

# Exploring the Factors Associated with 12-Month Non-Return to Work among Motorcyclists Involved in Road Accidents

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**How to cite this paper:** Glèlè-Ahanhanzo, Y., Daddah, D., Kpomezouen, A., Santos, B.H.D. and Paraiso, M.N. (2024) Exploring the Factors Associated with 12-Month Non-Return to Work among Motorcyclists Involved in Road Accidents. *Open Journal of Preventive Medicine*, 14, 1-16.

<https://doi.org/10.4236/ojpm.2024.141001>

**Received:** December 3, 2023

**Accepted:** January 22, 2024

**Published:** January 25, 2024

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## Abstract

**Introduction:** Motorcyclists bear a disproportionate burden of morbidity and mortality from road accidents. In addition, the consequences of these accidents affect the ability of victims to return to work. This study aimed to determine the prevalence and factors associated with non-return to work among surviving motorcyclists involved in road accidents 12 months after the event. **Materials and Methods:** It was a cross-sectional study conducted using data from a cohort of motorcyclists involved in accidents and recruited in five hospitals in Benin from July 2019 to January 2020. The dependent variable was non-return to work 12 months after the accident (yes vs no). The independent variables were categorized into two groups: baseline and 12-month follow-up variables. Logistic regression was used to determine the factors associated with non-return to work at 12 months among the participants. **Results:** Among the 362 participants, 55 (15.19%, 95% CI = 11.84 - 19.29) had not returned to work 12 months after the accident. Risk factors for non-return to work identified were: smoking (aOR = 4.41, 95% CI = 1.44 - 13.56, p = 0.010), hospitalization (aOR = 2.87, 95% CI = 1.14 - 7.24, p < 0.026), disability (aOR = 6.48, 95% CI = 2.73 - 15.37, p < 0.001), anxiety (aOR = 3.17, 95% CI = 1.23 - 8.17, p = 0.017), and depression (aOR = 6.94, 95% CI = 3.26 - 14.74, p < 0.001). **Conclusion:** The prevalence of non-return to work at 12 months was high among surviving motorcyclists involved in road accidents in Benin. Integrated support for patients based on identified risk factors should effectively improve their return to work.

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## Keywords

Road Accident, Return to Work, Motorcyclists, Hospital, Mental Health, Cohort, Benin

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## 1. Introduction

Every year, nearly 1.35 million people lose their lives due to road accidents worldwide [1]. In addition to fatalities, road accidents result in numerous other detrimental consequences for survivors. Even after escaping death, many survivors experience temporary or permanent declines in their physical or mental abilities, compromising their capacity to resume their initial professional activities for varying durations. In the literature, several studies have explored the functional [2]-[8] and psychological consequences associated with road accidents, such as anxiety [5] [9], depression [5] [9] [10] [11], or post-traumatic stress disorders [9]. However, there is insufficient work on the occupational side effects of these accidents. Road accidents and their associated burden affect all road users, but motorcyclists are particularly vulnerable. In the event of a collision, they have minimal physical protection (aside from helmets, if worn), which exposes them to a higher risk of death and other severe consequences, particularly in terms of functional capacity and occupational status. It is worth noting that motorized two-wheeled vehicles are among the most widely used means of transportation worldwide, especially in low- and middle-income countries, where approximately 770 million are used [12] [13].

Similarly, in Benin, road transportation is primarily characterized by high use of two-wheeled vehicles. Over the past few years, a growing body of literature has emerged in Benin addressing the issue of road accidents among road users in general, with a particular focus on motorcyclists [14] [15] [16] [17]. The studies conducted have notably examined the characteristics and severity factors of road accidents, the reference conditions for seriously injured road victims, and the psychological consequences associated with road accidents [14] [15] [16] [17]. However, there is still a lack of literature on the occupational consequences of road accidents, which represents a significant gap. In Benin, the frequency with which road users in general, and motorcyclists in particular, return to work after a road accident is not known, let alone the associated factors. Returning to work after a road accident signifies a return to everyday life and economic activities, a vital step for the individual and their community. In contrast, non-return to work (NRW) and its associated social and economic implications can often be the catalyst for stress and psychological disorders, such as anxiety and depression, creating a vicious cycle. Therefore, it is relevant to incorporate NRW prevention as an integral part of the patient management process for road accident victims, alongside other interventions. However, the limited availability of data on NRW negatively affects the relevance and effectiveness of prevention, care, and

follow-up interventions for workers who are victims of road accidents in Benin.

