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**RETROSPECTIVE ASSESSMENT OF THE PREVALENCE OF TRAUMATIC BRAIN INJURY
AMONG PATIENTS REFERRED FOR COMPUTED TOMOGRAPHY SCAN AT PORT MORESBY
GENERAL HOSPITAL, PAPUA NEW GUINEA**

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ABSTRACT:

Traumatic brain injury (TBI) remains one of the serious health and socioeconomic problems throughout the world. It affects people of all ages; however, adolescents, young adults and the elderly are mostly affected. It is prevalent in both developing and developed countries. However, the greatest burden of TBI is experienced in the low and middle income countries (LMICs). This study is a retrospective assessment of TBI among patients referred for computed tomography (CT) scan at the Port Moresby General Hospital (PMGH) over a period of 28 months (September 2017 to December 2019). The case files of all the TBI patients were collected after obtaining ethical clearance. The relevant information was recorded in Excel Spread sheet. A total of 647 cases were recorded. The data was statistically analyzed using Microsoft Excel 2013. More than 50% of the cases were young adults, followed by adults in the age range of 35-64 years. Motor vehicle accidents (MVAs) and assaults were the leading cause of TBI. Male outnumbered their female counterparts with the ratio of 4:1. We cannot conclude that MVAs and assaults are the common cause of TBI in PNG currently, because no standardized data recording is available.

Keywords: traumatic brain injury, head injury, adolescent, young adults, elderly patients, epidemiology, Papua New Guinea

INTRODUCTION:

Traumatic brain injury (TBI) also known as head injury (HI) or head trauma (HT) is one of the leading causes of death and disability worldwide [1-4]. TBI is referred to as “silent epidemic” [3, 4,

8] because the problems resulting from TBI may not be directly visible. The term TBI is non-specific because it includes clinically obvious external injuries to the face, scalp and calvarium such as laceration, contusions and fractures

[12]. TBI is defined by Common Data Elements (CDE) as an alteration in brain function or other evidence of brain pathology caused by an external force such as blast or explosion, firearms, or Motor vehicle accident (MVA) or road traffic accident (RTA) [4, 12]. Assaults such as interpersonal violence, street fight, tribal fight or firearms are common in economically depressed or resource poor countries [9]. MVA and RTA are prominent causes of TBI in both developed and less developed countries [4, 8]. However, MVA or RTA related TBI in some developed nations have declined due to adequate traffic educations and traffic safety regulations [4]. Alcohol consumption or drug intoxication in developed countries represent an important risk factor of TBI and is suggested to be the contributing cause in up to 50% of hospital admission to intensive care unit (ICU) [4, 8].

TBI affects people of all ages, though adolescent, young adults and the elderly are predominantly affected [3-4]. Millions of people in the United States of America (USA) and European Union (EU) incur TBI every year. Approximately 5.3 million and 7.7 million people in the USA and EU respectively, are living with TBI related disability [4]. Papua New Guinea (PNG) and other countries are facing the same problem. Low- and middle-income countries (LMICs) such as PNG experience the burden of TBI more than high-income countries [4]. However, epidemiological data in the developing

countries are scanty [4] thus the actual number of people who died or live with TBI related disability is not known. MVAs, RTAs, falls and assaults are the common causes of TBI that are well documented [4-7]. Greater variability however, exists across regions of various population, regulations and infrastructure [4, 8]. For example, in a low-income country such as PNG, MVAs and assaults are common whereas in high-income countries such as the USA or Australia, fall related TBI is common.

In PNG, published data on TBI is scanty. Two hospital based studies published in 1996 [6] and 2007 [9] reported that TBI is among the common causes of death and hospitalization. The results also indicated that MVA and assaults were the leading cause of TBI related death and hospitalization among young adults and adolescents [6]. Moreover, MVA was the leading cause of TBI in Goroka and overall in Port Moresby. Another study conducted in PMGH over a two-year period (2003 to 2004) on the trends in TBI outcomes demonstrated that assaults have overtaken MVA as the leading cause of TBI with a margin of 47% and 31%, respectively [9]. Other common causes of trauma related cases for surgical admissions reported in the Southern Highlands of PNG were tribal fights (24%), domestic violence (14.3%), assault (16.7%), road accidents (14%) and domestic accidents (25.1%) that included falls, penetrating wounds and bites [18]. In some

areas in PNG, falling from trees or coconut trees contributed to TBI [19].

