

GENERAL ARTICLE

Incidence and etiology of maxillofacial trauma: A retrospective analysis of patients attending a provincial hospital in northern Thailand

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Abstract

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This study aimed to identify cumulative incidences, causes, severity reflected by extent of damage and treatment modalities of maxillofacial traumas in Thai patients attending Phichit Hospital in northern Thailand. Methods: This study retrospectively analyzed all maxillofacial trauma cases pursuing treatment from October 2009 to January 2014 (4 years and 3 months). Cumulative incidence was estimated for each calendar year (2010-2013). Helmet use and alcoholic drinking statuses prior to injuries and causes of trauma were obtained from records of injury surveillance system. Maxillofacial traumas were diagnosed according to ICD-10. Diagnoses and treatments were provided by a specialized oral and maxillofacial surgeon.

There were 210 incident cases in this study period. Annual incidences in 2010-2013 ranged between 6.4-10.4 per 100,000 populations. Most cases were males (161, 76.7%) and average age was 37.1±16.0 (range 8-78 years old). Causes of trauma were identified in 194 cases. There were 142 fracture cases from motorcycle accident. From 107 cases with identifiable statuses of helmet use prior to motorcycle accident, 89 cases (83.2%) did not wear helmet. About half of the cases with identifiable statuses of alcoholic drinking were found drinking prior to injuries. The most common treatment was open reduction and internal fixation with plate.

Incidences of maxillofacial traumas in Phichit Province were exiguous. Nonetheless, severity was considerable as indicated by several multiple fracture cases and common treatment by open reduction. Hypothesis of motorcycle driving without helmet use as a cause of maxillofacial fractures was supported.

Keywords: maxillofacial fracture, trauma, maxillofacial surgery, injury, epidemiology

อุบัติการณ์และสมมูลฐานวิทยาของการบาดเจ็บบริเวณ ใบหน้าและขากรรไกร: การศึกษาในผู้ป่วยที่เข้ารับ การรักษาในโรงพยาบาลจังหวัดแห่งหนึ่งในภาคเหนือ ประเทศไทย

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บทคัดย่อ

สมร บุญเกษม ชนพงษ์ โรจนวรฤทธิ เสาวภา คันสร และสุกกาญจน์ ปุณกะบุตร
อุบัติการณ์และสมมูลฐานวิทยาของการบาดเจ็บบริเวณใบหน้าและขากรรไกร:
การศึกษาในผู้ป่วยที่เข้ารับการรักษาในโรงพยาบาลจังหวัดแห่งหนึ่งในภาคเหนือ ประเทศไทย.
ว.สาธารณสุขและการพัฒนา 2558;13(2):57-71

การศึกษานี้มีวัตถุประสงค์เพื่อระบุอุบัติการณ์สะสม สาเหตุ ความรุนแรง และรูปแบบการรักษาของการบาดเจ็บบริเวณใบหน้าและขากรรไกรในผู้ป่วยไทยที่เข้ารับการรักษาในโรงพยาบาลพิจิตร

ผู้วิจัยรวบรวมข้อมูลย้อนหลังของผู้ป่วยทุกรายที่เข้ารับการรักษาทางศัลยกรรมช่องปากและแม็กซิลโลเฟเชียล ณ แผนกทันตกรรม ในเดือนตุลาคม พ.ศ. 2552 ถึง มกราคม พ.ศ. 2557 (รวม 4 ปี 3 เดือน) คำนวณอุบัติการณ์สะสมของการบาดเจ็บบริเวณใบหน้าและขากรรไกรรายปีปฏิทิน (พ.ศ.2553-2556) ข้อมูลสถานะการสวมหมวกนิรภัยและการดื่มสุราก่อนเกิดการบาดเจ็บรวมทั้งสาเหตุการบาดเจ็บ รวบรวมจากบันทึกของระบบเฝ้าระวังการบาดเจ็บระดับชาติในส่วนของโรงพยาบาลพิจิตรรับผิดชอบการให้คำวินิจฉัยการบาดเจ็บอ้างอิงตามระบบ ICD-10 บันทึกแพทย์เฉพาะทางศัลยกรรมช่องปากและแม็กซิลโลเฟเชียลเพียงคนเดียวเป็นผู้ประเมิน ให้คำวินิจฉัย และให้การรักษ

