

Time of Return to Work and Associated Factors in Rib Fracture Victims

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Abstract

Background: Rib fracture is one of the leading causes of trauma-related deaths globally. The time elapsed to return to work (RTW) following the injury is an important indicator of treatment outcomes. It is subject to the influences of the complications of the injury. The aim of this study was to determine the time of RTW and the associated factors in patients with rib fractures. **Methods:** This is a retrospective study, in which the sociodemographic variables including age, sex, marital status, residency, and clinical conditions (the type of accident, days of hospitalization, having surgery, Glasgow Coma Scale [GCS], and the number of rib fractures) were obtained from the database. The variables related to RTW were obtained through telephone interviews. We performed a survival analysis to evaluate the time of RTW of 193 victims with rib fractures managed during 2017 and 2018 in Poursina Hospital in Rasht, Iran. We used the Cox regression to determine the factors associated with the time of RTW. **Results:** The mean time of RTW was 18.80 ± 11.405 weeks and 97.9% of the victims returned to work. The age of the victims, length of hospitalization, GCS, and type of work were significantly ($P < 0.05$) associated with the time of RTW. **Conclusion:** Improving the interventions for the older adults and for those with long-term hospitalization, and low GCS, as well as strengthening preventive measures for victims with high risk of accidental trauma can effectively increase the rate of RTW.

Keywords: Iran, Rasht, return to work, rib fracture, survival analysis

INTRODUCTION

Trauma is one of the most common causes of mortality among people under 40 years of age and the third leading cause of death in all age groups.^[1-3] Rib fracture is frequently associated with death within a few minutes following trauma^[4,5] and account for about 45% of trauma-related mortalities in the world.^[6]

Approximately, 25% of the 100,000 annual reported deaths due to trauma in the urban areas of the United States are attributed to rib trauma.^[1] In Iran, a cross-sectional study was performed on traumatic patients in Kashan from 2014 to 2017, which reported the frequency of rib fractures as 4.9%.^[7]

In most cases, the deaths due to thorax trauma occur after admission to the emergency departments. However, <15% of

the patients with thoracic injuries require emergency surgery, and only adequate supportive measures and early therapies can save the life of the victim.^[8]

Blunt thorax injuries are more common than penetrating trauma. Falling injuries and road traffic accidents are the most common causes of thoracic injuries.^[1,8,9] Over 10% of the victims referring to the trauma emergency department of

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hospitals had blunt trauma of the thorax.^[10,11] Using seatbelt in cars and other safety devices in transportation have markedly reduced the number of blunt thoracic injuries over the past decades.^[12]

Rib fractures in children are not common due to chest flexion but are very prevalent in the elderly. Most rib fractures occur in the middle part of the rib. The upper rib fractures can be associated with aortic and tracheal injuries and the lower rib fractures with injury to intra-abdominal vital organs such as the kidneys, spleen, and liver.^[13,14]

According to the reports, victims usually have a strong tendency to return to work (RTW), so studying the predictors of RTW has recently become more popular. Several studies have examined this issue and identified several factors related to returning to work after injuries, being different in various studies and in terms of the anatomical site of injuries. Factors such as education level, sex, age, race, the severity of injury, previous job requirements, marital status, Barthel index, functional independence measure, income, social support, and participation in a vocational rehabilitation program.^[15-17]

In the study by Darenhal *et al.* in Iran, 504 of 603 patients returned to work after lumbar disc surgery within 6 months (83.6%). A multivariable analysis found a significant relationship between age, sex, education levels, body mass index, length of hospitalization, and manual work with RTW. However, there was no significant relationship between RTW and marital status, income, insurance, and coworker support.^[18]

In a study that examined the ability to RTW in multiple traumas in Iran from 2012 to 2014, 2.9% ($n = 24$) did not RTW. There was a significant difference between RTW with job and rehabilitation rate.^[19] However, in this study, a few samples were examined.

