



Clinical and Diagnostic (CT scan) Case Profile of Traumatic Brain Injury (TBI) Patients in a Tertiary Care Center, Visakhapatnam - A Retrospective Observational Study

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Abstract

Introduction: India experiences increase in incidence of Road Traffic Accidents (RTA). During 1970 to 2011, there is 7.3 times increase in road accident injuries. Head injury is the commonest due to RTA injury which accounts for 60% of cases in Visakhapatnam which is situated along the ⁹National Highway. **Aim:** The aim is to study the clinical and CT scan diagnostic case profile of Traumatic brain injury (TBI) in Visakhapatnam region. **Material & Methods:** It is a retrospective observational study of cases of TBI reported at the trauma care center at the tertiary care King George Hospital (KGH), Visakhapatnam, for the period 2011 – 2018. Proper permission and clearance for the present study is duly obtained. **Results & Discussion:** Head injury is the commonest among traumatic injuries. CT scan is performed as the gold standard diagnostic test for head injury cases. Contusions followed by Sub arachnoid hemorrhage (SAH) and Sub dural hemorrhage (SDH) are the most common CT findings. About 25% needed ventilator support. Most common cause of death is CNS injuries (42%) followed by blood loss in 39% of cases. **Conclusions:** Regulated traffic control, wearing helmet and seat belt, limiting speed and avoiding L & U bends at road corners can prevent and minimise the incidence of fatal injuries.

Keywords: RTA, TBI, injuries, CT scan brain, case

Introduction and Statistics

Definition of ⁴TBI: TBI is a non degenerative, non congenital insult to the brain from an external physical force, possibly leading to permanent or temporary impairment of cognitive, physical and psychological functions with an associated diminished or altered state of consciousness. Glasgow coma scale classifies TBI severity and grades the serious level of consciousness on a scale of 3 - 15 based on verbal, motor and eye opening reactions to stimuli.

Primary mechanical injury: Translational acceleration causes focal hemorrhagic contusions which largely involve the frontal and temporal lobes (EDH & SDH). Rotational acceleration causes diffuse shearing stretch of axonal and vascular cell membranes.

^{18,19}**Glasgow coma scale (GCS):** was introduced by Teasdale & Bennett in 1974 is the best initial measure of severity of head injury. TBI is mild if score is 13-15, moderate if 9-12, severe if 3-8. **PTA:** is post traumatic amnesia, patients are confused and disoriented, duration of PTA and not retrograde amnesia is the useful predictor of outcome. Imaging: Difficult to perform ⁸MRI scan in acute state. Imaging can't predict the outcome but GCS can. ²³Injury severity score (ISS) is based on the body anatomic regions affected and predicts outcome. In the trimodal distribution, the first golden hour deaths are due to cardiorespiratory arrest. Most of the deaths due to head injury (TBI) are due to SDH, EDH and Hemothorax. EDH is supratentorial in 95% cases and is associated with skull bone fracture in 90% of cases, > 30 cm on CT has to be operated. SDH is the most common TBI with 60 – 80%

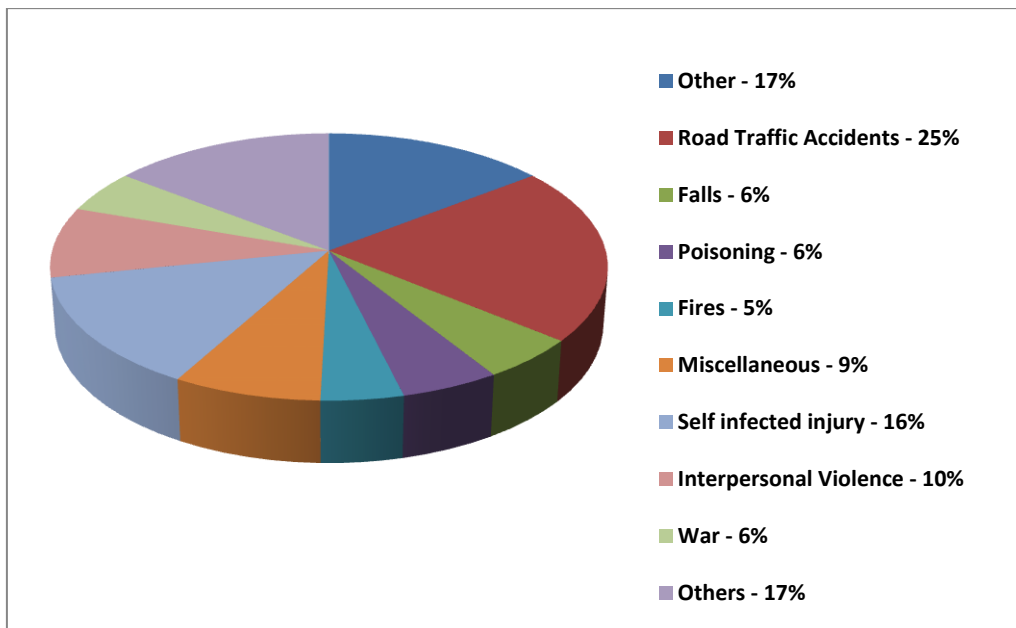
of mortality, and in 30 – 50% of cases pupils are affected, lesion > 10 mm has to be operated, and presents with crescent haematoma on CT scan. DAI is caused in high velocity RTA and MRI is better diagnostic. Adam’s grading 1 – 3 is applied. Secondary brain injuries are edema, infarction and herniation

