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Estimation of the Incidence of Head Injury in Korea: an Approximation Based on National Traffic Accident Statistics

Head injury is a leading cause of death and disability in Korea. It usually results from an avoidable accident. Epidemiologic data on the head injury is important for the effective reduction of this controllable disaster. The aim of this study is to estimate the incidence of head injury in Korea. Data on the incidence of the traffic accidents were collected from Traffic Accident Statistics 1998 by the National Police Agency. Proportion of head injuries due to traffic accidents was obtained from various literatures. The incidence of head injury was approximated simply by a formula H=T/0.625 [the total number of patients after traffic accidents (T) would be 62.5% of the total number of patients with head injury (H)]. In 1998, the estimated number of head injury was 109,462. The annual incidence was 236/100,000 person, 334/100,000 for males and 136/100,000 for females. The causes were road traffic accident in 62.5%, and falls in 15.6%. The operation was performed in 20.2% with a mortality of 4.0% in average. Case fatality rate was 8.2%. Annual death rate was 19/100,000 population. A public campaign is required on the basis of trustworthy epidemiologic data to reduce the incidence of head injury for the public health.

Key Words : *Incidence; Epidemiology; Craniocerebral Trauma; Korea*

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INTRODUCTION

Head injury is a leading cause of death and disability since it is common and accompanies a high rate of death (1, 2) as well as various and numerous long-term disabilities (3-7). Each year, an estimated 15,000,000 Americans sustain a traumatic brain injury (8). About 50,000 people die, 230,000 people are hospitalized and survive, and an estimated 80,000-90,000 people became chronically disabled. Death from motor vehicle accident has been the most common cause of death below the fifth decades in Korea (9). Since most of the victims are young men, not only the victims themselves but also their families should cope with the disabilities for many years. Statistical data show that the risk of road traffic accidents is as high as every 1 out of 5 Koreans has become the very victim during the last 5 yr. The cost for motor vehicle accidents was reported as high as 10,800,000,000,000 won (about 10 billion U.S. dollars) in Korea (10).

It is not only a public health problem, but also a social and economical problem. Epidemiologic data on the head injury is of great importance for the effective reduction of this disaster, which usually results from a potentially avoidable accident. Since there has been no nationwide survey on the head injury except hospital-based case series in Korea, the author performed an epidemiologic study on the incidence and causes of head injury.

MATERIALS AND METHODS

By collecting data from all clinics and hospitals in Korea, it is hard to obtain the total number of head injuries in Korea. It requires great efforts and cost. It is easy to estimate the total number of head injuries by calculating the total number with the proportions of the head injuries in traffic accidents and the National Traffic Accidents Statistics. The author collected data on the incidence, regional distribution, and case fatality rate of the motor vehicle accidents from Traffic Accident Statistics 1998 by the National Police Agency. Data on the head injury were collected from Korean literatures (11-17). Using these two data sets, the incidence and causes of head injury in Korea were estimated.

Traffic Accident Statistics included accidents with human injuries. The severity of the injury was graded into 4 levels, i.e., death for the cases of death within 72 hr after the accident, severe injury for cases requiring treat-

ment for more than 3 weeks, mild injury for cases requiring treatment for 5 days to 3 weeks, and minimal injury for cases requiring treatment for less than 5 days. According to the definition by Organization for Economic Cooperation and Development (OECD), death means death within 30 days after the injury, while the term includes all deaths after 30 days in the Korean literatures. Case fatality rate was calculated as a percentage value by dividing the number of deaths by the number of accidents. Regional distribution was classified into 10 regions, i.e., the head, face, neck, chest, abdomen, back, lumbar, upper extremities, lower extremities, and others (asphyxia, drowning, etc) according to the most severe injury.

RESULTS

Traffic accident statistics

According to the Traffic Accident Statistics 1998 by the National Police Agency, a totoal of 349,621 people were injured by motor vehicle accidents in 1998. As a result of the injury, 9,057 people died within 72 hr after the accident. The mortality rate due to motor vehicle accident is 19.3 per 100,000 people or 8.7 per 10,000 cars. This figure represents the highest rate except those in a few developing countries (Fig. 1).

In 68,414 victims out of 349,621 (19.6%), the injured region was head (Table 1). Among them 6,472 died within 72 hr and 61,942 survived. The mortality rate of the head injury was 9.5%. However, deaths from the head injury occupied 71.5% of the total death after motor traffic accidents.

Review of the Korean literature

The author reviewed 7 case series to get percentage distribution of the external cause and case fatality rate in Korea (Table 2) (11-17). Transport accident occupied 62.5±10.4% (range, 50.9-77.1%) in average. The percentage distribution of the motor vehicle-related head injury differs from country to country. Even within a country, it differs according to the city or time. In any events, transport accident is the most common cause of head injury in Korea (Fig. 2) (18-26). Skull fracture was found in 34.9±8.0%. Operative intervention was required in 20.2±8.1%, and the operative mortality rate was 4.0±1.9%. Case fatality rate was 8.2±2.8% (range, 3.1-12.3%) in average. Male to female ratio was 2.5:1.

