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AN OVERVIEW OF SPINAL CORD INJURY PATIENTS AT PROF. DR. I.G.N.G NGOERAH HOSPITAL DENPASAR IN 2022

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ABSTRACT

Spinal cord injury (SCI) occurs when spinal cord axons are disrupted, causing loss of motor and sensory function below the level of injury. This study aims to determine the description of SCI patients at Prof. Dr. I.G.N.G Ngoerah Hospital in 2022. This study was a cross-sectional study with total sampling. The subjects were 59 SCI patients at Prof. Dr. I.G.N.G Ngoerah Hospital who met the inclusion criteria, namely patients diagnosed in 2022 with accessible medical record data. Measuring instruments were medical record data collection sheets. The result found that the majority of patients were male (76.3%), aged 19-44 years (39%), had private/civil servant jobs (45.7%), had injuries due to falls (59.3%) injuries in the cervical region (89.9%), tetraplegia (91.5%), AIS A (33.9%), and final evaluation discharge (64.4%). Motor function impairment was predominant in left C8 (n=13), left T1 (n=13), and lumbosacral (n=29). Decreased sensory function was predominant at C5 (n=16), T4 (n=4), L1 and L2 (n=2). Patients with cervical injury and tetraplegia were more likely to be male (93.3%), aged 45-59 years (95%), employed as students, housewives, labourers, and fishermen (100%), with the mechanism of injury struck by objects and attempted suicide (100%). AIS A and dead patients were more likely to be male (37.8%), fisherman (100%), and mechanism of injury RTA (47.6%; 52.4%). AIS A patients were more likely to be 19-44 years old (47.8%), while dead patients were more likely to be 45-59 years old (40%).
Keywords: Spinal Cord Injury, Tetraplegia, ASIA Impairment Scale

INTRODUCTION

Spinal cord injury (SCI) is a neurological condition when spinal cord axons are disrupted, causing sensory, motor, and autonomic dysfunction. The impact on the patient is physical but also psychological, social, and economic. Spinal cord is the main communication channel between the brain and the body and can respond independently to sensory information without input from the brain. Physiologically, SCI involves the interaction of many cells, such as neurons, oligodendrocytes, and microglia. After injury, these multi-cellular interactions were disrupted[1,2].There are 250,000 to 500,000 SCI patients per year in the world[3]. The majority of SCI patients are male (60%), aged between 15-35 years, and the most common region of injury is cervical. The leading mechanism of injury is trauma caused by road traffic accidents (RTA), falls, and sports injuries[2]. Non-traumatic causes include degenerative diseases, infections, neoplasms, and congenital diseases[4]. Neoplasms are the most common cause of death in children less than 19 years of age[5].

There is currently no national epidemiological data on SCI. Research at Fatmawati Hospital found 104 cases of SCI in 2014[6]. Research at Dr. Soetomo Hospital found 144 cases of SCI in 2017 – 2019[7]. The population of Bali Province in 2020 was 4.32 million people, with a majority of 2.17 million men. The number of people of productive age (15-64 years) is the most significant portion, at 3.035 million people (70.9%)[8]. The number of RTA cases in Bali by 2022 is 3620 cases, with the majority of victims aged 25-55 years (41.12%)[9].

Research related to spinal cord injury disease overview is very limited in Indonesia. Referring to the high rate of RTA in Bali at productive age, which is the most significant risk factor for SCI, we need a study that discusses the overview of spinal cord injury patients based on demographic profiles and disease characteristics. This study was conducted at Prof. Dr. I.G.N.G Ngoerah Hospital Denpasar, Bali.This study aims to determine the demographic profile of spinal cord injury patients based on gender, age, and occupation. Another aim was to know the characteristics of spinal cord injury patients based on the mechanism of injury, injury region, type of paralysis, motor function, sensory function, the severity of the lesion, and the final evaluation of the patient's clinical status.

