



ISSN 2320-8643 (Print) ● ISSN-2320-8651 (Electronic)

Volume 13

Number 02

July- December 2025

INTERNATIONAL JOURNAL OF NURSING CARE

Website: www.ijonc.com

International Journal of Nursing Care

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International Journal of Nursing Care is a double blind peer reviewed international journal which has commenced its publication from January 2013. The journal is half yearly in frequency. The journal covers all aspects of nursing care. The journal has been assigned ISSN 2320-8643 (Print Version) and ISSN 2320-8651 (Online Version). The journal is Indexed in many international data bases.

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ISSN 2320-8643 (Print Version) and ISSN 2320-8651 (Online Version). Frequency: Half Yearly

Published at

Institute of Medico-legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall, Sector- 32, Noida - 201 301 (Uttar Pradesh)

International Journal of Nursing Care

Vol 13 No. 2, July - December 2025

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Factors Affecting Medication Adherence in Patients with Heart Failure: A Systematic Review

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How to cite this article: Abbas Heydari, Zahra sadat Manzari, Atefeh Dehnoalian. Factors Affecting Medication Adherence in Patients with Heart Failure: A Systematic Review. International Journal of Nursing Care / Vol 13 No. 2, July - December 2025

Abstract

Background: This research aims to identify the key factors influencing medication adherence among individuals diagnosed with heart failure

Methods: we searched PUBMED, Web of Science, and Scopus from January 2014 to October 2024 to locate the most recent original cross-sectional studies that addressed the factors affecting medication adherence in patients with heart failure.

Conclusion: The initial search identified 123 studies, of which we included 15 qualitative studies in the systematic review. We categorized the factors as patient-specific, disease- and treatment-specific, demographic-related, and psychological-related. Education level, socioeconomic status, comorbidity, polypharmacy, marital status, depression and anxiety, patient-provider relationships, self-efficacy, health literacy, and forgetfulness appeared to be the factors affecting medication adherence in patients with heart failure from the studies.

Keywords: Medication Adherence, Heart Failure, Systematic Review

Introduction

Heart failure is a critical clinical condition resulting from structural or functional abnormalities of the heart, which impair its ability to pump blood effectively to meet the body's metabolic demands⁽¹⁾. Heart failure causes symptoms like shortness of breath, fatigue, coughing, and ankle swelling. Despite advances in treatment, the outlook remains poor globally, especially in developing countries⁽²⁾.

Patients with heart failure often need multiple medications, and improving their adherence is essential for optimal treatment outcomes⁽³⁾. Pharmacotherapy is a cornerstone of heart failure management, and adherence to medications is considered a vital self-care behavior for maximizing therapeutic benefits⁽⁴⁾. According to the Centers for Disease Control and Prevention (CDC), medication adherence refers to the extent to which

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Submission: June 2, 2025

Revision: July 21, 2025

Published date: Aug 7, 2025

a patient's behavior aligns with healthcare provider recommendations, whereas non-adherence involves failure to take medications as prescribed or to follow healthcare advice^(2, 5).

Numerous studies have demonstrated that medication adherence not only helps maintain physiological function but also improves quality of life and reduces hospitalizations⁽⁶⁾. However, non-adherence is common among patients, leading to higher hospitalizations, mortality, and healthcare costs⁽⁴⁾.

Adherence to heart failure medications is often difficult for patients and is a major concern for healthcare providers. Without patient cooperation, even the best treatments may not be effective^(7, 8).

Various factors influence medication adherence in heart failure and other chronic diseases, including gender, educational level, marital status, age, and comorbidities^(9, 10). Therefore, identifying the demographic and clinical characteristics

that influence adherence is the first step toward improving compliance with treatment regimens in heart failure patients⁽³⁾. This study aims to identify the factors that influence medication adherence among patients with heart failure.

This study is a systematic review conducted in 2024, examining the factors influencing medication adherence in patients with heart failure. The search was conducted independently by two researchers using the electronic databases PUBMED, Web of Science, and Scopus for articles published between January 2014 to October 2024. The following search terms were used: Heart failure, Medication adherence, non-adherence, Influencing factors, related factors.

Study Selection

From the initial search, 123 titles and abstracts were identified. After removing duplicates, the abstracts and titles were reviewed for relevance, and a preliminary list of 74 potentially relevant articles was compiled (Figure 1).

