



Original Article

Knowledge and attitudes toward palliative care and their association among nurses and physicians at a secondary referral hospital in Oman: A cross-sectional study

Said Mubarak Alhakmani¹, Maryam Rassouli¹, Hadis Ashrafizadeh², Oscar Maramg Turingan¹, Salem Said Al Touby^{1*}

¹School of Nursing, College of Health Sciences, University of Nizwa, Nizwa, Oman

²School of Nursing, Dezful University of Medical Sciences, Dezful, Iran

ARTICLE INFO

Received 25 July 2026
Accepted 23 September 2026

Available online at:
<https://npt.tums.ac.ir>

Keywords:

palliative care;
nurses;
physicians;
attitudes;
knowledge

Corresponding Author:

Salem Said Al Touby, School of
Nursing, College of Health Sciences,
University of Nizwa, Nizwa, Oman.
E-mail: altouby@unizwa.edu.om

DOI: 10.18502/npt.v13i4.23022

ABSTRACT

Background & Aim: Providing comprehensive, holistic care is a fundamental goal of healthcare systems, and palliative care constitutes an essential component of such care. Nurses' and physicians' attitudes may influence the integration of palliative care into routine clinical practice. This study aimed to characterize nurses' and physicians' knowledge of and attitudes toward palliative care, assess the relationship between these variables, and identify factors independently associated with attitudes in a secondary referral hospital in Oman.

Methods & Materials: A cross-sectional descriptive correlational study was conducted among 280 nurses and physicians recruited through convenience sampling from clinical departments at Nizwa Hospital, Oman. Data were collected using a demographic questionnaire and the Health Care Providers' Knowledge and Attitude of Palliative Care Questionnaire. Descriptive statistics, nonparametric tests, Spearman's rank-order correlation, and hierarchical multiple linear regression were performed using IBM SPSS Statistics version 26.0.

Results: The mean attitude and knowledge scores were 140.20 ± 13.47 and 18.60 ± 4.11 , respectively. Knowledge and attitude scores showed a statistically significant, positive, moderate correlation ($r_s = 0.348$, $p < 0.001$). In the final hierarchical regression model, higher knowledge scores were independently associated with higher attitude scores ($\beta = 0.353$, $p < 0.001$), and the model accounted for 21.0% of the variance in attitude scores.

Conclusion: Knowledge was positively and moderately associated with attitudes toward palliative care, and this association persisted after adjustment for the examined variables. These findings may inform educational planning at the study hospital; however, given the cross-sectional design, they do not establish that higher knowledge leads to more favorable attitudes or improved quality of care. The effectiveness of educational programs should be evaluated in intervention studies.

Introduction

Providing comprehensive and holistic care is a fundamental goal of healthcare systems, and Palliative care (PC) is an essential component of such care. PC focuses on improving the quality of life of patients living with life-threatening illnesses, as well as that of their families, by addressing their physical, psychological, spiritual, and social needs through individualized, patient-centered care (1). According to the World Health Organization (WHO, 2020), an estimated 56.8 million people worldwide require PC each year; however, only 14% of those in need receive

these services (2). In Oman, population-based estimates indicated that approximately 9,000 people required palliative care (PC) in 2015, including nearly 4,000 deceased individuals and 5,000 people living with serious health-related conditions. Collectively, these individuals experienced approximately 1–3 million days of physical and psychological symptoms associated with serious health-related suffering (3). The continuing burden of life-threatening conditions in Oman is also reflected in the 2024 GLOBOCAN estimates, which reported 4,076 new cancer cases and 1,719 cancer-related deaths in the country (4). Despite this substantial



need, the World Health Organization-supported Eastern Mediterranean Regional Palliative Care Atlas reported only one specialized PC service in Oman (5).

The growing burden of chronic and life-limiting diseases, including cancer, cardiovascular disease, and neurodegenerative disorders, has further emphasized the importance of integrating PC into routine healthcare practice (6). Although the prevalence of non-communicable and terminal illnesses continues to rise in Oman, evidence indicates that PC remains inadequately integrated into healthcare services and that healthcare providers' awareness and preparedness vary considerably (7).

The provision of high-quality PC depends on multiple factors, particularly the availability of competent healthcare providers, most notably nurses and physicians. Healthcare providers' attitudes toward PC play a crucial role in determining how and when these services are delivered (8). Their attitudes may be relevant to symptom management, communication about end-of-life care, and referral to PC services (1). Understanding the factors underlying nurses' and physicians' attitudes toward PC could help healthcare organizations recognize context-specific educational and organizational priorities and guide strategies for incorporating PC services into routine care (9, 10).

Research on knowledge and attitudes toward PC in Oman has largely been limited to tertiary hospitals and academic settings (7, 11), restricting the generalizability of existing evidence across the country's diverse healthcare settings. Moreover, only a limited number of studies in Oman have concurrently investigated the associations of healthcare providers' knowledge, professional role, educational background, and demographic characteristics with their attitudes toward palliative care. Consequently, policymakers and healthcare educators have limited evidence to guide strategies aimed at improving healthcare providers' readiness to deliver PC, particularly among nurses and physicians working outside major tertiary centers. Evidence from previous research indicates that healthcare professionals' knowledge and attitudes are relevant to the

implementation of PC. In Oman, however, existing studies have identified continuing gaps in professionals' knowledge of PC, alongside variability in their attitudes toward its provision (7, 11, 12).

Research on nurses' and physicians' knowledge of and attitudes toward PC in secondary healthcare settings has received limited attention, with previous studies focusing primarily on nursing students or healthcare professionals working in tertiary hospitals. Secondary hospitals play a pivotal role in improving access to PC services by bridging primary healthcare centers and tertiary hospitals, where most patients requiring specialist PC are managed. As an essential component of the healthcare referral system, secondary hospitals have the capacity to provide intermediate-level PC by stabilizing symptoms, delivering routine symptom management, and coordinating ongoing care. When secondary hospitals have the capacity to provide these services, patients can receive timely care closer to home, reducing travel and treatment costs. In contrast, limited PC capacity at the secondary level often necessitates referral to tertiary centers, increasing out-of-pocket expenses, prolonging waiting times, and placing additional pressure on specialist services. Strengthening PC capacity in secondary hospitals can therefore improve continuity of care, reduce unnecessary referrals, and enhance the overall efficiency and equity of the healthcare system (6).

