

# Basic Knowledge of Physician about Total Parenteral Nutrition in Saudi Arabia

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## ABSTRACT

**Objectives:** To explore the physician's basic knowledge about Total Parenteral Nutrition in Saudi Arabia. **Materials and Methods:** It analyzes a cross-sectional survey that discussed the physician's basic knowledge of some items for Total Parenteral Nutrition services (TPNs) in Saudi Arabia. The survey consisted of respondents' demographic information about the Assessment of Total Parenteral Nutrition services (TPNs) knowledge of physicians, The resources of Parenteral Nutrition services (TPNs) used by physicians. The 5-point Likert response scale system was used with closed-ended questions. The survey was validated through the revision of expert reviewers and pilot testing. Besides, various tests of the reliability of McDonald's  $\omega$ , Cronbach alpha, Gutmann's  $\lambda_2$ , and Gutmann's  $\lambda_6$  been done with the study. Furthermore, the physician's basic knowledge about Total Parenteral Nutrition is analyzed through the survey monkey system. Besides, the Statistical Package of Social Sciences (SPSS), Jeffery's Amazing Statistics Program (JASP), and Microsoft Excel sheet version 16. **Results:** A total number of 409 physicians responded to the questionnaire. Of them, almost one-half responded from the Northern region (186 (45.48%)), and one Quarter responded from the central area (106 (25.92%)), with statistically significant differences between the provinces ( $p=0.000$ ). Females responded more than males (268 (65.53%)) versus 141 (34.47%), with statistically significant differences between all levels ( $p=0.001$ ). Most of the responders were in the age group of 36-45 years (198 (48.41%)) and 46-55 years (109 (26.65%)), with statistically significant differences between all age groups ( $p=0.000$ ). Almost one-half of responders, 176 (43.03%), worked at an organization that had Parenteral Nutrition services (TPNs) services, with only 86 (21.03%) had been ever requested any Parenteral Nutrition services (TPNs) with statistically significant differences between all answers ( $p=0.000$ ). The average score of basic knowledge of physicians about the Total Parenteral Nutrition services (TPNs) was (2.57). The element "Have you ever heard about the concept of Total Parenteral Nutrition services (TPNs)" obtained the highest score (3.22). The aspect "know the requirements of TPN through peripheral line administration" (2.89). The element "know the interaction of the drug with total Parenteral Nutrition services (TPNs)" was (2.76). The most resources for Parenteral Nutrition services (TPNs) were the Saud Food and Drug Authority (SFDA) website 178 (43.63%), Peer discussions 113 (27.70%), and Medical association literature/guidelines/recommendations 112 (27.45%). **Conclusion:** The basic knowledge of physicians about total parenteral nutrition is inadequate. Therefore, targeting education nutrition support for physicians is highly recommended, and the privilege of prescribing TPN should be reviewed.

**Keyword:** Basic, Knowledge, Total Parenteral Nutrition, Physicians, Saudi Arabia.

## INTRODUCTION

Healthcare providers provide medical care to all various patients. That starts with emergency services when the patient visits due to an emergency or transfers from the primary health care center. Either followed by medical or surgical care during admission or through ambulatory care services.<sup>[1]</sup> Then ambulatory care services after discharge. The physician assesses the patient for diseases to make the diagnosis, requests appropriate laboratory tests, prescribes the proper medication according to drug therapy guidelines, and provides supportive treatment when necessary.<sup>[1]</sup> One of the significant supportive interventions needed for the patient is nutrition. Nutritional support could be given through a regular diet.<sup>[2]</sup> If the patient can not take normal nutrition, the pre-made diet by tube

administration is called enteral nutrition.<sup>[2]</sup> If the patient can not administer or should not take anything by mouth, the physician will switch to parenteral nutrition, called total parenteral nutrition.<sup>[2,3]</sup> TPN consists of components such as Fluid demand for the patient, total calories needed, daily carbohydrates, protein, and lipids. Besides, electrolytes, multivitamins, and trace elements.<sup>[4]</sup> All those substances should be listed within TPN Order.<sup>[5]</sup> Therefore, The prescribing of TPN prescriptions needs a fundamental aspect of knowledge. Unfortunately, few studies have been conducted about physician knowledge of nutrition support locally or internationally, and nil studies focused and Total Parenteral Nutrition.<sup>[6-12]</sup> The authors were unfamiliar with any publication targeting the topic locally or in Gulf and Arabic countries. The aim of the current research was the assessment of knowledge for

physicians through the cross-sectional self-reported survey.