MATERIALS AND METHODS

This research is a descriptive study with a cross-sectional design. Sampling was collected by total sampling from secondary data, which is the patient's medical record at the Medical Records Installation of Prof. Dr. I.G.N.G Ngoerah Hospital in 2022. This

study analyzed data on sex, age, occupation, mechanism of injury, injury region, type of paralysis, motor function, sensory function, lesion severity, and final evaluation of the patient's clinical status. We selected samples based on inclusion criteria, namely patients diagnosed with SCI in 2022 at Prof. Dr. I.G.N.G Ngoerah Hospital and medical record data we could access at the hospital's Medical Records Installation. Samples were excluded if the medical record data did not contain the complete data to be studied. The number of samples obtained was 93 from the Medical Record Installation. After data cleaning, with inclusion and exclusion criteria, researchers used 59 valid data samples.The data obtained in the study was processed to find the proportion of numbers in each research variable and then presented in tabular form. The data were processed using the Statistical Package for the Social Science (SPSS) version 23 program and Microsoft Excel. This study has fulfilled the ethical aspects of research based on an ethical eligibility letter with reference number **0951/UN14.2.2.VII.14/LT/2024** issued by The Research Ethics Committee Faculty of Medicine Udayana University.

RESULTS

The following presents the demographic profile and disease characteristics in tables and column charts and their explanations.

Table 1. Proportion distribution of demographic profiles in SCI patients

Variables	Frequency (n=59)	Percentage (100%)
Sex		
Male	45	76.3
Female	14	23.7
Age		
Mean ± SD	50,10 ± 15,5	
19-44 years	23	39.0
45-59 years	20	33.9
≥ 60 years	16	27.1
Occupation		
P/C Servant	27	45.7
Student	2	3.4
Housewife	3	5.1
Farmer	17	28.8
Labourer	3	5.1
Fisherman	1	1.7
Not Working	2	3.4
No Information	4	6.8

The data distribution based on sex, age, and occupation of SCI patients is presented in Table 1. Based on gender, SCI mainly occurred in men, with a total of 45 patients (76.3%), and least in women, with a total of 14 patients (23.7%). Based on age, SCI cases occurred mainly in the 19-44 years age group with 23 patients (39%), followed by the 45-59 years age group with 20 patients (33.9%), and the least at the age of ≥60 years with a total of 16 patients (27.1%). Based on occupation, SCI cases mainly were experienced by the Private/Civil Servant (P/C Servant) occupation group, with 27 patients (45.7%), and the least in the fisherman occupation group, with a total of 1 patient (1.7%).

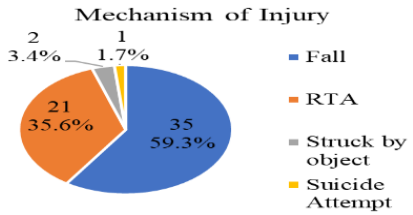

Figure 1. Proportion distribution of mechanism of injury in SCI patients

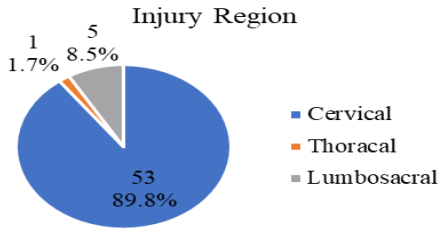

Figure 2. Proportion distribution of injury region in SCI patients

Moving to the proportion of injury mechanism by SCI patients. Injuries were mainly caused by falls with 35 patients (59.3%), followed by RTA with a total of 21 patients (35.6%), struck by objects with a total of 2 patients (3.4%) and suicide attempts with a total of 1 patient (1.7%). The data is presented in Figure 1.The proportion of injury regions among SCI patients can be seen in Figure 2. Injuries were more common in the cervical region, with a total of 53 patients (89.8%), followed by the lumbosacral region, with a total of (8.5%), and the least in the thoracic region, with a total of one patient (1.7%).

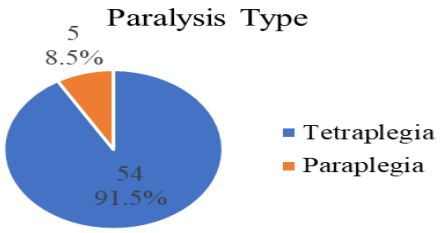

Figure 3. Proportion distribution of paralysis type in SCI patients

Meanwhile, the distribution of paralysis types experienced by SCI patients is shown in Figure 3. There were 54 patients (91.5%) with tetraplegia and five patients (8.5%) with paraplegia.