PNG is located north of Australia in the South Pacific region. It shares land border with West Papua (Indonesia) to the west and an ocean border with Solomon Island to the east and Australia to the south [13]. It has an estimated population of over 7 million, of which 80% of the population lives in the rural areas [13].

The major objective of this study was to retrospectively assess the prevalence of TBI among the patients referred for CT scan at the PMGH over a period of 28 months (September 2017 to December 2019).

METHODOLOGY:

This was a descriptive study with convenience sampling conducted at the PMGH Radiology Department [14-15]. The PMGH is the major public general, specialist and reference hospital in the National Capital District (NCD) and PNG. It is also the teaching hospital for the School of Medicine and Health Sciences (SMHS), University of Papua New Guinea (UPNG). The patients represent a cross-section of the NCD population and the Central Province.

Cases of TBI were collected retrospectively from the CT record book from September 2017 to December 2019. The variables collected were gender, age and recorded cause of TBI. The data were recorded in Microsoft (MS) Excel Spreadsheets.

Patients whose age ranged below 10 years were excluded in this study. A total of 803 TBI cases were recorded. Of these, 156 cases were below 10 years of age, thus were excluded from the study. The final sample size was 647 cases of TBI. The data was analyzed statistically using the MS Excel Spreadsheet data pack version 2013.

Ethical approval for this study was granted by the School of Medicine and Health Science Research and Ethics Committee (SMHS REC). Written consent was granted by the Director of Medical Service at PMGH with the approval from the Head of Radiology Department.

Criteria for data analysis by age groups: Five categories of age groups were used in the present study [16]. Children: 10 to 14 years. Adolescence: 15 to 19 years. Young adults: 20 to 34 years. Adults: 35 to 64 years. Elderly: 65 plus years.

RESULTS:

Over the duration of 28 months a total of 803 TBI cases were recorded in the CT record book in PMGH. However, because of the exclusion criteria in the present study only 647 (80.6%) TBI cases were found suitable for analysis. Table 1 shows the distribution of all the patients according to age groups. The prevalence of TBI was highest (54.6%) among those in the 20 to 34 years age group, followed by (24.4%) those in the 35 to 64 years age group. The lowest prevalence (2.2%) was among those in the 65-

plus age group. Gender distribution indicated that 80.0% (518/647) were male patients and 20.0% (129/647) were female patients. The distribution of the male and female patients according to age groups is also presented in Table 1.

Causes of TBI among patient age groups:

The causes for 32.5% (210) of the 647 TBI cases were clearly stated in the CT record book. The most frequent cause was MVAs (52.4%) followed by assault (28.6%) and fall (15.7%). RTA accounted for only 1.9% of the TBI cases in the present study. These results are not the true reflection of the actual causes of TBI over the duration of the study because the causes of

67.5% (437/647) of the cases were not recorded (Table 2).

In terms of the distribution of causes of TBI among different age groups, the results revealed that young adults had the highest distribution of MVAs (54.5%), followed by adolescence (22.7%), children (13.6%) and adults (9.1%). Assault was the second common cause among young adults (75%), followed by adults (16.7%), adolescence (5%) and children (3.3%) with the least distribution. Fall was common among young adults (27.3%) while children, adolescence and adults had equal distribution of falls with 24.2% each. There was no recorded distribution of causes among the elderly patients (Table 3).

Table 1: % (n) distribution of all the patients according to age groups.

Age groups (years)	Males % (n = 518)	Females % (n = 129)	Total % (n = 647)
10 – 14	7.5 (39)	7.8 (10)	7.6 (49)
15 – 19	9.3 (48)	19.4 (25)	11.3 (73)
20 – 34	58.3 (302)	39.5 (51)	54.6 (353)
35 – 64	23.7 (123)	27.1 (35)	24.4% (158)
65 plus	1.2 (6)	6.2 (8)	2.2 (14)

Table 2: % (n = 210) distribution of causes of TBI among all the patients.

Causes of TBI	% (n)
MVA	52.4 (110)
Assault	28.6 (60)
Fall	15.7 (33)
RTA	1.9 (4)
Sports Injury	1.0 (2)
Suicidal	0.5 (1)

Table 3: % (n) distribution of causes of TBI according to age categories.