## MATERIALS AND METHODS

It analyzes a cross-sectional survey that discussed the physician's basic knowledge of some items for Total Parenteral Nutrition services (TPNs) in Saudi Arabia. It self-reported an electronic survey of the physician, including a physician from internship to consultant, physician specialties, and Saudi Arabia. All non-physician or students, non-completed, non-qualified surveys will be excluded from the study. The survey consisted of respondents' demographic information about the Assessment of Total Parenteral Nutrition services (TPNs) knowledge of physicians, The resources of Parenteral Nutrition services (TPNs) used by physicians.<sup>[6-10,13]</sup> The 5-point Likert response scale system was used with closed-ended questions. According to the previous literature with an unlimited population size, the sample was calculated as a cross-sectional study, with a confidence level of 95% with a z score of 1.96 and a margin of error of 5%, a population percentage of 50%, and a drop-out rate 10%. As a result, the sample size will equal 380-420 with a power of study of 80%.<sup>[14-16]</sup> The response rate required for the calculated sample size is at least 60-70% and above.<sup>[16,17]</sup> The survey was distributed through social media of WhatsApp applications and telegram groups of a physician. The reminder message had been sent every 1-2 weeks. The survey was validated through the revision of expert reviewers and pilot testing. Besides, various tests of reliability McDonald's  $\omega$ , Cronbach alpha, Gutmann's  $\lambda_2$ , and Gutmann's  $\lambda_6$  been done with the study. The data analysis of the physician practice of some items for Total Parenteral Nutrition services (TPNs) at the institution is done through the survey monkey system. Besides, the Statistical Package of Social Sciences (SPSS), Jeffery's Amazing Statistics Program (JASP), and Microsoft Excel sheet version 16. It included a description and frequency analysis, good of fitness analysis, and correlation analysis. Besides, inferential analysis of factors affecting the physician essential knowledge some items for Total Parenteral Nutrition services (TPNs) at institution with linear regression. The STROBE (Strengthening the reporting of observational studies in epidemiology statement: guidelines for reporting observational studies) guided the reporting of the current study.<sup>[18,19]</sup>

## RESULTS

A total number of 409 physicians responded to the questionnaire. Of them, almost one-half responded from the Northern region

