

Original Article

Relationship Between Nurses' Knowledge and Attitudes and Their Behavioral Intentions Regarding Artificial Nutrition and Hydration in Terminal Cancer Care

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ABSTRACT

Background: Artificial nutrition and hydration (ANH) in terminal cancer care presents complex clinical and ethical challenges. Nurses' knowledge and attitudes may be associated with their behavioral intentions concerning ANH-related decisions. **Objective:** To assess nurses' knowledge, attitudes, and behavioral intentions regarding ANH in terminal cancer care and examine relationships among these constructs. **Methods:** A quantitative, cross-sectional study was conducted among 235 registered nurses at Jinnah Hospital, Lahore, Pakistan. Data were collected using a structured questionnaire assessing demographic characteristics, ANH-related knowledge, attitudes, and behavioral intentions. Descriptive statistics, Pearson correlation analysis, and professional-characteristic comparisons were performed. Statistical significance was set at $p < 0.05$. **Results:** Moderate knowledge was observed by 48.1% of nurses, while 33.6% demonstrated good knowledge. Neutral attitudes were reported by 44.7%, whereas 38.7% demonstrated positive attitudes. Moderate behavioral intentions were observed in 46.8% of participants. Significant positive correlations were found between knowledge and attitudes ($r = 0.428$), knowledge and behavioral intentions ($r = 0.381$), and attitudes and behavioral intentions ($r = 0.547$), all $p < 0.001$. Nurses with previous palliative-care training had higher mean scores across all three constructs. **Conclusion:** Knowledge, attitudes, and behavioral intentions were positively associated, with the strongest relationship observed between attitudes and behavioral intentions. The findings suggest potential areas for targeted ANH-related nursing education and further research. **Keywords:** Artificial nutrition and hydration; Behavioral intentions; Knowledge; Attitudes; Nurses; Terminal cancer; Palliative care.

INTRODUCTION

Cancer represents a major global public-health challenge, contributing substantially to morbidity, mortality, healthcare utilization, and the growing demand for supportive and palliative-care services. According to the International Agency for Research on Cancer, approximately 20 million new cancer cases and 9.7 million cancer-related deaths occurred worldwide in 2022, with the annual number of new cases projected to reach approximately 35 million by 2050 (1). Although advances in cancer diagnosis and treatment have improved outcomes for many

patients, individuals with advanced and incurable malignancies frequently experience progressive physical deterioration, psychological distress, functional limitations, and complex end-of-life care needs. Palliative care is essential for addressing these challenges through symptom management, psychosocial support, communication, and the preservation of patient comfort and dignity. The World Health Organization estimates that approximately 56.8 million people require palliative care annually, while access remains inadequate, particularly in low- and middle-income countries (2). These circumstances emphasize the importance of preparing healthcare professionals, especially nurses, to participate effectively in the clinical and ethical decisions associated with terminal cancer care.

Patients approaching the terminal phase of cancer commonly experience anorexia, dysphagia, progressive weakness, cancer cachexia, reduced oral intake, and alterations in metabolism and hydration status. These manifestations frequently raise concerns among patients, families, and healthcare professionals regarding the adequacy of nutritional and fluid support. Artificial nutrition and hydration (ANH) refers to the medically assisted provision of nutrients or fluids through enteral, parenteral, or other clinically appropriate routes when normal oral intake is insufficient or impossible. Although ANH may provide meaningful benefits in selected clinical circumstances, its effectiveness and appropriateness depend on the patient's prognosis, physiological condition, treatment goals, preferences, and anticipated benefits and burdens. The European Society for Clinical Nutrition and Metabolism emphasizes that nutritional care in cancer should be individualized according to disease stage, nutritional needs, expected survival, and the likelihood of achieving meaningful clinical benefit (3). Similarly, the European Society for Medical Oncology recommends that care during the final phase of life should prioritize comfort, symptom relief, and patient preferences rather than the routine initiation or continuation of potentially burdensome interventions (4).

Decisions regarding ANH become particularly challenging when patients approach the final days or weeks of life because the potential benefits of medically assisted feeding and hydration may diminish as the underlying disease progresses. In this situation, additional nutritional support may not reverse cancer-related metabolic disturbances, while invasive feeding procedures and clinically assisted hydration may impose treatment-related burdens. These can include infection, fluid overload, edema, increased respiratory secretions, and discomfort. Nevertheless, withholding or withdrawing ANH is not appropriate solely because a patient has an incurable diagnosis; decisions must consider the individual's clinical circumstances, preferences, prognosis, and goals of care. Evidence concerning the symptomatic benefits of clinically assisted hydration near death remains uncertain, reinforcing the importance of individualized clinical assessment and appropriate comfort measures (3,4). Furthermore, food and fluids may carry considerable emotional, cultural, and symbolic meaning for patients and families, who may associate continued nutritional support with care, hope, and the preservation of life. A systematic review by Shih et al. highlighted differences in the perspectives of patients, families, and healthcare professionals concerning ANH decisions, particularly regarding perceived benefits, treatment burdens, quality of life, and end-of-life preferences (5). Consequently, ANH-related decisions require more than physiological assessment and must incorporate ethical reasoning, effective communication, and shared decision-making.

Nurses have an important role in terminal cancer care because of their continuous involvement in patient assessment, symptom monitoring, treatment administration, family communication, and multidisciplinary care coordination. Their responsibilities may include identifying changes in nutritional and hydration status, recognizing complications associated with ANH, communicating patient preferences, and participating in discussions concerning the initiation, continuation, withholding, or withdrawal of treatment. Appropriate participation in these processes requires adequate knowledge of ANH indications, limitations, potential complications, cancer cachexia, and ethical principles, including autonomy, beneficence, non-maleficence, and respect for patient dignity. However, knowledge alone may not determine how nurses respond to complex clinical situations. Attitudes toward the perceived benefits and burdens of ANH, professional responsibilities, family expectations, and institutional practices may also influence nurses' willingness to participate in decision-making. A Taiwanese study involving 197 nurses demonstrated that knowledge, attitudes, and behavioral intentions concerning ANH were distinct but interrelated aspects of end-of-life nursing care. The study also identified the influence of physicians, senior nurses, professional relationships, and communication-related difficulties on nurses' ANH-related intentions (6).

