

# Epidemiological evaluation of fractures of the mandible among country dwellers of the Lublin region, in material of Maxillofacial Surgery Clinic in Lublin, in years 2007-2010

Jolanta Wojciechowicz, Andrzej Stodółkiewicz, Anna Gawęda, Tomasz Tomaszewski

*Maxillofacial Surgery Clinic, Medical University of Lublin, Lublin, Poland*

## Abstract

The aim of the study was determining the relationship between the socio-economic specificity of the Lublin Region in southeast Poland and the amount of injuries to the bony face with special attention devoted to fractures of the mandible, causes of injuries, and the impact of so-called 'other factors' to the occurrence of the injury. The Lublin Region constitutes potentially one of the most important agricultural and industrial regions in the country. In relation to the systematically increasing mechanization of agricultural work and the development of cultivations in this area, a great changeability of causes and effects of injuries to the facial skull is being noticed in the group of the rural population. In years 2007-2010 at a Maxillofacial Surgery Clinic at the Medical University in Lublin due to fractures of the bones of the bony face: 1,256 patients were being treated. In this group, fracture of the mandible constituted about 50% of cases. Fracture of the mandible as a result of agricultural work was common with 9% of treated patients, hitting with wood was the most frequent complaint, other included: work with chain or disc saw, fall from a height, and kicked by a farm animal. Analysis of the results of the treatment showed that the most effective procedure for fractures of the mandible is miniplate osteosynthesis with parallel supplying wounds of the bony face.

## Key words

mandible fracture, work trauma, treatment, agriculture related injuries

## INTRODUCTION

Among the many external factors influencing the state of public health, some are prominently significant: lifestyle and the physical and social environments. Lifestyle depends on behaviour typical of a given social group, as well as on general socioeconomic conditions. According to the WHO, every year worldwide, injuries are experienced by roughly 75 million people. Transportation injuries are the most frequent cause, Poland being no exception in this respect, with the number of lives lost through road accidents reaching about 5,500 persons killed annually, and a further 65,000 injured [1,2]. The problem concerns mainly young individuals, but the effects of these are passed on to the families of victims and society as a whole. An essential component accompanying such occurrences is the consumption of alcohol and psychedelic substances by the victims. Accidents at work are also an important social-health problem, though in recent years their number in Poland country has been systematically reduced.

The highest accident frequency rates take place in the forestry, farming and construction industries, although exact data are difficult to establish. This is particularly the case in individual farming since there is obligation to report to the Central Statistical Office information about accidents. Almost

a half of the accidents during agricultural work on a farm occur due to the fault of the employees. In private companies the accident rate is being lowered because employers do not want to pay compensation, and the employees are afraid of losing their jobs. The so-called 'black market job', i.e. employment without entitlements to benefits, are very popular because the difficult economic situation makes many individuals decide to exclude necessary safety precautions or protection [1-3]. Our study concerns the rural population of the Lublin Region who comprise the majority of patient treated at the Maxillofacial Surgery Clinic of the Medical University in Lublin.

The Lublin Region is located in the southeastern part of Poland and although it occupies a large area it is sparsely populated. Rural areas constitute 96.2% of the territory of the region, with nearly 4,300 villages but only 41 cities or towns [4]. The Region has a large agricultural and industrial potential, but due to different reasons, unfortunately not entirely utilized advantageously. In relation to the systematically increasing mechanization of agricultural work and the development of cultivation, the Lublin Region has become characterized by a great diversity of causes and effects of injuries to the facial skull in the group of the rural population.

The aim of the study undertaken was determining the relation between the socio-economic specificity of Lublin region and the amount of injuries to the bony face with special notice devoted to fractures of the mandible, causes of injuries and the impact of so-called "other factors" to the occurrence of the injury.

Corresponding author: Jolanta Wojciechowicz, Wyżynna 17/46, 20-560 Lublin, Poland.