Table 2. Proportion distribution of motor function (dextra) in SCI patients

Motor function score	Myotome Dextra									
	C5	C6	C7	C8	T1	L2	L3	L4	L5	S1
Zero	12	12	10	8	8	28	28	28	28	28
One	18	15	6	2	5	9	8	8	5	5
Two	10	8	10	12	9	2	4	4	6	5
Three	7	10	13	9	6	2	3	4	4	7
Four	5	7	9	10	9	5	3	3	5	4
Five	7	6	11	18	22	13	13	12	11	10
NT	0	1	0	0	0	0	0	0	0	0
Total (n)	59									

Table 3. Proportion distribution of motor function (sinistra) in SCI patients

Motor function score	Myotome (n) Sinistra									
	C5	C6	C7	C8	T1	L2	L3	L4	L5	S1
Zero	7	7	9	13	13	29	29	29	29	29
One	5	5	10	13	16	5	5	7	7	8
Two	6	7	6	9	11	3	3	3	2	0
Three	9	11	11	9	6	3	3	3	3	4
Four	10	11	10	7	5	8	7	5	4	4
Five	21	17	12	6	7	10	11	11	13	13
NT	1	1	1	2	1	1	1	1	1	1
Total (n)	59									

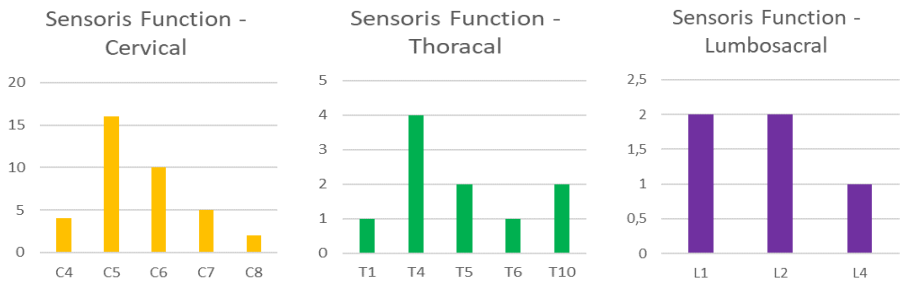

Figure 4. Proportion distribution of sensory function in SCI patients

Tables 2 and Table 3 show the distribution of motor function examination results in SCI patients. We took data from assessments before operative treatment. In the cervical region, the myotomes with more 'Zero' motor function values were C5 and C6 for the right body side with a total of 12 patients and C8 for the left body side with a total of 13 patients. In the thoracic region, the T1 myotome of the left side of the body had more 'Zero' motor function values with a total of 13 patients, compared to T1 of the right side of the body with eight patients. In the lumbosacral region, all myotomes on the left side had a motor function value of 'Zero' more, with 29 patients, compared to all myotomes on the right side of the body, with 28 patients. Figure 4 shows the distribution of sensory function examination results in SCI patients. Researchers took data from the assessment before operative treatment. The most common dermatome with impaired sensory function in the cervical region was C5 with 16 patients. In the thoracic region, the dermatome most often has impaired sensory function in T4, with four patients. The most common dermatomes with impaired sensory function in the lumbosacral region are L1 and L2, with two patients .

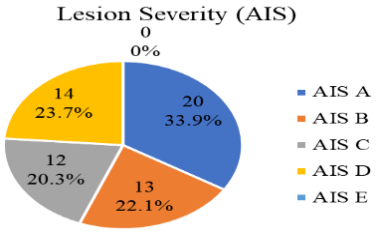

Figure 5. Proportion distribution of lesion severity in SCI patients

The severity of lesions was graded using the ASIA Scoring System (AIS). The result of patient classification based on lesion severity is shown in Figure 5. Most patients were classified as AIS A with a total of 20 patients (33.9%), followed by AIS D with a total of 14 patients (23.7%), then AIS B with a total of 13 patients (22.1%) and the most diminutive AIS C with a total of 12 patients (20.3%). There was no patient data classified as AIS E.

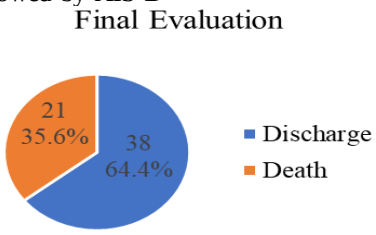

Figure 6. Proportion distribution of final evaluation in SCI patients

Figure 6 presents the distribution of patients based on their final evaluation of the patient's clinical status. Only patients who died during hospitalization were counted. Discharge is patients' data other than death, such as recovery or transfer. There were 38 patients (64.4%) with a final evaluation of the clinical status of discharge, compared to 21 patients (35.6%) with a final evaluation of the clinical status of death.The distribution of patient injury regions was also classified based on patient demographic profile. Demographic profiles used in this classification consist of S. The result of the classification can be seen in Table 4. Cervical injury patients mainly were male, with a percentage of 93.3%; from the age 45-59 years, with a percentage of 95%; had occupations of students, housewives, labourers, fishermen, and not working with a percentage of 100%; and experienced injuries due to falling objects and suicide attempts with a percentage of 100%. Thoracic injury patients were more female, with a percentage of 7.1%; from the age group ≥60 years, with a percentage of 6.3%; had a farmer's occupation, with a percentage of 5.9%; and experienced injuries due to falls, with a percentage of 2.9%. Lumbosacral injury patients mainly were female, with a percentage of 14.3%; from the age 19-44 years, with a percentage of 13%; had a farmer's occupation, with a percentage of 11.8%; and experienced injuries due to falls with a percentage of 11.4%.