Closing this gap could contribute to higher-quality patient care, enhance healthcare professionals' readiness to deliver PC, and facilitate the incorporation of PC into Oman's healthcare system. Conceptually, the present study was informed by the Knowledge–Attitude–Practice (KAP) framework, which conceptualizes knowledge, attitudes, and practices as interrelated components of professional behavior. Because PC has not yet been fully integrated into the Omani healthcare system, assessing physicians' and nurses' PC-related practices was not considered sufficiently informative in the present context. Accordingly, recognizing the conceptual links among knowledge, attitudes, and practice, the present

study examined these two components by assessing whether knowledge of palliative care was independently associated with attitudes toward palliative care after adjustment for demographic, occupational, experiential, and training-related characteristics. The present study therefore sought to characterize nurses' and physicians' knowledge of and attitudes toward palliative care, assess the relationship between knowledge and attitudes, and identify demographic, occupational, experiential, and training-related factors independently associated with attitudes toward palliative care at Nizwa Hospital, a secondary referral hospital in Oman. The findings may help inform context-specific educational initiatives and institutional policies aimed at strengthening PC services and advancing the integration of PC into routine clinical practice (8).

Methods

Study design

A cross-sectional descriptive-correlational design was employed to characterize nurses' and physicians' knowledge of and attitudes toward palliative care, assess the relationship between these variables, and examine factors independently associated with attitudes toward palliative care. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparent and high-quality reporting of observational research (13).

Study setting

The study was conducted at Nizwa Hospital, a secondary referral hospital in the Al Dakhiliyah Governorate of the Sultanate of Oman. The hospital, which is affiliated with the Ministry of Health, has a capacity of 555 beds and provides a wide range of medical and surgical services, including emergency care, critical care, internal medicine, burn care, and outpatient services (MOH, 2025). Because healthcare providers at Nizwa Hospital routinely care for patients with life-threatening illnesses across multiple clinical settings, the hospital provided an appropriate setting for investigating

nurses' and physicians' knowledge of and attitudes toward PC.

Population

The target population consisted of all physicians and registered nurses employed at Nizwa Hospital during the study period (2025–2026). Eligible participants were physicians and registered nurses who had been employed at Nizwa Hospital for at least six months, were directly involved in patient care, were able to communicate fluently in English, and were willing to provide informed consent and participate in the study.

Sampling method and sample size

The target population comprised approximately 1,500 eligible registered nurses and physicians working at the study hospital. Participants were recruited using convenience sampling. During the study planning phase, the initial sample size for the survey component was estimated using the Raosoft sample size calculator, with a target of 300 participants.

By the end of the data-collection period, 280 eligible nurses and physicians had completed the questionnaire and were included in the study, representing 93.3% of the target sample. Because the questionnaire link was distributed through WhatsApp groups, the exact number of eligible individuals who received or viewed the invitation could not be determined. Therefore, a conventional response rate could not be calculated. Overall, 280 completed questionnaires were obtained from an estimated eligible population of approximately 1,500, corresponding to a participation proportion of 18.7%.

After data collection was completed, a supplementary, model-specific assessment was conducted to evaluate the adequacy of the sample size for the regression analysis. This assessment was not used to determine the initial sample size or to determine when recruitment would be stopped. The calculation was based on the overall test of a multiple linear regression model with a fixed model and R^2 deviation from zero, using the computational approach implemented in G*Power. With 17 variables

entered into the model after coding, excluding the intercept, an assumed effect size of 0.15, a significance level of 0.05, and 80% statistical power, the calculated minimum sample size was 146 participants. The regression analysis was performed using complete data from 279 participants, exceeding this requirement. A sensitivity analysis further indicated that, with this sample size, an effect size of approximately 0.0744 could be detected for the overall model test with 80% power. This assessment was limited to the overall model test under the specified assumptions and should not be interpreted as demonstrating sufficient power to detect small associations for individual predictors or to compare subgroups.

Data collection tool

Data were collected using the Health Care Providers' Knowledge and Attitude of PC Questionnaire, a standardized instrument developed and psychometrically validated by Ashrafizadeh et al. (2022) in Iran (8). Before data collection commenced, authorization to use the English version of the questionnaire was obtained from its original developer. The English version of the questionnaire was used in the present study because English is commonly used as a working language among nurses and physicians at the study hospital. An Arabic version of the questionnaire was not provided to participants. The clarity and comprehensibility of the English version were also assessed during the pilot study.

The questionnaire comprises three sections:

Part A: Demographic and professional characteristics

This section gathered information on participants' demographic and professional characteristics, including age, sex, educational level, professional role, clinical department, years of work experience, previous palliative care experience (defined as experience caring for patients approaching the end of life), palliative care training, pain-management training, and perceived need for formal palliative care training.

Part B: Health care providers' knowledge of PC questionnaire

This section consists of 30 true/false items organized into four subscales: psychological symptom management, pain management, physical symptom management, and general concepts of PC. Each correct response is scored as one point, yielding a total possible score ranging from 0 to 30, with higher scores indicating greater knowledge of PC.

Part C: Health care providers' attitude toward PC questionnaire

This section consists of 37 items organized into four subscales: patient autonomy, family involvement, end-of-life care, and principles of PC. Responses are rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating more positive attitudes toward PC.

Before data collection for the main study, the questionnaire was pretested with 10 eligible nurses and physicians. These participants were not included in the final study sample. The pretest was conducted to qualitatively assess the clarity and comprehensibility of the items, their cultural appropriateness, and the feasibility of administering the questionnaire, including the time required for completion. Participants were asked to identify any items that were unclear or culturally inappropriate. No major issues were identified; therefore, no changes were made to the questionnaire. This assessment was not intended to constitute a formal evaluation of content validity.

The 30-item knowledge scale demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.71$), whereas the 37-item attitude scale demonstrated good internal consistency (Cronbach's $\alpha = 0.84$).

Data collection procedure

To facilitate participation while maintaining confidentiality, data were collected using a secure online survey. The questionnaire was created using Google Forms and hosted on a password-protected platform. Access to the

survey was restricted to eligible participants through an invitation link distributed via the hospital's internal email system and professional WhatsApp groups.