E-mail: lanyfztk@wp.pl

Received: 15 May 2011; accepted: 26 October 2011

## MATERIALS AND METHODS

In the years 2007-2010 at Maxillofacial Surgery Clinic of the Medical University in Lublin 1,256 patients were treated due to fractures of the bony face. The present study, on the basis of the medical history of the treated patients, concerns an epidemiological analysis of fractures of the mandible in patients residing in the rural areas of the Lublin Region, with special attention to accidents at work on arable farms, taking into account such factors as age of the patients, cause of the injury, duration of hospitalization, courses of treatment, and so-called 'other factors', including the presence of alcohol in the organism of the injured. The results were subjected to statistical analysis using a Statistica 9.0 computer programme.

## RESULTS

As for patients hospitalized at Maxillofacial Surgery Clinic, Medical University of Lublin in 2007-2010, generalized traumas of the facial skull were diagnosed in 1,256 persons, including 626 cases of isolated fractures of the bone of the mandible; of these, 373 persons came from the villages and small towns. This group constituted the subject of our studies (Fig. 1).

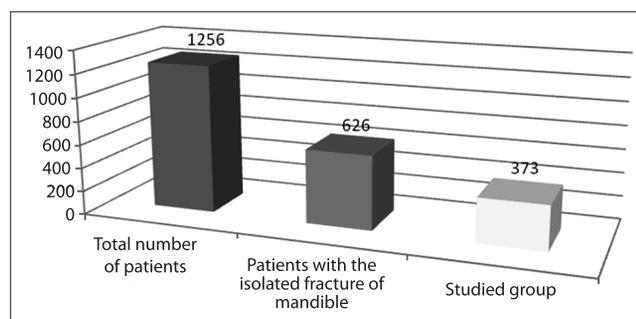


Figure 1. Groups of patients

Social analysis of the studied group showed that 90% of the patients were treated exclusively due to fractures of the mandible, and were mainly males, on average aged about 31, and among whom manual workers, the unemployed, and schoolchildren dominated (Fig. 2).

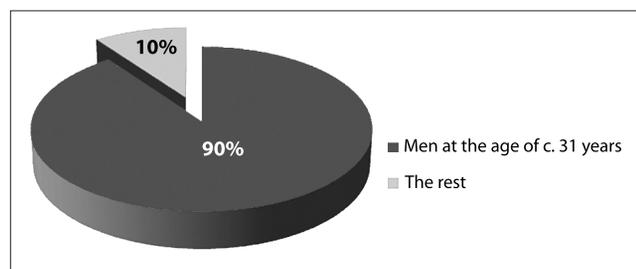


Figure 2. Dominant group by the age

The reasons for trauma were very diverse: fights comprised the largest percentage – 59%, transportation accidents – 16%, and accidents during agricultural work – 10%. Other cases involved: being struck by a foreign body while operating mechanical or electric machines, falling from a height, and zootic, traumas including kicking and biting by farm animals (Fig. 3).

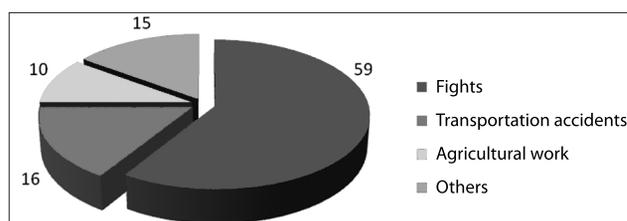


Figure 3. Trauma reasons in the analyzed group

The time of reporting to a hospital by post-traumatic patients for specialist treatment differed, and depended on the presence and scope of co-existing injuries, speed of the diagnosis of fracture in local hospitals and health centres, and the awareness of the victims. The average time amounted to about 3 days.

The time of the hospitalization in the case of fractures of the mandible depended, above all, on the extent of accompanying injuries, the location and quantity of cracks of fractures, and the applied of treatment procedure. In individual years analyzed the times were as follows: in 2010 – 7.65 day, 2009 – 8.46, 2007 – 8.76, 2008 – 8.72, which for the 4-year period, on average, amounted to 8.4 days (Fig. 4).

