

# Quality of life and spiritual health in motorcycle accident survivors: An analysis using the SF-36 Questionnaire and Spiritual Scale

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## Abstract

**Background:** Motorcycle traffic accidents rate remained high in Taiwan letting posttrauma care an imperative issue. This study investigates the spiritual, psychological, and physical impacts of motorcycle traffic accidents in Taiwan, focusing on the role of the Injury Severity Score (ISS) in influencing quality of life (QOL) and spiritual well-being outcomes, aiming to enhance holistic recovery strategies for trauma survivors.

**Materials and Methods:** A prospective study was conducted from April 2022 to March 2024 in a level I trauma center. Patients aged 20 and above with trauma from motorcycle accidents were enrolled and divided into major (ISS  $\geq$  16) and nonmajor (ISS  $<$  16) trauma groups. QOL and spiritual health were assessed using 36-item short-form general health survey measures (SF-36) and spiritual scale before discharge and 6 months later.

**Results:** Of 98 patients, we observed significant postdischarge declines in both physical and mental QOL scores, regardless of ISS. However, spiritual scores improved significantly after discharge, with notable enhancements in interpersonal relationships and adversity transcendence observed in patients with ISS  $<$  16, but not in those with ISS  $\geq$  16. SF-36 analysis revealed that nonreligious groups experienced significant declines in mental health scores postdischarge, unlike religious groups, which remained stable. In addition, religious individuals showed significant postdischarge improvements in interpersonal relationships and adversity transcendence, while nonreligious showed no improvement. This suggests a beneficial link between religious adherence and enhanced spiritual well-being.

**Conclusions:** Motorcycle accidents reduce QOL and heighten spiritual needs for survivors, regardless of accident severity categorized by ISS score. Integrating spirituality into rehabilitation processes can positively impact overall well-being. Holistic care, addressing physical, psychological, social, and spiritual needs, is vital for optimizing long-term recovery and improving prognosis in trauma survivors, especially in regions with high rates of traffic accidents like Taiwan.

**Keywords:** Motorcycle accident survivors; Trauma; Quality of life (QOL); Spiritual health

## 1. Introduction

Trauma in Taiwan is recognized as a critical national security concern. Despite the focus on diseases like cancer, trauma ranks as the eighth leading cause of death in Taiwan, particularly affecting the younger population.<sup>[1]</sup> In 2022, the Ministry of Transportation's "Road Traffic Safety Annual Report" revealed 375,844 traffic accidents, averaging

1,029.7 incidents per day, resulting in 3,064 fatalities and 499,179 injuries, with Kaohsiung recording the highest fatalities (369 deaths).<sup>[2]</sup> There were 3,064 deaths from traffic accidental injuries, with a death rate of about 13.49 per 100,000 people,<sup>[1]</sup> surpassing South Korea's rate of 5.3<sup>[3]</sup> and also significantly exceeds Japan's rate of 2.6.<sup>[4]</sup> Despite lifestyle changes due to COVID-19, trauma incidents persist, demanding serious attention to trauma care as a national security issue.

Among all trauma mechanisms, the motorcycle accidents are the primary cause of trauma in Taiwan, which are a critical public health issue, disproportionately affecting young males and leading to severe injuries or fatalities.<sup>[5,6]</sup> In Taiwan, motorcycle incidents accounted for 55.8% of all accidents, causing 63.4% of all deaths.<sup>[2]</sup> Even nonfatal accidents often lead to debilitating conditions for young and middle-aged workers, imposing significant burdens on families. Disability following trauma was substantial. Braithwaite et al.<sup>[7]</sup> revealed that only 30% of patients achieved full recovery after major trauma, with 47% remaining with moderate, severe, or very severe disabilities. Von Rden et al.<sup>[8]</sup> reported that 48% of patients experienced interpersonal problems and 41% suffered from severe pain after multiple trauma. The study identified clinical symptoms including depression (48%), heightened anxiety (45%), posttraumatic stress disorder (PTSD) (41%), and social difficulties (28%). Notably, only 15% of the patients did not report any functional impairment. According to a systematic review, there is a greater chance of suffering a decline in quality of life (QOL) as a result of road traffic injuries if the patients are older, female, have lower socioeconomic status, have PTSD, have more severe injuries, or have lower limb injuries,<sup>[9]</sup> indicating the impact of trauma on QOL was enormous.<sup>[9–15]</sup>

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Formosan Journal of Surgery (2025) 58:1

Received: 31 March 2024; Revised: 9 May 2024; Accepted: 27 May 2024.