To fill this gap, the present study aimed to determine the prevalence and factors associated with NRW at 12 months among surviving motorcyclists involved in road crashes in Benin.

## 2. Methods

### 2.1. Study Type and Setting

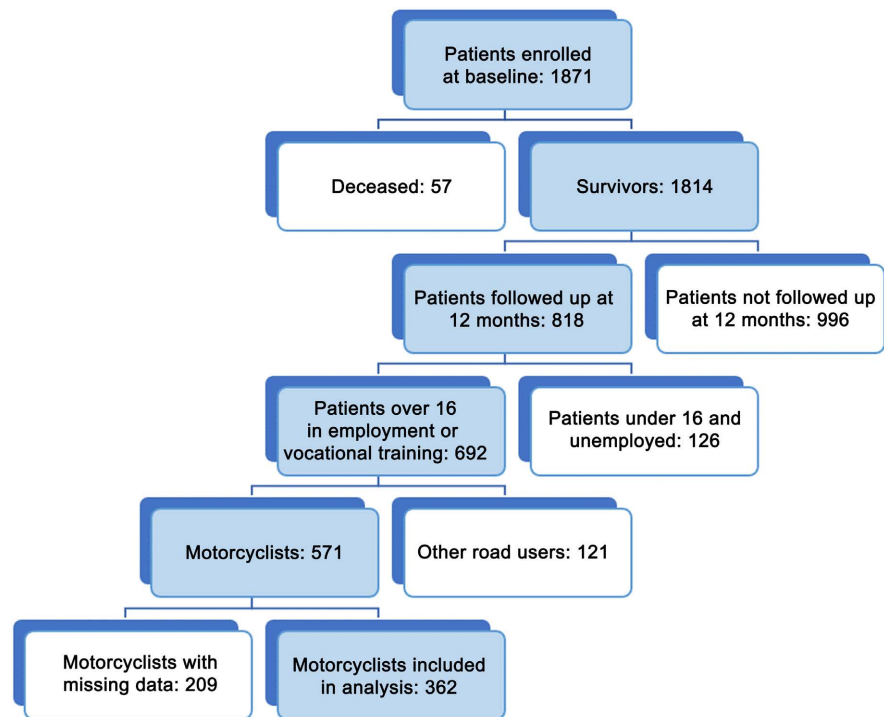
We conducted a cross-sectional study involving victims of road accidents from the TraumAR cohort. This cohort was established as part of a multidisciplinary research project on road accident prevention (ReMPART) in Benin. Individuals who had been victims of road accidents from July 2019 to January 2020, regardless of their age, residing in Benin, and admitted alive to one of the five selected hospitals (Centre National Hospitalier Universitaire Hubert Koutoukou Maga, Centre Hospitalier Universitaire Départemental de l'Ouémé-Plateau, Hôpital de Zone de Ménontin, Centre Hospitalier Universitaire Départemental du Borgou-Alibori et Hôpital de Zone de Boko) were eligible for inclusion in the cohort after obtaining their written, voluntary, and informed consent. For each patient enrolled in the cohort, baseline data were collected and were further completed with follow-up data at the sixth month (via telephone follow-up) and twelfth month (in-person follow-up) after the accident. Detailed methodological aspects of the TraumAR cohort have already been described in other publications [14] [16] [17].

### 2.2. Study Population

The study population consisted of motorcyclists (riders or passengers) who: 1) were involved in a road accident, 2) did not die, 3) were followed up for up to 12 months after the crash, 4) were aged 16 years or older, 5) were in employment or vocational training at the time of the crash, 6) and had complete data for the study variables. The TraumAR cohort recruited a total of 1871 road accident victims from July 2019 to January 2020, of whom 57 were deceased at the time of enrolment. Of the 1814 survivors, 818 underwent a 12-month follow-up. Within this group, 126 individuals were under 16 or were unemployed (or not in vocational training), and 121 were road users other than motorcyclists were not included. Of the remaining 571 participants, 209 were excluded due to missing data on the variables of interest. Finally, the data analysis focused on 362 motorcyclists who were victims of road accidents, survived, were 16 years or older, were either employed or in vocational training at the time of the accident and had complete data for the study variables (**Figure 1**).

