



# Etiology and Epidemiology of Nasal Bone Fractures in Patients Referred to the Otorhinolaryngology Section, 2019

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## Abstract

**Introduction** One of the most observed diseases in the otorhinolaryngology emergency, compared with the other facial fractures, is related to nasal bone fractures (NBFs). The peak of incidence is seen in the age group ranging from 11 to 30 years old.

**Objective** The present evaluation was devoted to the etiology and epidemiological study of NBFs.

**Methods** In the present cross-sectional study, 376 patients with NBF were evaluated. The necessary information such as gender, age, education, job, causes of NBF, and clinical symptoms of patients have been recorded on the checklist.

**Results** The study revealed that 76.9% of the patients were male and 23.1% were female; 37.5% of all patients were self-employed, and most of them were from urban areas. Traffic accident (26.6%) and falling (25.5%) were the main reasons for NBF. The most common clinical symptoms for NBF were tenderness (96%;  $n = 361$ ), nasal swelling (90.4%;  $n = 340$ ), and deformity (89.4%;  $n = 336$ ).

**Conclusion** The results showed that the incidence of NBFs in young men without higher education level and self-employed were high which can be related to the traffic accidents and fights. Also, falls, beatings and accidental hit are the most common causes of NBFs among women. Therefore, to decrease the incidence of otorhinolaryngology trauma, training about the general life skill and providing awareness about using personal safety equipment and measures should be increased at the future.

## Keywords

- ▶ epidemiology
- ▶ etiologic
- ▶ fracture
- ▶ nasal bone

## Introduction

The nose is a sensory and respiratory organ that plays an important role in the physical and immunological protection of the body from the environment. It also has an effect on generating speech and is the main unit of beauty in the center of the face and causes the integration and coordination of other parts of the face such as eyebrows, cheeks,

forehead and lips.<sup>1,2</sup> The nose is vulnerable to a wide range of traumas because it is located in the midline of the face and in front of important facial structures, and due to its delicate and fragile structure. Nasal fractures are any cracks or fractures in the bony part of the nose; they are the most common fractures in the face and the third most common fracture of the skeletal system of the body.<sup>3</sup> Exercise, falls and beatings are the most common mechanisms of nasal

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fractures. Advances in technology and the increasing use of motor vehicles, increasing statistics of conflict and violence, the prevalence of sports accidents, workplace accidents, falls and other factors have increased the prevalence of various physical injuries, including nasal trauma.<sup>1,2,4</sup>

The incidence of nasal fractures in both young and old men is almost twice as high as that in women, with the peak prevalence in the 2<sup>nd</sup> and 3<sup>rd</sup> decades of life. In common fractures of the nasal bones, usually, the upper part of the nasal pyramid is broken. This bone is also broken in injuries to the middle part of the face.<sup>5</sup> There are different types of nasal bone fractures (NBFs), depending on their severity and type. A severe fracture occurs when the bone goes out of alignment. But if the bone cracks slightly, the fracture of the nose is not severe and is considered incomplete.<sup>1,6</sup> Although nasal injuries are often not severe, to neglect treating them properly and in a timely manner can lead to long-term problems after the injury, such as nasal deformity, nasal obstruction, septal perforation, and other complications like chronic sinusitis.<sup>7</sup> In children, it may also lead to disproportionate growth of the nose more than other parts of the face. Patients with facial bone fractures represent a significant proportion of cases who are admitted to special trauma hospitals worldwide, with high costs.<sup>1</sup>

Advances in technology, increasing the production of cars and motorcycles, unsuitable condition of roads and passages in cities and villages are effective factors in increasing the prevalence of traffic accidents which leading to trauma in the country. Due to the lack of novel epidemiological studies and also having a view about the condition of NBF situation in this studied area, we designed the present study to investigate the epidemiology and etiology of NBF in patients referred to the otorhinolaryngology section of Fatemi hospital in 2019.