Moving to the type of paralysis distribution based on demographic data. Patients with tetraplegia were more likely to be male, with a percentage of 93.3%; from the age of 45-59, with a percentage of 95%; had a student, housewife, labourers, and fisherman occupation, with a percentage of 100%; and had injuries due to struck by object and attempted suicide, with a percentage of 100%. Patients with paraplegia were more likely to be female, with a percentage of 14.2%; from the age of 19- 44, with a percentage of 13%; had a farmer occupation, with a rate of 11.8%; and experienced injuries due to falls, with a percentage of 11.4%. Complete data can be seen in Table 5.

Table 4. Distribution of injury regions by demographic profile and mechanism of injury

Variable	Injury region			Total
	Cervical	Thoracal	Lumbo -sacral	
Sex				
Male	42	0	3	45
(%)	93.3%	0%	6.7%	100%
Female	11	1	2	14
(%)	78.6%	7.1%	14.3%	100%
Age				
19-44 years	20	0	3	23
(%)	87%	0%	13%	100%
45-59 years	19	0	1	20
(%)	95%	0%	5%	100%
≥60 years	14	1	1	16
(%)	87.5%	6.3%	6.3%	100%
Occupation				
P/C servant (%)	24	0	3	27
	88.9%	0%	11.1%	100%
Student	2	0	0	2
(%)	100%	0%	0%	100%
Housewife	3	0	0	3
(%)	100%	0%	0%	100%
Farmer	14	1	2	17
(%)	82.4%	5.9%	11.8%	100%
Labourer	3	0	0	3
(%)	100%	0%	0%	100%
Fisherman	1	0	0	1
(%)	100%	0%	0%	100%
No work (%)	2	0	0	2
	100%	0%	0%	100%
No info.	4	0	0	4
(%)	100%	0%	0%	100%
Mechanism of injury				
Fall	30	1	4	35
(%)	85.7%	2.9%	11.4%	100 %
RTA	20	0	1	21
(%)	95.2%	0%	4.8%	100 %
Struck by	2	0	0	2
object (%)	100%	0%	0.0%	100 %
Suicide	1	0	0	1
attempt (%)	100%	0%	0.0%	100 %

Table 5. Distribution of paralysis type by demographic profile and mechanism of injury

Variable	Paralysis type		Total
	Tetraplegia	Paraplegia	
Sex			
Male	42	3	45
(%)	93.3%.	6.7%	100%
Female	12	2	14
(%)	85.7%	14.2%	100%
Age			
19-44 years	20	3	23
(%)	87%	13%	100%
45-59 years	19	1	20
(%)	95%	5%	100%
≥60 years	15	1	16
(%)	93.8%	6.3	100%
Occupation			
P/C servant (%)	24	3	27
	88.9%	11.1%	100%
Student	2	0	2
(%)	100%	0%	100%
Housewife	3	0	3
(%)	100%	0%	100%
Famer	15	2	17
(%)	88.2%	11.8%	100%
Labourer	3	0	3
(%)	100%	0%	100%
Fisherman	1	0	1
(%)	100%	0%	100%
No work (%)	2	0	2
	100%	0%	100%
No info	4	0	4
(%)	100%	0%	100%
Mechanism of injury			
Fall	31	4	35
(%)	886%	11.4%	100%
RTA	20	1	21
(%)	95.2%	4.8%	100%
Struck by	2	0	2
object (%)	100%	0%	100%
Suicide attempt (%)	1	0	1
	100%	0%	100%

Table 6. Distribution of lesion severity by demographic profile and mechanism of injury