Eligible nurses and physicians were identified in collaboration with department heads and the hospital's Human Resources Department. Eligible healthcare providers received an invitation email from the researcher that included a brief explanation of the study purpose and procedures, a participant information sheet describing the study objectives, confidentiality, anonymity, and the voluntary nature of participation, as well as an electronic informed consent form.

Before accessing the questionnaire, participants reviewed the study information and provided electronic informed consent by selecting the statement "I agree to participate." For healthcare providers who preferred to participate in person, an identical paper-based version of the questionnaire was distributed and collected by the researcher.

After providing informed consent, participants completed the Health Care Providers' Knowledge and Attitude of PC Questionnaire, which required approximately 15–20 minutes to complete. To maintain data integrity, Google Forms was configured to prevent duplicate submissions from the same respondent. Data collection remained open for two months. During this period, weekly reminder messages were sent to encourage participation, and the researcher conducted regular visits to the hospital to facilitate recruitment and maximize the response rate.

Data analysis

Quantitative data were analyzed using IBM SPSS Statistics version 26. Participants' demographic and professional characteristics, along with their knowledge and attitude scores, were summarized using means, standard deviations, frequencies, and percentages. Descriptive and bivariate analyses were conducted using data from all 280 participants, whereas the regression analysis was based on 279 complete cases after one participant with a missing value was excluded. No missing data were imputed.

The distributions of the knowledge and attitude scores were evaluated using the Kolmogorov–Smirnov and Shapiro–Wilk tests. As neither score was normally distributed, nonparametric tests were used for the bivariate analyses. The correlation between PC knowledge and attitudes toward PC was assessed using Spearman's rank correlation coefficient. Cohen's (1992) guidelines, with absolute correlation values of 0.10, 0.30, and 0.50 corresponding approximately to small, medium, and large effects, respectively, were used to interpret the magnitude of Spearman's correlation coefficient (14).

The Mann–Whitney U test was used for comparisons between two independent groups, whereas the Kruskal–Wallis test was used for comparisons involving more than two independent groups. When the Kruskal–Wallis test was statistically significant, pairwise comparisons were conducted using the Mann–Whitney U test with Bonferroni adjustment.

Hierarchical multiple linear regression was conducted to identify factors independently associated with total attitude scores toward PC. The sequence of variable entry was specified a priori based on the study's conceptual framework. Age, sex, years of work experience, clinical department, and profession were entered in Block 1. Block 2 included previous PC experience, PC training, pain-management training, and perceived need for formal PC training. Knowledge score was entered in Block 3 to determine the additional variance explained. Age was entered as an ordinal variable representing four age groups, while the remaining categorical variables were dummy-coded. The reference categories were nurses for profession, less than 1 year for work experience, and the emergency department for clinical department. Educational level was excluded because of sparse categories and its close relationship with professional roles. R^2 , adjusted R^2 , change in R^2 , and F-change statistics were reported for each block.

Linearity, normality of residuals, and homoscedasticity were evaluated using residual plots. Independence of residuals was assessed using the Durbin–Watson statistic, and multicollinearity was examined using tolerance

and variance inflation factor values. Potential outliers and influential observations were assessed using standardized and studentized residuals, Cook's distance, leverage, and Mahalanobis distance. Where applicable, two-tailed tests were used, with statistical significance defined as $p < 0.05$.

Ethical considerations

Ethical approval for the study was obtained from the Research Committee of the College of Health Sciences, University of Nizwa (Ref: CHS/F/15/2025-26; Date: 22 October 2025), in addition to administrative approval from Nizwa Hospital. Permission to use the standardized Health Care Providers' Knowledge and Attitude of PC Questionnaire was obtained from its original developers. Eligible participants received information about the study purpose and procedures, and participation was voluntary. Informed consent was obtained before data collection. For participants completing the questionnaire online, electronic consent was obtained before access to the questionnaire, whereas written

consent was obtained from those participating through the paper-based format. Confidentiality and anonymity were protected through the use of identification codes rather than participants' names. All study data were securely stored on a password-protected computer accessible only to members of the research team. Participants were also informed that they could withdraw from the study at any point without consequences.

Results

Descriptive and bivariate analyses were conducted using data from all 280 participants. Because one participant had a missing value for a variable entered into the multivariable regression model, this participant was excluded from the regression analysis, which consequently included 279 complete cases. More than half of the participants were aged 31–40 years (55.7%). The majority were female (78.6%) and worked as nurses (89.6%). The remaining demographic and professional characteristics are presented in Table 1.

Table 1. Demographic and professional characteristics of participants (N = 280)

Variables	Category	n	%
Age (years)	20–30	82	29.3
	31–40	156	55.7
	41–50	37	13.2
	51–60	5	1.8
Sex	Female	220	78.6
	Male	60	21.4
Educational status	Diploma degree	95	33.9
	Bachelor's degree	160	57.1
	Master's degree	13	4.6
	Medical Doctor (MD)	4	1.4
	Fellowship	7	2.5
	PhD	1	0.4
Job title/Profession	Nurse	251	89.6
	Doctor	29	10.4
Years of work	Less than 1 year	25	8.9
	1–3 years	44	15.7
	4–5 years	21	7.5
	6–10 years	63	22.5
	More than 10 years	127	45.4
	Emergency department	18	6.4
Grouped department category	Outpatient / perioperative / support services (OPD, Surgical ward, OT, RMU, Nutrition and dietetics department, PSW, Breast clinic)	81	28.9
	Medical Ward, Psychiatry, Burns unit (Medical Ward, Psychiatry, Burns unit)	87	31.1
	Women's health (OBG, OBD, GYN)	11	3.9
	Pediatrics / specialized units (Pediatrics / NICU, CCU, ICU, Anesthesia)	83	29.6
	Yes	61	21.8
Experience in PC	No	219	78.2
Training in PC	Yes	86	30.7
	No	194	69.3
Training in pain management	Yes	167	59.6
	No	113	40.4
Need for formal education	Yes	254	90.7
	No	26	9.3

The mean total attitude score was 140.20 ± 13.47 (range, 85–179), within a theoretical range of 37–185. The mean total knowledge score was 18.60 ± 4.11 (range, 7–30), within a theoretical range of 0–30. Higher

scores indicated greater PC knowledge and more positive attitudes toward PC. Because the instruments did not provide validated cut-off points, scores were not categorized as low, moderate, or high (Table 2).