RTAs accounts for major share in TBI in India. During 1970 to 2011, there is 7.3 times increase in road accident injuries. As a result, a large number of individuals with TBI endure life-long impairment and disability. It was estimated that the total costs of road traffic injuries alone is about 55,000 crore a year in India. As per national crime records bureau of Delhi, India maximum number of RTA cases occur between the age group 15-44 years.

Helmet & Seat belt injuries: In an individual with seat-belt

during impact, violent deceleration of human body occurs. Seat-belt impinges heavily on its point of contact with trunk and viscera continue to move forward. As per **Amritsar** study by Tejender Singh in 2012, only 12.08% used helmet, 23.61% used seat belt and as per **New Delhi** study by Puneet Mishra in the 2011, about 63.3% not used helmet and 32.3% not used seat belt.

INDIAN SCENARIO: The increase in economic growth in India coupled with rise in population, motorization and industrialization have contributed to a significant increase in TBI with each advancing year. An epidemiological study in Bangalore in the year 2012 indicates that the incidence, mortality and case fatality rates were 150/1,00,000, 20/1,00,000 and 10%, respectively.



¹²Diagram 1: As per WHO report above the most common cause of trauma is RTA.

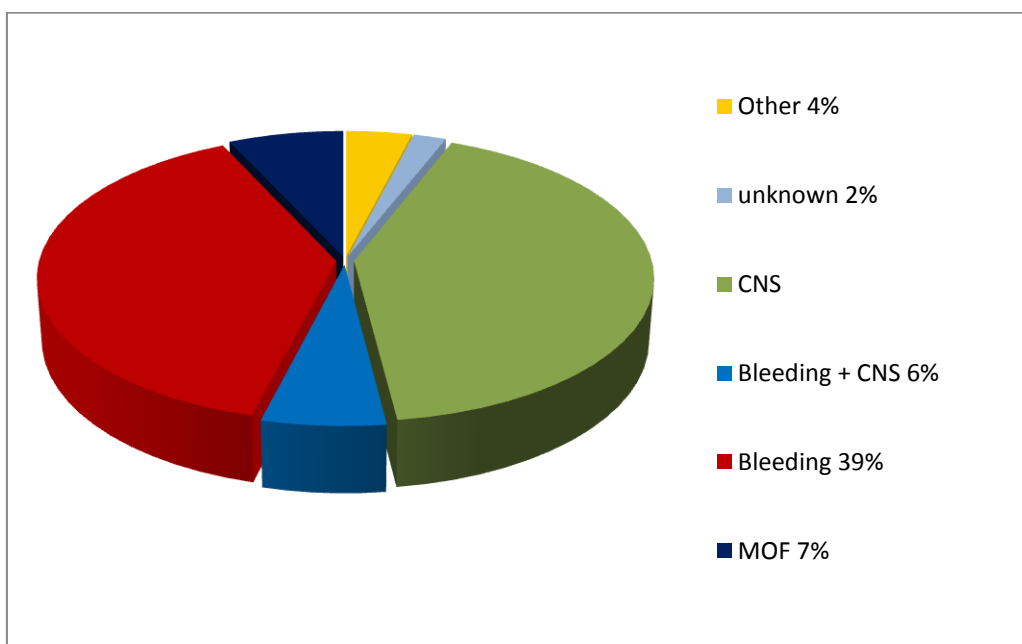
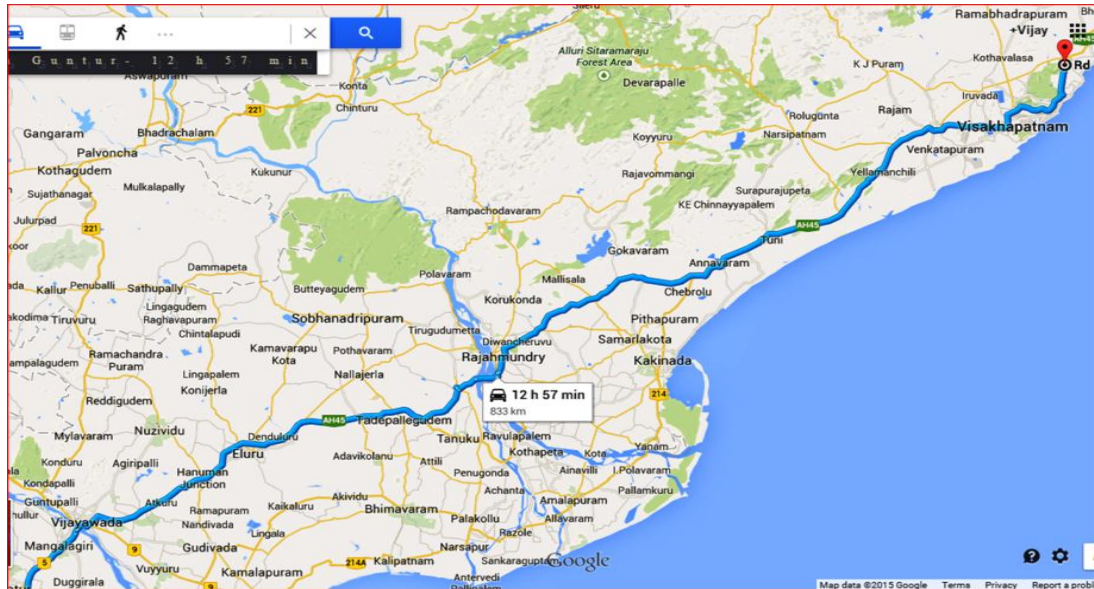