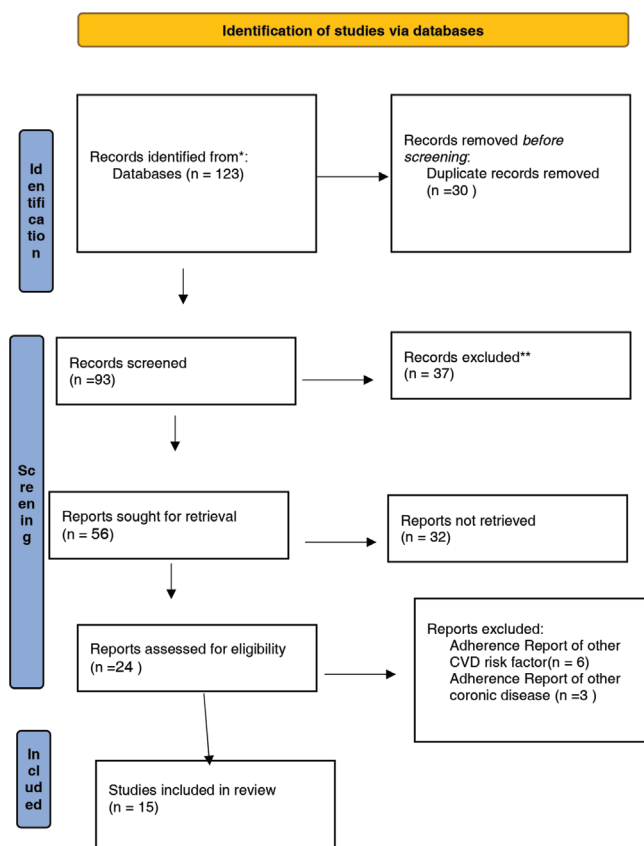


Figure 1: search strategy(n=15)

Inclusion Criteria

1. **Population:** Heart failure patients. Only studies that specifically assessed factors influencing medication adherence in patients diagnosed with heart failure were included.
2. **Study Type:** Cross-sectional studies.
3. **Publication Period:** Studies published between January 2014 to October, 2024.

4. **Publication Type:** Studies published in reputable journals with full-text availability.

5. **Language:** English.

The quality of the studies was assessed using the 22-item STROBE checklist, which scores up to 30 points. A minimum score of 20 was considered acceptable. A summary of these studies is presented in Table 1.

Table 1. Summary of Studies Reviewed(n=15)

Author Name	Year	Study Design	country	Sample Number	Questionnaire Name (for medication adherence)	Key Results
Mohammed Assen Seid et al.	2023	Cross-sectional study	Ethiopia	245 adult patients with HF	Medication Adherence Report Scale (MARS-5)	Approximately 23.7% of heart failure patients were nonadherent to their medication. Refilling problems and feeling better from the illness were the most common reasons for nonadherence. Presence of comorbidity, taking three or more types of medication, and being unmarried were significantly associated with medication nonadherence.
Ale OK et al.	2021	Descriptive cross-sectional study	Nigeria	202 previously diagnosed HF patients	Medication Adherence Report Scale 5-items	The study found a high prevalence (70%) of medication nonadherence (MNA) among heart failure (HF) patients in Nigeria. MNA was highest among subjects on ACEI (73.1%) and least among those on ARNI (0%). - The presence of three comorbidities was associated with nonadherence

Continue....

Seyedeh Somayeh Amininasab et al.	2017	Cross-sectional study	Iran	300 patients with heart failure	Morisky Medication Adherence Scale (MMAS-8)	- The study found a significant relationship between medication adherence and human dignity, with higher threats to dignity associated with lower adherence. - Improving patients' dignity can enhance medication adherence, potentially leading to better health outcomes and reduced hospitalizations..
Amininasab SS et al.	2018	Cross-sectional study	Iran	300 patients with heart failure	Morisky Medication Adherence Scale (MMAS)	- Medication adherence was significantly correlated with education level, number of children, comorbidity, ejection fraction, and the number of tablets used per day. - None of the demographic and clinical characteristics were significant predictors of medication adherence according to logistic regression analysis.
Marion Eisele et al.	2020	Secondary analysis of a prospective RECODE-HF cohort study (cross-sectional)	German	3099 primary care heart failure patients	Morisky Medication Adherence Scale (dichotomized into moderate and high adherence)	- Psychological distress is significantly associated with poorer medication adherence but not with lifestyle adherence. - Common factors for both lower medication and lifestyle adherence include male sex, younger age, lower self-efficacy, and less familiarity with the GP..

Continue....

