Original Article

doi:10.31674/mjn.2025.v16i03.004

MJN

Assessment of Nutritional Knowledge in Spinal Cord Injury Patients: A Cross-sectional Study

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ABSTRACT

Background: Individuals with spinal cord injuries (SCI) are encountered a myriad of dietary complexities, stemming from altered energy expenditure, metabolic variations, digestive concerns, susceptibility to pressure ulcers, and apprehensions regarding bone health. Despite the paramount significance of nutrition within this demographic, a gap persists in the availability of tailored educational programs for SCI patients. Existing literature underscores the profound impact that heightened nutritional awareness can have on the overall health outcomes of individuals with SCI. **Objective:** This study aims to evaluate the nutritional management knowledge of spinal cord injury patients to better understand their dietary comprehension and associated factors. **Methods:** Employing a descriptive, cross-sectional design, a purposive sample of 30 SCI patients was surveyed at the Ibn AL-Kuff Hospital in Baghdad City for Spinal Cord Injuries. A self-report questionnaire comprising 20 true/false/I don't know questions was utilised to assess patients' knowledge across various nutritional management domains. Data analysis involved frequency, mean, standard deviation calculations, and multiple linear regression analysis. **Results:** Multiple linear regression analysis revealed that gender and marital status did not significantly impact patients' nutritional knowledge levels (*p*-values of 0.92 and 0.74, respectively), suggesting minimal influence of these demographic factors on SCI patients' understanding of nutritional management. **Conclusions:** The study indicates a notable deficiency in nutritional management knowledge among SCI patients, potentially predisposing them to nutritional challenges. While gender and marital status seem insignificant, demographic variables like age, education level, occupation, and income play pivotal roles in shaping patients' nutritional understanding. Tailored educational initiatives, healthcare professional involvement, regular nutritional evaluations, and easily accessible information are recommended to enhance nutritional management knowledge among SCI patients.

Keywords: Knowledge; Nutritional Management; Patients; Spinal Cord Injury

INTRODUCTION

Spinal cord injury (SCI) is a devastating condition that can lead to significant physical and functional impairments. Individuals with SCI often face numerous challenges that can impact their overall health and well-being, including changes in their nutritional needs and requirements. Adequate nutritional management is crucial for optimising health outcomes and improving the quality of life of SCI patients. Assessing the knowledge of SCI patients regarding nutritional management is essential for identifying areas where educational interventions and support programs can be implemented to address potential knowledge gaps. By understanding their current level of knowledge, healthcare professionals can develop targeted strategies to improve their understanding of proper nutrition and dietary requirements. (Farkas *et al*., 2021; Buchholz & Pencharz, 2018). Prior research by Yaaroub *et al*. (2024); López *et al*. (2020); and Buchholz and Pencharz (2018) underscored the significance of nutritional management for individuals with spinal cord injury (SCI). They emphasised the elevated risk of obesity and metabolic complications in this population, highlighting the necessity for personalised nutritional interventions. Previous studies conducted by Gelalis *et al*. (2019) and López *et al*. (2020) have underscored the significance of nutrition in influencing bone health among spinal cord injury (SCI) patients, highlighting the critical importance of sufficient calcium and vitamin D intake.

Other studies by Gelalis, Papanastasiou and Pakos (2019) and López *et al*. (2020) highlighted the impact

Received: May 17, 2024 Received in revised form: July 28, 2024, Accepted: October 29, 2024

of nutrition on bone health in SCI patients, emphasizing the importance of adequate calcium and vitamin D intake. Wong et al. (2022) showed there is a lack of proper knowledge among spinal cord injury (SCI) patients regarding malnutrition assessment and management. Although 83% of patients are aware of nutritional screening tools, only 53% of them use the correct tools. The absence of formal nutritional training in SCI centres can make it challenging to manage nutrition effectively, leading to poor clinical outcomes and increased healthcare expenses. Assessing the knowledge of SCI patients through pre-experimental designs provides valuable insights into their understanding of key areas of nutritional management. Pretest assessments allow researchers to identify the specific areas where knowledge gaps may exist and tailor interventions accordingly (Wong *et al*., 2022; Reber *et al*., 2019). Two pretest studies conducted by Reber *et al*. (2019) and Farkas, Sneij and Gater (2021) assessed the nutrition knowledge of SCI patients and identified deficiencies in their understanding of macronutrients and hydration.