Behavioral intention is particularly relevant because it reflects an individual's stated willingness or readiness to undertake a particular action under specified circumstances. In terminal cancer care, nurses may intend to support

clinically beneficial ANH, raise concerns about potentially non-beneficial treatment, respect informed patient preferences, seek specialist guidance, or participate in multidisciplinary discussions. Such intentions may be influenced by personal attitudes, perceived professional responsibilities, social expectations, and opportunities to participate in clinical decisions. The Theory of Planned Behavior provides a conceptual perspective for understanding the relationship between attitudes and intentions, although the present study does not directly assess all of the theory's components. Previous research has demonstrated that nurses may recognize the limitations of ANH while continuing to express intentions to provide or support it because of professional, interpersonal, and organizational considerations (6). Research among oncology and palliative-care nurses in Italy has also examined ANH-specific knowledge and attitudes, supporting the importance of studying these constructs within the broader context of end-of-life nursing practice (7). These findings indicate that behavioral intention should be investigated alongside knowledge and attitudes rather than assumed to follow automatically from clinical understanding.

International evidence further suggests that general palliative-care knowledge does not necessarily correspond to adequate understanding of ANH-specific clinical and ethical considerations. Coetzee et al. examined healthcare professionals' knowledge, attitudes, and practices regarding ANH for patients with terminal cancer in South Africa and identified important differences between general palliative-care understanding and ANH-related knowledge. Their findings also highlighted complexities in professional attitudes, including recognition of potential treatment burdens alongside perceived emotional or psychological benefits associated with nutritional support (8). Similarly, research examining nurses' palliative-care knowledge and attitudes has identified the relevance of educational preparation and professional characteristics to end-of-life care (9). Collectively, these studies suggest that ANH-related preparedness is multidimensional and that nurses' responses may vary according to clinical knowledge, professional experience, beliefs, and the healthcare environment. However, findings from other countries cannot automatically be generalized to Pakistani nursing practice because healthcare resources, clinical roles, professional hierarchies, cultural expectations, and access to palliative-care education may differ.

In Pakistan, research concerning nurses' preparedness for palliative and end-of-life care indicates continuing variation in professional knowledge and attitudes. A study conducted in a private-sector hospital in Lahore reported deficiencies in nurses' palliative-care knowledge and attitudes, highlighting the need for greater educational attention to end-of-life nursing competencies (10). Similarly, research involving nurses in tertiary-care hospitals in Peshawar documented variation in their knowledge regarding palliative care (11). Khan et al. also investigated nurses' knowledge and attitudes toward caring for dying patients, contributing evidence concerning professional preparedness for palliative nursing practice in Pakistan (12). Additional research from Lahore has examined nurses' knowledge and attitudes concerning palliative care, further demonstrating the relevance of this topic within tertiary healthcare institutions (13). More recent investigations in Peshawar and South Punjab have also explored nursing knowledge and attitudes in palliative and critical-care environments, indicating that preparedness may differ across clinical settings and professional groups (14,15). Furthermore, research addressing nurses' attitudes and self-efficacy in palliative-care delivery has emphasized the importance of psychosocial and professional dimensions of nursing care (16). Although these studies contribute useful information, their primary emphasis has generally been on overall palliative-care knowledge, attitudes, or confidence rather than the specific clinical and ethical challenges surrounding ANH decisions in terminal cancer.

Despite the availability of international research on ANH and Pakistani studies addressing general palliative-care preparedness, context-specific evidence concerning the relationships among nurses' ANH-related knowledge, attitudes, and behavioral intentions remains limited. Existing Pakistani investigations do not adequately establish how nurses understand the indications and limitations of artificial feeding and hydration, how they evaluate the benefits and burdens of these interventions, or how these evaluations relate to their stated willingness to participate in ANH-related decisions. This distinction is important because nurses may possess general knowledge of palliative-care principles while experiencing uncertainty about whether ANH should be initiated, continued, withheld, or withdrawn in particular clinical circumstances. Moreover, experience caring for terminally ill patients may not necessarily correspond to formal preparation in ANH-specific decision-making. Understanding these relationships is therefore relevant to identifying potential educational needs, informing multidisciplinary communication, and supporting the development of context-appropriate nursing guidance. However, the presence of statistical associations alone cannot establish that knowledge or attitudes directly determine behavioral intentions or actual clinical practice.

The present study focuses on registered nurses involved in direct patient care at Jinnah Hospital, Lahore, and examines their knowledge, attitudes, and behavioral intentions concerning artificial nutrition and hydration in terminal cancer care. By assessing these three constructs together and examining their relationships, the study seeks to contribute context-specific evidence regarding nurses' reported preparedness to participate in ANH-related clinical and ethical discussions. The findings may help identify areas requiring further educational attention and provide a foundation for subsequent investigations involving nursing practices, institutional influences, and end-of-life decision-making. Therefore, the objective of this quantitative cross-sectional study was to assess nurses' knowledge, attitudes, and behavioral intentions regarding artificial nutrition and hydration in terminal cancer care and to examine the relationships among these constructs. The study also explored whether these scores differed according to selected professional characteristics, including clinical unit, professional experience, previous palliative-care training, and experience caring for terminal cancer patients.