Variable	Lesion severity (AIS)				Total
	A	B	C	D	
Sex					
Male	17	11	7	10	45
(%)	37.8%	24.4%	15.6%	22.2%	100%
Female	3	2	5	4	14
(%)	21.4%	14.3%	35.7%	28.6%	100%
Age					
19-44 years	11	5	2	5	23
(%)	47.8%	21.7%	8.7%	21.7%	100%
45-59 years	5	5	7	3	20
(%)	25%	25%	35%	15%	100%
≥60 years	4	3	3	6	16
(%)	25%	18.8%	18.8%	37.5%	100%
Occupation					
P/C servant	14	5	3	5	27
(%)	51.9%	18.5%	11.1%	18.5%	100%
Student	1	1	0	0	2
(%)	50%	50%	0%	0%	100%
Housewife	0	1	1	1	3
(%)	0%	33.3%	33.3%	33.3%	100%
Farmer	3	2	7	5	17
(%)	17.6%	11.8%	41.2%	29.4%	100%
Labourer	0	1	1	1	3
(%)	0%	33.3%	33.3%	33.3%	100%
Fisherman	1	0	0	0	1
(%)	100%	0%	0%	0%	100%
No work	0	2	0	0	2
(%)	0%	100%	0%	0%	100%
No info	1	1	0	2	4
(%)	25%	25%	0%	50%	100%
Mechanism of injury					
Fall	10	7	8	10	35
(%)	28.6%	20%	22.9%	28.6%	100%
RTA	10	4	4	3	21
(%)	47.6%	19%	19%	14.3%	100%
Struck by	0	2	0	0	2
object (%)	0%	100%	0%	0%	100%
Suicide	0	0	0	1	1
attempt (%)	0%	0%	0%	100%	100%

According to the AIS severity lesion distribution, patients were mainly male, with a percentage of 37.8%, from the age 19-44 years, with a percentage of 47.8%, had a fisherman occupation, with a percentage of 100%, and suffered injuries due to KLL with a percentage of 47.6%. AIS B patients were more likely to be male with a percentage of 24.4%, from the age group 45-59 years with a percentage of 25%, from the workgroup not working with a percentage of 100%, and suffered injuries due to falling objects with a percentage of 100%. AIS C patients were mainly female, with a percentage of 35.7%, from the age 45-59 years, with a percentage of 35%, had a farmer's occupation, with a percentage of 41.2%, and had injuries due to falls with a percentage of 22.9%. AIS D patients were mainly female, with a percentage of 35.7%, from the age group ≥60 years, with a percentage of 37.5%, from the unspecified occupation group, with a percentage of 50%, and had injuries due to suicide attempts with a percentage of 100%. The complete data is presented in Table 6.

The distribution of the final evaluation of the patient's clinical status by gender, age, occupation, and mechanism of injury is shown in Table 7. Patients with a final evaluation of discharge mainly were female, with a percentage of 71.4%, from the age 19-44 years and ≥ 60 years, with a percentage of 65.2% and 68.8%, had a labourer occupation with a percentage of 100% and had injuries due to falling objects and suicide attempts with a percentage of 100%. Patients with the final evaluation of death were more male, with a percentage of 37.8%, from the age group 45-59 years, with a percentage of 40%, had a fisherman's job, with a percentage of 100%, and experienced injuries due to KLL with a percentage of 52.4%.Based on lesion severity, Table 8 shows the proportion distribution of sensory function. Patient AIS

A had the most decreased sensory function at dermatome T1 with a percentage of 100%, patient AIS B had the most decreased sensory function at dermatome T4 with a percentage of 75%, patient AIS C had the most decreased sensory function at dermatomes T5 and T6 with a percentage of 100%, and patient AIS D had the most decreased sensory function at dermatome L4 with a percentage of 100%. In AIS A patients, there were more patients whose sensory function could not be tested/Non-Testable (NT) with a percentage of 100%. In AIS D patients, there were more patients with normal sensory function with a percentage of 100%.Lastly, Table 9 shows the distribution of lesion severity based on motor function. AIS A patients with 'Zero' motor function score were prevalent in L2-S1 myotomes on both the right and left sides of the body with 19 patients, while 'Five' motor function score was more prevalent in T1 myotomes on the right side of the body with 3 patients. AIS B patients 'Zero' motor function scores were numerous in the L2-S1 myotomes on the left side, with a total of 9 patients, while 'Five' motor function scores were more numerous in the T1 myotomes on the right side of the body with 5 patients. AIS C patients with a 'Zero' motor function score were higher in the L2-S1 myotome on both the right and left sides of the body, with a total of 1 patient. In comparison, the 'Five' motor function score was higher in the C5 myotome on the left side of the body, with a total of 5. AIS D patients were not found to have a motor function value of 'Zero'. AIS D patients with a motor function value of 'One' were more in myotomes C5 and T1 on the right side of the body and T1 on the left side of the body with a total of 2 patients, while motor function values of 'Five' were more in myotomes C8, T1, L2, and L3 on the right side of the body and C5, C6, L5 and S1 on the left side of the body with a total of 10 patients.