ในช่วงที่ศึกษามีผู้ป่วยรายใหม่ทั้งสิ้น 210 คน อุบัติการณ์สะสมในปีพ.ศ.2553-2556 อยู่ในช่วง 6.4 ถึง 10.4 ต่อ 100,000 ประชากร ผู้ป่วยส่วนใหญ่เป็นเพศชาย (161 คน, 76.7%) อายุเฉลี่ยของผู้ป่วยทั้งหมดคือ 37.1 ± 16.0 ปี (พิสัย 8-78 ปี) สามารถระบุสาเหตุการบาดเจ็บได้ใน 194 ราย มีผู้ป่วย 142 รายที่มีการแตกหักของกระดูกใบหน้าและขากรรไกรจากอุบัติเหตุรถจักรยานยนต์มีผู้ป่วย 107 รายที่สามารถระบุสถานะการสวมหมวกนิรภัยก่อนเกิดอุบัติเหตุรถจักรยานยนต์ได้ซึ่งมี 89 ราย (83.2%) ที่ไม่สวมหมวกนิรภัย ประมาณครึ่งหนึ่งของผู้ป่วยที่สามารถระบุสถานะการดื่มสุราก่อนเกิดอุบัติเหตุได้ดื่มสุราก่อนเกิดการบาดเจ็บ การรักษาที่พบมากที่สุดคือการผ่าตัดจัดชิ้นกระดูกหักและยึดตรึงภายใน (open reduction and internal fixation)

โดยสรุป แม้ว่าอุบัติการณ์การบาดเจ็บบริเวณใบหน้าและขากรรไกรในจังหวัดพิจิตรจะไม่มากเมื่อเทียบกับฐานประชากรทั้งจังหวัด แต่มีความรุนแรงดังแสดงได้จากการแตกหักร่วมของกระดูกหลายชิ้นและการต้องรักษาด้วยการผ่าตัดจัดชิ้นกระดูกหัก ผลการศึกษานี้สนับสนุนสมมติฐานที่การไม่สวมหมวกนิรภัยขณะขับขี่รถจักรยานยนต์เป็นปัจจัยที่มีผลต่อการเกิดการบาดเจ็บในบริเวณใบหน้าและขากรรไกร

คำสำคัญ: การแตกหักกระดูกใบหน้าและขากรรไกร, การบาดเจ็บ, ศัลยกรรมช่องปากและแม็กซิลโลเฟเชียล, วิทยาการระบาดของ

Introduction

Maxillofacial traumas are physical injuries causing damage to soft and hard tissues constituting organs of maxillofacial region. Anatomical boundary of the region extends vertically from superior border of frontal bone to inferior rim of mandible, and horizontally between zygomatico-temporal sutures in both sides. Maxillofacial structures are vulnerable to trauma since they are the most exposed body parts.¹ Epidemiological profile of the traumas; characterized by patients' clinical characteristics (person), geographical and environmental context (place), and period of analysis (time); varies among studies in different countries.²⁻⁷ Such variation is primarily due to difference in several factors; for instance, demographic structure, environment, socioeconomic context, and mechanism of injury.^{3,4}

Apart from description of pattern by person, place, and time; several studies identified magnitude of maxillofacial traumas by 'number of cases' or 'cases per year'.²⁻¹³ Nonetheless, study specifying 'cumulative incidence'—which implies risk or probability of event occurrence in a certain population¹⁴—of the traumas is scarce. Measuring cumulative incidence may not be simply achieved in several settings. For instance, referral center caring for patients from diverse residential locations would face challenge in terms of difficulty to determine whether the registered cases represent total number of cases in a certain location of origin. Therefore, overall and age-specific cumulative incidences in a defined population and targeted age groups remain gaps of knowledge for prevention and control of the problem. Phichit Hospital provided a unique opportunity for estimating the cumulative incidence since it was the only facility in Phichit

Province offering comprehensive maxillofacial trauma care. Loss of cases through referral to nearby provinces was uncommon. Estimation of total number of cases who were residents of this province and use of mid-year population for calculation of the incidence were therefore rational.