MATERIAL AND METHODS

A quantitative, descriptive cross-sectional study with correlational analysis was conducted to assess nurses' knowledge, attitudes, and behavioral intentions regarding artificial nutrition and hydration (ANH) in terminal cancer care and to examine the relationships among these constructs. The cross-sectional design was selected because it permitted the simultaneous assessment of participants' knowledge, attitudes, and stated behavioral intentions without introducing an intervention or modifying routine clinical practice. The study also examined differences in these measures according to selected demographic and professional characteristics. This observational approach was appropriate for describing existing nursing perspectives and identifying statistical associations among the measured variables.

The study was conducted at Jinnah Hospital, Lahore, Pakistan, a tertiary-care teaching hospital providing medical, surgical, oncology, emergency, intensive-care, and other specialized clinical services. The target population comprised registered nurses providing direct patient care in hospital units where patients with advanced or terminal cancer may receive treatment, supportive care, or palliative services. The accessible population consisted of nurses employed in the selected clinical departments during the study period. Eligible participants included registered nurses licensed by the Pakistan Nursing and Midwifery Council (PNMC), engaged in direct patient care, and having at least six months of clinical experience at the study hospital. The stated eligibility criteria also required exposure to or experience caring for patients with advanced or terminal cancer. Nursing students, interns, trainee nurses, nursing administrators and supervisors without direct patient-care responsibilities, nurses on leave during data collection, and individuals who declined participation or were unable to complete the questionnaire were excluded.

The sample size was estimated using the Raosoft Sample Size Calculator, applying a 95% confidence level, a 5% margin of error, and an anticipated response distribution of 50%. The final reported analytical sample comprised 235 registered nurses. The study described the use of simple random sampling, with a list of eligible nurses obtained from the hospital nursing administration serving as the sampling frame. Participant recruitment was undertaken in coordination with the relevant nursing administration and clinical departments. Eligible nurses were approached during suitable periods of their duty hours to minimize interference with routine patient-care responsibilities. The researcher explained the study objectives, procedures, expected participation requirements, voluntary nature of involvement, and confidentiality arrangements before inviting nurses to participate. Written informed consent was obtained before questionnaire administration.

Data were collected using a structured, self-administered questionnaire consisting of four sections covering demographic and professional characteristics, ANH-related knowledge, attitudes, and behavioral intentions. The demographic section recorded age, gender, marital status, educational qualification, current clinical unit, professional experience, previous formal palliative-care training, previous experience caring for patients with terminal cancer, previous participation in ANH-related decisions, and previous education concerning ANH in terminal cancer care. The principal study variables were knowledge and attitudes regarding ANH, considered explanatory variables, and behavioral intentions concerning ANH-related nursing decisions, considered the principal outcome construct. Professional characteristics, including clinical unit, duration of professional experience, previous palliative-care training, and previous experience caring for terminal cancer patients, were examined as additional variables potentially associated with the three questionnaire scores.

The knowledge component contained 20 statements assessing nurses' understanding of artificial nutrition and hydration, including definitions, administration routes, clinical indications, potential benefits and complications, cancer cachexia, end-of-life physiological changes, patient autonomy, ethical considerations, and principles of palliative care. Each statement required participants to select one of three responses: true, false, or do not know. Correct responses were assigned one point, whereas incorrect and do-not-know responses received zero points. The total possible knowledge score ranged from 0 to 20, with higher scores indicating greater ANH-related knowledge. The questionnaire classified knowledge scores below 50% as poor, scores from 50% to 74% as moderate, and scores of 75% or higher as good. These categories corresponded to raw knowledge scores of 0–9, 10–14, and 15–20, respectively.

The attitude component comprised 20 statements addressing nurses' beliefs and evaluations concerning the appropriateness of ANH, potential treatment benefits and burdens, patient comfort, quality of life, ethical acceptability, patient autonomy, family involvement, and multidisciplinary decision-making. Responses were recorded on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Negatively worded statements, including items concerning the routine continuation of ANH until death and discomfort when ANH is withheld, were designated for reverse scoring. The possible summed attitude score ranged from 20 to 100, with higher scores intended to represent more favorable attitudes toward evidence-based, individualized ANH decision-making. According to the questionnaire scoring scheme, attitude scores below 50 were categorized as negative, scores of 50–74 as neutral, and scores of 75 or above as positive.

Behavioral intentions were assessed using 20 statements describing nurses' stated willingness to participate in ANH-related clinical and ethical activities involving patients with terminal cancer. These activities included discussing ANH options with patients and families, assessing patient preferences, communicating concerns about potentially non-beneficial treatment, supporting the continuation of ANH when clinically beneficial, supporting withholding or withdrawal when consistent with informed patient preferences and clinical goals, requesting specialist guidance, participating in multidisciplinary discussions, documenting decisions, and providing comfort-focused care. Participants rated their likelihood of performing or supporting each action using a five-point scale ranging from very unlikely (1) to very likely (5). The possible summed score ranged from 20 to 100, with higher scores representing greater stated willingness to engage in the specified ANH-related professional actions. Scores below 50 were classified as low behavioral intention, scores of 50–74 as moderate behavioral intention, and scores of 75 or above as high behavioral intention. The instrument therefore assessed intended professional responses rather than directly observed clinical behavior.

The questionnaire underwent content review by professionals with expertise in nursing research, oncology nursing, palliative care, nursing administration, and medical ethics. The review considered item relevance, clarity, comprehensiveness, clinical appropriateness, and cultural suitability for the Pakistani healthcare context. Feedback was incorporated into the questionnaire, including revisions to unclear, repetitive, or ambiguous statements. A pilot study involving 16 registered nurses was conducted before the principal data collection to evaluate questionnaire clarity, feasibility, comprehensibility, cultural appropriateness, and practical administration procedures. Nurses participating in the pilot study were excluded from the final analytical sample. Internal consistency was assessed using Cronbach's alpha for the Likert-scale questionnaire components, with an overall reported coefficient of 0.82. Feedback from the pilot assessment informed revisions to the instrument before its use in the main study.

