



doi: 10.4103/2221-6189.291284

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An epidemiological report on the burden and trend of injuries in the Philippines from 2011 to 2018

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ABSTRACT

Objective: To describe the epidemiological distribution of injury cases in the Philippines from 2011 to 2018.

Methods: A retrospective review of records from the Online National Electronic Injury Surveillance System involving trauma cases was done, and data were collated, tabulated, and statistically analyzed.

Results: A total of 668 179 injury cases were recorded, and 68.99% of these cases involved males. Vulnerable individuals belonged to the group aged 15-29 years (34.01%). The most populated regions in the country, the National Capital Region (14.90%) and Region IV A (13.96%), incurred the highest number of recorded cases. Traffic crash (32.67%) was reported to be the major cause of injury; and open wounds (37.56%) and abrasion (26.23%) were found to be the most common types of injury.

Conclusions: The burden of injury remains high in the Philippines due to the lack of resources and inadequate healthcare. The findings of the present study on the distribution of injury cases provide useful information for taking appropriate preventive measures, developing effective safety guidelines, allocating limited resources in an appropriate manner, and implementing necessary public health programs.

KEYWORDS: Traffic crash; Trauma; Surveillance system

1. Introduction

Injuries are a serious cause of mortality and morbidity worldwide, accounting for over five million deaths per year or

approximately 16 000 deaths per day[1]. According to the World Health Organization (WHO)[2], the burden of injuries worldwide is disproportionately concentrated in low- and middle-income countries. This is evident in 2004 wherein over 91% of unintentional injury deaths and 94% of disability-adjusted life-years were lost in low- and middle-income countries[3]. Clearly, the highest injury burden often occurs in those countries with the weakest evidence to guide intervention strategies, the fewest resources, and the least developed infrastructure to effect change[4].

The Philippines is among the vulnerable countries in Asia in terms of the burden of injury, considering that over 26 million Filipinos lived in poverty in 2018[5]. The challenges people face are vulnerability to natural disasters, weak governance, inadequate health services, and lack of natural resources[4]. Despite the high burden of injury in the Philippines, there has been a severe undercounting of deaths from all causes, including non-fatal health outcomes. In fact, the vital statistics registration systems reflect only 10.2% of all deaths in the region[6]. Although studies suggest that injury deaths in the Philippines are well attributed to vehicular collisions and intentional causes, available literature has only characterized injuries in the Philippines from 1960 to 1995[6] and

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How to cite this article: Macaranas IT, Notarte KIR, Ver ATM, Pastrana AM, Chua FJ, Sumalapao DEP. An epidemiological report on the burden and trend of injuries in the Philippines from 2011 to 2018. J Acute Dis 2020; 9(5): 200-205.

Article history: Received 9 June 2020; Revision 16 July 2020; Accepted 27 July 2020; Available online 3 August 2020

from 2013 to 2014[7]. Other than these reports, no data are available describing the burden of injury in the Philippines in the most recent decade. Given this gap in knowledge, the present study investigated the epidemiological distribution of injury cases in the Philippines from 2011 to 2018 using the data from Online National Electronic Injury Surveillance System (ONEISS) quarterly published by the Department of Health (DOH), Philippines. Furthermore, this study described the distribution of injury cases by sex, age, geographical region, and type and cause of injury per year.

2. Materials and methods

2.1. Ethics approval

This study was registered with the Research Grant Administration Office, University of the Philippines Manila (RGAO-2020-0302) and did not contain any studies involving human participants nor animals performed by the authors.

2.2. Data collection and classification

A retrospective study describing trauma cases in the Philippines from 2011 to 2018 was conducted. Epidemiological information such as age, sex, geographical regions, causes and types of injuries sustained was retrieved from the data from ONEISS published by the DOH, Philippines. Data from these quarterly factsheets were collated and tabulated in spreadsheets using Microsoft Excel software. Frequency of cases across different age ranges, sex groups, and geographic regions was computed. Injury cases were also described according to the reported gender-age specific proportions and the reported missing data were classified as unknown.