Michael Feehan et al.	2017	Population-based cross-sectional quantitative study	USA	9202 healthcare consumers	Eight-item Morisky Medication Adherence Scale (MMAS)	- A high level of low medication adherence (42%) was found in the general population, particularly among younger individuals and ethnic minorities. - Low adherence was significantly associated with barriers such as difficulty with healthcare costs, transportation, and infrequent primary care visits. -
Nural N, Kayhan SA	2022	Descriptive cross-sectional study	Turkey	130 patients with HF	Beliefs about medication compliance scale (BMCS)	- Older age, lower education, lower income, comorbidities, and difficulty sleeping are associated with perceived barriers to medication and dietary adherence in heart failure patients.
Manuela Huber et al.	2024	Non-experimental cross-sectional study	Switzerland	72 participants (out of 153 invited)	German-translated version of the Medication Adherence Report Scale (MARS-5)	- 26.4% of surveyed heart failure patients were not fully adherent to their medication, with forgetfulness being the most common reason.
Dagemaw Hussein et al.	2024	Institutional-based cross-sectional study	Ethiopia	603 individuals	Morisky eight scale	- Fifty-six percent of chronic heart failure patients had optimal medication adherence. - Factors associated with medication adherence included educational status, community-based health insurance, absence of comorbidities, fewer medications, not adding salt when cooking, and open communication with healthcare providers.

Continue....

Basheti IA et al.	2016	Cross-sectional study	Amman	167 patients with chronic conditions	Validated scale developed by Morisky et al. (likely MMAS-8)	- About half of the patients (46.1%) were nonadherent. - Lower adherence was associated with a higher number of disease states, medications, and treatment-related problems (TRPs). - Older age, higher educational level, and more frequent physician visits were positively associated with adherence, while difficulty in getting medication refills on time was negatively associated.
Anan S Jarab et al.	2023	Cross-sectional study	Jordan	427 participating patients with HF	Validated Arabic version of the 4-item Morisky Medication Adherence Scale	- A significant majority (92.5%) of the patients had low to moderate medication adherence. - Higher education level and absence of medication-related side effects were associated with higher odds of moderate adherence.
Mohamad Jarrah et al.	2023	Cross-sectional study	Jordan	164 patients with HF	General Medication Adherence Scale (GMAS)	- Only about a third of patients with heart failure had high adherence to their medication, while nearly half had partial to poor adherence. - Factors associated with higher adherence included being younger than 60 years, having more than a high school education, being married, living with someone, and having health insurance.

Continue....

Rebecca Meraz et al.	2023	Prospective, cross-sectional design	USA	174 adults with HF	Part 1 of the Domains of Subject Extent of Nonadherence (DOSE-Nonadherence) scale	- Resilience fully mediates the effects of self-care activation and hope on medication adherence in heart failure patients. - Resilience is a crucial factor in improving medication adherence, as it is the mechanism through which self-care activation and hope influence adherence.
Soheila Rezaei et al.	2022	Cross-sectional study	Iran	250 participants with HF	Eight-item Morisky Medication Adherence Scale (MMAS-8)	- Most patients with heart failure had low medication adherence. - There was a positive association between higher health literacy and better medication adherence. - Significant predictors of medication adherence included gender, health literacy, duration of heart failure, and number of cardiovascular medications.
Abate Wondesen Tsige et al.	2024	Hospital-based cross-sectional study	Ethiopia	344 ambulatory HF patients	Morisky Green Levin Medication Adherence Scale (MGLS)	- The study found a treatment satisfaction rate of 67.6% and a medication adherence rate of 60.9% among heart failure patients. - Participants with druginteractions were 38% less likely to adhere to medication, and those taking five or more drugs were 68% less likely to adhere compared to those taking only one drug.

Ethics approvals and consent to participate: The Ethics Committee of Mashhad has approved this research protocol. University of Medical Sciences under the reference code IR.MUMS.NURSE.REC.1404.020.

Results and Discussion

The reported rates of medication adherence varied widely, ranging from 30.7% ⁽⁹⁾ to 83.6% ⁽¹⁾, with some studies indicating moderate adherence as the most common level.

In the Jarrah et al. (2023) study focusing on heart failure patients, nearly half of the participants

demonstrated poor adherence⁽²⁾. Additionally, a study in Tanzania showed that 75% of participants had poor medication adherence⁽¹⁰⁾. Van der Wal, in his systematic review on medication adherence in heart failure patients and its management, reported adherence rates ranging from 10% to 99% ⁽¹¹⁾. The variation in research populations and the different methods used to measure adherence may explain these large differences in adherence rates⁽¹⁾.

Factors Influencing Medication Adherence

The factors identified as influencing medication adherence in the reviewed studies can be categorized into four domains (Figures 2 and 3).