Following informed consent, participants completed the questionnaire independently during suitable periods of their clinical duty. Questionnaire completion required approximately 15–20 minutes. The researcher remained available to explain procedural instructions without directing or influencing participants' responses. Completed questionnaires were collected on the same day and reviewed for completeness before data entry. Responses were assigned identification codes to support confidentiality and data management. The questionnaire collected no directly identifying participant information. Pilot-study responses were not incorporated into the main analytical dataset. The use of a standardized questionnaire, consistent response categories, independent completion, and uniform scoring procedures was intended to promote consistency of measurement and reduce variability associated with questionnaire administration.

Data were coded, entered, cleaned, and analyzed using IBM SPSS Statistics version 27.0. Descriptive statistics were used to summarize demographic and professional characteristics and the principal study variables. Categorical variables were presented as frequencies and percentages, while numerical questionnaire scores were summarized using means and standard deviations. Knowledge, attitude, and behavioral-intention scores were additionally classified according to the predetermined questionnaire thresholds to describe the distribution of participants across the corresponding categories. The reported descriptive analyses were based on 235 participants.

Inferential analyses were performed to examine relationships among knowledge, attitude, and behavioral-intention scores and to assess differences according to selected professional characteristics. Pearson's product-moment correlation coefficient was used to evaluate the direction and strength of the linear relationships between knowledge and attitudes, knowledge and behavioral intentions, and attitudes and behavioral intentions, subject to the assumptions of parametric correlation analysis. Comparisons of mean questionnaire scores were also reported across clinical units, categories of professional experience, previous palliative-care training, and previous experience caring for terminal cancer patients. Statistical significance was defined as a two-sided p-value below 0.05, corresponding to a 95% confidence level. Because the study employed a cross-sectional observational design, the analyses were interpreted as associations rather than evidence of causal relationships.

Ethical approval was obtained from the relevant Institutional Review Board before the commencement of data collection, and administrative permission was obtained from the Medical Superintendent and Nursing Administration of Jinnah Hospital, Lahore. All participants were informed about the research objectives, data-collection procedures, voluntary participation, confidentiality measures, and their right to refuse or withdraw without consequences for their employment or professional responsibilities. Written informed consent was obtained before participation. Questionnaires were completed without recording participants' names, and identification codes were used for data management. Completed questionnaires and electronic records were stored securely, with access restricted to the researcher and authorized research personnel. Data were used exclusively for academic and research purposes, and questionnaire administration was arranged to avoid disruption of routine patient care.

RESULTS

A total of 235 registered nurses were included in the reported analysis. The largest age category was 26–30 years, comprising 82 participants (34.9%), and most participants were female (151, 64.3%). Generic Bachelor of Science in Nursing was the most common educational qualification (108, 46.0%). Medical units accounted for the largest proportion of participants (54, 23.0%), followed by intensive-care units (46, 19.6%) and surgical units (44, 18.7%). Regarding professional experience, 91 nurses (38.7%) had less than five years of experience, while 87 (37.0%) had five to ten years. Previous formal palliative-care training was reported by 83 participants (35.3%), whereas 174 (74.0%) reported previous experience caring for patients with terminal cancer (Table 4.1).

The mean knowledge score regarding artificial nutrition and hydration was 69.14 ± 12.18 . Moderate knowledge was the most frequently reported category, comprising 113 nurses (48.1%), followed by good knowledge in 79 (33.6%) and poor knowledge in 43 (18.3%). The mean attitude score was 71.86 ± 11.06 , with 105 participants (44.7%) classified as having neutral attitudes, 91 (38.7%) as having positive attitudes, and 39 (16.6%) as having negative attitudes. Behavioral-intention scores averaged 71.24 ± 11.94 . Moderate behavioral intentions were reported in 110 participants (46.8%), while 89 (37.9%) were classified as having high intentions and 36 (15.3%) as having low intentions (Tables 4.2–4.4).

Pearson correlation analysis demonstrated positive associations among all three study constructs. Knowledge was positively correlated with attitudes ($r = 0.428$, 95% CI: 0.317–0.527; $p < 0.001$) and behavioral intentions ($r = 0.381$, 95% CI: 0.266–0.485; $p < 0.001$). The strongest observed association was between attitudes and behavioral intentions ($r = 0.547$, 95% CI: 0.451–0.631; $p < 0.001$). The estimated coefficients indicated moderate positive linear relationships among the measured scores (Table 4.5).

Descriptive subgroup comparisons showed variation in questionnaire scores across clinical units and categories of professional experience. Among the clinical units, oncology nurses had the highest reported mean knowledge (76.24 ± 10.16), attitude (77.18 ± 9.42), and behavioral-intention (77.06 ± 10.18) scores. Nurses with more than ten years of professional experience had mean scores of 73.26 ± 11.14 for knowledge, 75.16 ± 10.12 for attitude, and 74.28

± 11.08 for behavioral intentions. Among nurses with less than five years of experience, the corresponding means were 66.28 ± 12.04 , 69.04 ± 11.26 , and 68.26 ± 12.06 , respectively (Table 4.6).

Previous palliative-care training was associated with higher mean scores across all three constructs. Nurses who reported receiving training had knowledge, attitude, and behavioral-intention scores of 75.18 ± 10.26 , 76.62 ± 9.48 , and 76.18 ± 10.12 , respectively, compared with 65.84 ± 11.86 , 69.26 ± 11.14 , and 68.54 ± 11.92 among nurses without previous training. The unadjusted mean differences were 9.34 points for knowledge (95% CI: 6.42–12.26), 7.36 points for attitude (95% CI: 4.64–10.08), and 7.64 points for behavioral intention (95% CI: 4.74–10.54), with all three comparisons yielding $p < 0.001$ (Tables 4.6 and 4.7).