Published online: 8 July 2024

<http://dx.doi.org/10.1097/FS9.000000000000138>

Traffic accident survivors commonly experience significant disruptions to their lives, including physical impairments and disturbances to their daily routines. These challenges can precipitate feelings of social isolation and emotional distress, subsequently impacting their psychological and spiritual well-being. In addition, patients may perceive themselves as burdensome to others, resulting in a diminished sense of self-worth. The intricate relationship between trauma and spiritual well-being entails multifaceted dynamics. It can impact an individual's spiritual health, triggering profound meaning questioning, challenges to faith, and a sense of peace,<sup>[16,17]</sup> while some individuals may find their spiritual resilience strengthened and their sense of purpose deepened by trauma.<sup>[18]</sup> The relationship between spiritual health and traffic accidents has been explored in various studies, focusing on the impact of road traffic crashes on mental health (MH) outcomes and the role of spiritual care in recovery.<sup>[19]</sup> While direct studies specifically addressing spiritual health in the context of traffic accidents are limited.<sup>[20]</sup>

The relationship between the Injury Severity Score (ISS) and outcomes of traffic accidents has been extensively studied, revealing significant insights into trauma care and patient prognosis. Although research indicates that higher ISS values are associated with increased mortality rates, longer hospital stays, and greater healthcare resource utilization among traffic accident victims,<sup>[21–24]</sup> however, the literature does not provide enough information about its association with other outcome indicators such as QOL or spiritual health.

The aim of this study is to investigate the physical and spiritual changes in the trauma patients in motorcycle traffic accidents. It also looks into whether the results of QOL and spiritual health are impacted by the ISS score. By examining these multidimensional aspects of recovery, the study seeks to identify effective strategies to alleviate stress and suffering, thereby enhancing the overall QOL and spiritual well-being of trauma survivors. This research endeavors to contribute to the development of integrated care models that address the comprehensive needs of patients, promoting holistic healing and recovery.

## 2. Material and Methods

### 2.1. Study design

This is a prospective study performed from April 2022 to March 2024 in Kaohsiung Chang Gung Memorial Hospital, Taiwan, which design to longitudinally observe individuals aged 20 and above who have sustained trauma from motorcycle traffic accidents. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and its amendments. Approval for this study was obtained by the hospital institutional review board (approval number 202200308B0) before its initiation. Written informed consent was obtained from the participants. These individuals are divided into two groups based on ISS score. According to regulations set by the National Health Insurance Administration of Taiwan, individuals with an ISS < 16 are classified as having nonmajor trauma, while those with ISS ≥ 16 are classified as having major trauma. The ISS is a standard for assessing injury severity based on the 2008 Abbreviated Injury Scale (AIS).<sup>[21,22,25–27]</sup> The scale divides the body into six anatomical regions (head/neck, face, thorium, abdomen, extremity, and external), scoring each from one to six based on injury severity. The highest AIS score is selected for each region, and the ISS is calculated as the sum of the squares of the three highest scores, ranging from 1 to 75, with higher scores indicating greater severity of injury.<sup>[23]</sup>

Through questionnaire surveys and retrospective review of trauma registration data, a comparison of QOL and spiritual health is conducted between the two groups before discharge and 6 months after discharge. The study instruments include the following four scales: (1) a personal basic information questionnaire, (2) trauma register system, (3) the 36-item short-form general health survey measures

Taiwan Version Quality of Life Scale (SF-36),<sup>[28]</sup> and (4) the Spiritual Health Scale developed by Shen Sheng-Chuan in 2017.<sup>[29]</sup>

### 2.2. Inclusion and exclusion criteria of the study

Inclusion Criteria:

The study includes individuals aged 20 and above who have suffered trauma from motorcycle traffic accidents, are conscious, able to communicate and agree to participate in the study.

Exclusion Criteria:

1. Patients with impaired consciousness or speech who are unable to communicate effectively.
2. Patients expected to be unable to attend follow-up visits or complete questionnaires.
3. Patients with doubts or questions about the trial that cannot be satisfactorily addressed.

### 2.3. Sample size

The sample size for the study is determined based on the calculation of required samples using repeated measures analysis of variance. Using G-Power 3.1.9.2, the regression model for the predictor variable is inputted, with a medium effect size ( $f^2 = 0.35$ ) and a significance level (alpha risk) of 0.05. Considering a statistical power of 80%, it is calculated that each group requires 44 participants to achieve statistical significance. Accounting for potential loss to follow-up, missing data, and extreme values, the target enrollment for the study is set at 50 participants for both nonmajor trauma and major trauma patients.

### 2.4. Study measurement instruments

#### 2.4.1. Personal basic information questionnaire

Demographic information such as age, occupation, gender, marital status, education level, religious beliefs, and comorbidities were collected. In addition, main care giver after discharge, rehabilitation status after discharge (including duration and place), work status (original company and job position), and duration between discharge to work were also collected.