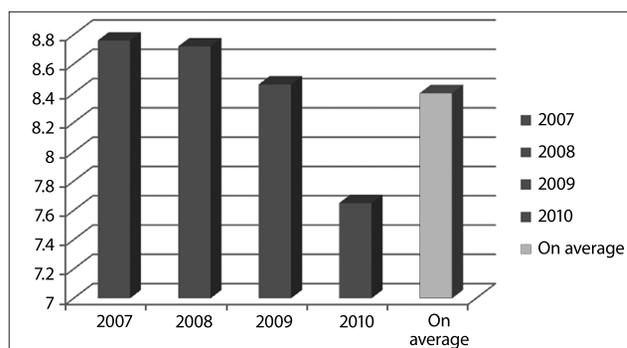


Figure 4. The time of the hospitalization in the analyzed years

Among the analyzed group of patients with fractures of the mandible, a conservative-orthopaedic treatment was applied in 23.6%, surgical treatment in 42.9%, and the twinned surgical-orthopaedic method in 33.5%, mainly with the application of titanic mini-plates established intraorally.

Using Kolmogorov-Smirnov test, it was checked on the significance level of  $p=0.05$ , assumption of standard variable distribution, the time of hospitalization in the analyzed groups. In order to evaluate statistical differences between the mean time of patients' hospitalization in individual years a t-Student test was used for independent trials. The assumed level of significance was  $p<0.05$  as an indication on statistical differences existence. After the statistical analysis it was concluded, that there was statistical significant differences between mean time of patients hospitalization in the years 2007 and 2010 ( $p=0.03$ ). The findings were presented below (Table 1).

Table 1. Differences between mean time of patients hospitalization in the years 2007 and 2010

	Mean -2007	Mean -2010	p	Valid n-2007	Valid n-2010	Std.Dev. -2007	Std.Dev. -2010
Time of the hospitalization	8.76	7.65	0.034	81	126	3.85	3.57

Patients staying in hospital in the year 2007 were hospitalized statistically longer than hospitalized in the 2010 year. The time of hospitalization is presented on a diagram (Fig. 5).

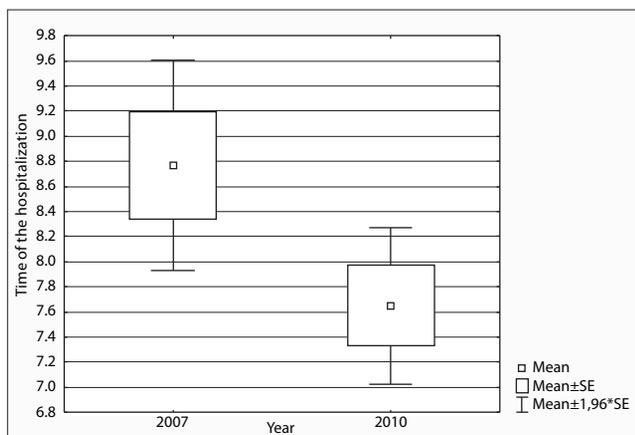


Figure 5. Time of hospitalization of patients in the years 2007 and 2010

Similarly, it was evaluated that there was statistical differences between the mean number of days of hospitalization in the years 2008 and 2010 (Table 2).

Table 2. Differences between the mean number of days of hospitalization in the years 2008 and 2010

	Mean 2008	Mean -2010	p	Valid n-2008	Valid n-2010	Std.Dev. -2008	Std.Dev. -2010
Time of the hospitalization	8.72	7.65	0.027	77	126	2.92	3.57

The time of patients' hospitalization in the year 2008 was statistically longer than in 2010. The values were presented on a diagram below (Fig. 6).