### 2.3. Study Variables

The dependent variable was the NRW, 12 months after the road accident (yes vs no). It was completed based on participants' declarations during the 12-month follow-up. The independent variables were categorized into two groups: baseline



**Figure 1.** Selection process for the study sample.

and 12-month follow-up variables. Baseline variables included 1) sociodemographic characteristics: age (16 - 24, 25 - 44, 45+), sex (male, female), marital status (single/divorced/widowed, married/cohabiting), employment status (employed, in vocational training), 2) medical history: history of chronic illness (yes, no), history of road accidents (yes, no), 3) behaviour-related characteristics: helmet use (yes, no), reason for trip (private, business), alcohol consumption (yes, no), smoking (yes, no), 4) clinical characteristics: severe injury (yes, no), hospitalization (yes, no), means of transport to the hospital (ambulance, no ambulance), attending healthcare provider (physicians, paramedical staff). Injury severity was assessed using the Abbreviated Injury Scale [18]. The 12-month follow-up variables included: disability (yes, no), anxiety (yes, no), depression (yes, no), post-traumatic stress syndrome (yes, no), negative financial situation (yes, no), and negative family situation (yes, no) due to the accident. Functional disability was assessed using the Washington Group for Disabilities Statistics functional disability assessment tool [2]. Anxiety and depression were evaluated using the Hospital Anxiety and Depression Scale. The questionnaire includes 7 items for anxiety and 7 for depression, each scored on a 4-point scale ranging from 0 to 3. The expected scores range from 0 to 21, with a threshold score of 8 used for diagnosing anxiety and depression. The specific version of the checklist (PCL-S) was used to assess post-traumatic stress syndrome (PTSS).

It is a standardized self-assessment scale consisting of 17 items. It includes Likert scale response options ranging from 1 “not at all” to 5 “extremely” based on the intensity and frequency of symptoms during the preceding month. The total score for PCL-S, ranging from 17 to 85, was obtained by summing the scores of

each item, with a threshold score of 34 used for diagnosing PTSS [9].

## 2.4. Data Analysis

Factors associated with NRW were identified using logistic regression. Initially, we ran simple logistic regression to determine the association between each independent variable and NRW (univariate analysis). All covariates were examined for inclusion in the multiple logistic regression at a significance level of  $p < 0.2$ . We gradually removed variables with  $p > 0.05$  from the multiple regression. In the final model, all variables had  $p < 0.05$  (multivariate analysis). The associations between the dependent and independent variables were measured using crude and adjusted odds ratios (ORs) in univariate and multivariate analysis, respectively, along with their 95% confidence intervals (95% CI).

## 2.5. Ethical Considerations

The Ethics Committee of the University of Parakou (Benin) gave a favourable ethical opinion on the study under reference number 0182/CLERB-UP/P/SP/R/SA. An information sheet describing the study's context, objectives and methodology was provided to each potential participant. All participants signed an informed consent form that explicitly stated their right to participate or withdraw from the study at any time and the anonymous and confidential nature of the data to be collected.

## 3. Results

### 3.1. Participant Characteristics

The study included 362 participants (Table 1). Among them, 13.81% were aged 16 to 24, 60.50% were between 25 and 44, and 25.69% were 45 or older. Over 90% of participants were male. Most respondents were married or in a relationship (73.48%) and employed (90.88%). Approximately 21% of the participants had a history of chronic illnesses, and 36% had a history of road accidents. More than 90% of participants reported wearing a helmet during the accident. The primary reason for the trip was private for 59.39% of the survivors. Additionally, 72.65% of the respondents reported alcohol consumption, and 8.84% reported smoking. After the accident, 13.54% of survivors experienced severe injuries, and 57.46% were hospitalized. Half of the individuals were attended to by paramedical staff, while the other half were treated by physicians. Twelve months after the accident, 11.05% of drivers had functional disabilities, 56.91% experienced anxiety, 22.65% were depressed and 17.96% suffered from post-traumatic stress syndrome. Furthermore, 74.03% of participants reported financial problems, and 22.10% mentioned family difficulties resulting from the accident.

### 3.2. Prevalence of NRW

Among the 362 participants, 55 (15.19%, 95% CI = 11.84 - 19.29) had not returned to work or resumed their professional training 12 months after the accident.