Table 2. Descriptive statistics of total and subscale scores

Variable	Mean	SD	Min	Max
Attitudes (total score)	140.20	13.47	85	179
Domain 1 (Attitude towards Principles of PC)	50.90	6.08	21	65
Domain 2 (Attitude towards Family Participation in PC)	24.40	3.48	6	30
Domain 3 (Attitude towards end-of-life care)	26.80	3.46	14	40
Domain 4 (Attitude towards Patient Autonomy)	34.74	4.43	17	45
Knowledge (total score)	18.60	4.11	7	30
Domain 1 (General concept)	3.05	1.31	0	5
Domain 2 (Pain management)	5.29	1.56	2	9
Domain 3 (Physical Symptom management)	6.05	1.99	2	10
Domain 4 (Psychological symptom management)	4.21	1.11	1	6

Spearman's rank-order correlation showed a statistically significant positive correlation between knowledge and attitudes toward PC ($r_s = 0.348$, $p < 0.001$). Higher knowledge scores were associated with more positive attitudes toward PC.

Mann-Whitney U tests showed no statistically significant differences in knowledge or attitude scores according to grouped job title, sex, previous experience in PC, previous PC training, or pain management training. Likewise, no significant difference in attitude scores was observed according to participants' perceived need for formal education. However,

participants who reported a need for formal education had significantly higher knowledge scores than those who did not ($U = 2020.0$, $Z = -3.274$, $p = 0.001$, $r = 0.196$).

Kruskal–Wallis tests showed no statistically significant differences in knowledge or attitude scores across age groups, educational status, or grouped clinical departments. However, a statistically significant difference in attitude scores was observed across years of work ($H = 12.295$, $df = 4$, $p = 0.015$, $\epsilon^2 = 0.030$), indicating a small effect size. No significant difference was found in knowledge scores across years of work (Table 3).

Table 3. Nonparametric group comparisons of knowledge and attitude scores by demographic and professional characteristics

Panel A: Mann–Whitney U test results for two-group variables					
Grouping variable	Outcome	U	Z	p-value	Effect size (r)
Job/ Profession	Attitudes	3067.0	-1.104	0.269	0.066
Job/ Profession	Knowledge	2891.5	-1.544	0.123	0.092
Sex	Attitudes	6502.5	-0.175	0.861	0.010
Sex	Knowledge	6599.5	-0.001	0.999	0.000
Experience in PC	Attitudes	6517.0	-0.291	0.771	0.017
Experience in PC	Knowledge	6633.5	-0.083	0.934	0.005
Training in PC	Attitudes	7735.0	-0.972	0.331	0.058
Training in PC	Knowledge	7119.5	-1.964	0.050	0.117
Training in pain management	Attitudes	8776.5	-0.992	0.321	0.059
Training in pain management	Knowledge	9203.0	-0.351	0.725	0.021
Need for formal education	Attitudes	2732.5	-1.449	0.147	0.087
Need for formal education	Knowledge	2020.0	-3.274	0.001	0.196
Panel B. Kruskal–Wallis test results for variables with more than two groups					
Grouping variable	Outcome	H	df	p-value	Effect size (ϵ^2)
Age	Attitudes	2.830	3	0.419	0.000
Age	Knowledge	1.701	3	0.637	0.000
Educational status	Attitudes	10.346	5	0.066	0.020
Educational status	Knowledge	4.786	5	0.443	0.000
Years of work	Attitudes	12.295	4	0.015	0.030
Years of work	Knowledge	2.087	4	0.720	0.000
Department	Attitudes	7.998	5	0.156	0.011
Department	Knowledge	5.945	5	0.312	0.003

Because the overall Kruskal–Wallis test for attitude scores across years of work was statistically significant, post hoc pairwise comparisons were conducted using Mann–Whitney U tests with Bonferroni correction ($\alpha=0.05/10=0.005$). After Bonferroni correction, the only statistically significant difference remained between participants with 6–10 years of work experience and those with less than one year of experience ($U=443.0$, $Z=-3.190$, $p=0.001$, $r=0.340$), indicating a moderate effect size. No other pairwise comparisons remained statistically significant after Bonferroni correction (Table 3). Data from 279 participants were included in the hierarchical multiple linear

regression analysis. The final model reached statistical significance ($F(17, 261)=4.089$, $p<0.001$) and accounted for 21.0% of the variance in attitude scores ($R^2=0.210$; adjusted $R^2=0.159$). The demographic and occupational variables entered in Block 1 accounted for 8.1% of the variance ($R^2=0.081$, $p=0.029$). Introducing PC experience- and training-related variables in Block 2 did not produce a statistically significant increase in the explained variance ($\Delta R^2=0.020$, $F\text{-change}=1.438$, $p=0.222$). The addition of the knowledge score in Block 3 accounted for a further 11.0% of the variance ($\Delta R^2=0.110$, $F\text{-change}=36.225$, $p<0.001$) (Table 4).

Table 4. Hierarchical Multiple Linear Regression Model Summary for Attitudes Toward PC

Model	Variables entered	R	R ²	Adjusted R ²	R ² change	F change	p for change
1	Demographic/occupational variables	0.285	0.081	0.040	0.081	1.953	0.029
2	+Experience/training variables	0.317	0.101	0.046	0.020	1.438	0.222
3	+ Knowledge	0.459	0.210	0.159	0.110	36.225	<0.001

The final model showed an independent association between higher knowledge scores and higher attitude scores ($B=1.158$, $\beta=0.353$, 95% CI: 0.779 to 1.537, $p<0.001$). Compared with participants who had less than 1 year of work experience, those with 6–10 years of experience had significantly lower attitude scores ($B=-6.330$, 95% CI: -12.626 to -0.033, $p=0.049$). Physicians had higher attitude scores than nurses ($B=6.302$, 95% CI: 0.577 to 12.026, $p=0.031$), while participants in the medical/surgical department group had higher scores than those in the emergency department

($B=6.856$, 95% CI: 0.355 to 13.357, $p=0.039$). No other variables showed a statistically significant association with attitude scores in the final model (Table 5). Examination of the residual plots indicated no major departures from normality, linearity, or homoscedasticity. The Durbin–Watson statistic was 1.791, with tolerance values ranging from 0.205 to 0.904 and VIF values from 1.107 to 4.881. Three observations had standardized residuals below -3, while the maximum Cook’s distance was 0.065.