Diagram 2: Causes of Death 5 - Usa Experience

CNS - 42%, Bleeding - 39%



National highway 5 passing through AP state - Trauma Care Centers in Green Circle

Material & Methods

The source of the data for the present study is the clinical case material of trauma victims reported at the casualty dept. of KGH, Visakhapatnam for the period of Jan 2011 to Dec 2018 recorded at the data entry center of trauma care center. Of the total OP trauma cases of 71,857, screened, 6532 are IP admissions. However, deaths are calculated from OP and IP data.

Methodology: Study design and setting - The original research work is done at the research centre, GIMSR (Gitam Institute of Medical Sciences and Research), A Deemed to be University, Visakhapatnam, AP. The data is collected from the trauma care center, KGH with permission and clearance. The data is spread over the excel sheet and tabulated and applied SPSS software.

Statistical illustrations are given. Informed consent is taken from the patients wherever relevant. It is a retrospective observational study

TRAUMA CARE FACILITY AT KING GEORGE HOSPITAL(KGH), VISAKHAPATNAM, AP: The dedicated traumacare center is a 30 bedded ward with 6 bed ICU, 6 ventilators & multi channel monitors, transport ventilator, central oxygen & suction, neuro anaesthesia, Craniotome and drills, C-arm, Bipolar cautery, Pressure gradient suction apparatus, Microsurgical instruments, Haemostatic agents and dural patches and trained staff for traumacare, ICU and OT apart from the availability of specialist doctors like neurosurgeons, orthopaedicians and general surgeons round the clock. CT scan is attached to the center.