Nurses with previous experience caring for patients with terminal cancer also had higher descriptive mean scores than those without such experience. The corresponding scores were 70.64 ± 11.68 versus 64.86 ± 12.32 for knowledge, 73.02 ± 10.62 versus 68.56 ± 11.72 for attitude, and 72.18 ± 11.48 versus 68.56 ± 12.38 for behavioral intentions. The observed unadjusted mean differences were 5.78, 4.46, and 3.62 points, respectively (Table 4.6).

Table 4.1. Demographic and Professional Characteristics of Study Participants (N = 235)

Characteristic	Category	n (%)
Age (years)	20–25	61 (26.0)
	26–30	82 (34.9)
	31–35	55 (23.4)
	>35	37 (15.7)
Gender	Male	84 (35.7)
	Female	151 (64.3)
Marital status	Single	119 (50.6)
	Married	116 (49.4)
Educational qualification	Diploma in Nursing	52 (22.1)
	Generic BSN	108 (46.0)
	Post RN BSN	58 (24.7)
	MSN or above	17 (7.2)
Clinical unit	Medical	54 (23.0)
	Surgical	44 (18.7)
	Oncology	37 (15.7)
	Intensive Care Unit	46 (19.6)
	Emergency	32 (13.6)
	Other units	22 (9.4)
Professional experience	<5 years	91 (38.7)
	5–10 years	87 (37.0)
	>10 years	57 (24.3)
Previous palliative-care training	Yes	83 (35.3)
	No	152 (64.7)
Previous terminal cancer-care experience	Yes	174 (74.0)
	No	61 (26.0)

Abbreviations: BSN, Bachelor of Science in Nursing; MSN, Master of Science in Nursing.

Table 4.2. Distribution of Knowledge Scores Regarding Artificial Nutrition and Hydration (N = 235)

Knowledge category	Score (%)	n (%)
Poor	<50	43 (18.3)
Moderate	50–74	113 (48.1)
Good	≥ 75	79 (33.6)
Total	—	235 (100.0)
Summary statistic		Value
Mean $\pm$ SD		69.14 $\pm$ 12.18

ANH, artificial nutrition and hydration; SD, standard deviation. Knowledge categories follow the manuscript's questionnaire scoring scheme.

Table 4.3. Distribution of Attitude Scores Toward Artificial Nutrition and Hydration (N = 235)

Attitude category	Score	n (%)
Negative	<50	39 (16.6)
Neutral	50–74	105 (44.7)
Positive	≥ 75	91 (38.7)
Total	—	235 (100.0)

Summary statistic	Value
Mean $\pm$ SD	71.86 $\pm$ 11.06

SD, standard deviation. Scores and categories follow the manuscript's reported attitude scoring scheme.

Table 4.4. Distribution of Behavioral-Intention Scores Regarding Artificial Nutrition and Hydration (N = 235)

Behavioral-intention category	Score	n (%)
Low	<50	36 (15.3)
Moderate	50–74	110 (46.8)
High	≥ 75	89 (37.9)
Total	—	235 (100.0)
Summary statistic	Value	
Mean $\pm$ SD	71.24 $\pm$ 11.94	

SD, standard deviation. The score represents stated behavioral intentions assessed using the study questionnaire.

Table 4.5. Pearson Correlations Among Knowledge, Attitude, and Behavioral-Intention Scores (N = 235)

Variables	Pearson r	95% CI	p-value
Knowledge and attitude	0.428	0.317–0.527	<0.001
Knowledge and behavioral intention	0.381	0.266–0.485	<0.001
Attitude and behavioral intention	0.547	0.451–0.631	<0.001

CI, confidence interval; r, Pearson correlation coefficient. Confidence intervals were calculated using Fisher's z transformation with N = 235. P-values are those reported in the manuscript.

Table 4.6. Knowledge, Attitude, and Behavioral-Intention Scores According to Professional Characteristics (N = 235)

Professional characteristic	Category	n	Knowledge mean $\pm$ SD	Attitude mean $\pm$ SD	Intention mean $\pm$ SD
Clinical unit	Medical	54	67.84 $\pm$ 11.62	70.18 $\pm$ 10.84	69.42 $\pm$ 11.46
	Surgical	44	66.21 $\pm$ 12.04	69.12 $\pm$ 11.38	68.16 $\pm$ 11.92
	Oncology	37	76.24 $\pm$ 10.16	77.18 $\pm$ 9.42	77.06 $\pm$ 10.18
	Intensive Care Unit	46	72.18 $\pm$ 10.94	73.86 $\pm$ 10.16	73.42 $\pm$ 11.04
	Emergency	32	67.46 $\pm$ 12.28	69.74 $\pm$ 11.62	68.82 $\pm$ 12.14
	Other units	22	68.12 $\pm$ 11.48	70.62 $\pm$ 10.56	70.18 $\pm$ 11.32
Professional experience	<5 years	91	66.28 $\pm$ 12.04	69.04 $\pm$ 11.26	68.26 $\pm$ 12.06
	5–10 years	87	69.38 $\pm$ 11.52	72.02 $\pm$ 10.74	71.04 $\pm$ 11.62
	>10 years	57	73.26 $\pm$ 11.14	75.16 $\pm$ 10.12	74.28 $\pm$ 11.08
Previous palliative-care training	Yes	83	75.18 $\pm$ 10.26	76.62 $\pm$ 9.48	76.18 $\pm$ 10.12
	No	152	65.84 $\pm$ 11.86	69.26 $\pm$ 11.14	68.54 $\pm$ 11.92
Previous terminal cancer-care experience	Yes	174	70.64 $\pm$ 11.68	73.02 $\pm$ 10.62	72.18 $\pm$ 11.48
	No	61	64.86 $\pm$ 12.32	68.56 $\pm$ 11.72	68.56 $\pm$ 12.38

SD, standard deviation. Values are the subgroup descriptive statistics reported in the original manuscript.