The nutrition of veterans with spinal cord injuries (SCIs) can be influenced by a multitude of factors, including knowledge and beliefs about healthy eating, fasting practices, imbalanced nutrient intake, complications related to the injury, changes in body composition, and challenges in acquiring and preparing food (LaVela *et al*., 2024; Wong *et al.*, 2022). In the United States, approximately 291,000 individuals suffer from spinal cord injuries, placing them at risk of poor dietary habits and cardiovascular disease. Despite this vulnerability, there is a lack of weight management interventions tailored specifically for this population, highlighting the urgent need for such interventions to mitigate weight-related issues and cardiovascular risks (Al-Mayahi, Al-Jubouri & Jaafar, 2023 Murphy & Thomas, 2022). Building upon the existing literature, the present study aims to assess the knowledge of SCI patients regarding nutritional management using a pre-experimental design. By administering a structured questionnaire, the study seeks to identify potential areas for improvement in their understanding of proper nutrition, including macronutrients, micronutrients, meal planning, weight management, hydration, and dietary guidelines. The findings of this study will contribute to the development of targeted educational interventions and support programs tailored to the specific needs of SCI patients. By addressing knowledge gaps and providing comprehensive nutritional education, healthcare professionals can empower SCI patients to make informed decisions about their dietary choices and promote healthier lifestyles. In conclusion, assessing the knowledge of SCI patients regarding nutritional management is crucial for developing effective interventions and support systems. The objective of this study is to assess the knowledge of spinal cord injury patients regarding nutritional management and to find out association between demographic variables and level of knowledge for the study samples.

A lack of comprehensive educational programs tailored to SCI patients, with existing literature highlighting the positive impact of enhanced nutritional knowledge on health outcomes. Moreover, nursing professionals, as pivotal caregivers, are strategically positioned to deliver tailored care and educational support to individuals with spinal cord injuries. Their indispensable role in addressing the nutritional requirements of SCI patients is highlighted, emphasizing the significance of nursing interventions in fostering optimal health outcomes within this specialised population. This addition enhances the nursing scope of the study and underscores the significance of nursing interventions in promoting optimal health outcomes for individuals with spinal cord injuries.

METHODOLOGY

The study followed a descriptive, cross-sectional design with a purposive sample. The study was conducted at Ibn Al-kuff for Spinal Cord Injuries Hospital in Baghdad City, Iraq. The study was conducted during the period of 2nd November 2023 to 3rd April 2024.

The study included 30 patients with paraplegia who met the inclusion criteria, such as having a documented spinal cord injury, being within a specific age range (18-60 years), having a minimum duration of 6 months post-injury, and having the cognitive ability to provide informed consent. The study collected data on demographics, socio-economic status, clinical characteristics, and patients' knowledge about nutritional management.

The data was collected through a self-report questionnaire consisting of four parts. The questionnaire was designed using a structured format to assess patients' knowledge of spinal cord injury regarding nutritional management. To establish the reliability of a knowledge assessment tool, the researchers conducted a pilot test

to assess the internal consistency of the questionnaire, where the calculated Cronbach's alpha was 91.23.

The exclusion criteria were established to minimise potential biases, such as cognitive impairment, previous participation in a nutritional education program, medical conditions affecting nutritional status, and inability to communicate effectively. The study used quantitative variables to measure participants' knowledge levels, which were scored on a 20-point scale.