(186 (45.48%)), and one Quarter responded from the central region (106 (25.92%)), with statistically significant differences between the provinces ( $p=0.000$ ). Most of the responders were from National Guard Hospitals (90 (22.00%)), Military hospitals (79 (19.32%)), Ministry of Health (MOH) hospitals (53 (12.96%)), and University Hospitals (51 (12.47%)), with a statistically significant difference between working sites ( $p=0.000$ ). Females responded more than males (268 (65.53%)) versus 141 (34.47%), with statistically significant differences between all levels ( $p=0.001$ ). Most of the responders were in the age group of 36-45 years (198 (48.41%)) and 46-55 years (109 (26.65%)), with statistically significant differences between all age groups ( $p=0.000$ ). Most of the pharmacists were residents (133 (32.52%)) and General practitioners (110 (26.89%)), with statistically significant differences between all levels ( $p=0.000$ ). Most of the responders worked as Assistant directors of the medical unit (228 (55.75%)) and Medical Directors (90 (22.00%)), with a statistically significant difference between positions ( $p=0.000$ ). Most physicians had a work experience of 1-3 years (176 (43.03%)) and 4-6 years (137 (33.50%)), with a statistically significant difference between years of experience ( $p=0.000$ ). Most of physician's specialties was emergency (86 ((20.05%)), Surgery (79 ((19.32%)), Psychiatry (78 ((19.07%)), and Obstetrics and Gynecology (74 ((18.09%)) with statistically significant differences between all specialties ( $p=0.000$ ). Almost one-half of responders, 176 (43.03%), worked at an organization that had Parenteral Nutrition services (TPNs) services, with only 86 (21.03%) had been ever requested any Parenteral Nutrition services (TPNs) with statistically significant differences between all answers ( $p=0.000$ ). There are non-statistically significant correlations between all demographic variables ( $p>0.05$ ) (Tables 1 and 2). The average score of basic knowledge of pharmacists about the Total Parenteral Nutrition services (TPNs) was (2.57). The element "Have you ever heard about the concept of Total Parenteral Nutrition services (TPNs)" obtained the highest score (3.22). The aspect "know the requirements of TPN through peripheral line administration" (2.89). The element "know the drug's interaction with total Parenteral Nutrition services (TPNs)" was (2.76). In contrast, the lowest score was obtained for the element "Have you ever heard about the concept of enteral feeding" (2.25). Followed The score for the element "In your institution, are there Total Parenteral Nutrition services (TPNs)" (2.26), and for the part "Do you know the interpret Total Parenteral Nutrition services (TPNs) laboratory tests" was

(2.32), with a statistically significant difference between the responses ( $p<0.000$ ). All aspects of the basic knowledge of pharmacists about Total Parenteral Nutrition services were statistically significant between responses ( $p<0.000$ ) (Table 3). The most resources for Parenteral Nutrition services (TPNs) were the SFDA website 178 (43.63%), Peer discussions 113 (27.70%), and Medical association literature/guidelines/recommendations 112 (27.45%) (Table 4). The score for single-test reliability analysis of McDonald's  $\omega$  was 0.661, Cronbach's  $\alpha$  was 0.691, Gutmann's  $\lambda_2$ , 0.731, Gutmann's  $\lambda_6$  was 0.956, and Greater Lower Bound was 0.989 with statistically significant ( $p<0.05$ ).

### *Factors affecting the physician's basic knowledge about Total Parenteral Nutrition services (TPNs)*

Factors affecting the perception were analyzed. We adjusted the significant values using the independent samples Kruskal-Wallis test and the Bonferroni correction for multiple tests.

### *Physician basic knowledge about Total Parenteral Nutrition services (TPNs)*

includes Location, Age (years), Physician gender, and Physician qualification. Physician specialties, Years of experience, Position Held, Presence of the Parenteral Nutrition services (TPNs) at the institution, and Prescribing of Parenteral Nutrition services (TPNs) before, Number of TPN orders, Number of patients needed for TPN. The eastern region showed the lowest scores (3.1863), with statistically significant differences between regions ( $p=0.000$ ). Eleven worksites affected the *physician's basic knowledge about Total Parenteral Nutrition services (TPNs)*. The highest scores (3.6118) were obtained from National Guard hospitals, with statistically significant differences among all sites ( $p=0.000$ ). The female (3.4942) affected the *physician's basic knowledge about Total Parenteral Nutrition services (TPNs)* more than the male (3.2918), with a statistically significant difference ( $p=0.000$ ). The responders' age affected the physician's *basic knowledge about Total Parenteral Nutrition services (TPNs)*. Physicians aged 24-35 showed the highest score (3.4515), with a statistically significant difference between all age groups ( $p=0.003$ ). Five levels of academic qualifications affected the *physician's basic knowledge about Total Parenteral Nutrition services (TPNs)*, with the lowest score (3.3.1437) obtained for intern physicians with a statistically significant difference between all levels ( $p=0.000$ ). Five levels of the physician specialties affected the *physician's basic knowledge about Total Parenteral Nutrition services (TPNs)*, with the highest score (3.7908) obtained for the