Table 5. Final hierarchical multiple linear regression model examining factors independently associated with attitudes toward palliative care

Factor	B	SE	Beta	t	p-value	95% CI	Tolerance	VIF
Constant	114.831	7.901	—	14.534	<0.001	99.273 to 130.388	—	—
Age	-1.064	1.490	-0.055	-0.714	0.476	-3.999 to 1.870	0.512	1.953
Sex	-1.996	2.053	-0.061	-0.972	0.332	-6.040 to 2.047	0.771	1.298
Years of work: 1–3 years	-5.793	3.171	-0.157	-1.827	0.069	-12.037 to 0.450	0.411	2.435
Years of work: 4–5 years	-6.634	3.934	-0.127	-1.686	0.093	-14.381 to 1.114	0.533	1.878
Years of work: 6–10 years	-6.330	3.198	-0.197	-1.979	0.049	-12.626 to -0.033	0.307	3.258
Years of work: More than 10 years	-3.021	3.286	-0.112	-0.919	0.359	-9.491 to 3.450	0.205	4.881
Outpatient/perioperative/support services	5.311	3.348	0.179	1.586	0.114	-1.282 to 11.904	0.238	4.210
Medical/surgical department	6.856	3.302	0.236	2.076	0.039	0.355 to 13.357	0.234	4.265
Critical care department	3.729	3.715	0.095	1.004	0.316	-3.586 to 11.045	0.338	2.960
Women’s health department	-1.806	5.044	-0.026	-0.358	0.721	-11.738 to 8.126	0.569	1.757
Pediatric department	5.211	3.651	0.141	1.427	0.155	-1.979 to 12.401	0.310	3.228
Job/profession	6.302	2.907	0.141	2.168	0.031	0.577 to 12.026	0.719	1.391
Experience in PC	2.271	2.045	0.069	1.111	0.268	-1.756 to 6.299	0.777	1.287
Training in PC	-0.426	1.899	-0.015	-0.224	0.823	-4.165 to 3.314	0.718	1.393
Training in pain management	-0.760	1.639	-0.028	-0.464	0.643	-3.987 to 2.467	0.850	1.177
Need for formal education	-1.537	2.680	-0.033	-0.573	0.567	-6.814 to 3.741	0.904	1.107
Knowledge	1.158	0.192	0.353	6.019	<0.001	0.779 to 1.537	0.880	1.137

For the categorical variables, the reference categories were female sex, less than 1 year of work experience, the emergency department, and the nursing profession.

Discussion

The present study aimed to identify the factors independently associated with attitudes toward PC among healthcare providers, including nurses and physicians, working at Nizwa Hospital, a secondary referral hospital in Oman.

The findings indicate that healthcare providers at Nizwa Hospital demonstrated a moderate level of knowledge and generally positive attitudes toward PC. These findings are consistent with previous studies conducted in Oman and neighboring countries, reflecting a transitional phase in Middle Eastern healthcare systems in which PC is gaining increasing recognition but has not yet been fully integrated into routine healthcare services (11, 12). The generally positive attitudes observed in the present study suggest a degree of clinical readiness among healthcare providers; however, translating this readiness into routine practice will require continued educational initiatives together with broader organizational and system-level support. Participants demonstrated generally positive attitudes toward PC. This finding is consistent with previous studies conducted in comparable settings, including studies among Iranian nurses and physicians (1) and intensive care healthcare providers in Shanghai (15), both of which reported similarly moderate attitude levels.

Among the attitude domains, the Principles of PC subscale received the highest score, whereas the Family Participation in PC subscale received the lowest. Similar findings were reported by Khanali-Mojen et al. (2022), who also found that the Principles of PC subscale achieved the highest score, whereas the Family Participation subscale received the lowest (1). While participants expressed strong support for the principles of PC, their less positive attitudes toward family participation may reflect the complex sociocultural context of end-of-life decision-making in Arab societies. In Gulf Cooperation Council (GCC) countries, including Oman and Bahrain, families often play a central role in decisions regarding end-of-life care and may prefer to protect patients from receiving distressing prognostic information.

Consequently, healthcare providers may encounter ethical and communication challenges when balancing respect for patient autonomy with family-centred decision-making (16). Similarly, Xie et al. (2025) reported that community nurses in Shanghai recorded their lowest attitude scores for communication with dying patients, suggesting that communication about end-of-life care remains a common challenge across different healthcare settings (17).

Participants also demonstrated a moderate level of knowledge regarding PC. This finding is comparable to those reported among healthcare providers by Khanali-Mojen et al. (2022) and Hamdan et al. (2023) (1, 18), but more favorable than findings reported among Jordanian nurses (18), healthcare professionals in Syria (19), and intensive care providers in Shanghai (15), where lower levels of PC knowledge were observed. In the present study, participants achieved the highest scores in pain management and physical symptom management, whereas knowledge of the general concepts of PC received the lowest scores. This pattern is consistent with previous studies (1, 20). One possible explanation is that pain and symptom management are routinely incorporated into undergraduate nursing and medical education regardless of their specific association with PC, whereas the philosophy, scope, and principles of PC receive considerably less emphasis in many undergraduate curricula across the Middle East (1). In addition, the relatively higher performance in pain management may reflect the fact that 59.6% of participants had previously received pain management training.

Among the variables included in the final regression model, knowledge was most strongly associated with attitudes toward PC, independent of the other factors examined. Hierarchical multiple linear regression analysis demonstrated that knowledge explained an additional 11% of the variance in attitude scores beyond demographic, occupational, and training-related variables. This finding is consistent with those reported by Khanali-

Mojen et al. (2022) (1) and He et al. (2025)(15). Both of whom identified knowledge as an important determinant of healthcare providers' attitudes toward PC. Similarly, Younis et al. (2022) reported positive, albeit weak, correlations between palliative care knowledge and selected attitude domains, namely communication and the family as caregiver, among nursing students (20) (21). Masharipova et al. (2024), who also used hierarchical regression, reported low palliative care knowledge and predominantly neutral or negative attitudes toward caring for dying patients among primary care nurses (22), suggesting that knowledge gaps and less favorable attitudes may co-occur in settings where palliative care is not yet well established. Greater knowledge may enhance nurses' and Physicians' confidence in caring for patients with life-limiting illnesses, reduce uncertainty surrounding end-of-life care, and facilitate more effective communication with patients and their families.