Several studies have investigated causes of maxillofacial injuries. Motorcycle and car accidents have been the most common causes of maxillofacial traumas requiring maxillofacial surgery in many countries.^{3-6,8-10} Another most common cause is assault.^{4,11-13} This discrepancy in findings would imply need of investigation for context-specific causes of the incidence. Understanding the context-specific causes would enable specifying relevant preventive measures, target group to be focused, and how much resource to be allocated for each measure in a certain population.

Severity of maxillofacial traumas has been reflected by several means. Some studies indicated severity by identifying affected anatomical sites^{3,6-10}, extent of fractures including multiple fractures^{9,10,12} and concomitant injuries^{8,12}. Other reports presented treatment extents and numbers of surgical procedures as proxy measures of the severity.^{3,6,9,10} Nonetheless, lists of treatments varied across studies, primarily implying differences in settings and facilities. Closed reduction—a conservative manipulation of fractured bone fragments without tissue dissection to surgically expose the fracture site—was the most common treatment in several studies^{3,9,15-18}; while open reduction—a surgical intervention which exposes fractured bone fragments by tissue dissection—was instead reported in the others^{19,20}. Conservative treatment by patient counseling and follow-up is strategy commonly

indicated for fracture without displacement.¹⁸ For management of soft tissue damage either occurring alone or concomitant with fracture, debridement and suture is the treatment of choice.^{18,19}

In the context of Thailand, several studies have revealed maxillofacial injuries in Thai patients.¹⁵⁻¹⁹ Nonetheless, none has attempted to measure risk of maxillofacial injuries in a certain population by means of cumulative incidence estimation.¹⁵⁻¹⁹ Etiology and severity of maxillofacial traumas in specific context of northern Thailand is neither adequate. This study aimed to identify cumulative incidences, causes, and severity—reflected by extent of damage and treatment modalities—of maxillofacial traumas in Thai patients attending Phichit Hospital in the North of Thailand.

Methods

This study retrospectively analyzed characteristics of all maxillofacial trauma cases pursuing treatment from October 2009 to January 2014 (4 years and 3 months) at the Oral & Maxillofacial Unit, Dental Department, Phichit Hospital. This public hospital with inpatient facilities and approximately 400 beds served tertiary medical services to around 110,000 residents of central district and additionally acted as referral center for all other districts of Phichit Province in the North of Thailand.

Patient's clinical characteristics; including age, gender, statuses of alcoholic drinking and helmet use prior to injury; and causes of injury were primarily obtained from standard case record form (IS 2008_1st January) routinely used for data collection under National Injury Surveillance System. Registered nurses at emergency room were responsible for interviewing conscious patients or transporters of unconscious

ones and recording data based on protocol of injury surveillance.²¹ These data were triangulated with the ones obtained from routine history taking and patient assessment on visit to the Oral & Maxillofacial Unit. A specialized maxillofacial surgeon; who provided diagnoses, treatments and was responsible for submitting these clinical evidences related to the injury for consideration of claim and reimbursement of health expenses; validated the data. Maxillofacial traumas were diagnosed according to International Classification of Disease, Tenth Edition (ICD-10)²². Data concerning diagnoses and treatments were recorded and later collected for this research by the responsible surgeon. Individuals found dead at scene were excluded from study since the dead bodies were not delivered to the Oral & Maxillofacial Unit to determine whether maxillofacial structures were actually damaged. Without determining existence of the traumas in these deaths, misclassification problem could occur if these cases were included. Average annual number of deaths at scene in Phichit was around 13 cases per 100,000 populations during the period of study. Most of these deaths were caused by blunt trauma involving mainly body trunk.