## Materials and Methods

The present cross-sectional descriptive study was performed on 376 patients with a definitive diagnosis of complete NBF who were referred to the otorhinolaryngology emergency department in 2019. Patients were subjected to a diagnostic evaluation by an otolaryngologist with history-taking, physical examination by palpation, observation, and ultrasound. Patients with incomplete NBF were treated as outpatients and were excluded from the study. Necessary information such as age, gender, place of residence, education, occupation, and the cause of NBFs such as traffic, sports, and occupational accidents, falls or collapse, and accidental trauma, and clinical signs such as difficulty breathing, nasal obstruction, nasal congestion and swelling, nasal deformity, tenderness, sleep disturbance, open sores, nosebleeds, nasal ecchymosis, nasal hematoma, and ocular injury (ecchymosis, preorbital hematoma, and conjunctival hemorrhage) were collected through a checklist. The collected data were analyzed using descriptive statistical methods in the form of tables and graphs in IBM SPSS Statistics for Windows, version 24 software (IBM Corp. Armonk, NY, USA). We also used the

chi-squared test to examine the relationship between variables.

## Results

The average age of the patients was  $26 \pm 14.20$  years old (2–90 years old); 27.9% of the patients were in the age group between 21 and 30 years old (►Fig. 1); 63.6% of all patients were from urban areas and the rest were from rural areas. The most common causes of NBF in were traffic accident (26.6%), of which 21% were related to car occupants and 5.6% to pedestrians. Falling (25.5%) was the second leading cause of nasal fractures (►Fig. 2). Of all cases, 12.5% were illiterate and half of them had high school degree and only 12.2% had university degree of education and most of them suffered NBF due to falls and traffic accidents (►Table 2). A total of 37.5% of the patients were self-employed; 8.8% of them suffered NBF due to assaults and altercations, and the highest incidence of NBF among students was due to falls (11.2%) (►Table 3). Also, the most causes of nose fractures in studies patients were falling with 26% and then traffic accident by motorcycle with 21% (►Fig. 2). The results showed that 70% of the accidents were caused by driving a private car; 66% of them were in cities, especially at night. Also, 71.1% of people involved in traffic accidents were not using seat belts, and 96.6% of motorcycle and bicycle riders did not have helmets (►Table 4). The most common clinical signs were palpation sensitivity (96%), nasal swelling (90.4%), and nasal deformity (89.4%). The lowest clinical sign was sleep disorder with 23.4%. The cause of NBF in 11.7% of patients was due to sports accidents that 68.2% of them occurred at the time of playing football, basketball, and volleyball (►Fig. 3).

## Discussion

The frequency distribution of epidemiological and etiological factors of facial and nasal injuries varies in different parts of the world and even in different cities of a country. This pattern is different even in developing and developed countries. In the present study, 76.9% of the patients were male and 23.1% were female, with a ratio of 3:1. In the reference book "Cummings Otolaryngology: Head and Neck Surgery",<sup>1</sup> the rate of nasal fractures in men in both adult and child populations is almost twice that of in women. In the study by Jalali et al., in Rasht, 76.1% of the patients were male and 23.9% were female, which is a similar result to those of the present study.<sup>3</sup> In the study by Garadaghi et al., in East Azerbaijan, the results showed that 87.6% of the patients were male and 12.4% were female, which was slightly different from the results of the present study.<sup>4</sup> Fornazieri et al., in an epidemiological study of NBFs in 2008, showed that 80% of patients were male and their average age was 26 years old.<sup>8</sup> The reference book in Otolaryngology states that the peak prevalence of nasal fractures occurs in the 2<sup>nd</sup> and 3<sup>rd</sup> decades of life, and in the study of Jalali et al., the average age of the patients was  $30.17 \pm 13.45$  years old, which was higher than that of the present study, which was 26 years old.<sup>3</sup> The results of the present study showed