In one study, preoperative work status was the only positive predictor of RTW. Patients who worked before surgery were more likely to RTW. The demographic variables and the variables related to surgery and complications were not statistically significant. Smoking and the type of surgery had a negative clinical prognosis in terms of RTW.^[20]

The physical limitations that prevent the injured victims from returning to work have economic and psychological consequences that impair the quality of life of not only the injured but also their caregivers and families.^[21,22] The situation may necessitate nursing, medical therapy, physiotherapy, occupational therapy, speech therapy, psychological support, and social care services.^[23] Furthermore, the physical injury might have a negative long-term consequences, namely, delayed return to social and professional life and various physical, psychological, and social dimensions.^[24,25]

When returning to work is the main goal, the choice of treatment in people with fractures is affected and some methods are not recommended at all, so there is a need for careful consultation with the patient before surgery.^[26] The results of

these studies enable physicians to identify patients at risk for an unfavorable prognosis in terms of returning to their previous functions and to plan a physiotherapy program for them to achieve better outcomes.^[27]

So far, in Iran, few studies have been performed on RTW after rib fractures. The results of the existing studies were also contradictory. Performing such studies can fill this knowledge gap and identify the factors that cause poor outcomes in these injured individuals and determine their relationship with RTW. Based on the results of such studies, better planning can be done to reduce the complications of rib fractures. The results of the present study can also be helpful in identifying at-risk victims and placing them under special care to promote their health and prognosis. Therefore, the purpose of the present study was to analyze RTW victims with traumatic rib fracture and the associated factors in Guilan, Iran.

METHODS

Study setting

We conducted a study among victims of rib fractures admitted to Poursina Hospital, a trauma referral hospital located in Rasht, Guilan (northern Iran). The estimated total population of Guilan province was 2.5 million in 2018.

Study design

In this retrospective study, secondary data from the database of the Health Information System of Poursina Hospital in Guilan, Iran, were utilized. The data of all of the victims with rib fractures (according to the International Classification of Diseases-10 definitions for rib fracture) admitted to the hospital from 2017 to 2018 for ages ≥ 18 years old were used.^[28] In the present study, work status before the rib fracture and RTW after the injury were investigated. If the patient had a part-time work before the rib fracture, and s/he returned to work after the rib fracture, s/he was considered as RTW. However, if the patient had full-time work before the rib fracture, but s/he returned to a part-time work after the fracture, s/he was not considered as RTW. Housewives were considered as employed, although they were not paid. Moreover, their return to housework before rib fracture was considered as RTW. Students, the retired, and the unemployed patients with Abbreviated Injury Scale score < 3 and multiple trauma patients were excluded from the study.

Sample size

A total of 266 individuals from all of the patients with rib fracture admitted to the hospital within the study period who had the inclusion criteria were entered into the study. Out of whom, 193 (response rate = 72.56%) participated in the telephone interviews and were included in the final analysis.

Data collection tools

The data of the eligible participants including the sociodemographic (age, sex, marital status, and residency) and clinical conditions (the type of accident, days of hospitalization, having surgery, Glasgow Coma Scale [GCS]), and the number of rib fractures were retrieved from the hospital

database. However, the discharged victims were interviewed through telephone to obtain the required data on the time of RTW, the duration between the time of injury and RTW, and the changes in working condition.

Statistical analyses

We used survival analysis to evaluate the time of RTW and Cox regression to determine the associated factors. The patients' RTW was compared using the Kaplan–Meier charts and log-rank test statistics. All of the analyses were performed using Stata 14 (STATA Corp, Texas, United States), and the association was considered significant at a value of $P < 0.05$.

Ethical considerations

The patients gave verbal consent to participate in the study. The study was approved by the Ethics Committee of Deputy of Research, Guilan University of Medical Sciences, Iran (Ethical code: IR.GUMS.REC.1398.237).

RESULTS

Out of the 193 victims admitted due to rib fractures, 173 were male (89.6%), and the rest were female (10.4%). Their mean age was 54.59 ± 16.66 years, while those aged under 45, 45–60, and over 60 years were 62 (32.1%), 60 (31.1%), and 71 (36.8%), respectively. Furthermore, 179 (92.7%) were married, while the remaining 14 (7.3%) were single. The urban and rural residents accounted for 137 (71%), and 56 (29%), respectively.

Car accident, pedestrian accident, motorcycle accident, falling, and other causes of the rib fractures accounted for 143 (74.1%), 19 (9.8%), 19 (9.8%), 5 (2.6%), and 7 (3.6%), respectively. Furthermore, the number of victims with only one rib fracture and five rib fractures were 94 (48.7%), and 6 (3.1%), respectively. GCS at the time of hospital admission was 15 for 182 (94.3%) victims and 14 for 11 (5.7%) victims. The mean hospitalization was 1.87 ± 1.59 days, and 116 (60.1%) patients were hospitalized only for 1 day. The number of victims managed nonsurgically and surgically were 188 (97.4%) and 5 (2.6%), respectively [Table 1].