**Table 1: Demographic, social information.**

Nationality	Response Count	Response Percent	p-value (X2)	
Central area	106	25.92%	0.000	
North area	186	45.48%		
South area	68	16.63%		
East area	36	8.80%		
West area	13	3.18%		
Answered question	409			
Skipped question	0			
Site of work	Response Count	Response Percent	p-value (X2)	
MOH Hospitals	53	12.96%	0.000	
Military hospitals	79	19.32%		
National Guard Hospital	90	22.00%		
Security forces hospitals	39	9.54%		
University Hospital	51	12.47%		
MOH primary care centers	12	2.93%		
Private hospitals	30	7.33%		
Private ambulatory care clinics	47	11.49%		
Private primary healthcare center	7	1.71%		
Community pharmacy	0	0.00%		
University (academia)	1	0.24%		
Answered question	409			
Skipped question	0			
Gender	Response Count	Response Percent		p-value (X2)
Male	141	34.47%		0.000
Female	268	65.53%		
Answered question	409			
Skipped question	0			
Age	Response Count	Response Percent	p-value (X2)	
24-35	63	15.40%	0.000	
36-45	198	48.41%		
46-55	109	26.65%		
> 55	39	9.54%		
Answered question	409			
Skipped question	0			

anesthetics with a statistically significant difference between all levels ( $p=0.000$ ). Six levels of work experience affected the *physician's basic knowledge about Total Parenteral Nutrition services (TPNs)*. The lowest score (2.4706) was obtained for those with work experience of less than one year, with a statistically significant difference between

all levels ( $p=0.000$ ). Five levels of the position did not affect the physician's basic knowledge about Total Parenteral Nutrition services (TPNs), with a non-statistically significant difference between all levels ( $p=0.136$ ). The presence of the Parenteral Nutrition services (TPNs) at the institution with the highest score (3.5528) affected *physician's basic*

**Table 2: Demographic, social information.**

Physician Qualifications	Response Count	Response Percent	p-value (X2)	
Intern	34	8.31%	0.000	
Resident	133	32.52%		
General practitioner	110	26.89%		
Specialist	73	17.85%		
Consultant	59	14.43%		
Answered question	409			
Skipped question	0			
Position Held	Response Count	Response Percent	p-value (X2)	
Director of the medical unit	54	13.20%	0.000	
Assistant director of the medical unit	228	55.75%		
Medical Director	90	22.00%		
Supervisor	1	0.24%		
Physician staff	36	8.80%		
Answered question	409			
Skipped question	0			
Years of experience medical career	Response Count	Response Percent	p-value (X2)	
< 1	9	2.20%	0.000	
1-3	176	43.03%		
4-6	137	33.50%		
7-9	47	11.49%		
10-12	26	6.36%		
>12	14	3.42%		
Answered question	409			
Skipped question	0			
Physician Specialties	Response Count	Response Percent	p-value (X2)	
Critical Care	3	0.73%	0.000	
Emergency	82	20.05%		
Medical	33	8.07%		
Surgical	79	19.32%		
Pediatrics	23	5.62%		
Anesthesia	36	8.80%		
Psychiatry	78	19.07%		
Obstetrics and Gynecology	74	18.09%		
Family medicine	1	0.24%		
Answered question	409			
Skipped question	0			
Do you have Parenteral Nutrition services (TPNs) at your institution?	Response Count	Response Percent		p-value (X2)
Yes	176	43.03%		0.000
No	160	39.12%		
I do not know	73	17.85%		
Answered question	409			
Skipped question	0			
Have you ever requested any Parenteral Nutrition services (TPNs)?	Response Count	Response Percent	p-value (X2)	
Yes	86	21.03%	0.000	
No	179	43.77%		
I do not know	144	35.21%		
Answered question	409			
Skipped question	0			

Table 3: Total Parenteral Nutrition services (TPNs) assessment of knowledge.