Moreover, causes of injuries were classified into 10 major categories including: traffic crash, mauling, fall, bites and stings, sharp objects, burns, gunshots, chemicals, hanging and strangulation, and drowning. Unknown causes and other causes were classified under 'others' (*i.e.* sexual assault and abuse, firecracker, exposure to forces of nature). Internal causes of trauma injuries were not reported in the ONEISS and were not covered in the study. Injuries were classified into 8 major types: open wound, abrasion, contusion, fracture, avulsion, concussion, burn, and traumatic amputation. Unknown injuries sustained other than the aforementioned types were classified as 'others' (*i.e.* dislocation, sprain, strain, swelling, deformity). It is to be noted that more than one type of injury may be accounted for one trauma case.

2.3. Statistical analysis

Data were analysed by using STATA® 12.0. Descriptive data were expressed as frequency and percentage. Difference in proportions of cases involving two categories was examined using *z*-test while

homogeneity of the proportions of these cases across three or more categories was assessed using χ^2 -test. The significant level of this study was set at $\alpha < 0.05$.

3. Results

In 2011 to 2018, the ONEISS program of the DOH reported a total of 668 179 injury cases in the Philippines (Table 1). The spike in cases reported in 2012 could be ascribed to more hospitals reporting the injury cases compared to 2011 and 2013. Another spike in data was also observed in 2016 with the double reported cases compared to 2015. Males accounted for 461 002 (68.99%) of the injuries which significantly differed with the proportion of cases involving females ($P < 0.01$). Males had an annual average of 57 625 injury cases while females had an average of 25 897 ($P = 0.041$). Over the years, the frequency of injury cases in the Philippines remained higher among males with an average proportion of 0.70 ± 0.01 when compared with females ($\chi^2 = 290.37$, $P = 0.000$, Table 1). Males consistently accounted for the majority of the registered injuries from ages <1 year-old to 60-64 years-old, but in ages ≥ 65 , there was a higher incidence among females. Moreover, the age group of 20-24 years (12.57%) showed the highest number of injury cases from 2011 to 2018 with an annual average of 10 502 cases. Likewise, the age groups 15-19 years (10.74%) and 25-29 years (10.70%) had relatively higher incidence of injury cases. Thus, it was observed that the frequency of injury cases over the years was associated with age ($\chi^2 = 4 000$, $P = 0.000$).

For the geographical distribution of injury cases, the majority of these cases (14.90%) were recorded in the National Capital Region (NCR) in the Philippines from 2011 to 2018 (Table 2). In addition to NCR, Regions IV A (13.96%), XI (9.10%), VI (8.16%), and III (7.82%) had high proportions of injury cases among the geographical regions in the country (geographical regions in the Philippines are numbered in Roman numeral). The results showed that the distribution of the injury cases over the past years was associated with geographical regions ($\chi^2 = 160 000$, $P = 0.000$).

Of the reported injury cases in the Philippines from 2011 to 2018, the majority were subjected to open wounds (37.56%), while abrasion and contusion accounted for 26.23% and 13.34% of the types of these injuries, respectively (Table 3). It was observed that the distribution of the injury cases was associated with the types of injuries ($\chi^2 = 4 300$, $P = 0.000$). Multiple injuries could explain the difference between the total number of reported cases and the total number of reported types and causes of injuries. For the causes of injuries (Table 4), the reported cases from 2011 to 2018 were primarily due to traffic crash (32.67%). Three other major causes of injuries were fall (14.75%), contact with sharp objects (14.43%), and mauling (14.39%). Thus, there was an association between the distribution of these injury cases in the Philippines and the causes of injury over the years ($\chi^2 = 19 000$, $P = 0.000$).

Table 1. Distribution of injury cases in the Philippines by sex and age from 2011 to 2018.