There has been two reports in Korea on the severity of head injury classified according to the Glasgow Coma Scale (16, 17). On the average, the severity was mild in 73.4%, moderate in 11.4%, and severe in 16.3%. Severe head injuries were relatively common in these reports

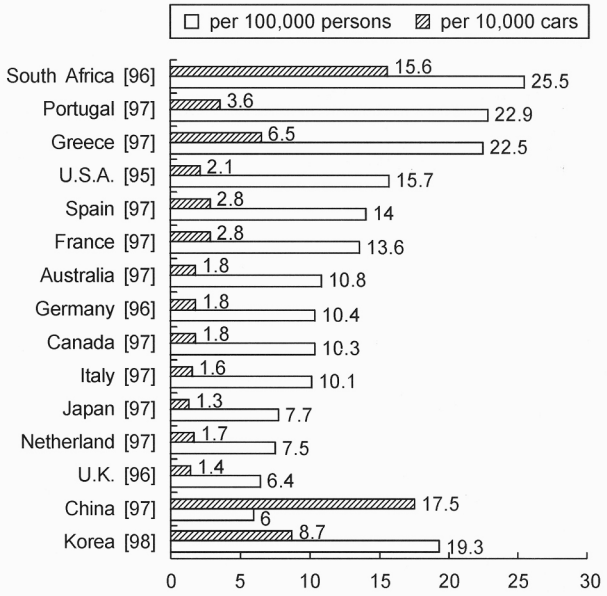

Fig. 1. Annual incidence of motor vehicle accidents [year] (Data from Korea Transportation Safety Authority).

Table 1. Number of the victims of the road transport accidents in Korea, 1998

Injured sites	No. of dead (%)	No. of injured (%)	Total (%)	Case fatality
Head	6,472 (71.5)	61,942 (18.2)	68,414 (19.6)	9.5%
Face	258 (2.8)	20,543 (6.0)	20,801 (5.9)	1.2%
Neck	345 (3.8)	109,969 (32.3)	110,314 (31.6)	0.3%
Chest	753 (8.3)	19,923 (5.9)	20,676 (5.9)	3.6%
Abdomen	277 (3.1)	3,653 (1.1)	3,930 (1.1)	7.0%
Back	60 (0.7)	3,219 (0.9)	3,279 (0.9)	1.8%
Lumbar	153 (1.7)	34,482 (10.1)	34,635 (9.9)	0.4%
Upper extremities	30 (0.3)	16,320 (4.8)	16,350 (4.7)	0.2%
Lower extremities	452 (5.0)	70,264 (20.6)	70,716 (20.2)	0.6%
Others	257 (2.8)	249 (0.1)	506 (0.1)	50.8%
Total	9,057 (100)	340,564 (100)	349,621 (100)	2.6%

Table 2. Selected papers on the head injury in Korea

Features	Rhee et al. (11)	Moon et al. (13)	Lee et al. (14)	Jun et al. (16)	Kim et al. (17)	Cho et al. (12)	Lee et al. (15)
Total number of patients	585	1523	1547	1210	1000	340	667
Traffic accident	57.3%	76.6%	62.2%	58.1%	77.1%	50.9%	55.2%
Fall	25.5%	11.6%	9.0%	5.9%	6.9%	31.8%	18.7%
Others	17.3%	11.9%	28.8%	36.0%	16.0%	17.4%	26.1%
Skull fracture	28.2%	28.3%	32.6%	31.0%	31.6%	48.5%	43.7%
Male : Female	3.2:1	2.1:1	2.3:1	2.3:1	2.2:1	3.2:1	2.0:1
Period of study	66-71	71-77	72-76	80-84	86-87	66-71	82-83
Population	adult (≧15)	all	adult (≧16)	adult (≧16)	all	child (≦15)	child (≦15)
Operation rate	35.7%	14.1%	12.6%	23.4%	14.9%	2.6%	17.4%
Case fatality	12.3%	9.3%	8.0%	8.0%	9.6%	23.2%	7.1%
Operation mortality	7.2%	4.3%	3.6%	4.6%	4.4%	4.8%	1.2%

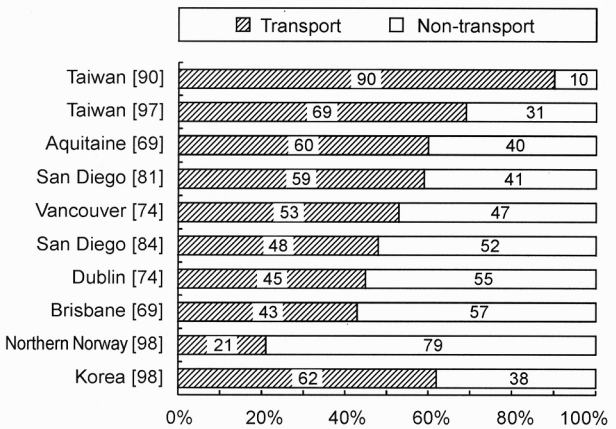

Fig. 2. Percentage distribution of head injuries by external cause from selected series of reports [year of study or report].