Annual cumulative incidences of maxillofacial traumas were estimated for 4 years (2010-2013). In cumulative incidence estimation, numerator comprising all trauma cases occurred in a given year was divided by denominator of mid-year population of Phichit in that year. The numerator in estimation was defined upon assumption that all trauma cases requiring maxillofacial treatments were referred to this only referral center in Phichit. Information regarding mid-year populations of Phichit was obtained from Bureau of Regional Administration (Site 6, Phichit Provincial

Office), Department of Provincial Administration, Ministry of Interior. The mid-year population included registered number of residents in all districts of Phichit to enable estimation of cumulative incidence in total population of this province.

Descriptive statistics were used to summarize characteristics of patients. Exact probability test was adopted for comparison of proportions. Stratified analysis of cases by single and multiple fractures of maxillofacial bones was undertaken to indicate extent of damage and reflect severity. Counts of treatment procedures were analyzed to represent service burden. Age-specific incidences were analyzed by graphical means to reveal risk of maxillofacial traumas in different age groups.

This research has been approved by Research Ethics Committee in Human Subjects of Phichit Provincial Hospital. (Approval No. 0049)

Results

Over the whole study period, there were 210 incident cases of maxillofacial traumas. Most cases were males (161, 76.7%). Age distributions of male and female cases were not statistically different ($p=0.330$). (Table 1) In 2010 to 2013, there were 193 incident cases. Annual cumulative incidences from 2010 to 2013 were 6.4, 8.4, 10.4, and 10.1 cases per 100,000 populations respectively. Age-specific incidences were identified in 5 age groups of 15-year interval (Figure 1). In 2010, incidences of traumas peaked around 9.5 and 9.1 cases per 100,000 populations at the age groups of 30-44 and 15-29. Nonetheless, incidences in the group of 15-29 exceeded all other age groups and fluctuated around 16.8, 14.2, 19.6 cases per 100,000 populations consecutively from 2011 to 2013.

Table 1 Age and gender distribution among maxillofacial trauma patients

Age group (years)	Gender		Total (%)
	Male	Female	
0-10	1	0	1(0.4)
11-20	31	10	41(19.5)
21-30	34	6	40(19.1)
31-40	33	7	40(19.1)
41-50	26	15	41(19.5)
51-60	19	7	26(12.4)
≥61	17	4	21(10.0)
Total	161	49	210