Variables	2011	2012	2013	2014	2015	2016	2017	2018	Total [n (%)]
Sex									
Male	25553	38807	28087	31582	43242	86085	95601	112045	461002 (68.99)
Female	10435	16016	12062	13359	19428	39264	44166	52447	207177 (31.01)
Age group									
Unknown	7	0	0	0	0	0	0	540	547 (0.08)
<1	260	412	69	150	320	820	972	1902	4905 (0.73)
1-4	2505	4076	2957	3520	4684	8747	10082	12448	49019 (7.34)
5-9	3228	4932	3808	4409	6025	11509	12542	15525	61978 (9.28)
10-14	2727	4012	3059	3480	4798	9257	10032	11764	49129 (7.35)
15-19	4272	6035	4527	4931	6745	13468	14903	16907	71788 (10.74)
20-24	5132	7767	5285	5859	7664	15488	17166	19656	84017 (12.57)
25-29	4030	6151	4408	4532	6234	13537	15186	17385	71463 (10.70)
30-34	3327	5059	3667	3800	5255	10678	11660	13626	57072 (8.54)
35-39	2521	3832	2880	3040	4458	9377	10202	11576	47886 (7.17)
40-44	1977	3311	2450	2630	3649	7279	8012	9230	38538 (5.77)
45-49	1678	2575	1849	2180	3269	6437	7242	8159	33389 (5.00)
50-54	1332	2041	1539	1860	2740	5367	6042	6880	27801 (4.16)
55-59	1009	1505	1257	1520	2170	4227	5032	5771	22491 (3.37)
60-64	715	1109	872	1050	1650	3160	3812	4606	16974 (2.54)
> 65	1268	2006	1522	1980	3009	5998	6882	8517	31182 (4.67)
Annual total	35988	54823	40149	44941	62670	125349	139767	164492	668179 (100.00)

Table 2. Distribution of injury cases in the geographical regions of the Philippines from 2011 to 2018.

Regions	2011	2012	2013	2014	2015	2016	2017	2018	Total [n (%)]
ARMM	77	79	68	300	1407	1830	1430	3367	8558 (1.28)
CAR	3205	6152	2769	5198	3277	3819	3170	6188	33778 (5.06)
NCR	6125	10911	8891	10266	5665	16908	22623	18142	99531 (14.90)
I	734	1666	2862	2550	5645	9499	16273	11743	50972 (7.63)
II	918	4308	4135	2380	2047	2930	1690	2196	20604 (3.08)
III	6318	8802	4241	6070	5765	6959	8350	5757	52262 (7.82)
IV A	3133	3584	2873	4269	4546	18179	26813	29892	93289 (13.96)
IV B	4505	4406	1843	760	4017	2260	2690	6810	27291 (4.08)
V	154	1200	120	290	2817	7189	8230	2271	22271 (3.33)
VI	1426	4014	1944	3380	7705	15219	9760	11068	54516 (8.16)
VII	383	188	4557	5248	6125	7269	5950	15344	45064 (6.74)
VIII	1418	912	98	10	439	1590	3610	6700	14777 (2.21)
IX	108	103	117	350	4326	7649	4680	3374	20707 (3.10)
X	1335	2088	2127	2330	3976	6039	5420	8213	31528 (4.72)
XI	5747	5984	2867	1200	2417	12910	13008	16645	60778 (9.10)
XII	301	361	627	230	2157	4010	3440	7375	18501 (2.77)
XIII	101	65	10	110	339	1090	2630	9407	13752 (2.06)
Annual total	35988	54823	40149	44941	62670	125349	139767	164492	668179 (100.00)

Geographical regions in the Philippines are numbered in Roman numeral; ARMM: Autonomous Region in Muslim Mindanao; CAR: Cordillera Administrative Region; NCR: National Capital Region.

Table 3. Distribution of injury cases in terms of types of injuries in the Philippines from 2011 to 2018.

Type of injury	2011	2012	2013	2014	2015	2016	2017	2018	Total [n (%)]
Open wound	15285	23638	17186	20136	29018	55755	63020	73776	297814 (37.56)
Abrasion	11359	17568	12987	13897	19199	38993	45133	48825	207961 (26.23)
Contusion	6745	10248	7581	6539	9025	23329	20390	21935	105792 (13.34)
Others	4229	5832	3655	3870	6472	13006	14875	16568	68507 (8.64)
Fracture	4244	5603	3993	4774	5335	11714	11026	11716	58405 (7.37)
Avulsion	1025	1390	1343	1287	2222	4691	5070	5718	22746 (2.87)
Concussion	659	1166	1118	1292	1737	4396	3843	3889	18100 (2.28)
Burn	631	896	691	792	1211	2418	2254	2714	11607 (1.46)
Amputation	98	153	144	163	209	403	430	454	2054 (0.26)
Annual total	44275	66494	48698	52750	74428	154705	166041	185595	792986 (100.00)

Table 4. Distribution of reported injuries by cause in the Philippines from 2011 to 2018.