#### 2.4.2. Trauma registry system

Comprehensive patient data, including age, sex, admission vital signs, injury mechanism, helmet use, the initial Glasgow Coma Scale in the emergency department, AIS severity score for each body region, ISS, New Injury Severity Score, Trauma-Injury Severity Score, duration of hospital stay, intensive care unit stay, in-hospital mortality, and rates of associated complications, were obtained from the Trauma Registry System of our institution. Our hospital had a well-established and maintained trauma register system, as documented in prior research.<sup>[30–32]</sup>

#### 2.4.3. The SF-36 QOL Scale, Taiwan version

The SF-36 QOL Scale used in this study was developed by Ware in 1990<sup>[33]</sup> as a multidimensional health-related QOL questionnaire. It is a general psychological measurement tool not specifically designed for any particular age group, disease, or treatment. It primarily measures respondents' perceived health status across eight dimensions, comprising a total of 36 items. The following dimensions are included in this study: physical functioning (10 items), role limitations due to physical health problems (role-physical [RP], four items), bodily pain (BP, two items), general health perceptions (GH, five items), vitality (VT, four items), social functioning (SF, two items), role limitations due to emotional problems (role-emotional [RE], three items), and MH (five items), with an additional item assessing self-rated health change. The Taiwan version (Short Form-36 Taiwan version) was translated and authorized for

**Table 1**  
**Patient Demographic**

Characteristics	N (%) / mean ± SD
Total	98
Gender	
Male	46 (46.9)
Female	52 (53.1)
Age	
20–29	25 (25.5)
30–39	17 (17.3)
40–49	12 (12.2)
50–59	25 (25.5)
60–69	16 (16.3)
70–79	3 (3.1)
Occupation	
None	7 (7.1)
Household	12 (12.2)
Labor	57 (58.2)
Business	9 (9.2)
Governmental	4 (4.1)
Other	9 (9.2)
Marital status	
Single	32 (32.7)
Married	58 (59.2)
Divorced	6 (6.1)
Widowed	2 (2.0)
Education level	
Elementary	5 (5.1)
Junior high	12 (12.2)
Senior high	34 (34.7)
Junior college	9 (9.2)
University	36 (36.7)
Graduate school	2 (2.0)
Religious beliefs	
None	15 (15.3)
Buddhism	3 (3.1)
Taoism	69 (70.4)
Christianity	8 (8.2)
Catholicism	2 (2.0)
Other	1 (1.0)
ISS	
<16	50 (51.0)
≥16	48 (49.0)
Comorbidities	
No	72 (73.5)
Diabetes mellitus	13 (13.3)
Hypertension	17 (17.3)
Asthma	3 (3.1)
CAD	1 (1.0)
Cancer	3 (3.1)
Hepatitis B/C	1 (1.0)
Main caregiver after discharge	
Spouse or cohabitant	45 (45.9)
Parents	33 (33.7)
Siblings	11 (11.2)
Children	33 (33.7)
Relatives	5 (5.1)
Neighbors	0 (0.0)
Friends	1 (1.0)
Religious or social group activities	0 (0.0)
Social welfare organization	0 (0.0)
Other	3 (3.1)
Rehabilitate after discharge	
Yes	47 (48.0)

Continued next page

**Table 1** (Continued)

Characteristics	N (%) / mean ± SD
No	51 (52.0)
Duration of rehabilitation	
1 month	2 (4.3)
2 months	3 (6.4)
3 months	2 (4.3)
4 months	0 (0.0)
5 months	0 (0.0)
6 months	40 (85.1)
Place for rehabilitation	
Hospital	9 (19.1)
Clinic	20 (42.6)
Home	27 (57.4)
Return to job after discharge?	
Yes	53 (54.1)
No	45 (45.9)
The duration between discharge from the hospital and the return to work.	
1 month	18 (34.0)
2 months	12 (22.6)
3 months	8 (15.1)
4 months	5 (9.4)
5 months	4 (7.5)
6 months	6 (11.3)
The original company or not	
Yes	49 (92.5)
No	4 (7.5)
The original job position or not	
Yes	44 (83.0)
No	9 (17.0)

academic use by domestic scholars following the International Quality of Life Assessment Project at the behest of the original developer, Dr. Ware.<sup>[28]</sup> In addition, the scores of the eight subscales can be aggregated into two composite scores: the Physical Component Scale (PCS) and the Mental Component Scale (MCS). PCS reflects physical functioning, RP, BP, and GH, while MCS reflects VT, SF, RE, and MH. This approach allows for differentiation between physiological and psychological aspects of health. The score system spans from 0 to 100, with 0 indicating the lowest level of health and 100 representing the highest level of health.<sup>[28]</sup>

#### 2.4.4. The Spiritual Health Scale

This study utilized the Spiritual Health Scale developed by Shen Sheng-Chuan in 2017,<sup>[29]</sup> consisting of the following five subscales: “Interpersonal Relationships” with seven items, “Meaning of Life” with four items, “Transcendence of Adversity” with six items, “Faith/Religious Trust” with four items, and “Human-and Nature” with four items, totaling 25 items. The responses were evaluated using a five-point Likert scale, which ranged from “completely inconsistent” to “completely consistent.” The results ranged from 1 to 5. Higher scores indicate better spiritual health. This Spiritual Health Scale was previously administered in community settings in Taipei City and New Taipei City of Taiwan, as well as in community care centers, elderly centers, and other community venues. The scale demonstrates a total construct validity of 0.84, with individual subscale construct validity ranging from 0.51 to 0.71. The Cronbach’s  $\alpha$  values for subscales all exceed 0.7, and the overall Cronbach’s  $\alpha$  value for the total scale is 0.96, indicating high reliability.<sup>[29]</sup>