Mean = 37.1 SD = 16.0
Min. = 8 Max = 78

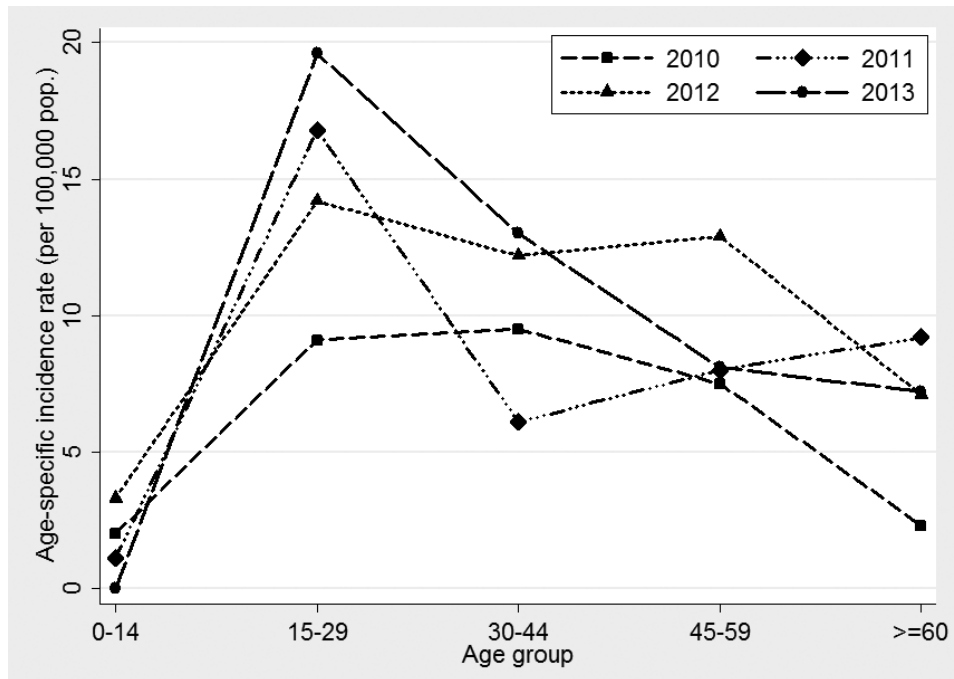


Figure 1 Age-specific cumulative incidence of maxillofacial traumas in 2010 to 2013

From 210 cases, most injuries resulted in fractures either at single site (162 cases, 77.1%) or multiple sites (39 cases, 18.6%). (Table 2) Facial wounds

were found in 57 cases, 48 as concurrent wounds with fractures and the rest as solitary lesions.

Table 2 Percentage distribution of anatomical sites of maxillofacial fractures in 201 cases

Site of fracture	n	(%)
Fracture at single site (n=162)		
Zygoma*	75	(37.3)
Mandible	58	(28.8)
Maxilla	8	(4.0)
Zygomatic arch	7	(3.5)
Alveolar process	7	(3.5)
Orbit	6	(3.0)
Naso-orbito-ethmoidal complex	1	(0.5)
Fracture at multiple sites (n=39)		
Zygoma+Maxilla	9	(4.4)
Zygoma+Mandible	8	(4.0)
Zygoma+Orbit	2	(1.0)
Zygoma+Zygomatic arch	1	(0.5)
Mandible+Maxilla	2	(1.0)
Mandible+Zygomatic arch	2	(1.0)
Mandible+Alveolar process	2	(1.0)
Orbit+Nasal bone	2	(1.0)
Orbit+Mandible	1	(0.5)
Zygoma+Mandible+Maxilla	3	(1.5)
Zygoma+Maxilla+Nasal bone	2	(1.0)
Zygomatic arch+Mandible+Maxilla	1	(0.5)
Mandible+Maxilla+Nasal bone	1	(0.5)
Zygoma+Maxilla+Nasal bone+Frontal bone	1	(0.5)
Zygoma+Mandible+Maxilla+Nasal bone	2	(1.0)

*The term implies fracture of zygomaticomaxillary complex.

Causes of trauma were identified in 194 cases and fractures were found as consequents in 185 cases. Proportions of cases distributed by causes were not significantly different between males and females ($p=0.093$). Motorcycle accidents were the major causes of traumas among cases of both genders, among those aged 15 to 29 years old, and accounted for 142 cases with fractures. 'Any falling' included both cases falling from height and those who lost balance and collapsed. 'Other road accidents' involved cases from bicycle and pedestrian accidents. Other physical injuries, such as sport injury, were grouped into 'Other accidents'. From 107 cases with identifiable statuses of helmet use prior to motorcycle accidents, 89 cases

(83.2%) were found not wearing helmet. Proportions of helmet use in male and female cases were not significantly different ($p=1.000$). About half of the cases with identifiable statuses of alcoholic drinking were found drinking prior to injuries. Proportion of alcoholic drinking prior to injuries was significantly higher among males ($p<0.001$). Motorcycle accidents resulted in various damage extents, ranging from having only facial wound to larger extent of multiple fractures. In contrast, other road traffic injuries—including car and other road accidents—involved only few cases of multiple fractures. None of multiple fractures was caused by any falling and assault. (Table 3)