Table 1: Trauma - RTA Case Profile Statistics - 2011 To 2018

YEAR	2011	2012	2013	2014	2015	2016	2017	2018	TOTAL
O.P.	8246	8554	8710	8424	9425	10191	9885	8422	71857
I.P.	662	736	640	797	802	971	1142	782	6532
IP %	8.03	8.60	7.35	9.46	8.51	9.53	11.55	9.29	9.04%
MALE	544	588	503	650	637	833	888	651	5294
FEMALE	118	148	137	147	165	138	254	131	1238
M/F RATIO	4.61	3.97	3.67	4.42	3.86	6.04	3.50	4.97	4.38
DISCHARGE	4	0	2	31	17	127	23	7	211
LAMA	97	108	74	99	88	114	85	52	717
SHIFT	250	265	243	330	410	436	770	508	3212
RTA	404	388	359	453	490	493	543	321	3451
FALLS	179	184	142	198	204	387	535	426	2255
ASSAULT	12	25	16	21	14	29	28	20	165
MLC	550	598	517	686	766	954	1139	773	5983
NON-MLC	112	138	123	114	36	17	3	9	552
CONSERVATIVE	530	515	434	638	673	841	994	662	5287
SURGICAL	132	221	206	159	129	130	148	120	1245
HEAD INJURY	622	682	590	721	722	822	914	650	5723
SPINE INJURY	30	43	39	36	24	24	80	58	334
POLY TRAUMA	154	153	81	112	98	169	192	123	1082
DEATHS	311	363	321	337	287	294	264	215	2392

LAMA - Left Against Medical Advise.

RTA - Road Traffic Accident

MLC - Medico Legal Case

In the present study RTA constitute about 58% of the total IP trauma cases. Head injury constitutes 87.61% of the total RTA. Death rate is 3.33% of the total OP trauma cases reported.

Table 2: CT Brain - TBI - Findings - Area of brain affected - analysis of 552 cases for the year 2018

Area		Contusion	EDH	SDH	SAH	Total
Frontal	Right	39	10	7		56
	Left	39	7	6	1	53
	Un-Sp	34	1	4		39
Parietal	Right	5	10	3	1	19
	Left	13	3	3	1	17
	High Parietal		8	1		11
	Un-Sp	7		2		7
Temporal	Right	29	7	4	1	41
	Left	46	4	3	4	57
	Un-Sp	5	11			16
Occipital	Right		2			2
	Left	2	1			3
	Un-Sp	1	1			2
Fronto-Parietal	Right	3	1	3		7
	Left	3	2	3		8
	Un-Sp	2				2
Fronto-Temporal	Right	4	2	5	3	14
	Left	7	2	5	2	16
	Un-Sp					
Parieto-Occipital	Right		1			1
	Left					
	Un-Sp	2				2
Temporo-Occipital	Right					
	Left	1				1
	Un-Sp					
Temporo-Parietal	Right		3	7		10
	Left		9	9	2	20
	Un-Sp		1			1
Fronto-Temporo-Parietal	Right	28		27	3	58
	Left	40		36	3	79
	Un-Sp	4		4	2	10
Total:		314	86	132	23	552

Brain stem – 23 contusions, 1 SDH, Cerebral - 1, Cord - 2 contusions, Ventricular - 1, Others - 97, Total - 125... Grand total - 552 + 125 = 677. Frontal area is affected most often (148), followed by temporal (114). Hence, frontal impact injuries are significant in TBI.

As per the data of the CT brain findings, contusions are 314 out of 552 scans amounting to 56.88% i.e., about half of all the CT brain scans. Frontal and fronto-temporal take the lot among contusions. Next comes SDH and SAH in equal proportion. Front impact injuries are more common than side impact injuries.

Table 3: CT scan brain diagnostic - surgical pathology of head injury: 2011 – 2018

Year	Contusion	Sub Arachnoid Haege	Sub Dural Haege	Extra Dural Haege	Diffuse Axonal Injury	Quadriplegia	Obstructive Hydrocephalus	Mass Effect	Mildline Shift
2011	105	187	104	86	52	24	6	12	3
2012	262	223	155	72	16	29	30	34	52
2013	268	128	159	88	35	20	29	31	87
2014	316	183	165	92	56	10	30	19	94
2015	331	203	203	103	110	5	10	37	80
2016	378	210	182	111	92	6	4	47	113
2017	385	255	187	129	42	31	1	101	214
2018	299	144	163	86	44	21	2	57	94
TOTA:	2344	1533	1318	767	447	146	112	338	737

Hematoma - 125, Intra Cerebral Haege - 4, No Injury on CT - 123. Total -7742(both IP & OP)

As per the data in the table above the commonest CT Brain finding is contusion followed by sub arachnoid haemorrhage (SAH) and later sub dural haemorrhage(SDH). About 10% have mid line shift and about 5.8% are cases of diffuse axonal injury which are of poor prognostic concern. SAH, SDH and EDH constitute about 50% of cases of head injury as per CT findings.