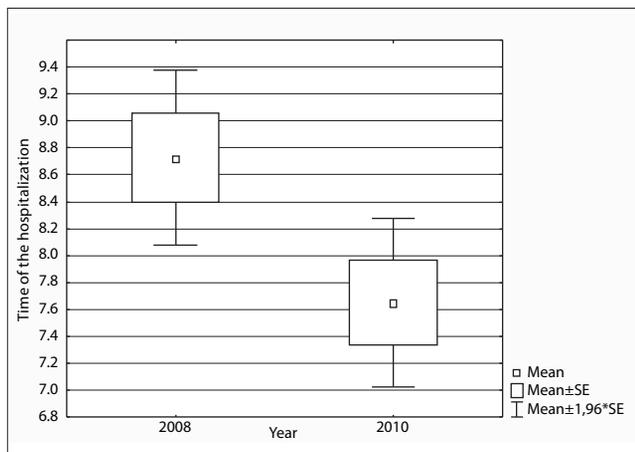


Figure 6. Time of hospitalization of patients in the years 2008 and 2010

There was no statistically significant differences in hospitalization time between another evaluated groups. The results were presented in a table below (Table 3).

Consumption of alcohol by the patients in the time of occurrence of the injury had undoubted influence on the occurrence of the studied injuries: 173 patients reported this fact, which constitutes 46.4 % of the cases (Fig. 7).

Table 3. Statistic differences in hospitalization time between another evaluated groups

Year of the hospitalization	Mean	p	Valid n	Std.Dev.
Between 2007 and 2008				
2007	8.76	0.94	81	3.85
2008	8.72		77	2.92
Between 2007 and 2009				
2007	8.76	0.57	81	3.85
2009	8.46		89	3.11
Between 2008 and 2009				
2008	8.72	0.57	77	2.92
2009	8.46		89	3.11
Between 2009 and 2010				
2009	8.46	0.09	89	3.11
2010	7.65		126	3.57

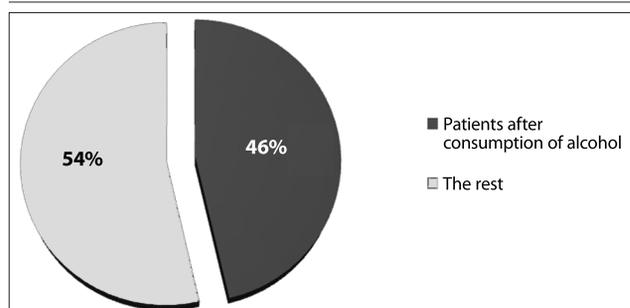


Figure 7. Groups of patients in regard to consumption of alcohol

## DISCUSSION

The Maxillofacial Surgery Clinic at the Medical University in Lublin has been dealing for many years with the epidemiological analysis of causes and courses of treatment of fractures of the bones of the bony face. This study, covering a period of only 4 recent years, was aimed at updating and checking certain applications, concerning both my observations and those of others pertaining which concerned earlier time periods. Relating these observations to the population of the large area of the Lublin Region, allows the connection of the medical aspects of the study with conclusions which should trigger concrete public actions. In the analyzed group of patients, males aged from 7-92 years dominated, with a distinct lowering of the average age of patients compared with earlier periods concerning this geographical area – at present 31 years of age [5,6].

These proportions are very similar to the results obtained concerning facial skull injuries in north-east of Poland [7], and to data concerning fractures of the mandible from other parts of Poland and worldwide [3,5,8-11]. Fights and transportation accidents remain the main cause of fractures, in our material they constitute 59% and 16%, respectively, and are similar to calculations presented in publications referring to the whole of Poland [3,5-9].

In case of results obtained by foreign authors, the proportions change, depending on geographical areas where in most cases communication cases remain the cause of DMT fractures [8,11-13]. Referring to our own work concerning fractures of the mandible in the period 1988-1997, it is possible to notice the decrease of transportation accidents and the increase of fight injuries among the rural population of Lublin Region

[5]. This probably results from socio-economic conditioning, scarcity of places of employment for young people who stay in a place of residence, exercising their frustration in occasional fights and brawls, or fast car driving which most often takes place under the influence of alcohol.