Table 3 Causes of maxillofacial traumas in 194 identifiable cases

Characteristics	Causes of injuries					
	Motor-cycle accident	Car accident	Any falling	Assault	Other road accidents	Other accidents
Age groups						
0-14	5	1	-	-	-	-
15-29	60	2	-	3	4	2
30-44	33	5	1	3	5	2
45-59	38	4	-	2	1	2
≥60	12	2	2	1	2	2
Gender						
Male	115(77.2) [†]	8(5.4)	2(1.3)	7(4.7)	12(8.1)	5(3.4)
Female	33(73.3) [†]	6(13.3)	1(2.2)	2(4.4)	-	3(6.7)
Helmet use (n=107)						
Yes	18(16.8) [‡]	-	-	-	-	-
No	89(83.2)	-	-	-	-	-
Alcoholic drinking (n=128)						
Yes	57	3	-	4	4	-
No	53	3	2	-	2	-

Table 3 Causes of maxillofacial traumas in 194 identifiable cases (Cont.)

Characteristics	Causes of injuries					
	Motor-cycle accident	Car accident	Any falling	Assault	Other road accidents	Other accidents
Lesions						
Facial wound only	6	2	-	-	-	1
Fracture at single site						
Zygoma*	56	3	1	2	2	2
Mandible	35	5	2	5	8	1
Maxilla	6	1	-	-	-	-
Zygomatic arch	2	1	-	1	1	2
Alveolar process	5	1	-	-	-	-
Orbit	5	-	-	1	-	-
Naso-orbito-ethmoidal complex	1	-	-	-	-	-
Fracture at multiple sites						
Zygoma+Mandible	7	-	-	-	-	-
Zygoma+Maxilla	8	-	-	-	-	1
Zygoma+Orbit	1	-	-	-	-	1
Zygoma+Zygomatic arch	1	-	-	-	-	-
Mandible+Maxilla	2	-	-	-	-	-
Mandible+Zygomatic arch	1	-	-	-	1	-
Mandible+Alveolar process	1	-	-	-	-	-
Orbit+Nasal	2	-	-	-	-	-
Orbit+Mandible	1	-	-	-	-	-
Zygoma+Mandible+Maxilla	1	1	-	-	-	-
Zygoma+Maxilla+Nasal	2	-	-	-	-	-
Zygomatic arch+Mandible+Maxilla	1	-	-	-	-	-
Mandible+Maxilla+Nasal	1	-	-	-	-	-
Zygoma+Maxilla+Nasal+Frontal	1	-	-	-	-	-
Zygoma+Mandible+Maxilla+Nasal	2	-	-	-	-	-
Total cases	148(76.3) [†]	14(7.2)	3(1.5)	9(4.6)	12(6.2)	8(4.1)

[†]Percentage by row, [‡]Percentage by column

*The term implies fracture of zygomaticomaxillary complex.

Up to 312 procedures of maxillofacial treatment were provided in 210 cases. Treatments of fractures ranged from the simplest procedure of conservative treatment, closed reduction, to the most complicated procedure of open reduction and internal fixation with plate (ORIF with plate). Debridement and suture was treatment indicated for facial wounds. Required

treatments varied by different fracture sites. Fractures of zygomaticomaxillary complex and orbit mainly required ORIF with plate. In contrast, fractures of mandible required ORIF with plate and closed reduction in relatively comparable numbers while fractures of maxillary bones instead required mostly the closed reduction. (Table 4)

Table 4 Sites of damage and corresponding treatment procedures (n=312 procedures)

Sites of damage	Maxillofacial treatments (by procedure)			
	Open reduction and internal fixation with plate	Closed reduction	Conservative treatment	Debridement and suture
Fractures				
Zygoma*	97	-	6	-
Mandible	40	43	-	-
Orbit	10	-	1	-
Zygomatic arch	7	3	1	-
Maxilla	1	28	-	-
Alveolar process	1	7	1	-
Nasal bone	-	4	3	-
Frontal	1	-	-	-
Naso-orbito-ethmoidal complex	1	-	-	-
Facial wounds	-	-	-	57

*The term implies fracture of zygomaticomaxillary complex.