Figure 1 and Table 2 show the Kaplan–Meier failure estimation for the time of RTW of the victims with rib fracture. Out of the total victims with rib fractures, 189 (97.9%) ones returned to work. The mean length of their RTW was 18.88 ± 11.405 weeks, with the minimum and maximum lengths of 6 and 64 weeks. After injury, the time of RTW at 6th, 33rd, and 64th weeks accounted for 7.2%, 89.1%, and 97.9% of the victims, respectively.

Figure 2 reveals the relationship between different factors and time of RTW of the victims. There was no change in the work of patients after returning to work. The time to RTW for the manual workers, housewives, and drivers was later than for the other employees. Overall, the log-rank test indicated that the time to RTW significantly ($P < 0.001$) varied according to the type of job.

Table 1: Descriptive statistics

Variable	Frequency (%)
Sex	
Male	173 (89.64)
Female	20 (10.36)
Age	
Under 45	62 (32.12)
45-60 years old	60 (31.09)
More than 60	71 (36.79)
Marital status	
Married	179 (92.75)
Single	14 (7.25)
Residency	
Urban	137 (70.98)
Rural	56 (29.02)
Type of accident	
Car accident	143 (74.09)
Pedestrian accident	19 (9.84)
Motorcycle accident	19 (9.84)
Falling	5 (2.59)
And other causes	7 (3.63)
GCS score	
14	11 (5.70)
15	182 (94.30)
Having surgery	
Non-surgically	188 (97.41)
Surgically	5 (2.59)

GCS: Glasgow Coma Scale

Table 2: Percentage of victims with rib fractures returned to work against length of time in weeks

Week	Return to work (%)
6	7.2
8	15
12	32.6
15	52.3
20	64.2
24	80.3
28	84.4
33	89.1
36	92.9
39	94.1
43	95.7
49	96.1
53	96.9
56	96.9
59	97.9
64	97.9

Figure 3 indicates the victims' RTW based on their sex, location, age, and causes of trauma using the Kaplan–Meier estimation. The women's chart is on the right side of the men's chart and reveals the late return of the victims to work. However, the χ^2 log-rank test statistic of 2.93 shows an insignificant difference between men and women ($P = 0.122$). Furthermore, Figure 3 demonstrates the time of RTW in the

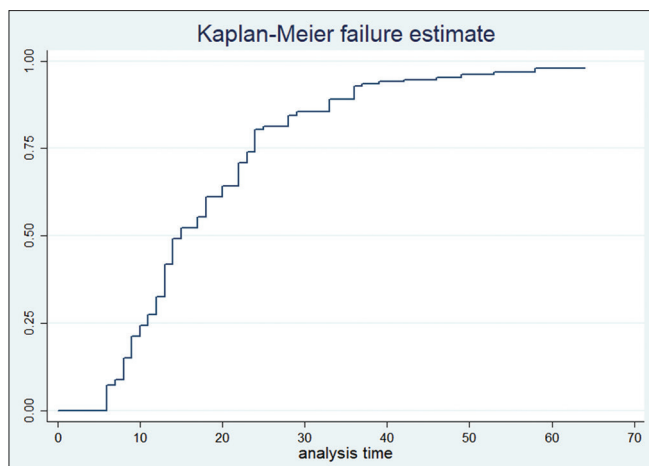


Figure 1: Kaplan–Meier failure estimate of return to work among patients with rib fractures

patient in relation to their place of residence. The difference between the urban and rural residents in the time to RTW was statistically insignificant ($P = 0.647$). However, as shown in Figure 3, the victims above the age of 60 had a significantly longer time of RTW ($P < 0.001$). Besides, the victims with falling and motorcycle accidents [Figure 3] had a longer time of RTW than the other groups ($P < 0.001$).

Table 3 presents the relationship between the different variables and the time of RTW using the Cox regression model. Sex, marital status, and place of residence of the victims were insignificantly associated with the time to RTW. Nevertheless, the length of days of hospitalization ($P < 0.001$, hazard ratio = 0.63), type of treatment (surgical, nonsurgical), GCS, and cause of accident were significantly associated. The age of the victims was inversely associated with the time to RTW of the victims. That is, the time to RTW was lower in the older people ($P = 0.012$, hazard ratio = 0.98), and a 1 year increase in the age of the victim was likely to decrease the time to RTW by 2%. The number of days of hospitalization was also significantly associated ($P < 0.001$, hazard ratio = 0.63) with the time to RTW. A 1-day increase in hospital stay reduced the probability of returning to work by 37%. The victims with motorcycle accidents were 1.46 times more likely to RTW, while those with falling accidents revealed a 2.56 times lower chance ($P < 0.001$). Furthermore, the victims' time of RTW was significantly associated with the GCS ($P = 0.021$, hazard ratio = 2.98), and the type of treatment of the victims ($P = 0.003$, hazard ratio = 6.451). The admitted victims were 5.45 times more likely to RTW than those who were operated.