Table 4: Bhopal study

Distribution of RTA cases according to type of injury - study by Khare Neeraj, Bhopal from Jan 2009 - Oct 2011 of 1268 cases				
Types of Injury	2009	2010	2011	Total
Head Injury	236(58.3)	252(56.6)	237(56.7)	752(59.3)
Fracture of Upper Limb	86(21.2)	98(22)	86(20.6)	270(21.3)
Fracture of Lower Limb	58(14.3)	55(12.4)	61(2)	174(13.7)
Chest Injury	15(3.7)	23(5)	18(4.3)	56(4.4)
Others (Rib+Vertebra)	10(2.5)	17(3.8)	16(3.8)	43(3.3)
Total	405(100)	445(100)	418(100)	1268(100)

It was observed that head injury was most common (59.3%) injury among RTA victims followed by fracture of upper limb (21.3%) & lower limb 174(13.7%) respectively similar observation were reported in studies from Karnataka out of 360 RTA cases 156(43.32%) had head injury.

Table 5: Head injury (tbi) related personal factors of victims

FACTORS	YEAR	2010	2011	2012	2013	2014	2015
PROTECTIVE DEVICES	HELMET USED	32	27	21	0	1	10
	HELMET NOT USED	136	160	201	265	490	348
	SEAT BELT USED	9	6	5	0	0	7
	SEAT BELT NOT USED	95	53	61	375	222	45
INTOXICATION	ALCOHOL CONSUMED	NA	NA	NA	149(23.28%)	133 (16.69%)	226(28.17%)
	ALCOHOL NOT CONSUMED	NA	NA	NA	491(76.72%)	664 (83.31%)	576 (71.82%)
STATUS OF PATIENT	CONSCIOUS	197	234	128	88	114	65
	UN-CONSCIOUS	399	419	470	550	683	734
LIFE SUPPORT	VENTILATOR NEEDED	197	174	151	98	156	90
	VENTILATOR NOT NEEDED	404	488	457	542	557	712