The sample size calculation was performed using a specific equation considering the desired confidence level, estimated proportion of patients with sufficient knowledge, population size, and desired margin of error. To calculate the sample size, the formula provided is the calculation for determining the sample size required for estimating a population proportion.

$$n = \frac{Z^2\text{-p-q-N}}{(Z^2\text{-p-q})+((N\text{-}1)\text{-}e^2}$$

Source: (Lohr, 2019)

Where

N: Sample size for each stratum

Z: Z-score corresponding to the desired confidence level (1.96 for a 95% confidence level)

p: Estimated proportion of patients with sufficient knowledge (based on previous studies)

q: Complementary probability to *p* (q = 1 - *p*)

N: Total population size (number of spinal cord injury patients)

e: Desired margin of error (the precision you want in estimating the proportion)

Statistical methods included frequency, mean, standard deviation to analyse descriptive data and Multiple Linear Regression (MLR) was applied to analyse inferential data.

Ethical Consideration

The researchers obtained ethical clearance from the Sobriety Committee for Scientific Research and the Research Ethics Committee at the University of Baghdad's College, Egypt with reference number 1 on 18th March 2023.

RESULTS

Table 1: Distribution of Spinal Cord Injured Sample by Demographic Data

Variables	Groups	Study Sample	
		Freq.	%
Age Group	20-29 years old	17	57
	30-39 years old	7	23
	40-49 years old	2	7
	50-59 years old	4	13
	Total (n)	30	100
Gender	Male	21	70
	Female	9	30
	Total (n)	30	100
Level of Education	Not read &not write (Illiterate)	1	3
	Read & write	9	30
	Primary school	10	33
	Intermediate school	4	13
	Secondary school	2	7
	Institute	2	7
	College &postgraduate	2	7
	Total (n)	30	100

Occupational Status	Unemployed	5	17
	Housewives	5	17
	Free business	9	30
	Student	4	13
	Employee in the public or private sectors	4	13
	Retired	3	10
	Total (n)	30	100
Marital Status	Single	13	43
	Married	11	37
	Widowed	3	10
	Divorced	2	7
	Separated	1	3
	Total (n)	30	100
The Family's Monthly Income	Sufficient	4	13
	Somewhat sufficient	6	20
	Insufficient	20	67
	Total (n)	30	100
Number of Family Members	(3-5) persons	10	33
	(6-8) persons	14	47
	(9-11) persons	6	20
	Total (n)	30	100
Residence Environment	Rural	11	37
	Urban	19	63
	Total (n)	30	100
Ownership of a Home	Owned house	13	43
	Rental house	8	27
	Shared house	3	10
	Others	6	20
	Total (n)	30	100

Freq: frequency, %: percentage, N= 30 sample size

Table 1 explains the current study involved a group of 30 participants, out of which 57% were aged between 20 to 29 years. Among the participants, 70% were male, 33% had completed primary school education, 27% were unemployed, and 17% were housewives. The majority of the participants were single (43%), while 37% were married. The monthly income of 67% of the participants was insufficient, and 47% of them belonged to larger families consisting of 6 to 8 members. Most of the participants (63%) lived in urban areas.

Table 2: Distribution of Spinal Cord Injured Sample by their Clinical Information

Variables	**Groups**	**Study Sample**	
		Freq.	**%**
Cause of Injury	Trauma	2	7
	Shrapnel or a gunshot wound	3	10
	Falling from height	15	50
	Accidents involving a car or a bicycle	9	30
	Other reasons were mentioned.	1	3
	Total	30	100
The Level and Severity of the Injury	Complete paraplegia	19	63
	Incomplete paraplegia	11	37
	Total	30	100
The Site of Injury	The thoracic vertebrae	15	50
	The Lumbar vertebrae	11	37
	The sacral vertebrae	4	13
	Total	30	10
Duration of Injury	Less than a year	15	50
	(1-5) years	9	30
	(6-10) years	3	10
	(11-15) years	3	10
	Total	30	100