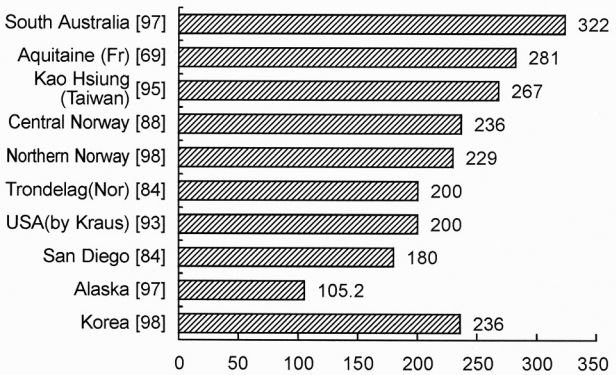

Fig. 3. Head injury incidence rates per 100,000 from selected series of reports [year of study or report].

from the university hospitals, which are the tertiary care units.

Epidemiology of the head injury in Korea

The total number of patients with head injury after transport accident (T) would be 62.5% of the total number of patients with head injury (H). Then, the total number of patients with head injury can be calculated by a simple formula, H=T/0.625. According to the data from Traffic Accident Statistics 1998, T was 68,414. So, the total number of patients with head injury was calculated as 109,462 in Korea during a year 1998. Total population of Korea was 46,430,000 in 1998 (27). The annual incidence rate of head injury was 236/100,000 population (95% CI=204-279), 334/100,000 for males (95% CI=312-351) and 136/100,000 for females (95% CI=119-158). This incidence is higher than that in the United States, but lower than that in France (Fig. 3) (20, 26-32). The total number of deaths due to head injury

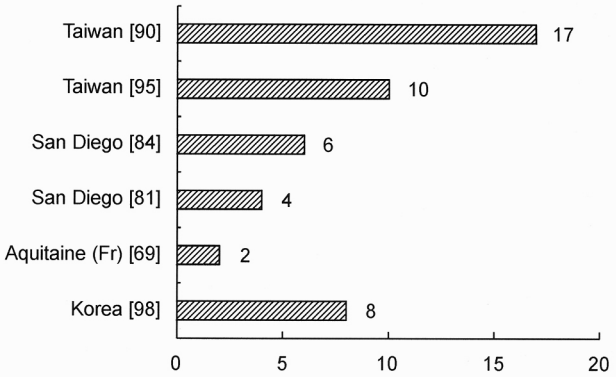

Fig. 4. Case fatality rates reported from selected series of studies [year of study or report].

was calculated to be 8,976 per year, and annual death rate due to head injury was to be 19/100,000 population. The case fatality rate is lower than that in Taiwan, but higher than that in United States or France (Fig. 4) (18, 20-22, 31).

Given that 7% of the survivors after head injuries had

significant neurologic sequelae (22), 7,034 people became disabled due to head injury in 1998.

DISCUSSION

The author demonstrated some epidemiologic features of Korean head injury by a literature review and an official data, the Traffic Accident Statistics 1998, which was collected nationwide by the National Police Agency, although this study is not based on the direct survey.

Several problems should be pointed out. Percentage distribution of head injury by the external cause was obtained by hospital-based, limited cases. So simple mathematical averaging may not represent the actual values. However, data from these series were quite similar with small standard deviation. Moreover, the incidence of the head injury can be influenced by how to define the head injury. Although brain injury or traumatic brain injury differs from the head injury, these terms are used interchangeably (30). Besides the definition or criteria, the incidence can be variable according to the cities or time. Even a direct survey, which will cost much money, may vary. A gross estimation can be a useful tool for comparison or recognizing the magnitude of the problem.

Injuries are a large and neglected health problem, accounting for 16% of the global burden of disease in 1998 (33). Injury is the most rapidly increasing cause of death and disability in developing countries, resulting from the combination of increasing urbanization and motor vehicle use and declining deaths from infectious diseases or malnutrition. In Korea, the proportion of deaths from accident among all deaths was 9.5% in 1983, 14.8% in 1993, and 13.3% in 1998.

In Taiwan, the number of motorcycle-related head injuries decreased by 33% after the implementation of the motorcycle helmet law (34). A well-planned law or a policy may save our lives, health, and wealth. If we develop a good administrative plan, which can bring about the reduction of the incidence of head injury by 1/3, nearly 40,000 victims of head injury and 2,000 disabled people will be prevented every year in Korea. A national or public campaign is required to reduce the incidence of head injury for the public health and wealth.

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