Causes of injury	2011	2012	2013	2014	2015	2016	2017	2018	Total [n (%)]
Traffic crash	10989	16151	13938	14499	22089	43383	44158	54177	219384 (32.67)
Mauling	6893	11260	7075	5679	8579	18332	18557	20287	96662 (14.39)
Fall	5994	10339	6721	8480	10501	18285	16400	22316	99036 (14.75)
Bites or sting	1952	6310	3302	5460	7444	13707	20778	26298	85251 (12.69)
Contact with sharp objects	4937	6257	6178	7493	10601	19046	19113	23263	96888 (14.43)
Others	4136	1824	2405	2421	2759	9510	17793	15034	55882 (8.32)
Burns	557	867	646	753	962	2252	2051	2591	10679 (1.59)
Gunshots	395	536	325	374	655	1244	921	905	5355 (0.80)
Chemicals or substances	70	133	77	91	146	291	301	295	1404 (0.21)
Hanging or strangulation	38	65	36	47	67	123	96	161	633 (0.09)
Drowning	27	43	13	32	45	69	81	94	404 (0.06)
Annual total	35988	53785	40716	45329	63848	126242	140249	165421	671578 (100.00)

4. Discussion

The study examined the eight-year (2011-2018) epidemiologic distribution of injury cases in the Philippines using data from ONEISS. More than five million people die each year because of injuries worldwide, which account for ~9% of total deaths, and these injuries resulted in higher mortality than malaria, tuberculosis, and HIV/AIDS combined[2]. These deaths have been increasing over the years in low- and middle-income countries. Although not all injuries lead to death, millions of people around the world suffer injuries which sometimes lead to disability. Therefore, an epidemiologic study on the distribution of injury cases is of great importance. In the present study, a total of 668 179 injury cases were reported and various parameters (sex, age, cause, region, and type of injury) were used to find their association with the distribution of the reported cases.

Of the 668 179 cases, 461 002 were males (68.99%) while 207 177 were females (31.01%). Males in the Philippines accounted for the majority of injury cases, which is consistent with the study of Rivera *et al.*[7] based on the 2013-2014 surveillance data. The study also reported the prevalence of younger patients, there was no clear definition for the involved population. In the present study, the age groups that were found to be highly vulnerable were the younger ones: 15-19 (10.74%), 20-24 (12.57%), and 25-29 (10.70%). Furthermore, a similar gender distribution is observed in other literature, but there are varying accounts in age distribution. In African countries, cases were higher among male patients. In Nigeria, the majority of the patients were aged between 20-29, similar to this study’s findings[8]. In Senegal, 50% of the cases were 20 years old and below, and 28% aged 21-40 years old[9]. The researcher also noted that as age increases, the number of patients declines. Similar findings were observed in a study from Iran[10] where most number of trauma cases were identified in the age group 15-24 with males greatly surpassing the females (3:1). Another study from Sichuan, China investigated the distribution in rural and urban areas from 2006 to 2015[11]. Higher proportions of male patients were observed both in rural and urban surveillance. Injury rates were recorded to be higher for ages 0-4 years old and 20-29 years old among urban residents. Rural residents had a

slightly older population of 35-40 years old.

In Canada, males also have higher mortality compared to females[12]. Prevalence based on age population varies depending on the cause. Mortality due to unintended injuries is higher among older patients. In Brazil, a more extensive review was conducted spanning 18 years (1998-2015) for intensive care hospitalization[13]. While males were found to have a higher hospitalization rate, an increased hospitalization rate of female patients was apparent in the recent years. The researchers attributed this to increased exposure to external causes. Majority of the age group reported belonged to 60 and older followed by 15-29 years old. Although this does not necessarily indicate that older patients are more frequently injured, severity or prognosis is worse for these age groups. This paper covered all injury cases, not limited to those that led to mortality and intensive care, which could be the main cause of disparity from the age distribution of the last two papers. Unlike in Brazil, no change has been observed with gender distribution over the past years. The higher prevalence of the 15-29 age group for this study may indicate higher exposure to external causes, particularly traffic crash.