Table 7. Distribution of final evaluation by demographic profile and mechanism of injury

Variable	Final evaluation		Total
	Discharge	Death	
Sex			
Male	28	17	45
(%)	62.2%	37.8%	100%
Female	10	4	14
(%)	71.4%	28.6%	100%
Age			
19-44 years	15	8	23
(%)	65.2%	34.8%	100%
45-59 years	12	8	20
(%)	60%	40%	100%
≥60 years	11	5	16
(%)	68.8%	31.3%	100%
Occupation			
P/C servant	15	12	27
(%)	55.6%	44.4%	100%
Student	1	1	2
(%)	50%	50%	100%
Housewife	1	2	3
(%)	33.3%	66.7%	100%
Farmer	15	2	17
(%)	88.2%	11.8%	100%
Labourer	3	0	3
(%)	100%	0%	100%
Fisherman	0	1	1
(%)	0%	100%	100%
No work	1	1	2
(%)	50%	50%	100%
No info	2	2	4
(%)	50%	50%	100%
Mechanism of injury			
Fall	25	10	35
(%)	71.4%	28.6%	100%
RTA	10	11	21
(%)	47.6%	52.4%	100%
Struck by	2	0	2
object (%)	100%	0%	100%
Suicide attempt	1	0	1
(%)	100%	0%	100%

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Table 8 Proportion distribution of lesion severity based on sensory function

Variable	Lesion severity				Total
	AIS A	AIS B	AIS C	AIS D	
Sensory level (%)					
C4	3	1	0	0	4
	75%	25%	0%	0%	100%
C5	6	5	3	2	16
	37.5%	31.3%	18.8%	12.5%	100%
C6	4	1	2	3	10
	40%	10%	20%	30%	100%
C7	2	2	1	0	5
	40%	40%	20%	0%	100%
C8	0	0	1	1	2
	0%	0%	50%	50%	100%
T1	1	0	0	0	1
	100%	0%	0%	0%	100%
T4	0	3	1	0	4
	0%	75%	25%	0%	100%
T5	0	0	2	0	2
	0%	0%	100%	0%	100%
T6	0	0	1	0	1
	0%	0%	100%	0%	100%
T10	1	0	1	0	2
	50%	0%	50%	0%	100%
L1	0	1	0	1	2
	0%	50%	0%	50%	100%
L2	1	0	0	1	2
	50%	0%	0%	50%	100%
L4	0	0	0	1	1
	0%	0%	0%	100%	100%
Normal	0	0	0	5	5
	0%	0%	0%	100%	100%
NT	2	0	0	0	2
	100%	0%	0%	0%	100%

Table 9 Proportion distribution of lesion severity based on motor function

Motor Function Score	Myotome	Lesion severity (n)			
		AIS A	AIS B	AIS C	AIS D
0	Dextra L2	19	-	1	-
	Dextra L3	19	-	1	-
	Dextra L4	19	-	1	-
	Dextra L5	19	-	1	-
	Dextra S1	19	-	1	-
	Sinistra L2	19	9	1	-
	Sinistra L3	19	9	1	-
	Sinistra L4	19	9	1	-
	Sinistra L5	19	9	1	-
	Sinistra S1	19	9	1	-

Table 9 Proportion distribution of lesion severity based on motor function (continue)

1	Dextra C5	-	-	-	2
	Dextra T1	-	-	-	2
	Sinistra T1	-	-	-	2
5	Dextra C8	-	-	-	10
	Dextra T1	3	5	-	10
	Dextra L2	-	-	-	10
	Dextra L3	-	-	-	10
	Sinistra C5	-	-	5	10
	Sinistra C6	-	-	-	10
	Sinistra L5	-	-	-	10
	Sinistra S1	-	-	-	10

DISCUSSION

According to data presented in Table 1, SCI patients are dominated by men. This result is supported by Widhiyanto et al.[7], who found that 79.4% of SCI patients were male. Physical differences and social duties between genders, where men are considered strong so that men mostly do dangerous work, cause men to experience injuries more often[10]. Based on the age group, patients were more in the age group of 19-44 years. This result is supported by Beutler et al.[11], who state that SCI often occurs in patients aged 16-30. The high level of physical activity and activity in adulthood leads to a greater likelihood of serious injury[12].