Brought Dead 31 Patients

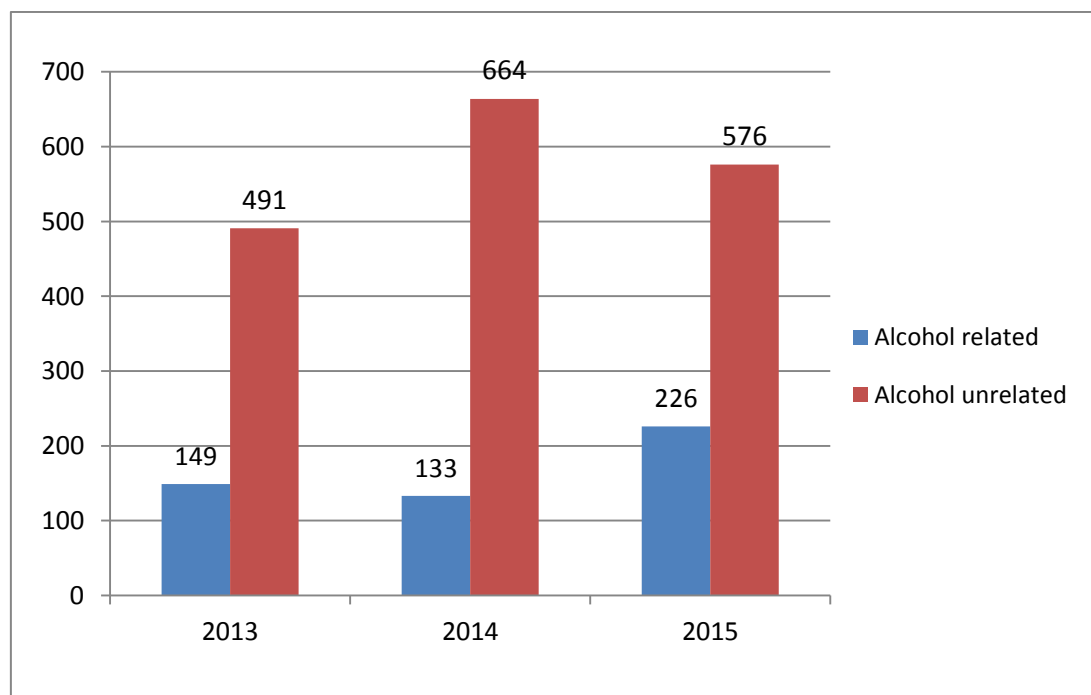


Diagram: 3

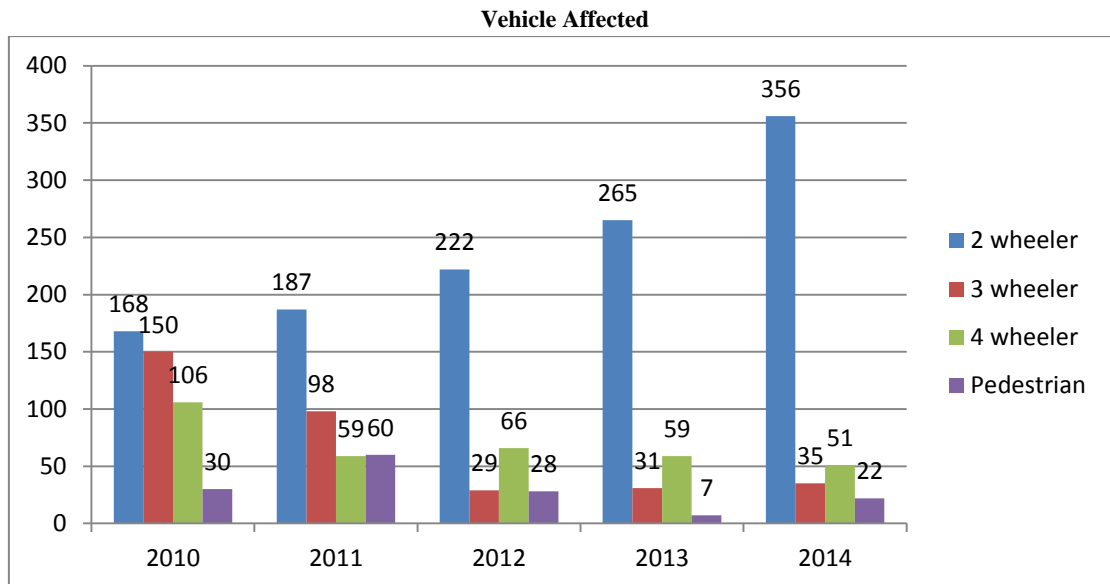


Diagram: 4

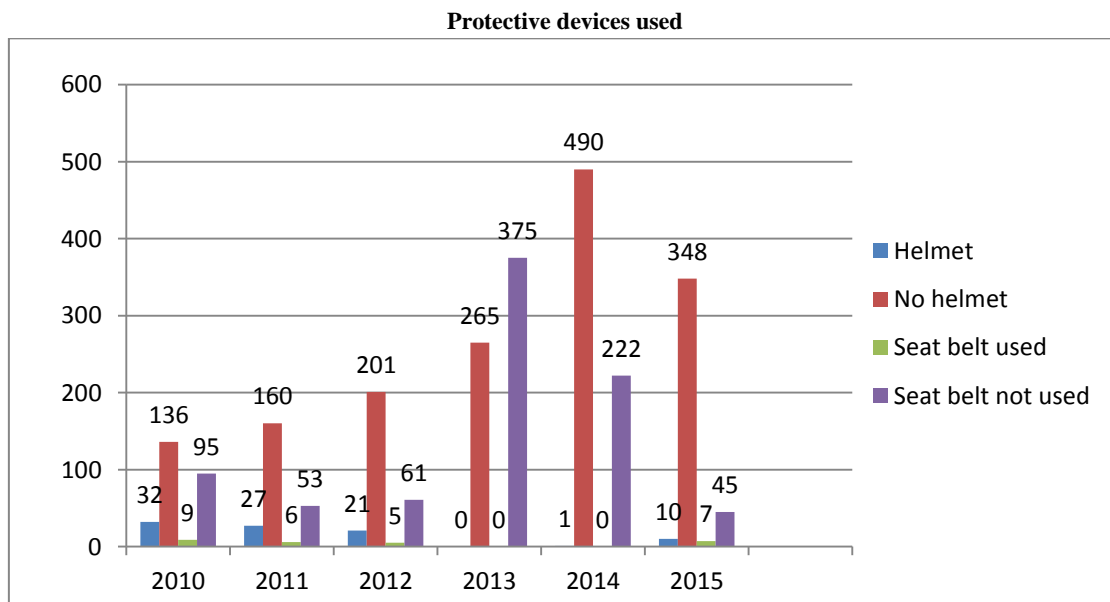


Diagram: 5

Only 3.54 % (91) used helmet and 1% (27) used seat belt out of 2569 cases studied.