The observed association between knowledge and attitudes highlights palliative care educational programs as a potential area for future research. However, the effectiveness of such programs in changing attitudes and improving clinical readiness should be evaluated in intervention studies. Given the cross-sectional nature of the study, the observed association between knowledge and attitudes should not be interpreted as causal. The findings indicate that higher knowledge was associated with more positive attitudes toward PC; however, they do not establish whether increasing knowledge would lead to changes in attitudes. Longitudinal and interventional studies are needed to determine the temporal direction of this association and to evaluate the effects of educational interventions on attitudes.

Years of work experience was the only demographic characteristic that remained significantly associated with attitudes toward PC. Participants with 6–10 years of work experience demonstrated significantly lower attitude scores than those with less than one year of work experience. This finding differs from those of several previous studies that reported more positive attitudes among healthcare

providers with greater professional experience. For example, Khanali-Mojen et al. (2022) found significantly higher attitude scores among older healthcare providers aged 41–60 years (1), whereas Adeyemi et al. (2023) reported that longer professional experience was associated with higher levels of both knowledge and more positive attitudes toward PC among emergency department healthcare providers (23).

One possible interpretation of this finding is that professionals with moderate levels of work experience may encounter greater occupational and emotional challenges. Previous studies, including Lazarus et al. (2025), have reported emotional distress and difficulties experienced by nurses when caring for dying patients (12). However, occupational stress, burnout, compassion fatigue, and emotional burden were not measured in the present study; therefore, their role in explaining the lower attitude scores observed among participants with 6–10 years of work experience cannot be established. The present data demonstrate only an adjusted statistical association between years of work experience and attitudes, and the proposed explanations should therefore be regarded as hypotheses for future research rather than interpretations supported by the current data. The final regression model also identified professional role as an independent factor associated with attitudes toward PC.

Participants in the grouped job/profession category demonstrated significantly higher attitude scores than those in the reference professional group. This finding is broadly consistent with previous studies. Granat et al. (2024) reported that physicians demonstrated significantly higher PC self-efficacy than nurses across multiple domains (24), whereas Ashrafizadeh et al. (2022) found that nurses expressed more sympathetic attitudes while physicians demonstrated greater knowledge of PC (8). Differences between professional groups may reflect variations in educational preparation, clinical responsibilities, decision-making authority, and the nature of patient contact. Physicians generally assume primary responsibility for diagnosis, treatment planning, and clinical decision-making, whereas nurses typically spend more time providing

direct bedside care and emotional support to patients and their families. These differences may partly account for the variation in attitudes observed across professional groups; however, the underlying reasons for these differences were not directly examined in this study.

The medical/surgical department category was also associated with significantly higher attitude scores than the reference department group. This finding is consistent with that of Khanali-Mojen et al. (2022), who reported more positive attitudes toward PC among healthcare providers working in coronary care units (1). Healthcare providers working in medical and surgical departments demonstrated more favorable attitudes toward PC. One possible explanation is their greater exposure to patients with advanced, life-limiting chronic illnesses, which may provide more opportunities to integrate symptom management and comfort-focused care into routine clinical practice. Greater clinical exposure to symptom management and end-of-life care in these settings may contribute to greater familiarity with the principles of PC and more positive attitudes toward its delivery. Importantly, the final regression model showed no statistically significant associations between attitudes toward PC and most demographic and professional characteristics, including sex, previous PC experience, prior PC training, pain-management training, and perceived need for formal PC education.

The absence of a significant association between sex and attitudes contrasts with the findings of Khanali-Mojen et al. (2022), who reported that female healthcare providers had significantly higher knowledge and more positive attitudes toward PC (1).

Similarly, the lack of a significant association between previous PC training and attitudes contrasts with the findings of Martín-Martín et al. (2021), who reported that continuous training was a significant predictor of higher PC knowledge (25). The absence of significant effects for these variables in the present study may be partly explained by the relative homogeneity of the study sample, which consisted predominantly of female participants and included relatively few healthcare providers

with previous PC training. Such limited variability may have reduced the statistical power to detect significant associations. In addition, the overwhelmingly high proportion of participants reporting a need for formal PC education suggests that this need was widely shared across demographic and professional groups, potentially diminishing differences associated with individual characteristics.

The consistently high demand for formal PC education across demographic and professional groups highlights an important gap in PC preparation within the healthcare system. The relative homogeneity of this educational need may also help explain why several demographic variables were not significantly associated with attitudes toward PC, suggesting that the perceived need for structured education is widely shared among healthcare providers regardless of their background. Inadequate formal PC education may also contribute to persistent misconceptions about PC reported in the region. For example, a study conducted in Syria found that PC was frequently misunderstood as being synonymous with discontinuing active treatment or patient abandonment, misconceptions that may delay timely referral to PC services.

One of the most notable findings of the present study was that 90.7% of participants expressed a need for formal education in PC. This high level of perceived educational need was observed across professional roles, years of work experience, and previous training categories, suggesting a widespread need for structured educational programs. Similar findings have been reported by Khanali-Mojen et al. (2022), who found that 89.7% of Iranian physicians and nurses identified formal PC education as a priority (1). Likewise, Biswas et al. (2021) reported that 89% of physicians in Bangladesh continued to hold misconceptions regarding PC despite demonstrating moderate knowledge levels (26), while Jawish et al. (2023) found that only 5.3% of healthcare providers in Syria correctly answered questions regarding opioid use (19). Collectively, these findings suggest that moderate overall knowledge scores do not necessarily indicate a comprehensive understanding of PC and may

conceal important misconceptions that could hinder timely referral to, and effective delivery of, PC. The high level of interest in formal PC education identified among healthcare providers at Nizwa Hospital therefore represents an important opportunity for both institutional and national educational initiatives.