BMI	Under- weight (Less than 18.5)		6	20
	Normal (18.5-24.9)		8	27
	Overweight (25.0-29.9)		10	33
	Obese class I (30.0 - 34.9)		3	10
	Obese class II (35.0 - 39.9)		1	3
	Obese class III (40 and above)		2	7
	Total		30	100
Medical Visits and follow-up	Visits for medical follow-up	Regular	21	70
		Irregular	6	20
		Nothing	3	10
		Total	30	100
	Visits to a physical therapist	Regular	22	73
		Irregular	3	10
		Nothing	5	17
		Total	30	100
	Visits to the dietician for adhering to a diet or dietary regimen	Regular	4	13
		Irregular	2	3
		Nothing	24	80
		Total	30	100

Freq: frequency, %: percentage, n= 30

According to a present study, table 2 explains falling from a height was the leading cause of injury (50%), followed by car or bicycle accidents (30%). Among the participants, the majority had complete paraplegia (63%), while the rest had incomplete paraplegia (37%). The most common site of injury was the thoracic vertebrae (50%). The duration of injury varied, with 50% being less than a year. As for the participants' BMI, it ranged from underweight (20%), normal (27%), overweight (33%), obese class I (10%), obese class II (3%), to obese class III (7%). Medical follow-up was mainly regular, with 70% of participants having regular visits. However, when it came to visits to a dietician, only 13% had regular visits, 3% had irregular visits, and 80% didn't report any visits.

Table 3: Distribution of the Answers of Patients with Spinal Cord Injury According to their Knowledge about Nutritional Management in the Pretest

SL No.	Knowledge Assessment Items	Correct Answer		Incorrect Answer	
		F	%	F	%
1.	Regular diets provide balanced nutrition	6	20	24	80
2.	Special diets are low in sugar and salt	3	10	27	83
3.	Drinking water before a meal helps you feel full	18	60	12	40
4.	Diet helps in losing weight	9	30	21	70
5.	Eating meat and fish helps in losing weight.	23	77	7	23
6.	Eating late makes it difficult to absorb nutrients	3	10	27	90
7.	Eat two modest meals a day	18	60	12	40
8.	Eat three servings a day of low-fat dairy products	12	40	18	60
9.	Food measured in cups, grams, pieces, slices, or spoons	3	10	27	90
10.	Dietary fibre, such as whole grains, some fruits, vegetables, and legumes. Helps ease digestion	6	20	24	80
11.	Eliminate salt consumption by avoiding condiments, fish sauce, and gravies.	15	50	15	50
12.	Sugar consumption can be reduced by eating uncooked fruits.	3	10	27	90
13.	Obesity causes heart disease, blocked arteries, high blood pressure and diabetes.	21	70	9	30
14.	Diet and exercise help in losing weight	18	60	12	40
15.	Dietary regimen, choose diets with fewer calories.	9	30	21	70
16.	Fruits rich in minerals and vitamins are crucial for a healthy diet.	15	50	15	50
17.	Meat and chicken skin are saturated fat-containing foods	2	7	28	93
18.	Excessive fried food intake raises cholesterol levels	3	10	27	90
19.	One teaspoon of iodized sodium is the daily recommended dose	12	40	18	60
20.	Two cups of fresh fruit and vegetable juice equals one serving.	8	27	22	73

Freq: frequency, %: percentage, n= 30

Overall, the table 3 indicates that a majority of the patients (65%) fall into the "Low" knowledge level category, suggesting a need for improvement in their knowledge about nutritional management. The percentages of correct and incorrect answers vary across the knowledge level categories, indicating different levels of understanding among the patients. The level of knowledge for the following items (1, 2, 4, 6, 8, 9, 10, 12, 15, 17, 18, 19, and 20) was low for all of these items, with the exception of items (3, 7, 11, 13, 14, and 16) which were at a moderate level. Furthermore Item (5) was within good knowledge level.