Traffic crash has been the top cause (32.67%) of reported injury in the Philippines from 2011 to 2018, and this has been consistent throughout the years. For both 2004[14] and 2014[2], road traffic crash has been the number one cause of death among all injuries. By the year 2030, WHO projected that the road traffic crash will be the seventh leading cause of death surpassing HIV/AIDS and diarrheal diseases. Fall (14.75%), the second major cause of injury in the Philippines, is also predicted to be one of the leading causes of death by 2030. The other major causes of injury in the country include contact with sharp objects (14.43%) and mauling (14.39%). In a 2004-2007 study involving a Philippine university hospital, stab wounds (32.9%) were found to be the number one cause of injury, followed by vehicular crash (28.6%)[15]. In a study by Oestern *et al.*[16], there has been an increasing number of road traffic accidents recorded over the years in India, a lower middle-income country. A teaching hospital in Ghana, Africa also reported that road traffic accidents (39.1%) were the major cause of injuries[17]. Iran, an upper middle-income country, also reported that accidents and fall were among the major causes of trauma[10].

In contrast to the first few accounts, Germany, a high-income country, reported a decline in road traffic accidents[16]. This disparity in injury cases is supported by the WHO data wherein injury-related mortality is increasing in low- and middle-income countries. This can be attributed to differences in infrastructure system, traffic laws, and healthcare system among countries[16]. In the Philippines, the country is divided into 17 regions with Region IV A as the most populated region, followed by the NCR. For the past eight years, NCR has recorded the greatest number of injury cases, followed by Region IV A. Throughout the years, NCR has also been one of the top five regions to have the greatest number of cases. For the most recent three years, Region IV A recorded the greatest number of cases followed by NCR. Given the epidemiological data in the Philippines, traffic crash could be considered as the most common cause of injury in populated regions of the country. Although no study has yet been conducted on the association of incidence of traffic crash with population distribution in populated regions. In a study published in 2018, NCR also recorded the highest number of deaths due to injuries, but it should also be noted that it does not have the highest death rate, because of high population in the region[7]. Underreporting among the other regions can also be a factor since not even 20% of all the hospitals in the country report their data to the DOH. Moreover, as noted by the WHO, not all injuries require hospitalization; and not all injuries lead to death. However, the severity of an injury can be influenced by the type of injury sustained by a patient. The most common type of injury experienced by patients in the Philippines from 2011 to 2018 is the open wound (37.56%), which was also the number one cause of death of trauma patients in 2014[7]. Abrasion, contusion, and fracture are the other major types of injuries suffered by Filipino patients. For the past eight years, there had been 668 179 recorded cases of injury in the country; but the total number of cases based on the distribution of types of injuries was 792 986. This means that over a hundred thousand of patients experienced multiple injuries. Multiple injuries can be more difficult to treat and can sometimes lead to multiple organ failure or sepsis in severe condition. According to the data reported in the Philippines, sepsis has been found to cause more deaths as time progresses[18]. In fact, sepsis has been reported to be the leading cause of death among trauma patients in 2011[15]. In Europe, severity of injury is the major cause of early death among patients. The type of injury sustained by patients is a reliable indicator of their survival[18].

Although the present study provided a comprehensive report on the number of injury cases from 2011 to 2018, one limitation of the study is the limited number of hospitals reporting to ONEISS. Data collection by ONEISS was done quarterly. However, the hospitals and reports per quarter vary which could eventually affect the analysis of data. Such is the case in some quarters of 2013 and 2014 where no data was reported from Regions V, VIII, and XIII. Moreover, as the years progress, there has been more classifications for the cause of injuries. For the sake of uniformity in processing the data, the new classifications in the later years have been classified under

the category 'others'. This does not greatly impact the evaluation of data available and shows that a more detailed collection of data was done or some causes caught more attention in the past few years.

5. Conclusion

The burden of injury remains high in the Philippines due to the lack of resources and inadequate healthcare, with males and the younger age groups (15-29 years old) facing the highest risk. The NCR and Region IV A recorded the most number of cases, both of which are also the most populated regions. Traffic accidents remain the most prevalent cause of injury and open wounds as the most common injury throughout the period of study. The findings on the distribution of injury cases in the Philippine can provide useful information for taking appropriate preventive measures, developing effective safety guidelines, allocating limited resources in an appropriate manner, and implementing necessary public health programs. Recommendations from policy makers on appropriate plans to address the causes of injuries can be formulated. Intervention measures to mitigate the identified main causes of injuries particularly among geographical regions with a high number of cases can be provided.