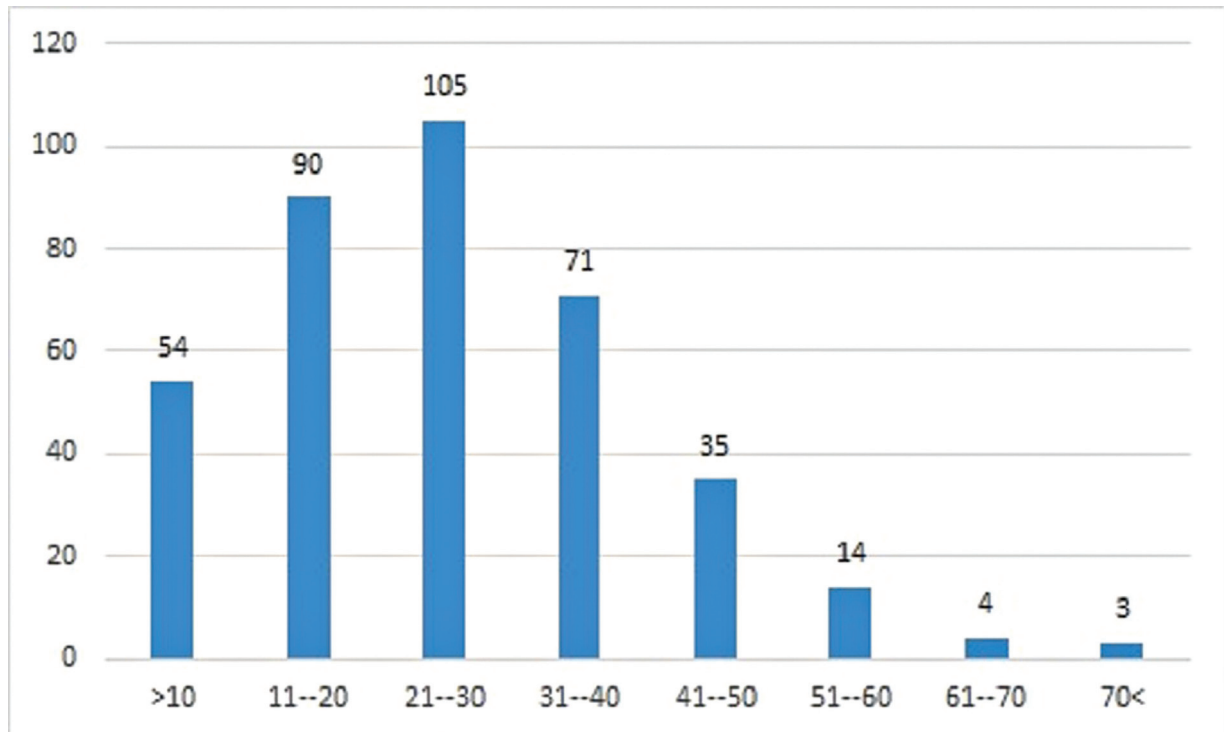


Fig. 1 The frequency of age groups in studied patients

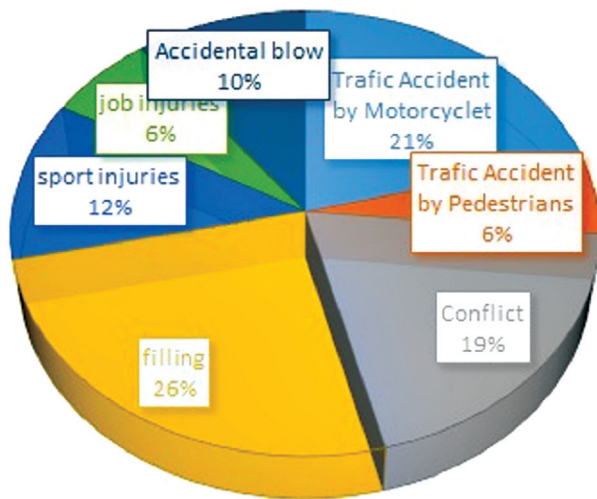


Fig. 2 The causes of nose fractures in studied patients

that 26.6% of the patients suffered nasal fractures due to traffic accidents, 25.5% due to falls, and 19.4% due to quarrels and conflicts. In a systematic review by Hwang et al., in South Korea, which reviewed 772 articles from around the world, the most common cause of nasal fractures in adults were conflict (36.3%), traffic accidents (20.8%), sports accidents (15.3%), and falls (13.4%); in children, the highest incidence was related to sports accidents (59.3%).<sup>6</sup> Kazemian et al., in a study of the pattern of maxillofacial fractures between 2011 and 2013, showed that the most common causes of maxillofacial fractures were driving accidents (75.4%) and conflicts (15.2%).<sup>10</sup> In the study of Jalali et al., conflicts and punches were the most common causes of NBF (44.3%) in Rasht.<sup>3</sup> In the study by Kalantaris et al., in Tehran, the most common causes of maxillary bone fractures were car (30.8%) and motorcycle accident (23%).<sup>7</sup> The results of the present study were with the results of Tehran study. Cummings

Table 1 The mechanism of injuries by the gender of patients

Gender		Mechanism of injury							Total
		Traffic accident		Conflict	Falling	Sport injuries	Occupational injuries	Accidental blow	
