of the lesion, more pain and greater depression. Worse functioning, measured by the GS36, was explained in 56.2% by being female, being older, greater severity of the lesion, more pain, and greater depression symptoms.

The best QoL in the PF dimension was explained in 46.6% through lower severity of the lesion, lower pain and depression, and better for men. Having lower PP was explained in 39.1% for being a woman, being younger, lower severity of the lesion, lower pain and less depression symptoms. In the emotional component, the best MH was explained in 37.7% for having lower depression, higher education and lower pain, and having a better EP was explained in 35% for being a woman, younger, less pain and less depression symptoms (Table 5).

Table 5. Factors associated with quality of life (SF-36) in the follow up 12 months after the traffic accident

Domains SF-36		beta coefficient	95% CI		p* value	R^2
Physical function (PF)	Sex (M/W)	5.73	1.86	9.6	0.004	0.466
	NISS	−0.627	−0.87	−0.39	0.000	
	Age	−0.234	−0.324	−0.143	0.000	
	VAS	−4.72	−5.37	−4.17	0.000	
	PHQ-9	−0.996	−1.27	−0.718	0.000	
Physical performance (PP)	Sex (M/W)	−9.13	−15.39	−2.87	0.004	0.391
	Education	0.998	0.312	1.68	0.004	
	Age	−0.372	−0.542	−0.203	0.000	
	VAS	−6.014	−6.98	−5.04	0.000	
	NISS	−0.754	−1.14	−0.365	0.000	
	PHQ-9	−1.782	−2.23	−1.33	0.000	
Emotional performance (EP)	Sex (M/W)	−7.03	−12.713	−1.35	0.015	0.350
	VAS	−4.15	−5.03	−3.28	0.000	
	PHQ-9	−2.31	−2.72	−1.91	0.000	
	Age	−0.223	−0.347	−0.1	0.000	
Mental health (MH)	Education	0.766	0.485	1.05	0.000	0.367
	VAS	−1.93	−2.4	−1.45	0.000	
	PHQ-9	−1.34	−1.6	−1.12	0.000	

* The table included variables with statistical significance $p < 0.005$

VAS: Visual analog scale; NISS: New Injury Severity Score; PHQ-9: Patient Health Questionnaire. R^2: Determination coefficient. A:Accompanied, S:alone.

Discussion

In Colombia, a significant underreporting exists of people injured in TA in data reported to the National Institute of Legal Medicine and Forensic Sciences, given that these reports are only of those who seek attention in this Institute. It is calculated that, in 2017, only 6.47% of the total recorded by the Information System for Health Care Reports for Victims of Traffic Accidents was reported. [21].

In 2010, globally, TA were the eight cause of death and in 2030 it can become the fifth cause. For individuals between 15 and 44 years of age, was the first cause of death [22]. According to Legal Medicine, in Colombia, in 2019, for each death there were 5.34 injuries [3]. In Medellín, an epidemiological study between 2010 and 2015 found injuries in 50% of the roadway incidents registered in TA police reports, with an average of 300 deaths/year and 3,000 injured/year, which could really be 10 times higher [23].

Our study was conducted with two prospective cohorts, one under 60 years of age and the other above that age. The cohort < 60 years of age had five years more schooling than the older cohort; most were motorcycle drivers and in whom the most-frequent type of accident was a collision. Mostly, those > 60 years of age were pedestrians run over by motorcycles. In a study conducted in another country, pedestrians and those using those who use non-motorized transport have the most fatal cases [24]. Another research reports that these injuries were more serious as age increased [25].

Herein, functioning continued compromised after one year in both cohorts, in dimensions CM, ADL, work activities, and PS. Global functioning in the 36-item score was worse in individuals over 60 years of age. This important compromise is explained because these people, although having an occupation prior to the TA, had not subsequently managed to return to their usual occupation and had greater compromise in independence of ADL. These activities are indispensable for the individuals' autonomy and should be the object of timely interventions to diminish impact on these populations.

No studies were found comparing disability associated to TA, measured with the WHO-DAS II, in cohorts over and under 60 years of age. Soberg *et al.,* studied 107 patients from 18 to 67 years of age, with severe traumatism (NISS > 16); at 1-year follow up, they noted

improvement in the CM, PC, ADL, and PS domains of the WHO-DAS II. Here, as with Soberg *et al.*, CC and RP were the least affected domains since the initial evaluation, with changes not significant 12 months later [26].

In our study, QoL had greater initial compromise of the physical component (PF and PP) and pain; 12 months later, the PP was the most compromised by almost 50% in both cohorts. One year later, those > 60 years of age had the worse QoL, with greater compromise in the CF and EP.

Andersen *et al.,* compared young patients (18-64 years old) with patients > 65 years of age who suffered moderate and severe traumas in TA [27], finding that in those > 64 years of age had, during the 12-month follow up, greater compromise in the PP and MH. In our study, PF was also compromised in those > 60 years of age. In MH, QoL was worse in the older patients, but this difference was not statistically significant. Moreover, Andersen *et al.,* identified that age was not an indicator of worse QoL, when adjusted by the base line state of health, comorbidities, and the severity of the lesion [27].

Gopinath *et al.,* found, in 364 adults with slight and moderate injuries in TA, monitored 12 and 24 months later, that the PF of QoL, evaluated through the EQ-5D and SF-12 was lower in older adults, compared with those < 65 years of age, and that pain had no differences according to la age [28].