Table 4: Assessment of Level of Knowledge about Nutritional Management for Studied Samples with Spinal Cord Injury

Level of Knowledge	Freq.	%
Low	19.5	65
Moderate	9	30
Good	1.5	5
Total	**30**	**100**

Freq. = frequency, ASS. = Assessment if level < 50 =Low; moderate (50-75), good level ≥ 75

Table 4 shows that 65% of spinal cord injury patients had low knowledge 30% moderate knowledge, and only 5% had good knowledge, on nutritional management. The study categorised patients' understanding of nutritional management into three groups: low knowledge (≤ 50%), moderate knowledge (50-75%), and good knowledge (>75%). This classification highlights the necessity for specific interventions aimed at enhancing nutritional education and support for people with spinal cord injuries.

Explanation of Categorisation Criteria

Low Knowledge (≤ 50%): Patients falling into this category scored below or equal to 50% on the assessment of their knowledge about nutritional management. This group represents individuals with a substantial lack of understanding or awareness regarding proper nutritional practices for their condition.

Moderate Knowledge (50-75%): Patients categorised under moderate knowledge scored between 50% and 75% on the assessment. This group demonstrates a moderate level of understanding and familiarity with nutritional management concepts, indicating room for improvement in their knowledge and practices.

Good Knowledge (> 75%): Patients classified as having good knowledge scored above 75% on the assessment. This category comprises individuals with a strong grasp of nutritional management principles, showcasing a high level of awareness and competence in implementing appropriate dietary strategies tailored to their spinal cord injury.

By utilising these categorisation criteria based on the percentage of correct responses in the assessment, the study was able to effectively categorise spinal cord injury patients into distinct levels of knowledge about nutritional management. This classification provides valuable insights into the current understanding and knowledge gaps among patients, highlighting the need for targeted interventions to improve nutritional education and support for individuals living with spinal cord injuries.

Table 5: Association between Demographic Variables of the Study Sample with their Knowledge about Nutritional Management

Variables	Patients' Knowledge at Pretest Period				MLR. Results
	Coefficient	Std. Error	*t*-value	*p*-value	
Age group	0.50	0.10	5.0	**0.01**	*F*-statistic: 1.269
Gender	0.07	0.718	0.098	0.92	
Level of education	-0.200	0.050	-4.00	0.02	*R*-squared: 0.986
Occupational status	0.677	0.319	2.123	0.03	
Marital status	0.20	0.06	0.33	0.74	
Monthly income	0.300	0.080	3.750	0.05	

MLR= Multiple Linear Regression, R2=R-squared, Std. Err. = Standard Error, F= F statistic, p-value is significant if < 0.05

Table 5 presents the association between demographic variables of the study sample and their knowledge about nutritional management, along with the regression results. The explanation of the coefficients, standard errors, *t*-values, and p-values for each variable:

Age Group: Coefficient: 0.50 - Std. Error: 0.10 - *t*-value: 5.0 - *p*-value: 0.01 Interpretation: An increase of one unit in the age group is associated with a 0.50 increase in the patients' knowledge about nutritional management. The coefficient is statistically significant with a low *p*-value of 0.01, indicating a strong association between age group and knowledge level.

Gender: Coefficient: 0.07 - Std. Error: 0.718 - *t*-value: 0.098 - *p*-value: 0.92 Interpretation: The coefficient for gender is 0.07, suggesting a negligible impact on patients' knowledge levels. This is supported by the high p-value of 0.92, indicating that gender does not significantly influence knowledge about nutritional management.

Level of Education: Coefficient: -0.200 - Std. Error: 0.050 - *t*-value: -4.00 - *p*-value: 0.02 Interpretation: A one-unit decrease in the level of education is associated with a 0.200 decrease in patients' knowledge about nutritional management. The negative coefficient indicates that lower education levels are linked to poorer knowledge. This relationship is statistically significant with a *p*-value of 0.02.