		Motorcycle	Pedestrians						
Male	n	79	18	60	60	36	21	23	289
	%	18.9	4.8	15.9	15.9	9.6	5.6	6.2	76.9
Female	n	8	3	13	36	8	3	16	87
	%	2.1	0.8	3.5	9.6	2.1	0.8	4.2	23.1

**Table 2** The mechanism of injuries by the education of patients

Education		Mechanism of injury							
		Traffic accident		Conflict	Falling	Sport injuries	Occupational injuries	Accidental blow	Total
		Motorcycle	Pedestrians						
Illiterate	n	3	4	3	25	1	5	6	47
	%	0.8	1.1	0.8	6.6	0.3	1.3	1.6	12.5
High school	n	38	12	33	50	27	10	18	188
	%	10.1	3.2	8.8	13.3	7.2	2.6	4.8	50
Diploma	n	33	4	24	15	6	6	7	95
	%	8.8	1.1	6.4	4	1.6	1.6	1.8	25.3
Bachelor	n	0	0	4	2	5	1	2	14
	%	0	0	1.1	0.5	1.3	0.3	0.5	3.7
Master of science	n	4	0	8	3	5	2	5	27
	%	1.1	0	2.1	0.8	1.3	0.5	1.3	7.2
Doctorate	n	1	1	1	1	0	0	1	5
	%	0.3	0.3	0.3	0.3	0	0	0.3	1.3

**Table 3** The cause of injuries by the job of patients

Job		Mechanism of injury							
		Traffic accident		Conflict	Falling	Sport injuries	Occupational injuries	Accidental blow	Total
		Motorcycle	Pedestrians						
Housekeeper	n	6	2	10	21	1	3	11	54
	%	1.6	0.5	2.7	5.6	0.3	0.8	2.9	14.4
Non-employee	n	5	0	7	8	0	0	2	22
	%	1.3	0	1.9	2.1	0	0	0.5	5.8
Employee	n	4	2	6	3	4	2	2	23
	%	1.1	0.5	1.6	0.8	1.1	0.5	0.5	6.1
Freelance	n	45	13	33	20	7	19	4	141
	%	12	3.5	8.8	5.3	1.9	5	1	37.5
Student	n	19	4	17	42	32	0	19	133
	%	5.1	1.1	4.5	11.2	8.5	0	5	35.4
Infant	n	0	0	0	2	0	0	1	3
	%	0	0	0	0.5	0	0	0.3	0.8