**Table 1.** Baseline and 12-month follow-up characteristics of surviving motorcyclists from the TraumAR cohort.

<b>Variables</b>	<b>n</b>	<b>%</b>
<b>Age (years)</b>		
16 - 24	50	13.81
25 - 44	219	60.50
45+	93	25.69
<b>Sex</b>		
Female	35	9.67
Male	327	90.33
<b>Marital status</b>		
Single/Divorced/Widowed	96	26.52
Married/Cohabiting	266	73.48
<b>Employment status</b>		
Employed	329	90.88
In professional training	33	9.12
<b>History of chronic illness</b>		
No	286	79.01
Yes	76	20.99
<b>History of road accidents</b>		
No	231	63.81
Yes	131	36.19
<b>Helmet use</b>		
No	35	9.67
Yes	327	90.33
<b>Reason for trip</b>		
Private	215	59.39
Business	147	40.61
<b>Alcohol consumption</b>		
No	99	27.35
Yes	263	72.65
<b>Smoking</b>		
No	330	91.16
Yes	32	8.84
<b>Severe injury</b>		
No	313	86.46
Yes	49	13.54
<b>Hospitalization</b>		
No	154	42.54
Yes	208	57.46

## Continued

<b>Means of transport to the hospital</b>		
Ambulance	131	36.19
No ambulance	231	63.81
<b>Attending healthcare provider</b>		
Physicians	178	49.17
Paramedical staff	184	50.83
<b>Disability</b>		
No	322	88.95
Yes	40	11.05
<b>Anxiety</b>		
No	156	43.09
Yes	206	56.91
<b>Depression</b>		
No	280	77.35
Yes	82	22.65
<b>PTSS</b>		
No	297	82.04
Yes	65	17.96
<b>Negative financial situation</b>		
No	94	25.97
Yes	268	74.03
<b>Negative family situation</b>		
No	282	77.90
Yes	80	22.10

### 3.3. Comparing the Prevalence of NRW by Baseline and Follow-Up Variables

Compared to individuals aged 16 to 24, those aged 45 and older (21.51% vs 8.00%,  $p = 0.048$ ) were less likely to have returned to work (**Table 2**). Patients who reported smoking (28.13% vs 13.94%,  $p = 0.038$ ) were less likely to return to work 12 months after the accident. Clinically, patients with severe injuries (32.65% vs 12.46%,  $p < 0.001$ ) and hospitalized (22.60% vs 5.19%,  $p < 0.001$ ) had significantly higher proportions of NRW. Patients experiencing long-term consequences in terms of disability (62.50% vs 9.32%,  $p < 0.001$ ), anxiety (23.30% vs 4.49%,  $p < 0.001$ ), depression (47.56% vs 5.71%,  $p < 0.001$ ), and post-traumatic stress syndrome (44.62% vs 8.75%,  $p < 0.001$ ) were significantly less likely to have returned to work. Moreover, patients who reported financial difficulties (19.78% vs 2.13%,  $p < 0.001$ ) or negative family situations (30.00% vs 10.99%,  $p < 0.001$ ) were significantly less likely to have returned to work.

**Table 2.** Univariate analysis of factors associated with NRW in surviving motorcyclists from the TraumAR cohort.

Variables	NRW		Crude OR	95% CI	p
	n	%			
<b>Age (years)</b>					
16 - 24	4	8.00	1.00		
25 - 44	31	14.16	1.90	0.64 - 5.64	0.250
45+	20	21.51	3.15	1.01 - 9.80	0.048
<b>Sex</b>					
Female	2	5.71	1.00		
Male	53	16.21	3.19	0.74 - 13.71	0.119
<b>Marital status</b>					
Single/Divorced/Widowed	12	12.50	1.00		
Married/Cohabiting	43	16.17	1.35	0.68 - 2.68	0.392
<b>Employment status</b>					
Employed	53	16.11	2.98	0.69 - 12.81	0.143
In professional training	2	6.06	1.00		
<b>History of chronic illness</b>					
No	45	15.73	1.23	0.59 - 2.58	0.579
Yes	10	13.16	1.00		
<b>History of road accidents</b>					
No	40	17.32	1.62	0.86 - 3.06	0.138
Yes	15	11.45	1.00		
<b>Helmet use</b>					
No	7	20.00	1.45	0.60 - 3.51	0.407
Yes	48	14.68	1.00		
<b>Reason for trip</b>					
Private	35	16.28	1.23	0.68 - 2.24	0.487
Business	20	13.61	1.00		
<b>Alcohol consumption</b>					
No	9	9.09	1.00		
Yes	46	17.49	2.12	1.00 - 4.51	0.051
<b>Smoking</b>					
No	46	13.94	1.00		
Yes	9	28.13	2.42	1.05 - 5.55	0.038
<b>Severe injury</b>					
No	39	12.46	1.00		
Yes	16	32.65	3.41	1.72 - 6.76	<0.001