No	Items	Complete knowledge	Incomplete knowledge	Partial knowledge	Little knowledge	No knowledge	Total	Weighted Average	p-value (X2)
1	I have heard about the concept of Total Parenteral Nutrition services (TPNs).	26.89%	23.23%	14.91%	15.40%	19.56%	409	3.22	0.000
2	I have ever heard about the concept of enteral feeding?	3.67%	13.45%	24.21%	21.27%	37.41%	409	2.25	0.000
3	I have had a course/attended workshops about Total Parenteral Nutrition services (TPNs).	0.73%	24.21%	26.16%	26.41%	22.49%	409	2.54	0.000
4	In Saudi Arabia, there is a legal provision in the medicines act providing Total Parenteral Nutrition services (TPNs) activities.	0.73%	16.63%	37.16%	32.52%	12.96%	409	2.60	0.000
5	In my institution, there is a Total Parenteral Nutrition services (TPNs).	0.98%	15.40%	33.50%	8.80%	41.32%	409	2.26	0.000
6	There is an official standardized form for requesting Total Parenteral Nutrition services (TPNs) in your institution.	2.70%	16.42%	24.75%	40.93%	15.20%	408	2.50	0.000
7	I know where to get the Total Parenteral Nutrition services (TPNs) form.	1.00%	18.20%	43.39%	20.70%	16.71%	401	2.66	0.000
8	I Can identify nutrition assessments for my patients.	3.18%	16.63%	31.54%	16.87%	31.78%	409	2.43	0.000
9	I know readily calculate the components of Total Parenteral Nutrition services (TPNs).	0.49%	20.29%	37.65%	24.69%	16.87%	409	2.63	0.000
10	I can adjust Total Parenteral Nutrition services (TPNs) components according to the various diseases.	0.49%	17.85%	43.28%	14.91%	23.47%	409	2.57	0.000
11	I know the interpret Total Parenteral Nutrition services (TPNs) laboratory tests.	0.49%	17.11%	29.10%	20.05%	33.25%	409	2.32	0.000
12	I can accurately resolve the complications of Total Parenteral Nutrition services (TPNs).	0.49%	18.83%	38.14%	16.87%	25.67%	409	2.52	0.000
13	I know the drug's interaction with total Parenteral Nutrition services (TPNs).	0.73%	21.76%	38.63%	30.56%	8.31%	409	2.76	0.000
14	I know the appropriate way to discontinue Total Parenteral Nutrition services (TPNs).	5.01%	22.56%	23.06%	32.33%	17.04%	399	2.66	0.000
15	I know the cost analysis of Total Parenteral Nutrition services (TPNs).	2.93%	14.43%	27.14%	33.25%	22.25%	409	2.43	0.001
16	I know the requirements of TPN through central line administration for our patients.	3.67%	16.63%	34.23%	24.21%	21.27%	409	2.57	0.000
17	I know the requirements of TPN through peripheral line administration.	2.69%	18.09%	54.28%	15.40%	9.54%	409	2.89	0.000
	<b>Answered</b>						<b>409</b>		
	<b>Skipped</b>						<b>0</b>		



**Table 4: The resources of Parenteral Nutrition services (TPNs) used by physicians.**

	Responses	
Scientific literature	37	9.07%
Peer discussions	113	27.70%
Medical association literature/guidelines/recommendations	112	27.45%
Internet (e.g., Google searches, WebMD, etc.)	29	7.11%
Drug labeling	16	3.92%
Laboratory director/personnel	50	12.25%
SFDA website	178	43.63%
Drug information resources (Micromedex, Lexicomp, Epocrates..)	50	12.25%
None of the above have consulted any sources	11	2.70%
<b>Answered</b>	<b>408</b>	
<b>Skipped</b>	<b>1</b>	

**knowledge about Total Parenteral Nutrition services (TPNs)**, with a statistically significant difference between all answers ( $p=0.000$ ). The physician did not request any Parenteral Nutrition services (TPNs) before, with the lowest score (3.2497) affected **physician basic knowledge about Total Parenteral Nutrition services (TPNs)**, with a statistically significant difference between all answers ( $p=0.000$ ).