Age category (years)	MVA (n=110)	Assault (n=60)	Fall (n=33)	RTA (n=4)	Sports Injury (n=2)	Suicidal (n=1)	Total (n=210)
Children (10-14)	13.6 (15)	3.3 (2)	24.2 (8)	0	0	0	11.9 (25)
Adolescence (15-19)	22.7 (25)	5.0 (3)	24.2 (8)	25.0 (1)	0	0	17.6 (37)
Young adults (20-34)	54.5 (60)	75% (45)	27.3 (9)	50.0 (2)	50.0 (1)	100 (1)	56.2 (118)
Adults (35-64)	9.1 (10)	16.7 (10)	24.2 (8)	25.0 (1)	50.0 (1)	0	14.3 (30)
Elderly (65 +)	0	0	0	0	0	0	0

DISCUSSION:

More than half (54.6%) of all the patients with TBI referred for CT scan in PMGH in the duration of this study were in the 20 to 34 year age group, which represents the young adults. This is a common pattern in most countries worldwide, where TBI is the common cause of death and disability among young adults [4, 16]. Our result also supports the findings in an earlier study by Kaptigau et al. [9] that TBI reported cases were predominant among young adults in Port Moresby. The authors also reported high incidence of TBI among adolescents. Our result however, shows relatively low prevalence (11.3%) of TBI among adolescents compared to the adults (24.4%).

In our present study 2.2% of the elderly are affected by TBI, this is lower than the values reported in the developed countries [2-4, 16]. The high prevalence of TBI among the elderly has increased in developed countries due to increase life expectancy and greater mobility as

reported elsewhere [4]. Such results are quite true because, in PNG the life expectancy and mobility are lower than in the developed countries.

In terms of gender distribution in the current study, male predominance is seen; M/F ratio of 4:1. The result is higher than the M/F ratio of 3:1 reported by Kaptigau et al. [9]. The high prevalence of male with TBI has been reported by others [12]. Bruns Jr and Hauser [12] reported M/F ratio of 2.7:1, 2:1, 1.3:1 and >4:1 in Australia, France, China and South Africa respectively. A recent study by Peeters et al. [3] in 2015, reported that M/F ratio ranged from 1.2:1 to 4.6:1.

The high M/F ratio of TBI in the current study could be due to law and order issues; and limited policies and service provision targeting the problems. PNG is known for increased domestic violence and tribal fights and these activities are dominant among male individuals, especially young adults [6, 18].

The increase in motorization with inadequate traffic safety regulations and traffic education [4] may also have contributed to such increase TBI. This may also be the reason why young adults experience the burden of TBI than adults and the elderly. Thorough analysis and interpretation of the causes of TBI in the present study cannot be made because of the incomplete entry of relevant information in the CT record books in the Radiology department in PMGH. This should be of concern to the authorities because of the possibility of misdiagnosis and inappropriate management of patients. Urgent actions are needed to improve the information management and recording system in the Radiology department in PMGH.

However, based on the limited data available, which is 32.5% of all the cases recorded in the CT record book, MVA (52.4%) was the leading cause of TBI followed by assault (28.6%) and fall (15.7%). These results can be compared to two previous studies in PNG [6, 9].

In 1996 MVA was the leading cause of TBI followed by assaults [6]. However, in 2007 assaults was reported as the leading cause followed by MVA [9]. The trend is again reversed showing that MVA is the leading cause followed by assault.

In some developed countries, MVAs have declined because of adequate traffic education and traffic safety regulations [4]. In terms of age group, MVAs remain a major cause of TBI among young adults. This correlates with

studies done elsewhere [2, 4, 8, 10]. Assaults are common in the LMICs as evidenced in the current study and also from previous studies [6,9].

Limitation of the study:

The data in the current study may not reflect the actual TBI trend in the NCD because of the inappropriate recording of information in the CT record book.

CONCLUSION:

The results indicated that TBI is prevalent among the young adults (54.6%) followed by adults (24.4%) and adolescents (11.3%). Prevalence of TBI was higher among the male compared to female patients with and M/F ratio of 4:1. The primary cause of TBI in the current study was MVA (52.4%) followed by assaults (28.6%). The incomplete entry of relevant information in the CT record books in the Radiology department in PMGH should be of concern to the authorities because of the possibility of misdiagnosis and inappropriate management of patients. Appropriate actions must be taken to improve the information management and recording system in the Radiology department in PMGH.

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