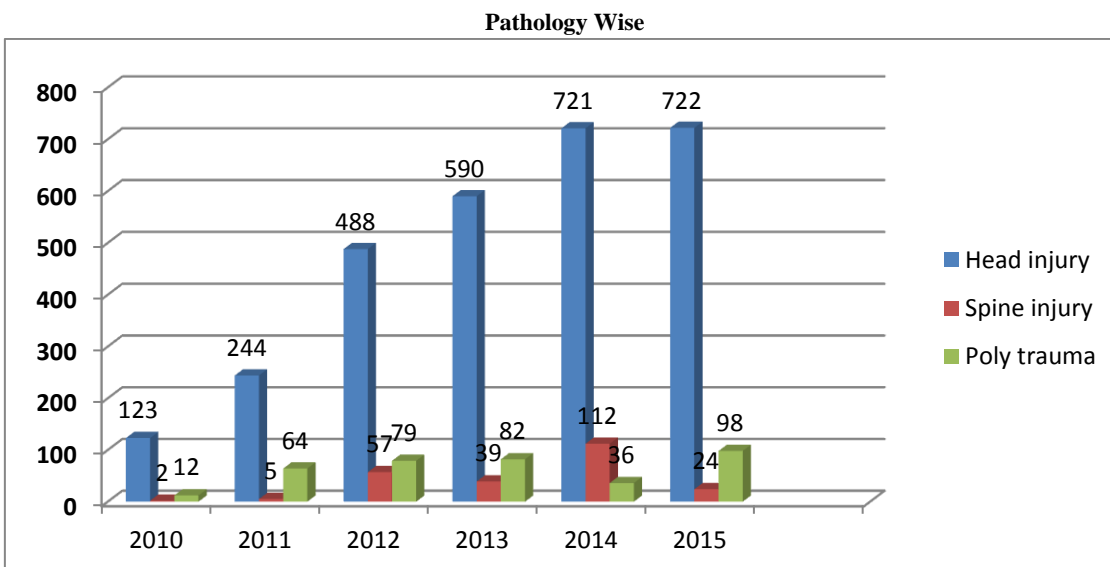


Diagram: 6

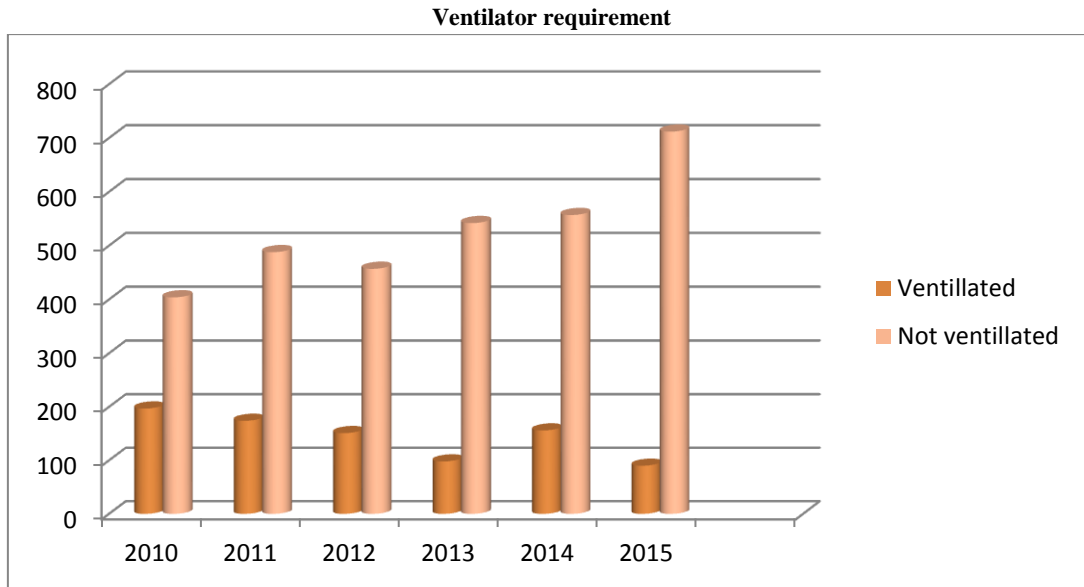


Diagram: 7

About 1/4th (25.76%-882) of patients (3423) needed ventilator support.