The total number of patients needed for TPN orders (>100) daily had the lowest score (3.0294), which affected **physician's basic knowledge about Total Parenteral Nutrition services (TPNs)**, with a statistically significant difference between all answers ( $p=0.000$ ). Likewise, the total number of TPN orders (1-5) daily had the lowest score (3.1676), affecting **physician's basic knowledge about Total Parenteral Nutrition services (TPNs)**, with a statistically significant difference between all answers ( $p=0.000$ ).<sup>[20-22]</sup> (Table 6).

The relationship between the physician's basic knowledge about Total Parenteral Nutrition services (TPNs) and factors such as Location, Age (years), Physician gender, and Physician qualification. Physician specialties, Years of experience, Position Held, Presence of the Parenteral Nutrition services (TPNs) at the institution, and Prescribing of Parenteral Nutrition services (TPNs) before, Number of TPN orders, Number of patients needed for TPN. The multiple regression analysis considered perception as the dependent variable and factors affecting it as an explanatory variable. There was a medium relationship ( $R=0.560$  with  $p=0.000$ ) between the physician's basic knowledge about Total Parenteral Nutrition services (TPNs) and its factors. Three (age, position, and the number of TPN orders) out of twelve were non-significant differences ( $p>0.05$ ). However, multiple regression analysis confirmed that four factors (i.e., locations, worksite, Present

of the Parenteral Nutrition services (TPNs) at the institution, and the number of patients needed for TPN) explained 16.6%, 16.3%, 30%, and 15.5% respectively of the negative relationship to the variation in knowledge, with a statistically significant difference ( $p=0.000$ ), ( $p=0.001$ ), ( $p=0.000$ ), ( $p=0.001$ ). The bootstrap model was also confirmed. Furthermore, the relationship was verified by the non-existence of multicollinearity with the location factor with a Variance Inflation Factor (VIF) of 1.288, 1.458, 1.836, 1.408, respectively less than three or five as a sufficient number of VIF. Besides, four factors (gender, qualifications, experiences, and Prescribing of any Parenteral Nutrition services (TPNs) before) explained 32%, 17.6%, 27%, 30.4% and 12.4% of the positive relationship to the variation in perception, with a statistically significant difference ( $p=0.004$ ), ( $p=0.000$ ), ( $p=0.000$ ), ( $p=0.000$ ), and ( $p=0.009$ ) respectively. The bootstrap model was also confirmed. Furthermore, the relationship was verified by the non-existence of multicollinearity with the three factors (gender, experiences, position held) with a Variance Inflation Factor (VIF) of 1.359, 1.178, 1.542, and 1.239, respectively less than three or five as an adequate number of VIF.<sup>[20-22]</sup> (Table 6).

## DISCUSSION

Total parenteral nutrition is a primary service in various healthcare departments.<sup>[10]</sup> That includes neonatal and surgical services. They were followed by critical care and medical services according to the appropriate indications. The only physician was legally authorized to prescribe medication or TPN.<sup>[10]</sup> That's necessary to have back knowledge of TPN science and information. The current cross-sectional approach demonstrates physicians' knowledge of basic TPN science that demands practical prescribing. The

study included physicians' specialties, ages, experiences, and academic qualifications. That's reflected in the medical culture, similar to previous studies.<sup>[6-8]</sup> Besides, the study used validated questionnaires with high-reliability scores, which were not reported previously.<sup>[6-8]</sup>

