Rehabilitation Nursing Care as a Mediators between Injury Severity and Functional Independence among Children with Physical Disabilities

Abstract

Background: Severe injuries experienced by children with physical disabilities become a significant determinant of their ability. The purpose of this study was to investigate if the association with the degree of injury and functional independence for children with physical impairments is mediated by recuperative nursing care.

Methods: A descriptive-correlational, cross-sectional study conducted in the Thi-Qar Governorate, Iraq, from April to July 2025.Using rigorous random sampling, 420 children with physical disabilities connected to injuries, ages 6 to 18, were gathered from hospitals and rehabilitation facilities. The Functional Independence Measure for Children, the Rehabilitation Nursing Care Scale (RNCSD), and the Pediatric Injury Severity Scale were validated tools used to gather data. For the statistical analysis, SPSS v28 and analysis techniques were used. Person correlation and regression, we used the PROCESS macro (Model 4) from and 5,000 bootstrap samples in mediation analysis.

Results: Injury Severity was negatively correlated with Rehabilitation Nursing Care and functional independence ($r = -0.68$ to -0.72, $p<0.001$) while Nursing Care was positively associated with functional independence ($r = 0.79$, $p<0.001$). The results of the mediation analysis have confirmed that the relationship between injury severity and functional independence is partially mediated by rehabilitation nursing care (B= -1.01, 95% CI [−1.19, −0.84]), with an overall model R^2 of 69% being explained.

Conclusion: It was found that rehabilitation nursing care significantly mediates the effect of Injury Severity on Functional Independence. Integrating structured nursing interventions into pediatric rehabilitation programs could further increase recovery outcomes.

Keywords: Rehabilitation Nursing Care, Injury Severity, Functional Independence, Pediatric Rehabilitation, Physical Disabilities.

1. Introduction

Childhood physical disabilities resulting from injuries are of major concern with respect to public health. Generally, these are associated with long-term functional limitations that can affect independence in day-to-day activities and quality of life. Severity of injury is one of the most significant determinants for physical rehabilitation outcomes. Mobility, the need for self-care, and cognitive abilities are all more likely to be negatively impacted by more severe injuries [1,2]. Children who sustain severe injuries frequently require a long recovery period and significant work to regain their function [3].

Functional independence is an important goal in pediatric rehabilitation for children with physical disabilities, reflecting the ability to obtain normal, independent lifestyles. In practice, this means that they can eat, dress, and groom themselves and are able move about with no help at all [4]. Previous research has found that children with lower levels of injury severity tend to achieve a higher level of functional independence. Severe injuries cause continued dependence and lagged development milestones[5,6]. Nevertheless, injury severity by itself does not completely explain variations in functional outcomes, revealing the existence of adjustable care-related factors[7].

Rehabilitation nursing care assumes a key role in connecting injury-induced impairments with functional recovery. Rehabilitation nurses are better suited than anyone to supply uninterrupted, full care services that incorporate physical rehabilitation, psychosocial support, educating families, and organizing various integrated services[8]. The evidence suggests that standard rehabilitation nursing improves compliance with treatment, promotes self-care techniques, forestalls side effects, and helps children with physical disabilities to tolerate[9,10]. In child populations, because of the stage of development that children pass through, in which they must be taught and supported by others, and also belong to a family unit, nursing care is particularly influential[10].

Emerging evidence indicates that rehabilitation nursing care may act as a mediating variable in the connection between injury severity and functional independence. In children who have suffered a serious injury, constant and specialized nursing interventions help retard the deterioration of

function and allow gradual independence to develop as individualized rehabilitation and family-unit objectives are established [11]. By contrast, inadequate or piecemeal nursing care can enhance the functional limitations that come with severe injuries and will lead to poorer rehabilitation outcomes [12].

Few empirical research has specifically examined rehabilitation nursing care's mediation function in pediatric rehabilitation effects, despite the fact that its importance is becoming more widely acknowledged. The majority of current research either addresses functional independence or injury severity independently, without examining the ways in which nursing care affects those relationships. Optimizing rehabilitation techniques, enhancing nursing practice, and creating policy guidelines targeted at enhancing youth rehabilitation services all depend on having knowledge of this mediating route. That being so, the present study sets out to study the relationship between injury severity and functional independence among children with physical disabilities, with special attention to the mediating effects of rehabilitation nursing care.

2. Materials and Methods

2.1. Study Design

In this study, a descriptive correlational cross-sectional design was used to examine the role of rehabilitation nursing care as a mediating variable in the relationship between injury severity and functional independence among children with a physical disability. The cross-sectional design was selected because it embodies one of ABI prime characteristics related to functional and clinical variables of those with this disorder. It also accords with the general research orientation of both nursing and pediatric rehabilitation. This article aimed to explore whether rehabilitation nursing care plays a mediating role between injury severity and children's functional independence. The operational distance proposed for each child, and its indicators (e.g., daily living activities or working and studying), are determined by this measure of functional independence.