#### 2.5. Statistical analysis

The encoded and archived data obtained from authentic questionnaires are subsequently subjected to analysis utilizing the IBM SPSS

**Table 2**  
**Comparison of SF-36 Score Before and After Discharge**

	Before Discharge (n = 98)	After Discharge (n = 98)	P
Physical functioning	88.21 ± 14.18	70.20 ± 26.19	<0.001*
Role-physical	94.38 ± 18.49	36.47 ± 46.27	<0.001*
Bodily pain	80.96 ± 17.23	66.91 ± 14.60	<0.001*
General health	78.43 ± 17.41	65.52 ± 16.57	<0.001*
Vitality	75.30 ± 10.76	73.72 ± 11.16	0.258
Social functioning	86.09 ± 14.23	69.64 ± 20.54	<0.001*
Role-emotional	97.27 ± 15.63	70.40 ± 45.88	<0.001*
Mental health	82.20 ± 12.18	80.57 ± 11.09	0.206
Physical component summary	85.50 ± 12.97	59.78 ± 20.82	<0.001*
Mental component summary	85.22 ± 10.32	73.58 ± 17.69	<0.001*
Total	85.36 ± 10.67	66.68 ± 17.91	<0.001*

\*Statistically significant difference with a *P* < 0.05.

version 23 software program for Windows. When considering continuous variables, the initial application of Levene’s test is to determine the homogeneity of variance. Following this, the paired t test and the Student’s t test are applied to examine the differences in continuous variables. The units of presentation for continuous variables are mean ± standard deviation or median ± interquartile range. The values of category variables are expressed as percentages. The threshold for statistical significance is a *P* value below 0.05.

### 3. Results

#### 3.1. Patient demographics

The study comprised a total of 98 patients who sustained trauma from motorcycle traffic accidents. Of these, 46 (46.90%) were men and 52 (53.10%) were women, with a mean age of 44.19 ± 15.73 years. The majority of patients fell within the age range of 20–29 years (25.50%), and most were married (59.20%). Regarding religious beliefs, the majority identified as Taoism (70.4%), followed by those with no religious affiliation (15.3%), and Christianity (8.2%). The prevalence of comorbidities was low among the patients, with hypertension being the most common underlying condition (17.30%), followed by diabetes mellitus (13.30%).

Regarding injury severity, 50 (51%) of patients were classified as ISS < 16, while 48 (49%) were classified as ISS ≥ 16, with a mean ISS score of 14.1 ± 10.2. Spouses or cohabitants were the main caregivers after discharge (45.9%), followed by parents (33.7%) and children (33.7%). Approximately half of the patients received rehabilitation

(48%), and half of them returned to work after discharge (54.1%). Among those who returned to work, the vast majority (92.5%) were able to return to their original company, and a significant portion (83%) were able to regain their original job position (Table 1).

#### 3.2. SF-36 analysis before and after discharge

Following discharge, patients exhibited significantly lower scores in physical functioning (88.21 ± 14.18 vs. 70.2 ± 26.19, *P* < 0.001), RP (94.38 ± 18.49 vs. 36.47 ± 46.27, *P* < 0.001), BP (80.96 ± 17.23 vs. 66.91 ± 14.60, *P* < 0.001), GH (78.43 ± 17.41 vs. 65.52 ± 16.57, *P* < 0.001), SF (86.09 ± 14.23 vs. 69.64 ± 20.54, *P* < 0.001), and RE (97.27 ± 15.63 vs. 70.40 ± 45.88, *P* < 0.001) domains of the SF-36 questionnaire. However, there were no significant differences observed in VT and MH scores. In addition, both physical component summary (PCS) (85.50 ± 12.97 vs. 59.78 ± 20.82, *P* < 0.001) and mental component summary (MCS) (85.22 ± 10.32 vs. 73.58 ± 17.69, *P* < 0.001) scores were significantly lower after discharge. The total score (85.36 ± 10.67 vs. 66.68 ± 17.91, *P* < 0.001) was also significantly lower after discharge (Table 2).