Conflict of interest statement

The authors report no conflict of interest.

Authors' contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

References

- [1] Takala J, Hämäläinen P, Saarela KL, Yun LY, Manickam K, Jin TW, et al. Global estimates of the burden of injury and illness at work in 2012. *J Occup Environ Hyg* 2014; **11**(5): 326-337.
- [2] World Health Organization. Injuries and violence the facts. [Online] Available from: https://www.who.int/violence_injury_prevention/media/news/2015/Injury_violence_facts_2014/en/. [Accessed on 20 March 2020].
- [3] Chandran A, Hyder AA, Peek-Asa C. The global burden of unintentional injuries and an agenda for progress. *Epidemiol Rev* 2010; **32**(1): 110-120.
- [4] Prinja S, Jagnoor J, Chauhan AS, Aggarwal S, Ivers R. Estimation of the economic burden of injury in North India: A prospective cohort study. *Lancet* 2015; **385**(2): 57-65.
- [5] Philippine Statistics Authority. Philippine statistical yearbook [Online] Available from: <https://psa.gov.ph/products-and-services/publications/>

- philippine-statistical-yearbook. [Accessed on 20 March 2020].
- [6] Consunji RJ, Hyder AA. The burden of injuries in the Philippines: Implications for national research policy. *Accid Anal Prev* 2004; **36**(6): 1111-1117.
- [7] Rivera AS, Lam HY, Macalino JU. Epidemiology of injuries in the Philippines: An analysis of secondary data. *Acta Med Philipp* 2018; **52**(2): 180-186.
- [8] Adoga A, Ozoilo K. The epidemiology and type of injuries seen at the accident and emergency unit of a Nigerian referral center. *J Emerg Trauma Shock* 2014; **7**(2): 77-82.
- [9] John K, Faye F, Belue R. A descriptive study of trauma cases encountered in the Grand M'Bour Hospital emergency department in Senegal. *Pan Afr Med J* 2019; **32**: 9-19.
- [10] Beigzadeh A, Tahami NA, Rezaei H, Bahman BB, Nazarieh M, Askari S. Epidemiology of trauma in Shahid Bahonar hospital in Kerman. *J Emerg Practice Trauma* 2016; **2**(2): 33-36.
- [11] Cai P, Wu X, Liu Z, Deng Y, Chen X, Yi G, et al. Analysis of the burden and trend of injury in Sichuan, China from 2006 to 2015: Results from the national injury surveillance system. *BMJ Open* 2019; **9**(11): e031184.
- [12] Yao X, Skinner R, McFaul S. At a glance-2015 injury deaths in Canada. *Health Prom Chron Disease Prev Canada* 2019; **39**(6-7): 225-231.
- [13] Lentsck MH, Sato APS, Mathias TAF. Epidemiological overview-18 years of ICU hospitalization due to trauma in Brazil. *Rev Saúde Pública* 2019; **53**: 83-95.
- [14] World Health Organization. Injuries and Violence the Facts. [Online]. Available from: "https://www.who.int/violence_injury_prevention/key_facts/en/". [Accessed on 20 March 2020].
- [15] Consunji R, Marinas JS, Maddumba JA, Dela Paz DA. A profile of deaths among trauma patients in a university hospital: The Philippine experience. *J Inj Violence Res* 2011; **3**(2): 85-90.
- [16] Oestern HJ, Garg B, Kotwal P. Trauma care in India and Germany. *Clin Orthop Relat Res* 2013; **471**(9): 2869-2877.
- [17] Blankson P, Amoako J, Asah-Opoku K, Odei-Ansong F, Lartey MY. Epidemiology of injuries presenting to the accident center of Korle-Bu Teaching Hospital, Ghana. *BMC Emerg Med* 2019; **19**(1): 39.
- [18] Lefering R, Paffrath T, Bouamra O, Coats TJ, Woodford M, Jenks T, et al. Epidemiology of in-hospital trauma deaths. *Eur J Trauma Emerg Surg* 2012; **38**(1): 3-9.