2.2. Study Sample

The study was conducted in Departments of Rehabilitation Centres and New Research Sites, across selected government hospitals, pediatric rehabilitation centres, and outpatient rehabilitation units. These sites were chosen because they were equipped with pediatric rehabilitation services and provided uninterrupted care to children with physical disabilities. The subjects in this study were children with physical disabilities resulting from injury who are receiving rehabilitation services at hospitals presently. We used systematic random sampling to select subjects from all the records in hospitals and rehabilitation centers, and so on. The single population proportion formula was used to calculate the sample size. The estimated sample was 384 cases, with a 95% confidence interval (CI) of ± 5%. The final total of actual cases was 420 to make up for any future loss. Inclusion criteria for the research team were children aged 6–18 years diagnosed with physical disabilities resulting from injury who were enrolled in a rehabilitation program for at least three months, with a primary caregiver present at the data-collection site. Exclusion criteria comprised those underage children who were diagnosed with mental disabilities too severe to be evaluated or those born with an injury unrelated to their parents' work, as well as the children whose disease was in such a state that they were unwilling to agree act as study members and provide data.

2.3. Study Instruments

A well-designed, interviewer-administered questionnaire with four primary sections was used to collect the data:

Section I: medical and demographic information, such as the child's age, sex, type of injury, etiology, duration of the injury, and rehabilitative period.

Section II: Injury severity was judged by the Pediatric Injury Severity Assessment Scale, a pediatric form of the standard injury severity scale (Prognostic indicators). This scale involves the classification of injury severity, using anatomical and functional criteria. Higher scores mean more serious injuries [13].

Section III: Rehabilitation Complexity Scale, Version 2 members used to measure the nursing care being provided during rehabilitation This set of 12 items addresses intervention activities such as mobility training, self-care training, treatment of disability With that remedied, psychological support With that improved). Each item is ranked on a level of agreement using a five-point Likert scale that ranges from “never provided” to “always provided.”[14]

Section IV: Functional independence was assessed by WeeFIM (Functional Independence Measure for Children), a validated instrument for children’s functional status that evaluates self-care,

mobility, and communication abilities. Higher scores indicate higher levels of functional independence [15].

2.4. Validity and Reliability

Content validity was optimized by review with a panel of five experts in pediatric nursing, rehabilitation nursing, and community health nursing. For reasons of clarity and cultural relevance, minor changes were made. A feasibility and clarity pilot was done with 42 children who met the study's requirements. Internal consistency was also checked. However, the data from the pilot had to be dropped from the final analysis to keep it clean. The reliability test showed satisfactory internal consistency. The Cronbach's Alpha coefficients were 0.86 for the injury severity scale, 0. 89 for the rehabilitation nursing care scale, and 0. 91 for the WeeFIM, respectively.

2.5.Data Collection

Data was collected by pediatric and rehabilitation nurses trained for this purpose through face-to-face interviews with the guardians and direct assessment of the children according to their age or level of disability. The tests took place in private consultation rooms at the rehabilitation centers or outpatient clinics. Approximately 30–45 minutes were required for each interview. Patients received a written explanation about the research and were then told that their answers would be kept a secret, as well as given freedom to opt out at any time without any consequences. All families of patients had one parent sign formal consent forms while another gave verbal assent, provided the child was older than 6 years. Approval for the study was obtained from the University Nursing College Research Ethics Board in Thi-Qar, as well as individual institutions.

2.6.Statistical Analysis

Data was analyzed using the latest version of SPSS Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize socio-demographics and clinical variables. Pearson correlation analysis was conducted to explore associations among the severity of injury, rehabilitation nursing care, and children's functional independence. The mediating role of rehabilitation care was then investigated via the Process for SPSS (Model 4) with 5,000 bootstrap samples used to give indirect effect estimates and 95% confidence intervals. All analyses were made with a p-value set at <0.05 to be regarded as a significant result.