The average score of basic knowledge TPN was insufficient. Most physicians heard about the TPN concept and are familiar with indications for TPN by peripheral administration, which was expected because they studied in medical schools. Besides, most physicians know about TPN drug interactions because they might always discuss TPN and prohibited drug interactions with their preceptor and should mix anything with TPN solutions. The physician should monitor the patient and notice the drug interaction with TPN. In contrast, most physicians are unfamiliar with interpreting the laboratory test while monitoring TPN. They can not make nutrition assessments related to the physician not commonly prescribed TPN or not discussed during medical school.<sup>[7,8]</sup> Besides, most physicians are unfamiliar with the enteral feeding concept like the previous studies<sup>[6,8]</sup> because the nutrition support services are unavailable to most of the responders working with it or have inadequate knowledge of nutrition support therapy. Most physicians are unfamiliar with various basic part knowledge of TPN, such as adjusting TPN according to patient disease status, dealing with TPN complications, calculating TPN components, appropriate ways of holding or stopping TPN, and TPN cost. That's related to most physicians not attending educational courses or workshops about TPN. Thus, there is no previous investigation to compare with the current findings

Various factors might affect the physician's knowledge of TPN. Such as, the location found eastern region has the lowest knowledge related to the unavailability of TPN services or lack of education or the pharmacist taking care of TPN services from prescribing to monitoring until stopping TPN. The working sites might affect the knowledge of TPN. Some healthcare organizations had high basic knowledge, such as the national guard hospital, which had organized TPN services for neonates and adults. Gender might affect the understanding, which found that female physicians had more knowledge than males related more practice of TPN than male physicians. The academic qualifications might affect the TPN knowledge with the highest knowledge with specialist practitioners because they have more experience in practice. In contrast, the young generation of physicians with less than one year of experience had the lowest knowledge of TPN, and that's expected. TPN services

Table 5: Multiple regression of Factors with the physician's knowledge of Total Parenteral Nutrition services (TPNs) adjusted based on diseases.

Model	R	R Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients		t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
					B	Std. Error	Beta				Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	.560 <sup>b</sup>	.314	15.078	.000 <sup>b</sup>	3.079	.112			27.490	.000	2.859	3.299		
Location					-.060	.017	-.166		-3.520	.000	-.094	-.027	.776	1.288
Site of work					-.026	.008	-.163		-3.242	.001	-.041	-.010	.686	1.458
Age (years)					.049	.025	.113		1.968	.050	.000	.099	.526	1.902
Physician gender					.248	.038	.320		6.601	.000	.174	.322	.736	1.359
Physician qualification					.055	.014	.176		3.900	.000	.027	.082	.849	1.178
Physician specialties					-.017	.008	-.101		-2.021	.044	-.033	.000	.699	1.430
Years of experience in a medical career					.092	.018	.270		5.223	.000	.057	.126	.649	1.542
Position Held					.002	.019	.005		.088	.930	-.035	.038	.665	1.504
The presence of Parenteral Nutrition services (TPNs) at the institution					-.150	.028	-.300		-5.319	.000	-.205	-.094	.545	1.836
Prescribing any Parenteral Nutrition (TPN) before					.062	.024	.124		2.622	.009	.016	.109	.773	1.293
Number of TPN orders					-.017	.012	-.077		-1.376	.170	-.041	.007	.556	1.799
Number of patients needed for TPN					-.029	.009	-.155		-3.141	.002	-.047	-.011	.710	1.408

a. Dependent Variable: Physician's basic knowledge about Total Parenteral Nutrition services, Predictors: (Constant), Location, Age (years), Physician gender, Physician qualification, Physician specialties, Years of experience, Position Held, Presence of the Parenteral Nutrition services (TPNs) at the institution, Prescribing of Parenteral Nutrition services (TPNs) before, Number of TPN orders, Number of patients needed for TPN.