Occupational Status: Coefficient: 0.677 - Std. Error: 0.319 - *t*-value: 2.123 - *p*-value: 0.03 Interpretation: Patients with employed occupational status have a 0.677 increase in knowledge about nutritional management. This positive coefficient suggests that being employed is associated with higher knowledge levels. The relationship is statistically significant with a *p*-value of 0.03.

Marital Status: Coefficient: 0.20 - Std. Error: 0.06 - *t*-value: 0.33 - *p*-value: 0.74 Interpretation: The coefficient for marital status is 0.20, indicating a minimal impact on patients' knowledge levels. The high *p*-value of 0.74 suggests that marital status does not significantly affect knowledge about nutritional management.

Monthly Income: Coefficient: 0.300 - Std. Error: 0.080 - *t*-value: 3.750 - *p*-value: 0.05 Interpretation: An increase of one unit in monthly income is associated with a 0.300 increase in patients' knowledge about nutritional management. The coefficient is statistically significant with a *p*-value of 0.05, indicating a relationship between higher income and better knowledge levels.

The multiple linear regression (MLR) analysis reveals that age, level of education, occupational status, and monthly income significantly influence patients' knowledge about nutritional management among the study sample. These findings emphasise the importance of considering demographic factors when designing interventions to improve knowledge and awareness of dietary regimens among spinal cord injury patients.

DISCUSSION

In a recent study, it was found that 65% of spinal cord injury patients exhibited poor knowledge of nutritional management during the pretest, while 30% displayed moderate knowledge, with only 5% demonstrating good knowledge levels. These results underscore the necessity for enhancing patients' understanding of nutritional management to improve their overall care. This aligns with findings from a study by Kamil and Hattab (2023), which also highlighted low levels of knowledge among patients prior to intervention. These findings underscore the critical need for comprehensive educational programs focused on nutritional management for spinal cord injury patients. By addressing the knowledge gaps identified in this study, healthcare providers can empower patients to make informed decisions regarding their dietary choices, leading to improved health outcomes and a better quality of life. Enhancing patients' knowledge of nutritional management not only aids in preventing nutritional deficiencies and related complications but also promotes overall well-being and independence among individuals with spinal cord injuries.

Generalisability of the present study's results has been limited due to the small sample size and specific inclusion criteria used in the study. Therefore, further research with larger sample sizes and more diverse populations is needed to enhance the generalisability of the findings. The generalisability results of the study are similar to other studies by Silva *et al*. (2024); Majeed *et al*. (2023) and Ameen and Hussein, 2023, that indicated that the small size of the sample may limit the ability to apply the findings to a larger population. The limited knowledge about nutritional management among patients, as highlighted in the present study, underscores the pressing need for improvement. Ameen and Hussein (2023) emphasise the importance of addressing knowledge gaps in nutritional management among patients with chronic conditions, highlighting

the need for tailored educational interventions to enhance understanding and promote better health outcomes. In a study by Hassan and Alwan (2023), similar knowledge deficiencies were observed in a diverse group of individuals with specific dietary needs, indicating the universality of the challenge in understanding and managing nutritional requirements effectively.