3.Results

Table (1) Socio-demographic and Clinical Characteristics of the Study Sample (n=420)

Variable	Category	Frequency (n)	Percentage (%)
Age (years) (Mean ± SD)	10.9 ± 3.4		
Age Group	6–9	124	29.5
	10–13	176	41.9
	14–18	120	28.6
Gender	Male	247	58.8
	Female	173	41.2
Type of Injury	Road traffic accidents	169	40.2
	Falls	141	33.6
	Sports-related	63	15.0
	Other injuries	47	11.2
Type of Physical Disability	Musculoskeletal	256	61.0
	Neuromuscular	164	39.0
Duration of Rehabilitation	< 6 months	111	26.4
	6–12 months	192	45.7
	> 12 months	117	27.9
Primary Caregiver	Mother	238	56.7
	Father	102	24.3
	Other family member	80	19.0

Table 1 gives a summary of the demographic and clinical characteristics of the children in this research. The average age was 10.9 years (SD= 3.4); almost 1/2 were between 10 and 13 years old (41.9 percent). Over half the children were male (58.8%). Road traffic accidents accounted for the most injuries by injury cause (40.2%). The vast majority of the children were disabled because of musculoskeletal disorders (61.0 percent) and had been going through rehabilitation for 6 to 12 months (45.7%). In over half the cases (56.7%), mothers were the primary caregivers for their children.

Table (2) Descriptive Statistics, Distribution, and Reliability of Main Study Variables

Variable	Mean ± SD	Min–Max	Scale Range	Skewness	Kurtosis
Injury Severity	18.74 ±4.91	8–30	5–30	0.38	0.67
Rehabilitation Nursing Care	41.26 ±6.18	22–60	12–60	−0.41	0.74
Functional Independence (WeeFIM)	87.42 ±13.05	35–126	18–126	−0.79	0.98

This table summarizes the descriptive statistics and psychometric qualities of six main variables. For assessment participants, injury severity scores were moderate. Rehabilitation nursing care was being advanced at a moderate to high level from the nursing viewpoint. Functional independence ratings were considerably good. According to standards, values for all items in agreement are consistent with these findings: Skewness and kurtosis are both within range.

Table (3) Pearson Correlation Matrix among Main Study Variables

Variables	Injury Severity	Rehabilitation Nursing Care	Functional Independence
Injury Severity	1		
Rehabilitation Nursing Care	-0.68**	1	
Functional Independence	-0.72**	0.79**	1

*** p<0.001*

The results revealed that the degree of injury severity was strongly negatively correlated with both rehabilitation nursing (r=-0.68, p <0.001) and important (r=-0.72 p≤0.001). Rehabilitative nursing achieved a high positive correlation strength. This showed that stronger nursing care can achieve higher functional independence (r=0.79, p≤0.001).

Table (4). Mediation Analysis Results Using PROCESS Macro (Model 4)

Path	Unstandardized B	SE	t-value	p-value	95% CI	Std. Beta
a (Injury Severity→ Rehab Nursing Care)	−0.83	0.05	−16.60	<0.001	[−0.93, −0.73]	−0.68
b (Rehab Nursing Care→ Functional Independence)	1.21	0.06	20.17	<0.001	[1.09, 1.33]	0.79
c′ (Direct: Injury Severity→ Functional Independence)	−0.41	0.07	−5.86	<0.001	[−0.55, −0.27]	−0.36
c (Total Effect)	−1.42	0.08	−17.75	<0.001	[−1.58, −1.26]	−0.72

Outcome Variable: (WeeFIM)

According to Table 4, the degree of injury is an important predictor of rehabilitation nursing care (path a). Rehabilitation nursing care is a key predictor of functional independence (path b). Even though the severity of injury still had a statistically significant effect on functional independence (path c′), that is only half as much as it was before and statistically non-significant anymore due to the mediation effect (path c).

Table (5) Bootstrapped Indirect Effect of Rehabilitation Nursing Care (5,000 Samples)

Indirect Path	Effect Estimate	Boot SE	95% Boot CI (LL–UL)	p-value
Injury Severity→ Rehab Nursing Care→ Functional Independence	−1.01	0.09	[−1.19, −0.84]	<0.001

The Rehabilitation appears to play a significant mediating role between injury severity and functional independence. The 95% confidence interval confirms a significant mediating effect with this data.

Table (6). Regression Model Summary Predicting Functional Independence

Model	R	R^2	Adjusted R^2	F	df	p-value
Final Model	0.83	0.69	0.69	465.27	2, 417	<0.001

The final regression model accounted for 69% of the variance in functional independence among children with physical disabilities. The structure of this model was quite good, injury severity and rehabilitation nursing were found as strong predictors of functional independence.

4. Discussion

This research mainly explored whether or not assisted-living rehabilitative nursing served as an intermediary to status or not among children with physical disabilities in Thi-Qar Province, Iraq. The results show that all the study variables are significantly correlated, and evidence is also

offered that, in effect, assisted-living rehabilitation from injury severity is dependent on the inverse fate of functional independence. These results provide strong empirical support for the central role played by nursing-led rehabilitation in pediatric disability outcomes, and they are in keeping with current rehabilitation practice and nursing research [16,17].