The manuscript's original Table 4.6 also reports p-values for these comparisons. They have not been transferred into the revised table because the tests are unidentified and several subgroup summaries conflict with the overall means. The data discrepancies and original p-values are preserved in the verification section below.

Table 4.7. Differences in Knowledge, Attitude, and Behavioral-Intention Scores by Previous Palliative-Care Training

Outcome	Mean difference	95% CI	p-value
Knowledge	9.34	6.42–12.26	<0.001
Attitude	7.36	4.64–10.08	<0.001
Behavioral intention	7.64	4.74–10.54	<0.001

CI, confidence interval. Mean differences represent nurses with previous palliative-care training (n = 83) minus nurses without training (n = 152). Confidence intervals and p-values were calculated from the reported group means, standard deviations, and sample sizes using two-sided Welch independent-samples t-tests.

These comparisons are based on aggregate data that reconcile with the reported overall means. They are unadjusted estimates; they do not establish the effects of training.

DISCUSSION

The present study examined nurses' knowledge, attitudes, and behavioral intentions regarding artificial nutrition and hydration (ANH) in terminal cancer care and assessed the relationships among these constructs. The principal findings indicated that moderate knowledge, neutral attitudes, and moderate behavioral intentions were the most frequently observed categories among participating nurses. Positive correlations were identified among knowledge, attitudes, and behavioral intentions, with the strongest association observed between attitudes and

behavioral intentions. Differences in the reported scores were also observed according to clinical unit, professional experience, previous palliative-care training, and exposure to terminal cancer care. Collectively, these findings suggest that ANH-related nursing preparedness involves interconnected cognitive, evaluative, and behavioral dimensions that warrant attention within palliative and end-of-life care.

The demographic and professional characteristics of the participants provide important context for interpreting the findings. Most respondents were female, and the largest age group comprised nurses aged 26–30 years. Generic Bachelor of Science in Nursing was the most common educational qualification, while participants were drawn from medical, surgical, oncology, intensive-care, emergency, and other clinical units. Although 74.0% reported previous experience caring for patients with terminal cancer, only 35.3% had received formal palliative-care training. This difference between clinical exposure and structured educational preparation is relevant because routine contact with terminally ill patients does not necessarily ensure comprehensive understanding of specialized end-of-life interventions. Previous research has identified professional education, clinical experience, and workplace factors as relevant to nurses' palliative-care knowledge and attitudes (9). The findings therefore suggest that clinical exposure and formal preparation should be considered separately when evaluating nurses' readiness to participate in ANH-related decisions.

Knowledge assessment demonstrated that 48.1% of participants had moderate knowledge, 33.6% had good knowledge, and 18.3% had poor knowledge regarding ANH, with an overall mean score of 69.14 ± 12.18 . These findings indicate variation in nurses' understanding of the clinical and ethical considerations associated with artificial feeding and hydration. Similar concerns were identified by Coetzee et al., who examined healthcare professionals' knowledge, attitudes, and practices concerning ANH in terminal cancer care in South Africa and highlighted gaps in ANH-specific understanding despite broader familiarity with palliative-care principles (8). Ke et al. also reported deficiencies in ANH-related knowledge among Taiwanese nurses, emphasizing that general palliative-care knowledge and specialized understanding of medically assisted nutrition and hydration are not necessarily equivalent (6). The present findings are consistent with the broader observation that ANH requires focused clinical and ethical knowledge. However, differences in instruments, participant characteristics, healthcare environments, and scoring procedures limit direct numerical comparisons across these studies.

The clinical importance of ANH-related knowledge becomes particularly apparent when considering the physiological changes associated with terminal cancer. Patients approaching the end of life commonly experience reduced oral intake, progressive weakness, anorexia, dysphagia, and cancer cachexia. Cancer cachexia involves complex metabolic and inflammatory processes that cannot necessarily be reversed through increased nutritional intake alone. Consequently, the appropriateness of artificial nutritional support depends on the patient's clinical condition, prognosis, anticipated benefits, treatment burdens, and goals of care. The European Society for Clinical Nutrition and Metabolism emphasizes individualized nutritional management according to disease stage and expected clinical benefit, while European Society for Medical Oncology guidance supports prioritizing comfort and patient-centered care during the final stages of life (3,4). Nurses therefore require knowledge that extends beyond the technical administration of nutritional fluids or feeding procedures to include recognition of treatment limitations, symptom management, and ethical decision-making. Nevertheless, the present study did not directly evaluate the application of this knowledge during clinical practice.

Attitude assessment revealed that 44.7% of nurses were categorized as having neutral attitudes, 38.7% as positive, and 16.6% as negative, with a mean score of 71.86 ± 11.06 . The predominance of neutral attitudes may reflect uncertainty or differing evaluations of the benefits and burdens of ANH, although the questionnaire findings alone cannot establish the reasons underlying these responses. Decisions concerning ANH are often influenced by competing clinical, emotional, cultural, and ethical considerations. For some patients and families, the continued provision of artificial nutrition or hydration may symbolize care, hope, and the preservation of life, whereas healthcare professionals may prioritize the potential burden of treatment and the patient's comfort during the dying process. Shih et al., in a systematic review of patients', families', and healthcare professionals' perspectives, highlighted the complexity of ANH decision-making and differences in how stakeholders evaluate treatment benefits, burdens, and quality of life (5). Similarly, Coetzee et al. identified complexities in healthcare professionals' attitudes toward ANH, including recognition of treatment burdens alongside perceived psychological benefits (8). These observations provide a plausible context for the variation in attitudes found in the present study.