Another important finding was that 78.2% of participants reported no previous experience in PC and 69.3% had not received previous PC training. These findings further highlight the limited integration of PC within secondary healthcare settings in Oman. Similar observations have been reported in previous studies, suggesting that PC services in Oman remain concentrated primarily in tertiary care settings. Al-Hasni et al. (2025), for example, reported higher levels of PC knowledge among oncology and specialist PC nurses, attributing these findings to greater clinical exposure (27). The contrast between these specialist nurses and the broader hospital workforce in the present study further underscores the importance of clinical exposure in strengthening PC knowledge and suggests that secondary hospitals, where opportunities for clinical exposure are often more limited, could benefit from targeted educational and clinical initiatives.

The final hierarchical regression model accounted for 21.0% of the variance in attitudes toward PC ($R^2 = 0.210$), whereas the adjusted R^2 was 0.159. Based on the unadjusted R^2 , approximately 79.0% of the variance in attitude scores was not explained by the model. This difference may partly reflect the broader range of demographic, occupational, experiential, and training-related variables included in the present model, whereas the model reported by Khanali-Mojen et al. primarily examined knowledge as an explanatory variable (1). The hierarchical approach did not, in itself, increase the final R^2 ; rather, it allowed the incremental contribution of knowledge to be evaluated after accounting for the variables entered in the preceding blocks. Knowledge accounted for an additional 11.0% of the variance in attitude scores ($\Delta R^2 = 0.110$). Differences in sample characteristics, healthcare settings, and model specifications may also have contributed to the variation in explained

variance. This comparison should therefore be interpreted cautiously. The substantial proportion of unexplained variance suggests that attitudes toward PC among nurses and physicians may also be associated with contextual factors that were not examined in the present study. Previous research has identified cultural values, religious beliefs, family-centered decision-making, and concerns regarding opioid use as potential influences on palliative care practice in Gulf Cooperation Council countries (16, 28). Future studies should examine these factors to provide a more comprehensive understanding of attitudes toward PC and to support culturally appropriate PC education and practice in the region.

The present study has several limitations. First, the study was conducted at a single secondary referral hospital in Oman, which limits the generalizability of the findings to other hospitals, healthcare settings, and regions of the country. Second, the use of convenience sampling and distribution of the questionnaire link through WhatsApp may have introduced selection and self-selection bias, as nurses and physicians with greater access to or engagement with the platform, or with greater interest in PC, may have been more likely to participate. In addition, because the exact number of eligible individuals who received or viewed the questionnaire invitation could not be determined, a conventional response rate could not be calculated, and the possibility of non-response bias cannot be excluded. Third, the final sample consisted of 280 participants, which was 20 participants, or 6.7%, below the calculated minimum sample size of 300. Although the model-specific power analysis indicated adequate power for the overall regression model under the specified assumptions, this shortfall may have reduced statistical power and estimation precision to some extent, particularly for detecting small associations and conducting subgroup comparisons. Fourth, the sample was predominantly composed of nurses and women. The relatively small number of physicians limits meaningful comparisons between the two professional groups and reduces the precision of profession-related estimates. Consequently, the

findings may reflect the perspectives of nurses to a greater extent, and their generalizability to physicians should be interpreted cautiously. It should also be noted that the composition of the hospital workforce is substantially different by profession and sex, with nurses outnumbering physicians and female staff outnumbering male staff. Fifth, data were collected using a self-administered questionnaire. Therefore, responses concerning attitudes, previous experience, and training may have been affected by response or social desirability bias and may not necessarily reflect participants' actual practices in the clinical setting.

Conclusion

In this cross-sectional study of nurses and physicians at Nizwa Hospital, the mean knowledge score regarding palliative care was 18.60, with a possible range of 0–30, and the mean attitude score was 140.20, with a possible range of 37–185. A statistically significant, positive, moderate correlation was observed between knowledge and attitudes, and the association between knowledge and attitudes remained after adjustment for the variables examined. Certain categories of work experience and clinical department, as well as professional group, were also independently associated with attitude scores. Overall, the final model accounted for 21.0% of the variance in attitude scores, with an adjusted R^2 of 0.159; thus, most of the variability in attitude scores remained unexplained by the variables included in the model.

The reported need for formal palliative care training among 90.7% of participants may be considered when identifying educational priorities at the study hospital. However, these findings alone do not demonstrate that training or increased knowledge leads to changes in attitudes or improvements in clinical performance. Longitudinal studies are needed to examine the temporal sequence between knowledge and attitudes, and intervention studies are needed to evaluate the effectiveness of educational programs. The generalizability of the findings should also be considered in light of the convenience sampling approach and the single-hospital setting.

The findings also highlighted substantial educational needs among healthcare providers. Most participants reported no previous experience in PC or formal PC training, and the majority expressed a need for formal education in this field. These findings highlight important opportunities to strengthen PC education within secondary healthcare settings.

Taken together, these findings support the importance of strengthening PC education through structured education and training programs. In the short term, continuing professional development programs, workshops, seminars, and practical clinical training may help improve nurses' and physicians' knowledge and preparedness for PC. Over the longer term, integrating PC into undergraduate nursing and medical curricula may contribute to improving the quality of palliative and end-of-life care.

Acknowledgments

The authors would like to express sincere gratitude to the University of Nizwa, School of Nursing, College of Health Sciences, for its academic and administrative support throughout this graduation research project. The authors also thank the administration of Nizwa Hospital and the relevant departments for facilitating data collection. Finally, sincere appreciation is given to all nurses and physicians who voluntarily participated in this study and contributed their time and responses.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

No funding grants were received for this study.

References

1. Khanali-Mojen L, Akbari ME, Ashrafizadeh H, Barasteh S, Beiranvand S, Eshaghian-Dorcheh A, et al. Caregivers' Knowledge of and Attitude towards Palliative Care in Iran. *Asian Pac J Cancer Prev*. 2022;23(11):3743-51.