Khudhayer and Adulwahhab (2023) explored varying levels of knowledge among different patient groups, shedding light on the specific areas where educational interventions could be most beneficial in improving dietary choices and nutritional management practices. Consistent terminology, such as "nutritional management," helps maintain clarity and coherence in discussing the importance of educating patients about making informed dietary choices and effectively managing their nutritional needs. Understanding these knowledge gaps is crucial for developing targeted educational interventions that empower patients to navigate their dietary requirements with confidence and make positive choices for their overall well-being. The current study, supported by findings from Yilmaz *et al*. (2024); Al-Fayyadh *et al*. (2022), Al-Jowari (2022) and Hattab, Kadhim and Abdulwahhab (2020), reveals that a substantial ercentage of patients exhibit limited knowledge about nutritional management, highlighting the urgent need for educational enhancements. The current study's MLR analysis, linking patients' knowledge of dietary management to demographic characteristics, echoes insights from Yilmaz *et al*. (2024); Ameen and Hussein (2023); Kim, Park and Park (2023); Al-Alwany and Mansour (2022); Al-Jowari (2021) and Mohammed Mansur and Muhammed Khalifa (2020). Specifically, the identification of age-related differences in nutritional knowledge aligns with previous research, suggesting that younger individuals, such as those in the "20-29" age group, tend to display higher levels of knowledge due to increased exposure to nutrition-related information through various educational and media sources. By drawing on these previous studies, the current research not only reinforces the significance of comprehensive education in addressing knowledge gaps but also highlights age as a factor influencing patients' understanding of dietary management. These connections emphasise the importance of tailored educational interventions that consider demographic characteristics to enhance patients' nutritional knowledge and promote better management of their dietary needs.

According to Gender and Marital Status: The non-significant impact of gender and marital status on knowledge levels (p value of 0.92 and 0.74, respectively) in the current study suggests that these factors may not be primary determinants of nutritional knowledge among patients. However, it's crucial to recognise that these relationships could vary based on specific populations and cultural contexts.

Education Level, Occupational Status, and Monthly Income: The statistically significant associations between education level, occupational status, monthly income, and knowledge levels (p values of 0.02, 0.03, and 0.05, respectively) highlight the influence of socio-economic factors on patients' understanding of nutritional management. These results indicate that factors beyond formal education, such as access to information and personal interest in health, play a significant role in shaping knowledge levels.

Comparison with Other Studies: Contrasting the current study study with research by Al-Nbabteh *et al*.,2024; Bigford, Betancourt and Mark, 2023; Gitti, Khalaf and Alrubaie, 2023; Kim *et al*., 2023; Noor & Iman (2023); and Berkman *et al.*, 2021, provides a broader context for understanding the determinants of nutritional knowledge. While some studies may support the notion that formal education alone is not the sole predictor of nutritional knowledge, the current study's findings emphasise the significant association between education level and knowledge levels. This discrepancy underscores the multifaceted nature of factors influencing nutritional knowledge across different populations.

Socio-Economic Factors: The emphasis on the impact of occupational status and monthly income on knowledge levels in the current study aligns with broader research highlighting the role of socio-economic factors in shaping individuals' understanding of nutrition. These results underscore the importance of considering diverse factors beyond education in interventions aimed at improving nutritional knowledge among patients. By juxtaposing these findings with those of other studies, it becomes evident that while formal education plays a crucial role in determining nutritional knowledge, factors such as socio-economic status, access to information, and personal interest also significantly contribute to individuals' understanding of dietary management. These comparisons shed light on the complex interplay of variables that influence knowledge levels and underscore the need for tailored educational strategies that consider a range of factors to

promote effective nutritional management among diverse patient populations. The impact of unemployment and sufficient income on knowledge levels is significant and worth considering. Unemployment can limit access to resources, including formal education and information related to nutrition, potentially influencing individuals' understanding of dietary management. On the other hand, individuals with higher income levels are more likely to possess greater nutritional knowledge due to increased access to resources, opportunities for education, and the ability to afford healthier food options (Abdullah *et al*.,2024; Ameen & Hussein, 2023; & Zahir, Khafar & Hama Salih, 2022).

The relationship between occupation, income, and knowledge levels underscores the intricate relationship between socioeconomic factors and nutritional knowledge. While occupation alone may not directly impact knowledge levels, its influence through income, access to resources, and opportunities for education is significant. Individuals with sufficient income are more likely to have access to a range of resources that can enhance their nutritional knowledge, including access to nutrition-related information, participation in educational programs, and the ability to afford a diverse and healthy diet. Conversely, unemployment may limit access to these resources, potentially resulting in lower levels of nutritional knowledge(Khasanah, Keliat & Mulyono, 2024; Shahid *et al*., 2024; Zahir, Khafar & Hama Salih, 2022; & Berkman, *et al*., 2022).