Meanwhile, based on their occupation, many patients have private/civil service jobs, followed by farmers. This result differs from a study by Schwegler et al.[13], which stated that the occupational group of many SCI patients was handyman (26.5%), followed by professional occupations (16.3%). The difference may be due to the low reporting of occupational disease cases in Indonesia, especially in Bali Province[14].Moving to the mechanism of injury, many patients suffered injuries from falls, followed by RTA (Figure 1). This result differs from the study of Widhiyanto et al.[7], who found that injuries often occurred due to RTA (45.5%) followed by falls (31.8%). The proportion of falls greater than RTA is likely because the average age of patients in this study was 50 years old, which is no longer a productive age. This result is supported by Arul et al.[15], who said the most common cause of SCI in elderly patients fell (67.9%), followed by RTA (17%).

The region of injury is dominated by the cervical region (Figure 2). This result is supported by the 2018 edition of the ATLS book[16], which says the cervical spinal region is often affected in SCI (55%). This result is likely due to the instability of the cervical spine, which, based on anatomy, is highly dependent on the surrounding ligaments to maintain stability, resulting in the cervical spine segment being most susceptible to injury[17].Most of the patients experience tetraplegia (Figure 3). This result is supported by research by Kim et al.[18], who found a higher proportion of tetraplegia (57.5%) compared to paraplegia (42.5%). This result may be because this study's patients' injuries were more in the cervical region. Cervical injuries cause loss of muscle strength, reflexes, and sensation below the level of injury, causing paralysis in all four extremities[3,19].Motor and sensory assessment results (Table 2, Table 3, and Figure 4) show that each region has its most common site for injury. In the cervical region, motor and sensory function decreased most often at the C5 level. This result is caused by the fact that the C5-C6 level supports and provides flexibility to the neck and head area, so the area has a large load, causing it to be vulnerable to damage when an injury occurs[19]. Meanwhile, sensory function decreases most often at the T4 level in the thoracic region. The myotome in motor function assessment is only one, T1. When a thoracic fracture occurs, the spinal nerve is susceptible to damage due to the narrow canal and the lack of space around the nerve. Fracture ruptures that often occur in the thoracic region cause compression or damage to the spinal nerves[20]. In the lumbosacral region, motor and sensory function is decreased in almost all myotomes and dermatomes. This result is likely because motor and sensory functions will decrease below the injury when SCI occurs[3]. Based on lesion severity grading, most patients are classified as AIS A (Figure 5). This result is different from the research of Kim et al.[18], who found that AIS D was more common (53.4%). It may be because Prof. Dr. IGNG Ngoerah Denpasar Hospital is the largest referral hospital in Bali, so patients who come tend to be in more complex conditions, so AIS D patients are rare[21].

The final evaluation of the patient is dominated by a Discharge patient (Figure 6). This result is supported by the research of Chhabra et al.[22], who said that more SCI patients recovered in hospital care (90%). The lower mortality rate of SCI patients may be due to improved medical care, especially in critical care[23].The distributions of patients who experienced cervical injury are dominated by men and patients in the range of age 45-59 years old. While the result varies based on the patient's occupation, most patients are students, housewives, labourer, and fishermen. The domination of men in this result might be caused by the men participating in more physical activities, such as construction work and riding motorbikes, than women[7]. Meanwhile, the high number of patients with an age range of 45-59 years old could be caused by the aging process and the present workload. As a person ages, physical abilities decrease, and the risk of falls and injuries increases. Moreover, many pre-elderly patients still work because they feel they are not old enough to retire[24]. The variety of occupations might be caused by injuries sustained while riding motorbikes or work accidents such as falling and being hit by objects[25]. Many cervical injury patients have injuries due to falling objects and suicide attempts. Possibly because when hit by an object or when making a suicide attempt by hanging yourself, the part of the spine that is affected is the cervical part[26].Patients with thoracic and lumbosacral injuries have a higher proportion of female patients, injuries due to falls, and farmers. This result is related to women doing less physical activity, such as riding motorbikes, so injuries rarely appear in the cervical[7]. According to Rajasekaran et al.[27], patients with