Model	Bootstrap for Coefficients										
	B	Bias	Std. Error	Sig. (2-tailed)	Bootstrap <sup>a</sup>		Sig.	Std. Error	Sig. (2-tailed)	Lower	Upper
					95% Confidence Interval	Lower					
1 (Constant)	3.079	-.004	.206	.001	.001	2.641	.206	.001	.001	2.641	3.452
Location	-.060	.000	.020	.007	.007	-.096	.020	.007	.007	-.096	-.021
Site of work	-.026	-.001	.009	.008	.008	-.043	.009	.008	.008	-.043	-.009
Age (years)	.049	.001	.037	.198	.198	-.021	.049	.198	.198	-.021	.127
Physician gender	.248	.001	.049	.001	.001	.158	.248	.001	.001	.158	.351
Physician qualification	.055	.000	.017	.002	.002	.021	.055	.002	.002	.021	.089
Physician specialties	-.017	-.001	.010	.091	.091	-.037	.010	.091	.091	-.037	.002
Years of experience in a medical career	.092	.002	.029	.001	.001	.039	.092	.001	.001	.039	.152
Position Held	.002	.002	.028	.959	.959	-.049	.002	.959	.959	-.049	.058
The presence of Parenteral Nutrition services (TPNs) at the institution	-.150	-.002	.034	.001	.001	-.217	-.150	.001	.001	-.217	-.084
Prescribing any Parenteral Nutrition (TPN) before	.062	-.002	.029	.036	.036	.000	.062	.036	.036	.000	.115
Number of TPN orders	-.017	.001	.014	.237	.237	-.042	-.017	.237	.237	-.042	.011
Number of patients needed for TPN	-.029	.000	.009	.002	.002	-.048	-.029	.002	.002	-.048	-.011

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples.

availabilities at healthcare institutions with regular prescribing of TPN had high levels of knowledge expected because the organized TPN services had education and training for all healthcare professionals and monitored parameters to improve knowledge and practice of TPN. The number of TPN orders and patient's needs for TPN might affect TPN knowledge positively and negatively. If the number is low, the knowledge will be limited. While if the number increases, the knowledge will increase until it reaches the maximum workload; then, the knowledge returns to a lower level because the physician will not concentrate with TPN with a high workload, and various problems might occur during an increased workload. The most dependable factors that might affect TPN knowledge positively were gender, academic qualifications, experience, and practice of TPN. In contrast, working sites, the presence of TPN services, and the number of patient's needs for TPN might negatively affect TPN knowledge for the same reasons above. Thus, there is no previous investigation to compare with the current findings.

### Limitations

The current study had various advantages, such as demonstrating physician's knowledge about parental nutrition, and the calculated sample size was appropriate. However, there are multiple disadvantages concerning the recent research, such non-randomized sampling methods with high variability of demographic characteristics. Besides, medium reliability findings need to review the survey with a detailed analysis of one-factor analysis to determine the appropriate questions used. Further research is required to overcome all difficulties in the current situation.

### CONCLUSION

The knowledge of the physician's profession about parenteral nutrition is insufficient. The physicians are familiar with superficial knowledge such as parenteral nutrition and drug interactions of parenteral feeding. However, the other basic knowledge, including patient assessment for nutrition, enteral feeding, calculation of parenteral nutrition requirements, and TPN complications management, did not reach the optimal level. Although various factors might affect the physician's knowledge, such as a working site with parental feeding services, female gender, medium experience, and specialist qualifications had higher knowledge of parenteral nutrition. Besides the presence of TPN at healthcare facilities, the number of patients required for TPN and the number of TPN orders. Therefore, education and training in nutrition support are highly recommended for

all general practitioners of physicians in Saudi Arabia.

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### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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### Consent for Publications

Informed consent was obtained from all the participants

### Ethical Approval

This research was exempted from research and ethical committee or an Institutional Review Board (IRB) approval.

<https://www.hhs.gov/ohrp/regulations-and-policy/decision-charts-2018/index.html>

### ABBREVIATIONS

**TPNs:** Total Parenteral Nutrition services; **MOH:** Ministry of Health; **KSA:** Kingdom of Saudi Arabia; **SPSS:** Statistical Package of Social Sciences; **JASP:** Jeffery's Amazing Statistics Program; **STROBE:** Strengthening the reporting of observational studies in epidemiology statement; **VIF:** Variance Inflation Factor.

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