Discussion

Maxillofacial traumas in this setting involved individuals of all age groups, primarily due to various causes feasibly experienced at any ages. Wide age distribution among cases was consistently found in other studies regardless of different geographical regions.^{17-20,23-31} Many studies have reported most traumas occurred in the third decade of life—21 to 30 years old.²³⁻²⁹ Nonetheless, this study found relatively the same ‘number of cases’ in the second to the fifth decades of life. (Table 1) This finding should not be misinterpreted as having equal risk of traumas for each of these decades. In other words, based on epidemiological principle, number of cases occurring in each age-specific category does not imply ‘risk’ and should not be used for comparison to identify high-risk age group.¹⁴ Regarding this principle, ‘cumulative incidence’—an epidemiological measure of disease frequency calculated by ‘number of new cases’ divided by ‘total population at risk’ (mid-year population in this study)—was adopted to identify risk of maxillofacial traumas in the defined population and to compare age-specific probability of traumas across different age groups in the same and different years. This study identified age group of 30-44 to have the highest risk of traumas in 2010 while the group of 15-29 showed the highest risk in 2011 to 2013. (Figure 1) Shift of the highest-risk group primarily suggested variation in pattern of the most affected age group by year of analysis. This finding empirically illustrated principle of descriptive epidemiology that pattern of health problem could be changed according to different time period under consideration.³² Difference in interpretation of counted ‘number of cases’ and ‘cumulative incidence’ is a critical point to consider.

Number of cases occurring within a specified time period should not be regarded as epidemiological ‘incidence’. Empirical evidence in this study well illustrated this point that reporting only the counted ‘number of cases’ occurred in a time period (e.g., per year)^{5,13,24} or ‘proportion of cases in a specified age group from the whole’^{23,28,31} would actually indicate magnitude of service burden rather than specifying high-risk age group. In facility treating patients from various residential locations; for example, from different countries or nationalities⁷, identifying total number of new cases and corresponding total number of population at risk from the same location would not be feasible and estimation of cumulative incidence would neither be achieved. This study functioned to illustrate a unique condition that cumulative incidence could be estimated for maxillofacial traumas.

Another use of descriptive epidemiology study is for trend analysis.³² Estimated cumulative incidence of maxillofacial traumas showed increasing trend in age group of 15-29. Although incidences in this group fluctuated only in range of 9.1 to 19.6 per 100,000 populations which were relatively exiguous, such incidence in 2013 was doubled that of 2010. Moreover, when age-specific incidences in 2010 were considered as baseline, most of age-specific incidences of traumas in subsequent years were greater than those of the baseline regardless of increase in numbers of age-specific mid-year populations adopted for estimation. These evidences urged the need for prevention and control of the problem both in all age groups and with focus on high-risk group of 15 to 29 years old.

Maxillofacial traumas mostly involved males as consistently revealed in several studies.^{15-20,23-31} No

statistically significant difference in age distributions of cases by gender was identified by exact probability test. Similarity in age structures of both genders was consistently found in a study.⁴ Significantly higher proportion of male cases was found drinking alcohol prior to injuries. Nonetheless, a study contrastively revealed that drinking alcohol was not a strong factor influencing occurrence of maxillofacial trauma.⁴ Thus, establishing association between alcoholic drinking and maxillofacial traumas would require further analytical study with control of confounding factors.

Finding of motorcycle accident as a major cause of maxillofacial traumas was consistent with other studies.^{3-6,8-10} When motorcycle, car and other road accidents were combined and broadly considered as road traffic injuries; this accounted for 89.7 per cent of all cases with identifiable causes (Table 3) and was consistently regarded as the most common cause as in other studies.^{26,28,31} Unlike some reports indicating assault as major cause of maxillofacial traumas^{4,11-13,30}, this study found assault only as a minor cause. Such difference in etiologic factors suggested variation across studies in terms of socioeconomic background, means of transportation, and protective and risk-taking behavior related to the traumas. Therefore, further study to reveal context-specific causes is still necessary for prevention and control of this problem in a certain setting.