thoracolumbar injuries tend to be caused by falling from a height. In addition, farmers are more likely to experience falls, slips, and trips[28]. Meanwhile, according to age, a more significant proportion of patients aged ≥60 years among thoracic injury patients and a more significant proportion of patients aged 19-44 years among lumbosacral injury patients. This result is probably caused by the fact that female patients tend to experience SCI at two peaks of age, namely when young (15-19 years) and the second peak in old age (≥60 years)[29].According to the type of paralysis, tetraplegia patients are predominantly male, while paraplegia patients are predominantly female. This result is likely due to differences in physical and social tasks between genders, as in the previous discussion[10]. Tetraplegia patients are predominantly aged ≥45, while paraplegia patients are predominantly aged 19-44. This is likely because elderly patients experience decreased cellular function, causing a loss of cellular ability to respond to injury. Old patients also tend to experience osteoporosis, which causes bones to become vulnerable to injury. That causes old patients to experience more severe traumatic injuries than young people[30]. According to the occupation, many tetraplegia patients have the occupations of students, housewives, labourers, and fishermen (100%). In comparison, many paraplegia patients have farming jobs (11.8%). Possibly, the reason for these findings is that students often experience injuries due to traffic accidents[31], housewives often experience injuries due to domestic accidents such as being hit by objects[32], and labourers and fishermen have a risk of head and neck injuries[25]. At the same time, farmers tend to experience injuries due to falls[28]. Tetraplegia is mostly experienced by patients with injuries caused by falling objects and suicide attempts, while paraplegia is mainly experienced by patients with injuries caused by falls. This result is possible because patients who are struck by objects and attempt suicide usually have cervical injuries, and patients with cervical injuries more often experience tetraplegia.

This study shows that male patients experienced worse conditions than female patients. It can be seen from the dominance of male patients in the cervical injury and tetraplegia groups, and this leads to a complete injury condition [34]. Patients classified as AIS A were predominantly aged 19-44. Like the previous explanation, a high level of physical activity in adulthood (19-44 years old) leads to a greater chance of serious injury[12].According to the occupation, many AIS A patients were fishermen (100%). Fishermen have a high risk of severe injury and death due to large and heavy equipment and extreme weather conditions35. Many of the AIS A patients sustained injuries due to RTA. RTA can cause injuries to various parts of the body as a result of violent collisions, resulting in serious injuries[36].This study also shows that men dominated the death patient category on the final evaluation. This result occurred because male patients in this study experienced worse conditions than female patients. It can be seen from the dominance of male patients in the cervical injury group, tetraplegia, and AIS A and B. Patients who died tended to be aged 45-59 years. Apart from the aging factor, pre-elderly patients in this study dominated the cervical injury, tetraplegia, and AIS B and C groups. The dead patients mostly sustained injuries from CLLs and falls. CLL is the 8th leading cause of death in the world, and falls are the 2nd leading cause of death from unintentional injury in the world[37,38]. Many of the dead patients were fishermen (100%). As explained earlier, fishermen have a high risk of severe injury and death due to the use of large and heavy equipment and extreme weather conditions that can occur suddenly[35].

Tables 8 and Table 9 show that patients with AIS A, AIS B, and AIS C mainly had decreased sensory function in the thoracic region and motor function in the L2-S1 myotomes. This decrease in sensory and motor function tends to occur in the lower body because when SCI occurs, sensory and motor functions will be impaired below the injury site.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The study found that the highest proportion of patients were male, aged 19-44, and had private/civil servant jobs. The mechanism of injury with the highest proportion was fall, the injury region with the highest proportion was cervical, and the type of paralysis with the highest proportion was tetraplegia. Motor function impairment was predominant in myotome left C8, left T1, and lumbosacral. Decreased sensory function was predominant at dermatome C5, T4, L1 and L2. AIS A had the highest proportion, and over half of the patients had a final discharge evaluation.

Cervical injury and tetraplegia patients were more likely to be male, from the age group of 45-59 years, have occupations of students, housewives, labourers and fishermen, and the mechanism of injury was falling objects and attempted suicide. AIS A and dead patients were more likely to be male, to be employed as fishermen, and to have a mechanism of injury of RTA. AIS A patients were prevalent in the 19-44 years age group, while dead patients were more prevalent in the 45-59 years age group.

Suggestions

Hospitals are expected to ensure that data in medical records are filled in completely and consistently, especially on occupational variables. The government is expected to pay more attention to private/civil servants classified as productive age to avoid SCI and make regulations related to company compensation for private/civil servants who experience SCI.

For fellow researchers, it is necessary to conduct further research on the description of SCI patients with a larger number of samples and longer research time and duration of observation to increase validity and research results that represent the community. This research can be used as basic data for further research related to spinal cord injury.

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