Examining SF-36 scores before and after discharge according to ISS categories reveals similar outcomes. Regardless of whether patients are classified under ISS < 16 or ISS ≥ 16 groups, SF-36 scores demonstrate a significant decline after discharge. Regarding the comparison among religious status (Table 3), apart from VT and the MH of religious groups, which did not show a significant decline in QOL scores after discharge, all other aspects experienced a

**Table 3**  
**SF-36 Score Analysis Before and After Discharge According to ISS Classification**

	ISS < 16 (n = 50)			ISS ≥ 16 (n = 48)		
	Before Discharge	After Discharge	P	Before Discharge	After Discharge	P
Physical functioning	90.00 ± 16.16	72.00 ± 24.18	<0.001*	86.35 ± 11.65	68.33 ± 28.27	<0.001*
Role-physical	94.00 ± 19.92	37.00 ± 46.08	<0.001*	94.79 ± 17.07	35.93 ± 46.95	<0.001*
Bodily pain	80.74 ± 17.05	68.32 ± 13.22	<0.001*	81.20 ± 17.59	65.45 ± 15.92	<0.001*
General health	79.98 ± 17.39	70.58 ± 13.52	<0.001*	76.83 ± 17.47	60.25 ± 17.91	<0.001*
Vitality	74.90 ± 12.63	73.40 ± 11.75	0.501	75.72 ± 8.50	74.06 ± 10.65	0.326
Social functioning	85.75 ± 14.50	71.00 ± 16.45	<0.001*	86.45 ± 14.08	68.22 ± 24.18	<0.001*
Role-emotional	96.66 ± 16.83	64.00 ± 48.48	<0.001*	97.91 ± 14.43	77.08 ± 42.47	0.002*
Mental health	81.04 ± 13.37	80.32 ± 11.07	0.667	83.41 ± 10.82	80.82 ± 11.22	0.198
Physical component summary	86.18 ± 13.64	61.97 ± 19.80	<0.001*	84.79 ± 12.34	57.49 ± 21.81	<0.001*
Mental component summary	84.58 ± 11.24	72.18 ± 17.69	<0.001*	85.88 ± 9.34	75.05 ± 17.75	<0.001*
Total	85.38 ± 11.23	67.07 ± 17.48	<0.001*	85.33 ± 10.19	66.27 ± 18.53	<0.001*

\*Statistically significant difference with a *P* < 0.05.

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**Table 4**  
**SF-36 Analysis across Religious Status**

		Before discharge	After discharge	P
Physical functioning	None religious	83.00 ± 18.00	61.33 ± 34.35	0.040*
	Religious	89.15 ± 13.29	71.80 ± 24.35	<0.001*
Role-physical	None religious	90.00 ± 26.38	28.33 ± 43.16	<0.001*
	Religious	95.18 ± 16.77	37.95 ± 46.91	<0.001*
Bodily pain	None religious	76.13 ± 17.86	61.00 ± 13.37	0.015*
	Religious	81.84 ± 17.08	67.98 ± 14.63	<0.001*
General health	None religious	76.13 ± 20.68	60.46 ± 17.10	0.001*
	Religious	78.85 ± 16.86	66.43 ± 16.42	<0.001*
Vitality	None religious	74.33 ± 15.56	74.66 ± 11.87	0.933
	Religious	75.48 ± 9.77	73.55 ± 11.11	0.199
Social functioning	None religious	80.83 ± 16.27	58.33 ± 27.00	0.009*
	Religious	87.04 ± 13.72	71.68 ± 18.63	<0.001*
Role-emotional	None religious	100.00 ± 0.00	60.00 ± 50.70	0.008*
	Religious	96.78 ± 16.96	72.28 ± 45.02	<0.001*
Mental health	None religious	81.86 ± 12.36	74.66 ± 12.43	0.026*
	Religious	82.26 ± 12.22	81.63 ± 10.56	0.655
Physical component summary	None religious	81.31 ± 17.14	52.78 ± 21.92	<0.001*
	Religious	86.25 ± 12.04	56.75 ± 20.50	<0.001*
Mental component summary	None religious	84.25 ± 9.74	66.91 ± 21.88	0.006*
	Religious	85.39 ± 10.47	74.79 ± 16.69	<0.001*
Total	None religious	82.78 ± 12.99	59.85 ± 20.93	0.001*
	Religious	85.82 ± 10.22	67.91 ± 17.17	<0.001*

\*Statistically significant difference with a *P* < 0.05.

significant decrease in QOL scores postdischarge. As for nonreligious group, excepts for VT, all other aspects had a significant decrease in QOL score (Table 4).

**3.3. Spiritual scale analysis before and after discharge**

The spiritual score significantly improved in all aspects after discharge (Fig. 1, Supplemental Table 1, <http://links.lww.com/FJSS/A20>). Regarding to the ISS subgroup analysis, after discharge, the ISS <16 group showed a statistically significant increase in spiritual scores in the following domains: interpersonal relationships (4.39 ± 0.53 vs. 4.55 ± 0.41, *P* = 0.033), transcendence adversity (4.07 ± 0.61 vs. 4.55 ± 0.41, *P* = 0.033), faith/religious trust (2.68 ± 1.07 vs. 3.29 ± 0.97, *P* < 0.001), and human and nature (2.81 ± 0.71 vs. 3.25 ± 0.50, *P* < 0.001). In addition, there is a noteworthy rise in the overall score (3.56 ± 0.54 vs. 3.87 ± 0.43, *P* < 0.001). On the other hand, in the ISS ≥16 group, there is a significant increase in scores after discharge in the areas of faith/religious trust (2.66 ± 0.93 vs. 3.22 ± 0.77, *P* < 0.001), and human and nature (2.76 ± 0.64 vs. 3.41 ± 0.39, *P* < 0.001). There is also a significant overall score increase (3.53 ± 0.50 vs. 3.84 ± 0.33, *P* < 0.001) (Fig. 2, Supplemental Table 2, <http://links.lww.com/FJSS/A20>).