The next cause of injuries in the agricultural industry is accidents during agricultural farm work: 9% through accidental falls and accidents during practicing sport. In accidents among farm labourers, their main reason is being hit with pieces of wood during the manual and mechanical processing of timber, falling from a cart and falling from ladders, being bitten and kicked by farm animals [6-8,14-16]. Compared with the earlier period of time, one can notice a slight increase in accidents at agricultural work of around 7.4% in the years 1988-1997 to 9% in years 2007-2010. This is probably associated with the non-observance of basic work safety precautions [6,14-16].

However, on average, the time of reporting to a doctor after the occurrence of the injury has not changed and amounts to about 3 days in most cases [5]. During the last 20 years an evaluation of the procedures for treating fractures of the mandible applied in the Maxillofacial Surgery Clinic of the Medical University in Lublin is well visible. In the years 1988-1997, orthopedic methods constituted 60% ways of treating DMT fractures; at present, they account for 23.6%, while surgical and surgical-orthopedic have accounted for about 76.4% of patients diagnosed in the last 4 last years with isolated fractures of the mandible [4]. Alcohol consumption played a substantial role in reported injuries to the skull. The number of patients in the analyzed group who admitted to drinking alcohol before the injury amounts over 46%, and continues to grow systematically. This is high statistic, and a sad one, for the southeastern part of Poland.

Data from the northeast part of Poland for the years to 1975-2004, show that about 23% of the individuals drank alcohol before sustaining an injury, whereas from the Sub-Carpathian region these data amounted 18.2% [5-7,9].

The fact of a gradual reduction in the average time of the hospitalization of treated patients instills optimism. In 1988, it amounted to 24.8 day, with a present-day average of 8.4 days. This is directly connected with the average age of patients, their lack of systemic illnesses, location of fractures, choice of the course of treatment, and the speed of referring patients to the specialist centre [5]. The fact that centres of treatment have been established where, at the same time, different specialists from various areas of medicine take care of the patient is not without impact on the treatment of injuries to the facial skull.

## CONCLUSIONS

1. Main causes of fractures of the mandible in patients from rural areas of the Lublin Region injuries sustained in fights and transportation accidents.
2. The number of patients declaring drinking alcohol before the occurrence of a facial injury is still high.
3. During recent years, the treatment of choice in treating fractures of the mandible is the mini-plate osteosynthesis from the intraoral operative access.
4. In the rural environment, the accident rate during farm labour has not decreased, which evidences a prevailing lack of knowledge of the basic and essential safety rules or precautions.
5. The time of hospitalization of treated patients has shortened.

6. Cases of extensive injury, including to the tissues, bone structures, and some sense organs, as occur in accidents during the farm labour, require early and multi-specialist treatment, with the participation of specialists from the field of maxillary-facial surgery, traumatology, ophthalmology, anaesthesiology and neurosurgery.
7. The majority of patients with single fractures of the mandible, particularly without transfers of bone fragments, should undergo treatment in clinical conditions.