Overall, the biggest compromise of the QoL domains mentioned in those > 60 years of age could be explained by the lowest base line levels of self-perceived functionality, reduced physiological reserve and frailty prior to injury, greater prevalence of comorbidities associated with aging, and functional decline prior to injury [29]. Other studies show that older adults have functional limitations after a trauma, which can last up to 12 months, without recovering their prior state [30].

The foregoing can be attributed, in Colombia, to low referral of patients to comprehensive rehabilitation services. Lugo *et al.,* in a study on costs conducted in Medellín with patients with moderate and serious TA, showed that the participation of the expense in rehabilitation was only of 1.06%, with very few attentions in this area and even less in comprehensive care processes [31].

Depression was moderate initially and at the end in both groups, with greater change after one year in the group > 60 years of age. Gopinath *et al.,* found that patients > 65 years of age had lower scores in the pain catastrophizing scale with respect to the younger patients (5% vs. 17%) [28]. These findings suggest that older patients have a more stoic way of thinking than younger patients regarding pain; in them, catastrophizing is associated with the intensity of pain, they have better regulation strategies and fewer negative emotions.

Regarding determining factors, as in our study, Soberg *et al.,* detected that patients with serious trauma, evaluated at 1-year follow up, had WHO-DAS II and SF-36 scores that indicated worse functioning and worse QoL if the general population was taken as reference, with changes not significant between the 1- and 2-year follow ups; besides finding that trauma severity, together with the profession, pain, and physical, cognitive, and social functions were significant predictors of disability at 2-year follow up [7]. The work herein found as explanatory factors of worse functioning after one year: being a woman, having less schooling, being older, greater severity of the lesion, greater pain and more depression symptoms.

Other studies reported that, in patients hurt in TA, specifically older individuals and women, the most-severe injuries and psychiatric compromise, like anxiety and depression, compromised QoL more [32]. The study found as explanatory factors of worse outcomes in QoL after one year: being a woman, having less schooling, being older, greater severity of the lesion, pain, and more depression symptoms.

In 2020, during the COVID-19 pandemic, injuries and deaths due to roadway incidents, compared with 2019, reduced in Colombia by 61% and 17.4%; in Antioquia, by 67% and 27%, and in Medellín, by 69.4% and 20,4%, respectively. This was due to mobility restrictions ordered in different cities of Colombia [3]. Nevertheless, in spite of the measures restricting mobility in the city, deaths of cyclists increased by up to 90%. Deaths of motorcycle passengers in the last five years (2016-2020) have numbered 17,000 users, 53% of all fatalities; those of pedestrians were 25%; vehicles, 13%, and bicycle riders, 6%. Motorcyclists are exposed most to risk and endure greater effects. They, together with pedestrians and cyclists, are the most vulnerable [33, p. 27].

In some studies, women reported worse QoL than men, lower scores in VT and EP [7.30]; however, herein, women had better QoL in the PP, EP, and MH dimensions.

Among the limitations in this study, few patients were found with serious injuries in the older patient cohort, explained because the sample was taken in consecutive and non-stratified manner. Another limitation was the time difference in data collection corresponding to the two cohorts. Notwithstanding, epidemiological studies show a similar trend in TA in Colombia between 2009 and 2016, with a higher number of cases in those < 60 years of age associated with motorcycle injuries, and in those older, with a higher percentage of pedestrians run over. In Colombia, no population QoL and disability data were found that serve as reference to compare the outcomes obtained in this study at 12-month follow up.

As principal strength, it may be highlighted that having data on disability and QoL in a medium-income

country, where the characteristics of the injured and their context are different from those observed in developed countries [5]. In addition, it is the first study in Colombia comparing the behavior of disability and QoL in cohorts of under and over 60 years of age, using as outcome measurement the WHO-DAS II domains and SF-36, and with the biggest sample collected to date.

Conclusion

The study results indicate that, in both groups, there was improvement over time in functioning and QoL. However, in both cohorts, important limitations exist in functioning 12 months after the TA and in important domains for autonomy, like independence in ADL. The factors associated with worse outcomes in functioning were being older, being a woman, greater severity of the trauma, pain and more depression symptoms.

Prevention, treatment, and rehabilitation interventions should be guided to diminish the impact of this Public Health condition, and improve control of potentially modifiable associated factors, as well as improve access to rehabilitation and mental health interventions, to obtain better outcomes in patients, like reducing the impact on mobility and improving physical performance, independence in activities of daily living, the occupation, mental health, and emotional performance.

It is a priority to accept the recommendations of the United Nations High-Level Political Forum on Sustainable Development [34], which indicate the need to continue acting in relation with the objectives of roadway safety from the objectives of sustainable development, and establish policies and programs to reduce deaths and serious injuries, for all groups using public roads, especially those vulnerable, such as pedestrians, those over 60 years of age, cyclists, motorcyclists, and public-transport users.

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Conflicts of interest

The authors declare having no type of conflict of interest.

Declaration of responsibility

The authors declare that the entire text and the different points of view is the responsibility of all the authors, who reviewed the final manuscript and approved of it. The affiliation institution nor the financing entity are responsible for what is described in this article.

Declaration of contributions by authors

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