A comparison of the research sample's socio-demographic data shows that most surveyed were school-aged children and that males were more frequently affected than females. This finding is consonant with international and national injury survey reports, which show that boys make up the majority of traumatic injuries from factors such as their greater freedom of movement outdoors, traffic environments, and risk-taking behaviours[18]. Traffic collisions and falls took first place by a wide margin in the causative injury category, fitting well with similar surveys in the Middle East (including Arab states) as well as low-income and middle-income countries where there is less space by which a sudden, unexpected moving vehicle may drive[19].

Descriptive analysis showed moderately high levels of injury severity with matching but relatively greater functional independence scores. This structure implies that some of the residual functional deficits of damage can be at least partially mitigated by good rehabilitation treatments. Similar conclusions can be drawn from research on pediatric rehabilitation, which showed that even in children with moderate or severe injuries, immediate and ongoing rehabilitative therapy improved mobility, self-sufficiency skills, and even participation results. [20] It was difficult to discover evidence of this in other parts of the literature, but correlation analysis showed a substantial inverse relationship between the degree of function and the severity of injury. Adolescents who suffer more severe injuries typically require longer hospital stays and recuperation periods, and they may still be somewhat disadvantaged after they leave the hospital [21]. Nonetheless, the robust positive association between functional independence and rehabilitative nursing care clearly demonstrates the critical role that nurse intervention plays in promoting recovery. Improving pediatric outcomes requires personal planning of care delivery, assistance in the form of therapeutic training, prevention of any potential secondary issues, and training of other providers [22,23].

The most compelling evidence is provided by the mediation analysis in our study. Rehabilitation nursing care significantly mediated the relationship between injury severity and functional independence, as confirmed by the statistically significant indirect effect and bootstrapped confidence intervals. This discovery implies that while injury severity directly impacts how patients fare functionally in the long run, if proper care can be provided, there will generally be lower correlation rates. Other studies have found the same mediation effects (with childhood injuries), pathologizing clinical severity to recovery outcomes, or in trauma centers for children on nursing care has also been implicated as a potential mediator [23,25].

The persistence of a highly substantial direct effect of damage severity on functional independence is the reason of partial, rather than full, mediation. This is consistent with the multifaceted character of childhood impairment, in which biological factors influence functional outcomes through interactions with care variables and the environment [26]. Nevertheless, the decrease in the direct effect size highlights how even rehabilitation nursing can improve living conditions by changing injury patients' recovery paths to a far higher extent than it previously could.

At least some of the remaining 31% cannot be explain. The robustness of the study structure and the crucial role of nursing in function recovery are supported by the fact that this degree of explained variance in functional independence is either higher than or roughly comparable to that seen in other pediatric rehabilitation studies [27]. Additionally, it supports the International Classification of Functioning, Disability and Health paradigm, which holds that functional outcomes are determined by the interaction of contextual factors such as health services and health conditions [28].

The results have important ramifications for Iraq and other environments with limited resources. Healthcare workers, particularly nurses, are more responsible for providing consistent, care that emphasizes families when access to cutting-edge therapy technology is restricted. Restoring functional autonomy for everyone can be achieved in large part by significantly enhancing long-term results and rehabilitative nursing competence in damaged youth. This study offers empirical support for the idea that functional independence is impacted by rehabilitative nursing care that is not mediated by the severity of the injury. The importance of nursing-led rehabilitation therapies in the treatment of children disabilities is further supported by these findings, which also highlight the

necessity of policies or strategies that uphold the role of rehabilitation nurses in multidisciplinary pediatric rehabilitation teams. [29].

Study Limitation

This study has its limitations. First, the cross-sectional design prevents the determination of causal relationships among injury severity, nursing rehabilitation care, and degree of functional independence. Furthermore, data were collected by caregivers with a degree of recall or social desirability bias on their part. In addition, the study was restricted to a single Iraqi governorate, making it difficult to generalize findings to other setups or settings. Finally, certain potential confounding factors, such as socioeconomic status or psychological condition, were not investigated and could have impacted the rehabilitation results.

5 Conclusion

Rehabilitation nursing care has a significant role in mediating the impact of injury severity on functional independence among disabled children. Therefore, it helps to reduce potential damage from severe injuries and also enhances daily activities. Based on these findings, it is suggested that health care providers should pay attention to the training of nurses for functional care while combining this training with family education and psychosocial support. Family involvement should be integrated into rehabilitation plans as well. Policy makers need to establish universal protocols to provide accurate, high-quality care. Finally, longitudinal or interventional research is recommended to both verify causal relationships and put into effect the long-term effects of