Image: 1



Image: 2

Gutter (depressed) fracture - neglected but healed. Degloving injury scalp exposing the cranial bone (sequestered):

Depressed Fractures Acute Epidural Haematoma

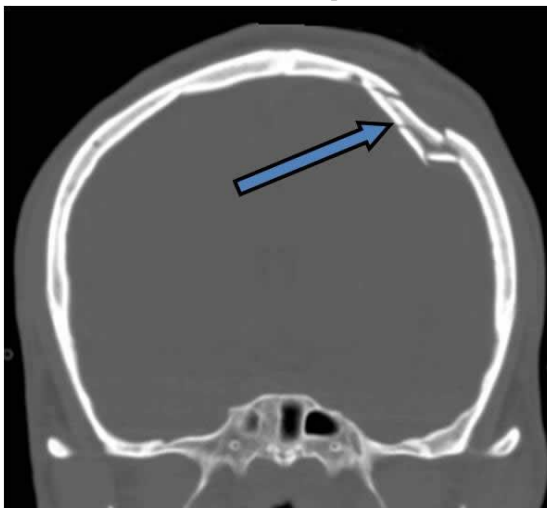


Image: 3



Image: 4

Acute Subdural Haematoma Parenchymal Contusions



Image: 5

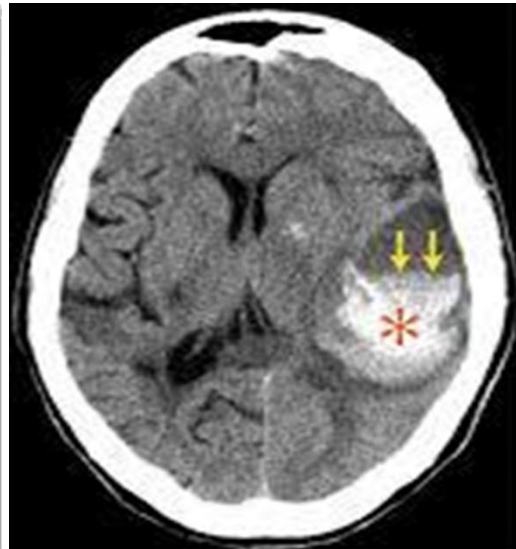


Image: 6

Crescent haematoma

Results & Discussion

Most common cause of TBI in India is RTA (60%) followed by falls (25%) and assaults (10%) as per crime bureau report. Even as per the present study, it is about the same. During 1970 – 2011 there is 7.3 times increase in road accident cases in India. Even as per the present study from 2011 – 2018 there is two times increase in TBI cases from 662 in 2011 to 1142 in 2017. Common causes of TBI in the west are falls (28%) and motor vehicle crashes (20%), but in India it is RTA (60%) and falls (34%). Yet as per New Delhi study by C. Sekhar in 2014, falls are 56% and RTA 36%, and 40% of deaths occur in first 48 hours and 37% in 2 – 7 days. Outcome in TBI in the west depends upon age but in India it is closely related to the impact of primary injury assessed by GCS.

In all the studies in India youth are most affected. As per central India study it is 32 – 64 years age group, In the New Delhi study mean age affected is 25 years, and in other studies 15 – 35 years but as per the present study the most common age group affected is 25 – 50 years. In the present study of total OP cases of 71,857 and IP cases of 6532 the male: female ratio is 4.5: 1.0, head injury cases are 5723 (87.61%) and cases due to falls are 2255(34.52%). 2 – wheeler passengers are affected most often, only 3.54% used helmet and 1% used seat belt, about 20% consumed alcohol. 25.76% needed ventilator support with ICU admission indicating the severity of impact during injury. As per CT findings of 7,742 cases (both OP & IP), 30.27% are contusions and most common and 36.82% are both SDH & SAH, 5.8% Diffuse Axonal Injury (DAI), and the mass effect with midline shift constitute about 14%. Brain concussion is most common finding in the west but in India contusions are the most common on ct scan study.

Death rate is 3.33% of all the cases of head injury, both IP & OP. Frontal area is affected most often (148), followed by temporal (114). Hence, frontal impact injuries are significant in TBI as per the data analysis of 677 CT scan reports. Main neurosurgical operative procedures performed are Craniotomy and Evacuation of hematoma, elevation of depressed fracture and de-compression and debridement.

Conclusion

As per the data analysis of 6532 IP at the 30 bedded dedicated level one trauma care center at King George Hospital(KGH), Visakhapatnam. In this retrospective study, RTA is the most common form of all trauma and head injury is most common of it, and also the commonest cause of mortality. Young males inexperienced in driving under alcohol influence and not wearing helmet or seat belt, driving fast in the evenings or night are the usual victims of TBI. Regulated traffic control, wearing helmet and seat belt, limiting speed and avoiding L & U bends at road corners can prevent and minimise the incidence of fatal injuries.

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Conflict of Interest: No.

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