## REFERENCES

1. Iizuka T, Randell T, Guven O, Lindqvist Ch. Maxillofacial fractures related to work accidents. *J Cranio-Max-Fac Surg* 1990;18:255-259.
2. Szarmach J, Grabowska SZ. Urazy części twarzowej czaszki u mieszkańców wsi regionu północno-wschodniej Polski (Maxillofacial fractures in country dwellers of north-eastern region of Poland). *Med Ogól* 1995;1:40-47 (in Polish).
3. Tomaszewski T, Bartoszcze M, Szymańska J. Agriculture-related craniofacial injuries. A Three-year survey of clinical cases. *Ann Agric Environ Med* 1995;2:83-86.
4. Wojciechowicz J, Tomaszewski T, Dobieżyńska B, Rahnema M: Złamania żuchwy na podstawie dokumentacji medycznej Kliniki Chirurgii Stomatologicznej i Szczękowo-Twarzowej AM w Lublinie w latach 1988-1997 (Mandibular fractures – retrospective study). *Wiad Lek* 2004;1-2:37-43 (in Polish).
5. Bartoszcze-Tomaszewska M, Tomaszewski T, Woronko P, Stodółkiewicz J, Wojciechowicz J. Epidemiologiczna ocena obrażeń czaszki twarzowej spowodowanych wypadkami przy pracy w regionie lubelskim (Epidemiological evaluation of craniofacial injuries related to work accidents in Lublin region). *Czas Stomat* 1998;7:474-478 (in Polish).
6. Lee JH, Cho BK, Park WJ. A 4-year retrospective study of facial fractures on Jeju, Korea. *J Cranmaxillfac Surg* 2010;38:192-196.
7. Bartoszcze-Tomaszewska M, Tomaszewski T, Załęski P, Woronko P, Rahnema M. Obrażenia czaszki twarzowej spowodowane urazami podczas pracy w rolnictwie w regionie środkowowschodnim Polski (część II) (Farming associated traumas of maxillo-facial skeleton in central-eastern region of Poland (part II)). *Wiad Lek* 2004;7-8:301-305 (in Polish).
8. Bartoszcze-Tomaszewska M, Tomaszewski T, Stodółkiewicz A, Koliński P, Dobieżyńska B. Urazy czaszki twarzowej powstałe podczas pracy w rolnictwie w rejonie środkowowschodnim Polski (część I). (Facial skeleton traumas in farmers in east – central region of Poland (part I)). *Wiad Lek* 2004;5-6:201-205 (in Polish).
9. Uliasz M, Czarnecki T, Reymond J, Płatos P. Analiza złamań dolnego masywu twarzy u chorych leczonych w warszawskiej Klinice Chirurgii Czaszkowo-Szczękowo-Twarzowej w latach 2001-2005 (The analysis of fractures to the lower face in patients treated in the Maxillofacial Surgery Clinic in Warsaw between 2001-2005). *Czas Stomat* 2006;12:864-875 (in Polish).
10. Erol B, Tanrikulu R, Gorgun B. Maxillofacial fractures. Analysis of demographic distribution and treatment in 2,901 patients (25-year experience). *J Cranmaxillfac Surg* 2004;32:308-313.
11. Hachl O, Tuli T, Schwabegger A, Gassner R. Maxillofacial trauma due to work-related accidents. *Int J Oral Maxillfac Surg* 2002;31:90-93.
12. Hryniewicz J. Uwarunkowania demograficzne polityki społecznej w Polsce, w latach 1990-2010. Biuro studiów i ekspertyz, kancelaria sejmu, 1993:Raport 45 (Demographic determinations of Poland social politics in years 1990-2010. Department of Studies and Analysis, Administrative Office of the Polish Parliament Report 1993; No 45) (in Polish).
13. Majsterek E, Stankiewicz Choroszuca B, Targowski M, Wdowiak L. Problemy zdrowia publicznego w kontekście transformacji demograficznej i epidemiologicznej (Public health problems in the demographic and epidemiological transformation's context). *Zdrow Publ* 2005;3:415-424 (in Polish).
14. Kheirallah M, Mateńko D. Analiza epidemiologiczna złamań żuchwy u chorych leczonych w I Klinice Chirurgii Szczękowo-Twarzowej IS AM w Warszawie w latach 1988-1992 (Epidemiological analysis of mandible fractures in patients treated in years 1988-1992 in the Maxillofacial Surgery Clinic of Medical University in Warsaw). *Czas Stomat* 1994;2:123-127 (in Polish).
15. Rocznik statystyczny województw (Statistical Yearbook of Poland). GUS, Warszawa 2010.
16. Yamamoto K, Matsue Y, Murakami K, Horita A, Matsubara Y, Sugiura T, Kirita T: Maxillofacial fractures due to work-related accidents. *J Cranmaxillfac Surg* 2011;39:182-186.