2. World Health Organization (WHO). Integrating palliative care and symptom relief into primary health care: A WHO guide. Geneva: WHO Press. 2020 [Available from: Retrieved from <https://www.who.int/news-room/fact-sheets/detail/palliative-care> (2020, accessed 21 December 2025).
3. Krakauer EL, Kwete XJ, Rassouli M, Arreola-Ornelas H, Ashrafizadeh H, Bhadelia A, et al. Palliative care need in the Eastern Mediterranean Region and human resource requirements for effective response. *PLOS Global Public Health*. 2023;3(11):e0001980.
4. International Agency for Research on Cancer. Global Cancer Observatory: Cancer Today—Oman fact sheet. World Health Organization. 2026 [Available from: <https://gco.iarc.who.int/today/en/fact-sheets-populations/512/oman>.
5. Sánchez-Cárdenas MA, Garralda E, Steijn DV, Pourghazian N, Slama S, Bouësseau MC, et al. Development of an atlas of palliative care in the Eastern Mediterranean Region through a stakeholder participative process. *East Mediterr Health J*. 2022;27(8):614-21.
6. Gafer N, Tripodoro V, Suarez D, Montero Calero Á, Garralda-Domezain E, Bastos F, et al. Atlas of Palliative Care Developments in the Eastern Mediterranean Countries 2025.
7. Al-Azri M, Al-Saidi S, Al-Musilhi J, Al-Mandhari Z, Panchatcharam SM. Knowledge and Experiences of Final Year Medical and Nursing Students with Regard to Palliative Care at Government University in Oman: A Questionnaire-Based Study. *Journal of cancer education: the official journal of the American Association for Cancer Education*. 2021;36(4):747-54.
8. Ashrafizadeh H, Mojen L, Barasteh S, Akbari M, Beiranvand S, Farahani A, et al. Factors Related to Nurses and Physicians' Knowledge and Attitudes Towards Palliative Care. *Int J Cancer Manag*. 2022;15.
9. World Health Organization. Integrating palliative care and symptom relief into primary health care: A WHO guide for planners, implementers and managers. Geneva: World Health Organization. WHO publication 2018.
10. World Health Organization Regional Office for the Eastern Mediterranean. Summary report on the expert meeting to develop a regional roadmap for palliative care in the Eastern Mediterranean Region. Cairo: WHO Regional Office for the Eastern Mediterranean. WHO EMRO report. 2019.
11. Muliira JK, Lazarus ER, Mirafuentes EC. A Countrywide Assessment of Omani Undergraduate Nursing Students' Palliative Care Knowledge and Attitudes Towards End-of-Life Care. *J Cancer Educ*. 2023;38(3):781-8.
12. Lazarus ER, Muliira JK, Al-Zaabi O, Al-Khabori MK, Al Adawi MM, Al Mamari Q. Palliative care knowledge and attitudes towards end-of-life care of nurses in tertiary hospitals. *Curationis*. 2025;48(1):e1-e9.
13. Cuschieri S. The STROBE guidelines. *Saudi J Anaesth*. 2019;13(Suppl 1):S31-S4.
14. Cohen J. A power primer. *Psychol Bull*. 1992;112(1):155-60.
15. He X, Cai H, Zhang J, Chen W, Zhu B. Knowledge, Attitude, and Practice of Palliative Care Among Physicians and Nurses in Intensive Care Units in Shanghai, China. *J Multidiscip Healthc*. 2025;18:2441-9.
16. Weng XR, Nakdali R, Almoosawi B, Al Saeed M, Maiser S, Al Banna M. Health Care Providers' Attitudes and Beliefs on Providing Palliative Care to Patients in Bahrain: Findings From a Qualitative Study. *J Pain Symptom Manage*. 2021;62(1):98-106.e1.
17. Xie Y, Cai T, Zhu A, Zhang X, Xu C, Song L. Attitudes toward caring for terminally ill patients among community nurses in Shanghai: A cross-sectional study. *Int J Nurs Sci*. 2025;12(4):401-7.
18. Hamdan KM, Al-Bashaireh AM, Al-Dalahmeh M, Saifan AR, Albqoor MA, Shaheen AM. Palliative care knowledge and attitudes toward end-of-life care among intensive care unit nurses in Jordan. *Acute Crit Care*. 2023;38(4):469-78.
19. Jawish N, Bohsas H, Swed S, Alibrahim H, Sawaf B, Khair Eldien Jabban Y, et al. Syrian Health Providers' Knowledge of Palliative Care: An Online Cross-Sectional Study in Syria. *Int J Med Stud*. 2023;10:S166.
20. AlDrees A, AlSalem S, AlDrees O, AlHaddad A. Current Knowledge, Attitudes, and Practices of Home Health Care Among Primary Health Care Physicians in Al-Ahsa, Saudi Arabia: A Cross-Sectional Study. *Cureus*. 2025;17(9):e91598.
21. Wejdan Y, Hamza A, Ruqayya Z, Ayman H-M. Status and correlates of attitudes towards end-of-life care among nursing students. *Nurs Pract Today*. 2022;9(2).
22. Alexandra M, Nassikhat N, Gulmira D. Primary care nurses' knowledge of palliative care, attitude towards caring for dying patients, and their relationship with evidence-based practice. *Nurs Pract Today*. 2024;11(2).

23. Adeyemi OJ, Bouillon-Minois JB, Siman N, Cuthel AM, Goldfeld KS, Grudzen CR. Knowledge and Attitudes Toward Hospice and Palliative Care: Instrument Validation Among Emergency Providers. *Am J Hosp Palliat Care*. 2023;40(3):280-90.
24. Granat L, Andersson S, Åberg D, Hadziabdic E, Sandgren A. Evaluation of the Swedish Self-Efficacy in Palliative Care Scale and exploration of nurses' and physicians' self-efficacy in Swedish hospitals: A cross-sectional study. *Scand J Caring Sci*. 2024;38(3):568-78.
25. Martín-Martín J, López-García M, Medina-Abellán MD, Beltrán-Aroca CM, Martín-de-Las-Heras S, Rubio L, et al. Physicians' and Nurses' Knowledge in Palliative Care: Multidimensional Regression Models. *Int J Environ Res Public Health*. 2021;18(9).
26. Biswas J, Banik PC, Ahmad N. Physicians' knowledge about palliative care in Bangladesh: A cross-sectional study using digital social media platforms. *PLoS One*. 2021;16(9):e0256927.
27. Hasni NA, Yahyaei AA, Omari OA, Muliira J, Lazarus ER, Riyami NA, et al. Oncology nurses at the frontline of palliative care: knowledge, attitudes, and factors associated with palliative care practice. *BMC Health Serv Res*. 2025;25(1):1634.
28. Arisanti N, Sasongko EPS, Pandia V, Hilmanto D. Implementation of palliative care for patients with terminal diseases from the viewpoint of healthcare personnel. *BMC Res Notes*. 2019;12(1):217.