DISCUSSION

The results of this study suggest that the mean duration of RTW in patients with rib fracture was 18.88 weeks and 97.9% of the injured had returned to work until 64th weeks. According to a study aimed at examining the outcome of rib fixation surgeries in injured patients, 90% of the patients returned to

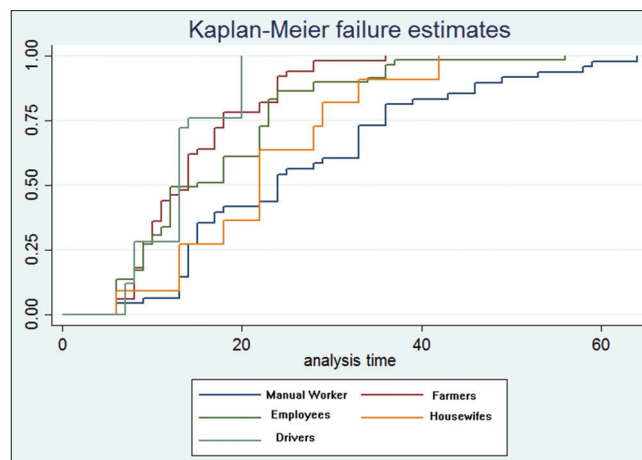


Figure 2: Kaplan–Meier failure estimate of return to work among patients with rib fractures by type of work

their previous job within 8.5 weeks^[29] who had a RTW earlier than the injured in the present study. Others reported that only 71% of the victims with rib fractures returned to their preaccident work.^[30] It was observed that the time to RTW in these two studies was lower than that of the present study. This was related to the difference in the severity and type of injuries and differences in labor laws, employment status, insurance, and financial status across countries.^[31] Despite the lack of similar studies in Iran, a research proposed that the period after injury was a predictor of RTW.^[32] The rate of RTW was lower in low financial conditions and the disadvantaged social groups (migrants).^[33]

The time to RTW was significantly associated with the age of the victim. As the age of the victim increases, the likelihood of returning to work decreases. In multiple trauma and brain trauma studies, age was reported to be a predictor of RTW which significantly decreased in older people.^[31,32]

The findings of our study also suggest that the time to RTW was higher in manual workers. Evidence from a systematic review proved that the blue-collar work was related to the duration of time to RTW in traumatic patients.^[34] It is important to note that manual workers need a preparation before strating to work. Changing the work of the victims and assigning them easier tasks help facilitate their RTW. Temporary work at home is another way to improve the economic conditions of the victims' families.^[35-37]

Our findings indicated a statistically significant relationship between the days of hospitalization and time to RTW. Hence, the increased hospital stay and delayed RTW of the victims observed in our findings might be explained by the disabilities and performance limitations of the victims. A study reported that 18% of the victims with traumatic injuries had at least one functional limitation in the year following trauma.^[38] Others reported similar findings.^[31,32,39] The severity of an injury can directly affect the victims' time to RTW. The length of hospitalization can be a good indicator of the severity of the injury, while it does not have a direct effect on RTW.^[40,41] A

Table 3: Cox regression of factors associated with time of return to work in rib fracture victims

Variable	Hazard ratio	SE	95% CI*		P
			Lower limit	Upper limit	
Sex					
Men	0.566	0.173	0.31	1.03	0.064
Age	0.958	0.005	0.97	1.66	0.012
Marital status					
Married	1.346	0.488	0.7	2.58	0.372
Residency					
Urban	1.178	0.201	0.84	1.65	0.338
Days of hospitalization	0.633	0.066	0.52	0.99	<0.001
Having surgery	6.451	4.097	1.86	0.78	0.003
Number of rib fractures	1.3	0.107	0.81	1.24	0.97
Glasgow coma scale	2.984	1.398	1.19	7.47	0.021
Type of accident					
Car accident	0.974	0.419	0.492	2.215	0.95
Pedestrian accident	1.005	0.284	0.58	1.75	0.98
Motorcycle accident	1.809	0.501	1.14	3.19	0.014
Falling	0.103	0.065	0.03	0.36	<0.001
Other	1.294	0.62	0.51	36.31	0.59