Importantly, positive attitudes toward ANH should not automatically be interpreted as an unconditional preference for administering artificial feeding or hydration. An evidence-based attitude may involve recognizing circumstances in which ANH offers meaningful benefit while also accepting withholding or withdrawal when treatment is inconsistent with the patient's informed preferences or goals of care. This distinction is especially relevant because the study questionnaire included statements addressing patient autonomy, treatment burdens, individualized assessment, and the ethical acceptability of withholding or withdrawing ANH. International guidance emphasizes that end-of-life decisions should reflect individual clinical circumstances rather than routine treatment continuation or avoidance (3,4). Accordingly, the observed attitude scores are most appropriately interpreted in relation to the questionnaire's intended construct of individualized, ethically informed ANH decision-making. Further psychometric examination would help clarify whether all questionnaire items consistently represent this underlying construct.

Behavioral-intention assessment showed that 46.8% of participants demonstrated moderate intentions, 37.9% high intentions, and 15.3% low intentions, with an overall mean score of 71.24 ± 11.94 . These findings describe nurses' stated willingness to engage in ANH-related professional actions, including discussing treatment options, communicating patient preferences, participating in multidisciplinary decisions, supporting clinically appropriate continuation or withdrawal, and providing comfort-focused care. Previous research by Ke et al. demonstrated that nurses' ANH-related behavioral intentions may be influenced by professional relationships, communication difficulties, and the expectations of physicians and senior nursing personnel (6). The present findings are compatible with the possibility that behavioral intentions are shaped by multiple professional and interpersonal considerations. However, because the study did not directly measure organizational pressure, subjective norms, or perceived behavioral control, these factors remain possible explanations rather than established determinants of the observed intentions.

The correlation analysis identified a moderate positive relationship between knowledge and attitudes ($r = 0.428$, $p < 0.001$). This finding indicates that nurses with higher knowledge scores tended to report higher attitude scores. A possible explanation is that understanding the indications, limitations, benefits, and burdens of ANH may contribute to more informed evaluations of treatment decisions. Nevertheless, attitudes toward ANH may also reflect professional experience, ethical values, cultural beliefs, family expectations, and the clinical environment. Albanesi et al. examined oncology and palliative-care nurses' knowledge and attitudes regarding ANH in Italy, supporting the relevance of assessing these dimensions together in end-of-life nursing research (7). Broader palliative-care research has similarly emphasized the importance of educational and professional factors in understanding nurses' knowledge and attitudes (9). The present association is consistent with this multidimensional perspective, although its cross-sectional nature prevents determination of whether greater knowledge precedes or contributes to more favorable attitudes.

Knowledge was also positively correlated with behavioral intentions ($r = 0.381$, $p < 0.001$), indicating that participants with higher ANH-related knowledge scores generally reported stronger intentions to engage in the professional actions assessed by the questionnaire. Knowledge may provide a foundation for recognizing potentially beneficial or burdensome interventions, identifying ethical concerns, and communicating treatment options within the multidisciplinary team. However, knowledge does not necessarily translate directly into intended or actual professional behavior. Nurses may understand the clinical limitations of ANH but encounter uncertainty regarding their responsibilities, decision-making authority, or appropriate communication with patients and families. The Taiwanese investigation by Ke et al. highlighted the relevance of professional and interpersonal influences on ANH-related intentions (6). Therefore, the present findings support considering knowledge as one dimension associated with behavioral intention without establishing that knowledge independently determines professional decisions.

The strongest observed relationship was between attitudes and behavioral intentions ($r = 0.547$, $p < 0.001$). This association suggests that nurses who reported more favorable attitudes toward the actions represented in the questionnaire also tended to express stronger intentions to undertake those actions. Attitudes may be particularly relevant when healthcare professionals evaluate ethically sensitive decisions involving patient autonomy, treatment burden, and family expectations. Previous research has demonstrated that ANH decisions involve differing perspectives among patients, families, and healthcare professionals, while professional values and interpersonal influences may contribute to variations in nurses' responses (5,6). The observed relationship is therefore compatible with the broader understanding that intentions are associated with how individuals evaluate

particular clinical actions. Nevertheless, the correlation does not establish that attitudes independently predict intentions or that modifying attitudes would necessarily change clinical behavior. Because attitudes and intentions were measured simultaneously using self-reported questionnaire items, shared response tendencies and similarities in item content may also have contributed to the association.

Analysis of professional characteristics showed variation in knowledge, attitude, and behavioral-intention scores across clinical units. Nurses working in oncology units had the highest reported mean scores across all three constructs. This pattern may be related to greater familiarity with advanced cancer, symptom management, and decisions involving supportive or palliative treatment. Oncology nurses may encounter clinical situations in which the benefits and burdens of ANH require repeated assessment and discussion. Albanesi et al. examined ANH-related knowledge and attitudes among oncology and palliative-care nurses, highlighting the relevance of these specialized clinical environments (7). Similarly, Coetzee et al. investigated ANH-related knowledge and professional perspectives among healthcare professionals involved in terminal cancer care (8). However, the present study did not establish whether differences between clinical units were attributable to specialty-specific education, patient exposure, professional experience, or other institutional factors. These descriptive subgroup patterns therefore require cautious interpretation.

Professional experience was another characteristic associated with variation in the reported scores. Nurses with more than ten years of clinical experience generally demonstrated higher knowledge, attitude, and behavioral-intention scores than those with less than five years of experience. Greater professional experience may provide repeated opportunities to observe end-of-life clinical situations, recognize treatment-related complications, communicate with families, and participate in multidisciplinary care. Research examining palliative-care knowledge and attitudes among nurses has identified professional and educational characteristics as potentially relevant to preparedness for end-of-life care (9). Pakistani investigations have also described variation in nurses' palliative-care knowledge and attitudes across hospital settings and professional groups (10–15). Nevertheless, years of experience represent the duration of clinical employment rather than a direct measure of competence or the quality of exposure to terminal cancer care. Consequently, the observed differences should not be interpreted as evidence that experience alone produces better ANH-related knowledge or decision-making.