Concerning the analysis based on religious group, in the group with religious beliefs, there was significant improvement observed in interpersonal relationships (4.45 ± 0.50 vs. 4.56 ± 0.40, *P* = 0.035), transcendence of adversity (4.13 ± 0.58 vs. 4.27 ± 0.47, *P* = 0.030), faith/religious belief (2.88 ± 0.88 vs. 3.34 ± 0.81, *P* < 0.001), and human and nature (2.81 ± 0.71 vs. 3.25 ± 0.50, *P* < 0.001). In comparison, in the group without religious beliefs, there was significant improvement in faith/religious belief (1.48 ± 0.75 vs. 2.78 ± 1.09, *P* < 0.001) and human and nature (2.48 ± 0.69 vs. 3.10 ± 0.44, *P* = 0.005). The total spiritual scores significantly increased for both religious (3.61 ± 0.49 vs. 3.89 ± 0.39, *P* < 0.001) and nonreligious groups (3.15 ± 0.53 vs. 3.64 ± 0.32, *P* = 0.002) after discharge (Fig. 3, Supplemental Table 3, <http://links.lww.com/FJSS/A20>).

**4. Discussion**

**4.1. Quality of life after trauma**

In our study, significant decrease of QOL score was noted after traffic accidents. Decline of QOL using SF-36 methods for patient with traffic accidents had been reported by several studied.<sup>[10,12-15]</sup> According to a research, significant trauma can lead to impairment, which is indicated by a score of ≤85 on the physical functional dimension of the SF-36 scale after 5 years of trauma.<sup>[34]</sup> Sluys et al.<sup>[10]</sup> also reported a significant decrease in SF-36 scores after 5 years of penetrating or blunt trauma, with 68% and 41% of their patients experiencing physical and psychological problems, respectively. Overgaard et al.<sup>[11]</sup> observed significantly lower SF-36 scores in injured patients compared to a matched control group even 6 to 9 years

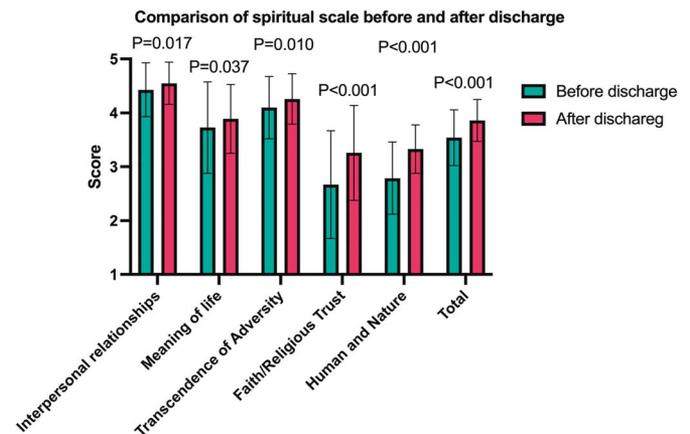


Figure 1. Comparison of spiritual scale before and after discharge.

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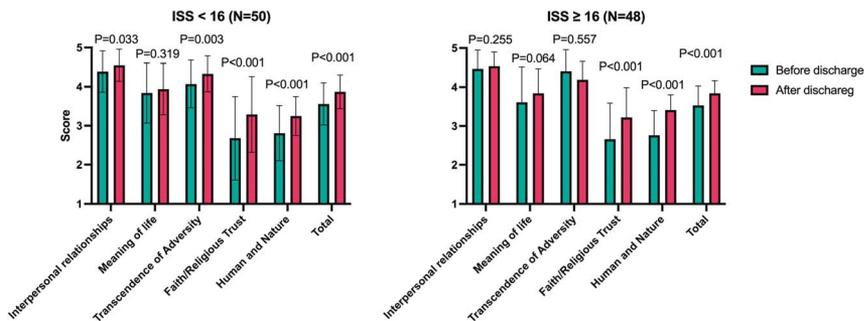


Figure 2. Spiritual scale analysis according to the SS classification.

after trauma, indicating the even long-term effect of trauma. Collectively, these studies indicate a sustained long-term decrease in QOL following trauma accidents.<sup>[10,12–15]</sup> It is concerning that a complete understanding of posttrauma care for improving prognosis is essential.