Among cases with identifiable statuses of helmet use prior to motorcycle accidents, 83.2% did not wear helmet, and this finding was similar to another study²¹. This evidence strongly supported assumption that motorcycle driving without protective helmet use would cause maxillofacial structures to be more vulner-

able to traumas.³³ About half of motorcycle accident cases with identifiable statuses of alcoholic drinking were found drinking prior to injuries, as similarly revealed in another study¹². Alcoholic drinking before accident was also found in assault, car and other road accidents.¹² Lack of helmet use and drink driving were still the issues to be considered for prevention and control of the traumas in this setting. High proportion of those cases without helmet use during motorcycle driving would suggest need for further investigation of reasons for not wearing helmet.²¹ Cases wearing helmet before injuries should also be investigated for quality of helmet wearing practice and characteristic of helmet which might not be sufficiently protective.

Severity of traumas in this study was reflected by extent of damage to maxillofacial structures. Single-site fracture mostly involved zygoma, mandible, and maxilla. Zygoma as the most common single-site fracture was also found in another study.⁸ A few studies reported that orbit¹² and nasal bone¹³ were mostly involved. Nonetheless, several studies reported mandible as the most common site for single fracture.^{15-20,23-30} This evidence suggested variation of the most common site of single fracture by context of consideration. Although cumulative incidences in this study were exiguous, many cases were found having fractures at multiple sites. There was considerable variation in pattern of multiple fractures.⁵ Fracture of naso-orbito-ethmoidal complex, for instance, has been identified to always occur as coincidence with other maxillofacial fractures.²⁸ Nevertheless, this study found such fracture to occur as single fracture only—not involving fracture of other bones. The 3 most commonly involved maxillofacial bones in fracture at multiple sites were zygoma, mandible, and

maxilla. (Table 2) This finding was different from a previous study reporting maxilla, zygomaticomaxillary complex, and mandible; respectively.²⁸ Variation in pattern of fractures accounted for limited feasibility of standardizing surgical treatment.⁵ Comprehensive clinical examination to identify extent of damage along with combined multiple necessary treatments was therefore recommended.⁵

Extent of treatment was also used as proxy of severity since larger extent of complicated treatments would be required in more severe trauma cases.⁵ ORIF with plate represented the most complicated treatment in this setting, followed by closed reduction, and conservative treatment which represented the simplest treatment. ORIF with plate was the most common treatment among fracture cases, as found in several studies.^{19-20,24} Closed reduction was more common in other studies.^{13,15-18} A study also found the use of open and close reduction in relatively the same frequency.³ The most common use of ORIF in this context would imply that most fractures were severe to the extent that internal fixation was needed. Regarding these evidences, it was suggestive that incidences of fractures might not be common but extent of damage to maxillofacial structures was inevitably considerable.

This study added to literature the magnitude of maxillofacial traumas in Phichit, northern Thailand. Unlike studies reporting number of cases as incidence, this study illustrated use of ‘cumulative incidence’ in unique setting to identify high-risk age group. Teenagers and young adults were the highest-risk group. Increasing trend of trauma incidences also informed worsening situation. Control and preventive measures directed to promote road safety use

should be the first priority. For clinical implication, since pattern of maxillofacial traumas considerably varied, comprehensive examination to specify damage extent and combination of necessary treatments were recommended.

Conclusion

Estimated incidences of maxillofacial traumas requiring maxillofacial treatment in Phichit were exiguous. Nevertheless, severity of damage was considerable, as indicated by several multiple fracture cases and common treatment by ORIF with plate. Hypothesis of motorcycle driving without helmet use as a cause of maxillofacial fractures was supported.

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