## Continued

<b>Hospitalization</b>						
No	8	5.19	1.00			
Yes	47	22.60	5.33	2.44 - 11.65	<0.001	
<b>Means of transport to hospital</b>						
Ambulance	26	19.85	1.72	0.97 - 3.08	0.065	
No ambulance	29	12.55	1.00			
<b>Attending healthcare provider</b>						
Physicians	25	14.04	1.00			
Paramedical staff	30	16.30	1.19	0.67 - 2.12	0.550	
<b>Disability</b>						
No	30	9.32				
Yes	25	62.50	16.22	7.72 - 34.08	<0.001	
<b>Anxiety</b>						
No	7	4.49	1.00			
Yes	48	23.30	6.47	2.84 - 14.74	<0.001	
<b>Depression</b>						
No	16	5.71	1.00			
Yes	39	47.56	14.97	7.69 - 29.11	<0.001	
<b>PTSD</b>						
No	26	8.75	1.00			
Yes	29	44.62	8.40	4.46 - 15.82	<0.001	
<b>Negative financial situation</b>						
No	2	2.13	1.00			
Yes	53	19.78	11.34	2.71 - 47.52	0.001	
<b>Negative family situation</b>						
No	31	10.99	1.00			
Yes	24	30.00	3.47	1.89 - 6.36	<0.001	

### 3.4. Factors Associated with NRW

After univariate analysis, the following variables were significant at  $p < 0.20$  and retained for multivariate analysis: age, sex, employment status, history of road accidents, alcohol consumption, smoking, injury severity, hospitalization, means of transportation to the hospital, disability, anxiety, depression, post-traumatic stress syndrome, negative financial situation and negative family situation (Table 2). Following multivariate analysis, the risk factors for NRW were (Table 3): smoking (aOR = 4.41, 95% CI = 1.44 - 13.56,  $p = 0.010$ ), hospitalization (aOR = 2.87, 95% CI = 1.14 - 7.24,  $p < 0.026$ ), disability (aOR = 6.48, 95% CI = 2.73 - 15.37,  $p < 0.001$ ), anxiety (aOR = 3.17, 95% CI = 1.23 - 8.17,  $p = 0.017$ ), and depression (aOR = 6.94, 95% CI = 3.26 - 14.74,  $p < 0.001$ ). After adjusting for the

**Table 3.** Multivariate analysis of factors associated with NRW in surviving motorcyclists from the TraumAR cohort.

Variables	Adjusted OR	95% CI	p
<b>Smoking</b>			
No	1.00		
Yes	4.41	1.44 - 13.56	0.010
<b>Hospitalization</b>			
No	1.00		
Yes	2.87	1.14 - 7.24	0.026
<b>Disability</b>			
No	1.00		
Yes	6.48	2.73 - 15.37	<0.001
<b>Anxiety</b>			
No	1.00		
Yes	3.17	1.23 - 8.17	0.017
<b>Depression</b>			
No	1.00		
Yes	6.94	3.26 - 14.74	<0.001

other variables in the final model, survivors with smoking history were 4.41 times more likely not to return to work 12 months after the accident. Hospitalization was a risk factor as the odds of not returning to work were more than two times higher for survivors who were hospitalized following the road accident. Survivors with disability or who suffered depression were about seven times more likely not to return to work after the 12-month follow-up.

#### 4. Discussion

The study aimed to determine the prevalence and factors associated with NRW at 12 months among surviving motorcyclists involved in road accidents in Benin. We found that 15.19% of survivors of road accidents experienced NRW, 12 months after the accident. The prevalence of NRW varies in the existing literature, with reports ranging from 19% to 34% [19]-[25]. This variation can be attributed to differences in study populations, variability in follow-up times, and country-specific contexts. Some extreme cases are worth noting, such as a 2020 study in Denmark, where only 7.3% of patients referred by ambulance after a road accident did not return to work [26], and a study in Norway in 2007, which reported a high proportion of 72% at 12 months for patients with severe injuries [27]. It's also crucial to account for variations between countries and contextual differences related to the healthcare systems in place for road accident victims. These systems encompass pre-hospital care, rehabilitative services, and the social protection and employment policies specific to each country.