In term of subgroup analysis divided patients into ISS < 16 and ISS ≥ 16 groups, there is no significant difference between two groups in QOL score measured with SF-36 in this study. Similarly, Brasel et al.<sup>[35]</sup> demonstrated ISS had no significant correlation with QOL scores. Overgaard et al.<sup>[11]</sup> conducted a long-term study (6–9 years after injury) on adult trauma patients with moderate to severe injuries, finding no significant differences in SF-36 scores across groups categorized by ISS ranges of 9–15, 16–24, and ≥25. On the other hands, some studied had revealed the relationship between ISS score and QOL.<sup>[36–38]</sup> Dimopoulou et al.<sup>[37]</sup> reported a single unit rise in ISS 1 year after hospital release was reported to increase the chance of poor outcome by 12%, while Vles et al.<sup>[38]</sup> discovered that ISS ≥25 indicated impaired QOL 1 to 4 years following trauma. Although it is hard to compare our results directly to others because of different QOL measured tool, different divided point, and distinct follow-up period. It suggests that aside from the acute mortality risk, ISS is not appropriate for forecasting QOL outcomes. The assessor’s perspective could be one explanation for this uneven relationship. QOL is a patient-derived assessment, while ISS was not intended to predict functional outcome; instead, it is allocated based on probable hazard to life as determined by the healthcare professional.<sup>[35]</sup> This suggests that while ISS may effectively indicate the physical severity of injuries, it may not provide a complete assessment of subsequent QOL.

In summary, QOL following traffic accidents is a critical aspect warrants close attention. Even individuals with low ISS score may experience long-term decreased QOL. The aftermath of such incidents can significantly impact individuals’ physical, mental, and emotional well-being, often leading to long-term consequences.<sup>[9,11]</sup>

#### 4.2. Trauma and spiritual health

In this research, significant increase of spiritual well-being was noted after traffic accidents. Turner et al.<sup>[18]</sup> discovered that most participants said that their engagement in a traumatic event was a springboard for growth, allowing them to gain new perspectives on life and living. In situations where beliefs or values are challenged, trauma survivors may turn to spirituality to reinterpret their experiences in a way that provides comfort and restores a sense of purpose and hope. For instance, they might view trauma as an unexpected blessing or an opportunity for spiritual growth. An additional investigation suggests that posttraumatic growth was notably associated with variables such as marital status,<sup>[20]</sup> level of education, personality, coping strategies, and symptoms of PTSD.<sup>[39]</sup> These explanations may indeed demonstrate why our patients experience a significant increase in spiritual scores after trauma. In addition, about analysis categorized by ISS score, there is significant increase of interpersonal relationship and transcendence of adversity in group with ISS < 16, while no significant in ISS ≥16 group. This indicated that although the severity of trauma had no significant effect on QOL, it had somehow affected the spiritual health.

A systematic study aimed to evaluate the function of spirituality in aiding adjustment and resilience for individuals with spinal cord

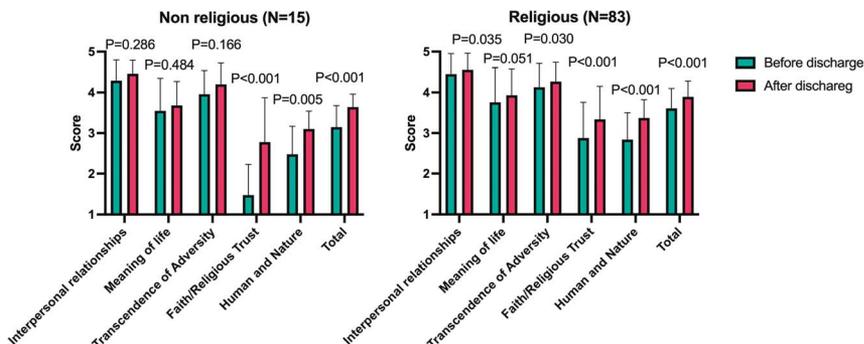


Figure 3. Spiritual scale analysis across religious status.

injury and found that spirituality was positively connected with life satisfaction, QOL, MH, and resilience.<sup>[40]</sup> Kenardy et al.<sup>[19]</sup> studied the impact of MH on long-term QOL after a traffic accident. The study discovered that MH disorders such as PTSD, major depressive episode, and generalized anxiety disorder are connected with lower QOL outcomes, stressing the need of addressing mental and spiritual health during the rehabilitation process. Spirituality can also help survivors cope better by encouraging acts of worship, meditation, prayer, and other activities that lower physiological arousal and promote pleasant feelings.<sup>[20]</sup> It implies that patients with greater degrees of spirituality may have a better QOL. Overall, the aftermath of a traumatic event may nurture spiritual development by offering novel perspectives on vulnerability and resilience, prompting shifts in relationships, and fostering philosophical, physical, and spiritual maturation. The enhancement of spiritual well-being seems to positively align with an increase in QOL. Therefore, there are clinical implications advocating for the integration of spirituality into assessments and interventions during the rehabilitation process.