*Animal accident, bicycle accident, agricultural vehicles and farm machines. CI: Confidence interval, SE: Standard error

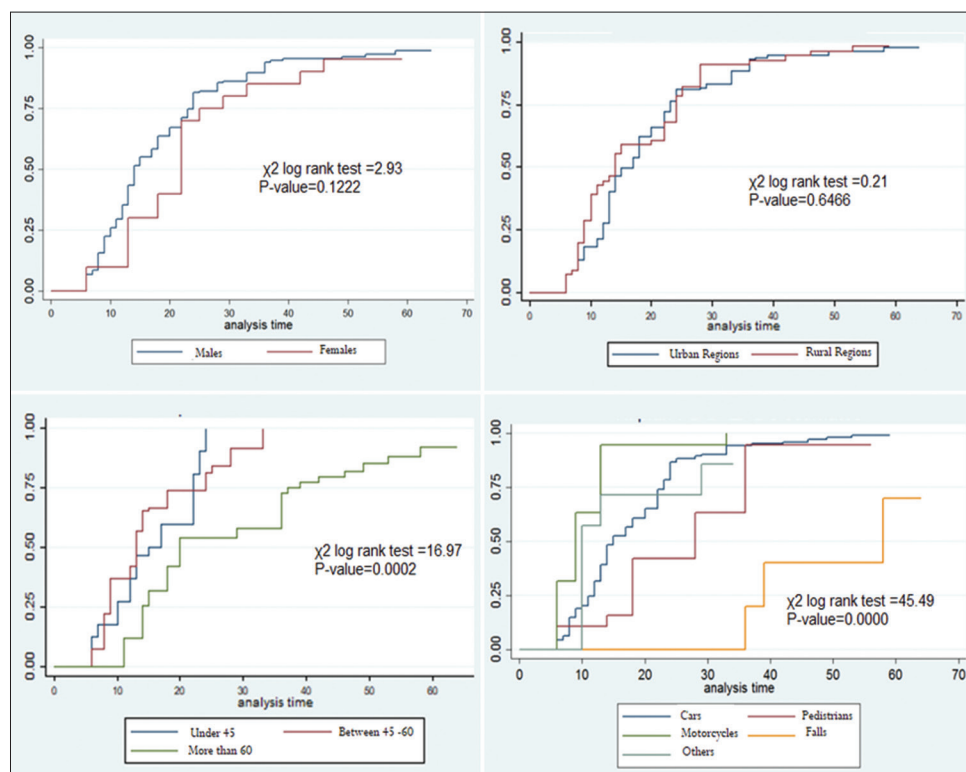


Figure 3: Kaplan–Meier failure estimate for return to work of rib fracture patients in different conditions

victim’s absence from work is likely to decrease the severity of the injury. Despite that safety interventions can be highly effective, the majority of the victims in our study were injured due to traffic accidents. Thus, educating the drivers, installing speed cameras, managing road traffic fines, improving the quality of motor vehicles, and increasing supervision on motorcyclists and road facilities for pedestrians are some of

the effective interventions that can decrease the severity of the injuries and related consequences.^[42-44]

The findings specified that the likelihood of the victims’ time to RTW increased as GCS increased. Another study also reported that GCS was a predictor of RTW (odds ratio = 1.53, confidence interval 1.22–1.92, $P < 0.001$) and victims with GCS >13 had

earlier RTW.^[45] Furthermore, there was a significant association between the type of treatment and the length of time to RTW. The majority of the victims in our study (97.4%) were only hospitalized and received nonsurgical treatments such as painkillers. In a study, multiple regression analysis displayed that the injury severity was a predictor of RTW.^[45]

This study revealed the issue of rib fracture and associated factors in Iran. However, it had some limitations. First, we excluded the victims with multiple trauma from the analysis because of the effects of other severe injuries on the time to RTW. Second, some variables such as income or pension could affect the time to RTW. Finally, a telephone interview cannot help obtain all of the required data.

CONCLUSION

The findings provided evidence about the average time to RTW in victims with rib fractures. Improving the interventions to the older with rib fractures, to those with long-term hospitalization, and low GCS, and strengthening safety interventions, especially the prevention of road traffic accidents to those in high risk can effectively increase the rate of RTW among victims with rib fractures.

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Conflicts of interest

There are no conflicts of interest.

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