From a behavioural perspective, we observed that individuals who reported regular smoking were less likely to return to work. Before the accident, those who declared smoking might have already been facing professional difficulties. Smoking is sometimes used as a coping mechanism to deal with various daily life challenges, including those in the workplace [28] [29] [30]. With the occurrence of an accident, these difficulties may become exacerbated. In such circumstances, the habit of smoking could persist or even intensify post-accident, further reinforcing the tendency not to reintegrate into the work environment. It is particularly significant in the Beninese context, where smoking in the workplace is uncommon. Furthermore, regular prior tobacco consumption can lead to other underlying health issues, such as lung diseases that may manifest or worsen following the accident, contributing to NRW.

The results indicated that hospitalization was a factor associated with NRW. Hospitalized individuals were nearly three times more likely not to return to work 12 months after the accident. Hospitalization is usually necessary for patients suffering from serious injuries. These patients may require long-term care and additional rehabilitation time, thus delaying their return to work. Extended hospitalization is also associated with high treatment costs. Some accident victims may, out of fear of being unable to afford medical expenses, forgo medical care despite medical recommendations. This decision can subsequently lead to further complications that hinder their reintegration into the workforce. Some authors have also observed that the length of hospital stay or time in intensive care was a significant factor associated with NRW among road accident victims [19] [24] [26] [27]. In a 2020 study in Denmark, hospitalization for more than one day was significantly associated with NRW [26].

Logically, disability was associated with NRW, consistent with previous studies showing that persistent physical impairments are associated with a lack of return to work [20] [22] [31] [32] [33]. Individuals with disabilities may require prolonged rehabilitation and medical follow-up. The necessity of undergoing these treatments can hinder an immediate return to work. Additionally, the absence of support or flexibility from the employer and insufficient workplace adaptations to enhance accessibility for individuals with reduced mobility can also impede the return to work. In agreement with the employer, here are some options to explore: teleworking or flexible working hours, where possible and appropriate to the job, or modifying the working environment to make it more inclusive for people with reduced mobility.

Post-traumatic stress syndrome is a disorder that can develop after an individual has experienced, witnessed, or been repeatedly exposed to a trauma. It is also reported as one of the most common psychiatric disorders after a road accident, explaining NRW among those who suffer from it [34] [35]. In the present study, it did not emerge as a significant factor. However, other psychiatric disorders, namely anxiety and depression, were identified as factors associated with NRW. This finding aligns with several other studies where psychiatric disorders

influenced return to work [20] [22] [24] [32] [33] [36]. In the present study, anxious and depressive survivors were 3.17 and 6.94 times more likely not to return to work 12 months after the accident, respectively. Road accidents can be traumatizing and trigger anxiety in survivors when they find themselves having to face road traffic again, which had nearly cost them their lives a few months earlier and led to numerous other detrimental personal or family consequences. In such circumstances, individuals suffering from anxiety after a road accident may need additional time to overcome the fear of experiencing a similar event again, thus delaying their return to work. Depression can lead to a loss of interest and motivation, causing depressed individuals to lack the necessary motivation to return to work and perform their professional tasks [37]. These results also underscore the need to implement integrated mental health care services following the physical care provided to road accident survivors. In the African context in general and Benin in particular, psychiatric disorders remain largely taboo. The deep and persistent stigma surrounding mental health issues is worsened by the limited integration of mental health care into primary health care [38] [39] [40] [41]. Psychiatric disorders are still poorly understood and associated with manifestations of personal weakness, discouraging many individuals from seeking help. As a result, individuals with mental diseases may develop a sense of exclusion from society on one hand and from the healthcare system on the other, creating a vicious cycle. Breaking this cycle requires, on the one hand, an improvement in mental health awareness at all levels of society and, on the other, an increase in resources allocated to mental health services.

We can identify some limitations to this study. Several variables included in the study were self-reported by participants and were not independently verified. Additionally, since data on the dependent variable and independent variables were collected cross-sectionally, causal relationships cannot be established. It is also worth mentioning the high number of people who were lost between the time of enrolment and the 12-month follow-up.

## 5. Conclusion

Preventing NRW is crucial, given its psychological, social and economic consequences, as are other interventions to care for road accident victims. The identification of risk factors for NRW is essential for the implementation of appropriate strategies based on vulnerable groups and contextual needs, hence the importance of this study. Integrated support for patients based on identified risk factors should effectively improve their return to work. In defining these strategies, particular attention should be paid to psychological and mental risks and disabilities, with an emphasis on multidisciplinary, integrated and anticipatory support.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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