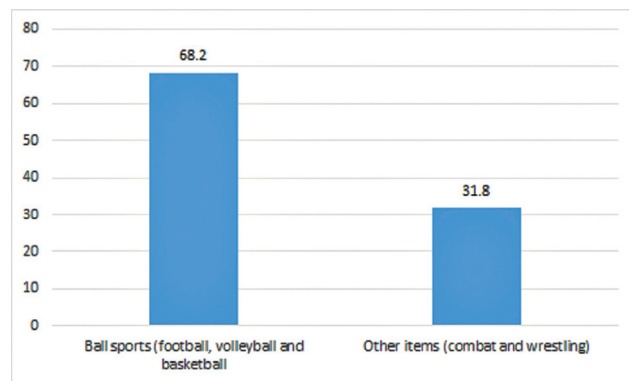
Otolaryngology: Head and Neck Surgery 2020 states that in terms of geographical distribution in Asia, South America and Europe, the most common cause of nasal fractures is interpersonal conflict, and, in North America, traffic accidents (33.6%) followed by accidents and then sports.<sup>1</sup> Among sports injuries, ball-related sports, with a frequency of 84.2%, are the highest cause of nasal fractures. In the present study, 11.7% of nasal fractures were due to sports accidents, and most of them were due to ball sports such as football, volleyball, and basketball. In a retrospective study by Chou et al., in Taiwan, to diagnose nasal bone fractures in addition to common clinical methods with tools; Nasal ultrasonogra-

phy was performed which showed a higher distribution of men than women. The symptoms of nasal obstruction, nasal congestion, sleep disturbance, difficulty breathing and inability to breathe through the nose were analyzed and all scores of the groups were significantly different from the group. The witness was different.<sup>10</sup>

Ruslin et al., in a study from 2019, showed that the most frequent mechanisms of BNF were car accidents, with 177 cases, followed by motorcycle accidents, which was similar to the results of our study, since our results indicate that the most frequent mechanism of BNF was traffic accidents. The most frequently observed fracture involved the mandible,

**Table 4** Characteristics of studied patients

Characteristics		n	%
Type of vehicle	Private vehicle	70	70
	General vehicle	1	1
	Motorcycle	18	18
	Bicycle	11	11
Location of accident	Inside city	66	66
	Road	34	34
Time of accident	Day	48	48
	Night	52	52
Seat belt	Yes	13	28.9
	No	32	71.1
Helmet	Yes	1	3.4
	No	28	96.6

**Fig. 3** Type of sport in studied patients

with 199 fractures, followed by maxillo-zygomatic-orbital (MZO) fractures.<sup>12</sup>

In a systematic review by Boffano et al. performed in Netherlands entitled "Aetiology of maxillofacial fractures: a review of published studies during the last 30 years", the results showed that in all studies men outnumbered women, the ratio usually being > 2:1. In American, African, and Asian studies, road traffic crashes were the predominant cause. In European studies, the etiology varied, with assaults and road traffic crashes being the most important factors. The results of our study were in line with the results of this study because in our study road traffic crashes were the most important factor in the mechanism of fractures.<sup>13</sup>

In a systematic review study by Hwang et al., the most frequent causes of NBF were fights (36.3%), traffic accidents (20.8%), sports (15.3%), and falls (13.4%) which was in line with our study results.<sup>6</sup>

In a study by Rocchi et al., the authors showed that the most frequent facial trauma cause in the age group from 11 to 19 years old was motorcycle accident (41%), and in our study the rate of trauma related to traffic similar was also high, in line with the results of this study.<sup>14</sup>

## Conclusion

In the present study, traffic accidents involving vehicles, motorcycles, and bicycles were the main causes of nasal fractures, which were more common in self-employed young men, diploma and lower education level. In women, the most common causes of nasal fractures were falls, accidental blows, and beatings, which was more common in young housewives with lower education level. To prevent accidents leading to nasal trauma, training such as informing in national and regional media by NGOs, training anger management skills, emotion control, and stress management skills for young people, life skill programs, housekeeping skills and marriage, training of occupational safety skills and upgrading the skills of school educators seem necessary. Also, by establishing occupational safety regulations and intensifying the implementation of restrictive laws in the field of traffic, developing urban and rural roads, and improving adequate lighting in the city and roads at night, we could prevent these events in future.

## Conflict of Interests

The authors have no conflict of interests to declare.

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