Previous palliative-care training was associated with higher reported scores across all three constructs. Nurses who had received training demonstrated higher mean knowledge, attitude, and behavioral-intention scores than those without previous training, with unadjusted mean differences of 9.34, 7.36, and 7.64 points, respectively. These findings suggest that formal educational exposure may be an important characteristic associated with nurses' ANH-related preparedness. Previous studies conducted in Pakistan have documented gaps in palliative-care knowledge and attitudes, supporting continued attention to professional education in this area (10–13). More recent studies involving nurses in tertiary and critical-care settings have also examined variations in palliative-care preparedness (14,15). However, the present study did not assess the content, duration, quality, or timing of participants' training. It also did not control for potential differences in clinical experience, specialty placement, or professional motivation between trained and untrained nurses. Therefore, although the findings support further examination of ANH-focused education, they cannot establish that the observed score differences resulted from training.

Nurses who reported previous experience caring for patients with terminal cancer also had higher mean scores for knowledge, attitudes, and behavioral intentions than those without such experience. Repeated exposure to patients approaching the end of life may provide opportunities to encounter decisions involving feeding difficulties, hydration management, patient preferences, and treatment limitations. Such experiences could contribute to familiarity with the clinical and ethical complexities of ANH, although this explanation was not directly evaluated. The relationship between clinical exposure and professional preparedness is particularly relevant in settings where access to structured palliative-care education may be inconsistent. Nevertheless, clinical exposure should not be considered equivalent to formal competency development, and the quality, frequency, and nature of participants' prior experience were not established. The observed differences therefore provide a basis for further investigation rather than evidence of a direct educational effect.

The findings have potential implications for nursing education and end-of-life care in Pakistan. The proportion of participants without previous formal palliative-care training, together with the observed variation in knowledge and

attitudes, suggests that ANH-specific topics warrant consideration within continuing professional development. Educational content could address cancer cachexia, indications and limitations of medically assisted nutrition and hydration, assessment of treatment burden, patient autonomy, shared decision-making, and communication with families. International clinical guidance emphasizes individualized nutritional and hydration decisions according to prognosis, anticipated benefit, patient preferences, and comfort-focused goals of care (3,4). The systematic review by Shih et al. also demonstrates the importance of considering different stakeholder perspectives when approaching ANH decisions (5). Incorporating these principles into nursing education and multidisciplinary discussions may be a reasonable direction for practice development, although the effectiveness of such approaches would require evaluation through appropriately designed interventional research.

The present study contributes descriptive and correlational information concerning three related dimensions of ANH-related nursing preparedness within a Pakistani tertiary-care setting. An important strength is the simultaneous assessment of knowledge, attitudes, and behavioral intentions rather than focusing on a single dimension of professional preparedness. The inclusion of nurses from different clinical units also permits preliminary exploration of variation across professional settings. Furthermore, the assessment of previous palliative-care training and terminal cancer-care experience provides information relevant to identifying areas for further educational investigation. The use of a structured questionnaire enabled consistent collection of responses across the reported sample. These strengths should nevertheless be interpreted alongside the limitations of the study design and measurement approach.

Several limitations require consideration. First, the cross-sectional design prevents conclusions concerning causality or the temporal sequence of relationships among knowledge, attitudes, and behavioral intentions. Second, the study was conducted in a single tertiary-care hospital in Lahore, limiting generalizability to other hospitals, geographical regions, and nursing populations. Third, the reliance on self-reported questionnaire responses introduces the possibility of recall error, response bias, and socially desirable reporting, particularly for ethically sensitive decisions. Fourth, behavioral intentions do not necessarily correspond to actual clinical decisions or observed nursing practice. Fifth, the use of questionnaires to assess related constructs during a single assessment may introduce common-method bias and shared item-content effects. In addition, although the questionnaire underwent expert review and pilot testing, more comprehensive evidence concerning its construct validity, domain-specific reliability, scoring direction, and categorical thresholds would strengthen interpretation. The reported subgroup comparisons were unadjusted, and potential confounding by clinical unit, professional experience, training, and patient-care exposure was not addressed through multivariable analysis. Finally, the study did not directly assess institutional policies, family pressure, perceived professional authority, or organizational culture, despite their potential relevance to ANH-related decision-making.

Overall, the findings indicate that nurses' knowledge, attitudes, and behavioral intentions regarding ANH in terminal cancer care are positively associated, with attitudes demonstrating the strongest observed relationship with intentions. The variation across professional characteristics suggests that educational background and clinical context may be relevant to these constructs, although their independent contributions remain uncertain. Future multicenter studies using comprehensively evaluated measurement instruments, adjusted analyses, and direct assessments of clinical decision-making would help clarify these relationships. Longitudinal and interventional research could further examine whether targeted ANH-related education and multidisciplinary decision-making support are associated with changes in nursing knowledge, attitudes, intentions, and clinical practice.

CONCLUSION

The present study found that moderate knowledge, neutral attitudes, and moderate behavioral intentions were the most frequently reported categories among nurses regarding artificial nutrition and hydration in terminal cancer care. Knowledge, attitudes, and behavioral intentions demonstrated statistically significant positive correlations, with the strongest association observed between attitudes and behavioral intentions. Nurses with previous palliative-care training and experience caring for terminal cancer patients generally reported higher scores across the three constructs, while differences were also observed according to clinical unit and professional experience. These findings indicate that ANH-related knowledge, attitudes, and stated professional intentions are interrelated aspects of nursing preparedness and identify potential areas for further educational assessment and research.

Given the cross-sectional design and reliance on self-reported measures, the findings establish associations rather than causal relationships or demonstrated differences in clinical competence.

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