### 4.3. Impact of religious status among QOL and spiritual health

In our study of SF-36 analysis, we observed that nonreligious groups experienced a significant decline in MH scores postdischarge, in contrast to religious groups, whose scores remained stable. Furthermore, in the analysis of spiritual scores, religious individuals showed significant improvements in aspects of interpersonal relationships and transcendence of adversity after discharge, whereas nonreligious individuals saw no change. These findings suggest that religiosity plays a beneficial role in the mental and spiritual health dimensions of interpersonal relationships and overcoming adversity. Park et al.<sup>[16]</sup> suggest that believing of God in control of the trauma was the strongest correlation of faith-based spiritual well-being. In addition, a review indicates that religious involvement typically has a stronger positive impact on MH, especially in individuals facing stressful circumstances.<sup>[41]</sup> Religious practices generally lead to favorable outcomes among disaster survivors.<sup>[42]</sup> Those with theistic forms of spirituality may find attachment, security, and comfort through personal relationships with God or higher powers. For religious individuals, traumatic events may be interpreted as part of a larger, mysterious plan or a path toward redemption for the universe.<sup>[20]</sup> Undoubtedly, religious beliefs have a beneficial effect on MH, particularly in stressful situations. Research indicates that the positive influence of religious involvement on MH is especially pronounced when individuals are facing challenging circumstances.<sup>[41,42]</sup>

### 4.4. Holistic care for patients after traffic accident

In Taiwan, given the alarmingly high prevalence of traffic accidents, it is imperative that we prioritize the QOL and spiritual well-being of patients suffered from traffic accident. Implementing holistic healthcare practices may be an effective way of enhancing patients' long-term prognosis. It is centered on patient-centric care, addressing physiological, psychological, social, and spiritual needs.<sup>[43,44]</sup> Specifically, individuals with trauma necessitate "person-centered care," encompassing not just physical therapy but also enhancements in patient care demeanor, communication, and education.<sup>[45]</sup> In our research, we found a significant decrease in QOL following trauma and increase spiritual well-being. Literature had found a positive correlation between spiritual health and QOL.<sup>[19,40]</sup> Spirituality involves a personal quest to understand life's profound questions and connections with the divine, which may or may not involve formal religious practices. This underscores the importance of addressing spiritual health as part of comprehensive care for

trauma survivors. Furthermore, Akbari et al.<sup>[46]</sup> suggested that emotional regulation plays a moderating role in the link between spiritual health and QOL. Another study demonstrated a notable correlation between happiness and spiritual well-being.<sup>[47]</sup> This indicating the role of psychologic status in improving overall spiritual health. In this study, 'holistic care' refers to an integrative approach to trauma recovery that encompasses physical, psychological, social, and spiritual dimensions. This approach recognizes the complex interplay of various factors in the healing process and aims to provide comprehensive support that addresses all aspects of a patient's well-being. This type of care can be beneficial for their long-term QOL and spiritual well-being.

### 4.5. Limitations

This study has several limitations. Initially, the research was executed exclusively at a single trauma center involving a restricted sample size, potentially impeding the applicability of the results. Secondly, the follow-up period was relatively short, preventing us from assessing the long-term impact on patients' QOL and spiritual well-being. Thirdly, while we underscore the importance of holistic care, implementing it effectively in hospital settings remains a challenge. Practical strategies for implementing holistic healthcare in hospitals need to be developed for further comparison and analysis. Furthermore, while dichotomous grouping by ISS provides clear categorization for severity, it may oversimplify the nuances of individual recovery trajectories. Different trauma mechanisms with distinct recovery challenges may not be fully captured by ISS alone.<sup>[48]</sup> Future studies may benefit from considering AIS components to derive more granular insights into how specific injuries impact QOL and spiritual well-being. Moreover, we recognize the imbalance in the number of participants across religious groups in our study, with the nonreligious group being notably smaller. This could affect the generalizability of our findings. Finally, the intervention or treatment by various physicians or surgeons may differ and have an influence on the result; however, we could only imply that such interventions were consistent throughout the whole investigated patient group.

### 5. Conclusion

Traffic accidents often result in significant physical, psychological, and spiritual challenges for survivors, leading to high rates of physical disability and MH issues. The study highlights a marked decrease in QOL and a rise in spiritual needs after motorcycle accidents, regardless of the ISS. It highlights a favorable relationship between overall spirituality and QOL, along with a positive link between religious faith and spiritual well-being. Integrating spirituality into rehabilitation processes can positively impact overall QOL outcomes. Holistic care, which addresses the physical, psychological, social, and spiritual needs of patients, is essential for optimizing long-term recovery. In Taiwan, where traffic accidents are prevalent, adopting holistic healthcare practices is critical for enhancing the well-being of trauma survivors and improving their long-term prognosis.

### Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

### Financial support and sponsorship

This study was supported by Chang Gung Memorial Hospital grant no. CORPG8M0291 & CORPG8N0471 to Ching-Hua Hsieh.

## Conflicts of interest statement

Ching-Hua Hsieh, a section editor at *Formosan Journal of Surgery*, had no role in the peer review process of or decision to publish this article. The other authors declare that they have no competing interests.

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