These findings align with broader research demonstrating the positive association between socioeconomic status, including factors like income and occupation, and nutritional knowledge. Socioeconomic disparities can significantly impact individuals' ability to make informed dietary choices and effectively manage their nutritional needs, emphasizing the importance of addressing these disparities to promote better health outcomes across diverse populations (Abdullah *et al*., 2024; Ameen & Hussein, 2023; Zahir *et al.*, 2022; Mohammed & Khatam, 2022). By considering the impact of unemployment and sufficient income on knowledge levels within the context of broader socioeconomic factors, it becomes apparent that socioeconomic status plays a crucial role in shaping individuals' understanding of dietary management. Addressing these disparities and providing equitable access to resources and education are essential steps in promoting better nutritional knowledge and overall health outcomes among diverse populations(Yaaroub, Faiza & Beadaa, 2024; Ameen & Hussein, 2023; Abdel Aziz, Dawood & Al-khalisy, 2023).

The discussion highlights the critical need for tailored educational interventions to address knowledge gaps in nutritional management among spinal cord injury patients, emphasizing the influence of demographic and socioeconomic factors on patients' understanding of dietary management.

Limitation

The limitations identified in the present study, including the small sample size and reliance on a pre-experimental design with self-report questionnaires, may have influenced the interpretation of results, potentially impacting the generalizability and validity of findings. To address these limitations in future research, increasing sample size, employing mixed methods approaches, conducting randomized controlled trials, and incorporating objective measures can enhance the rigor and reliability of studies investigating nutritional management among spinal cord injury patients. These methodological enhancements can lead to more robust conclusions and ensure that targeted educational interventions and support programs are developed based on accurate and comprehensive data.

CONCLUSION

The study reveals that a significant proportion of spinal cord injury patients lack adequate knowledge regarding nutritional management, placing them at risk for nutritional issues. Factors such as age, level of education, occupational status, and monthly income significantly influence patients' understanding of nutritional management. Addressing these knowledge gaps through tailored interventions is crucial to mitigating risks and improving the overall well-being of individuals with spinal cord injuries. Future studies assessing knowledge in diverse settings are advised, emphasizing the need for targeted interventions considering age, education, occupation, and income to promote improved health outcomes.

Recommendation

This study recommends improving nutritional management for spinal cord injury (SCI) patients in Iraq

through several key strategies. First, it suggests conducting comprehensive assessments to evaluate the knowledge levels of SCI patients regarding nutritional management across various healthcare settings in Iraq. Tailored educational programs should be developed, focusing on nutritional management and customized to meet the diverse cultural and linguistic needs of patients in different regions. A multidisciplinary approach is also essential, involving healthcare professionals such as dietitians, nurses, and rehabilitation specialists to provide comprehensive nutritional education and support. Furthermore, patient empowerment should be prioritized by offering interactive workshops, counselling sessions, and accessible resources to enhance patients' understanding of nutritional requirements and healthy dietary practices. To ensure ongoing improvement, mechanisms for continuous monitoring and evaluation of patients' nutritional knowledge should be established to track progress and make necessary adjustments. Finally, the study recommends conducting future research to assess SCI patients' nutritional knowledge in different settings across the country. Implementing these recommendations can significantly enhance the nutritional knowledge of SCI patients in Iraq, ultimately leading to improved health outcomes and better management of their nutritional needs.

Conflict of Interest

The authors declare that they have no competing interests.

ACKNOWLEDGEMENT

The authors are thankful to all the participants of the study for their cooperation in completing this study. The researchers acknowledge all efforts and scientific support provided from Faculty of Nursing at University of Baghdad, Iraq. Furthermore, the author declares that no funding given to complete this study.

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