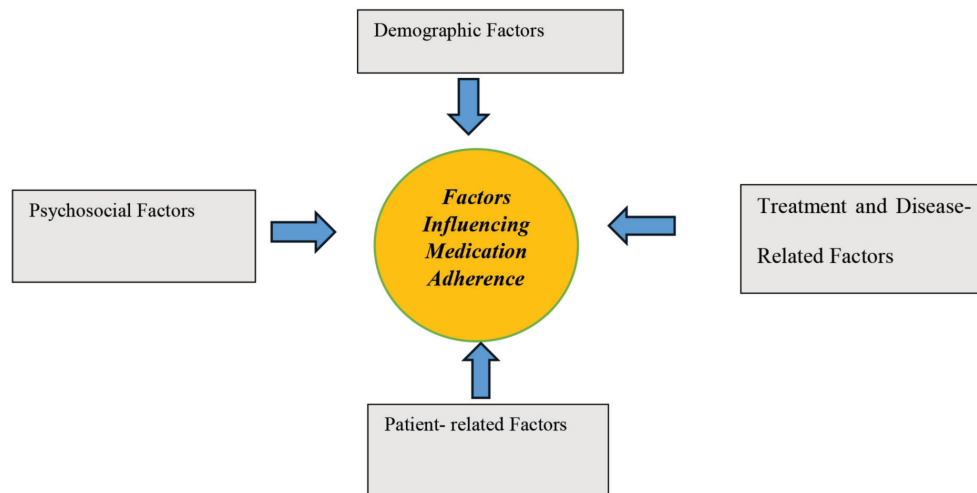


Figure 2: The identified Factors Influencing medication adherence based on the studies (n = 16)

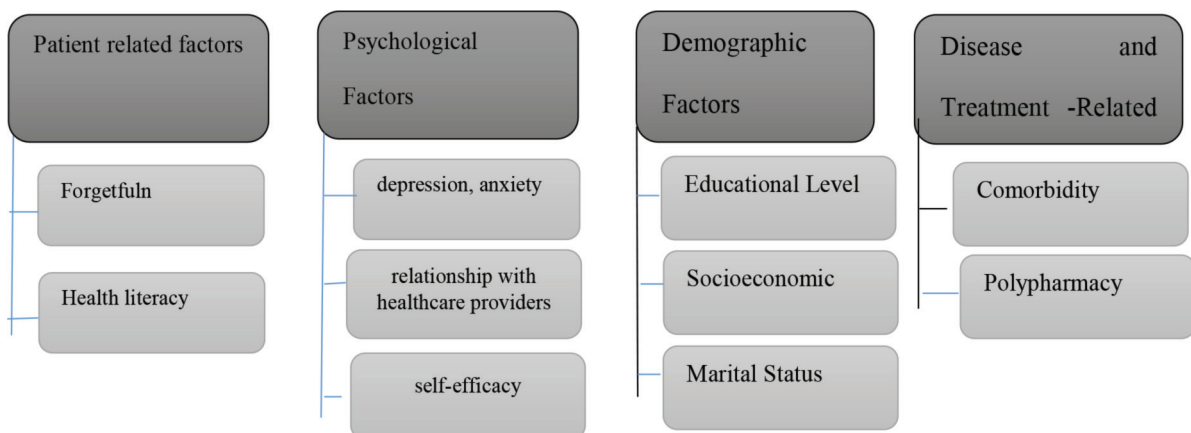


Figure 3: Sub-categorisation of Factors Affecting Medication Adherence in Patients with Heart Failure from the included studies (n = 15).

Demographic Factors

Demographic factors influencing medication adherence include higher education levels, Socioeconomic Status and Marital status have a positive impact on adherence. Understanding the demographic factors influencing medication adherence is crucial for effectively implementing adherence intervention programs⁽¹²⁾.

The relationship between age, gender, and medication adherence showed mixed and inconsistent results across the reviewed studies. Four studies indicated that older age was significantly associated with better adherence⁽¹³⁻¹⁶⁾. While findings on gender were limited and varied: two studies found women had lower adherence compared to men^(14, 17).

Higher educational attainment consistently predicts better medication adherence, as demonstrated by eight studies^(1, 13, 16-21). Consistent with our findings, previous studies have shown that higher education levels positively affect medication adherence in patients with various chronic conditions^(2, 21). This can be explained by the fact that Patients with higher education tend to communicate better with healthcare providers and comprehend educational materials more effectively, leading to increased health knowledge and improved medication adherence.

Financial constraints, including lower income and high medication costs, were frequently linked to poorer adherence, highlighting the importance of affordability and access in managing chronic diseases^(2, 13, 14, 19, 21). Raime and et al identified medication costs and financial constraints as primary reasons for non-adherence in Nigerian patients⁽²²⁾. Patients facing financial challenges, especially those with multiple health conditions, may hesitate to spend on medications, particularly when they do not see immediate benefits⁽²³⁾. Cost-related non-adherence is especially prevalent among low-income individuals⁽²⁴⁾.

Being unmarried is significantly associated with medication nonadherence. Unmarried HF patients were found to be more than twice as likely to be

nonadherent compared to married patients^(2, 13, 25). Heart failure patients mainly depend on their spouses for medication adherence, including financial support, transportation, supervision, reminders, and assistance with fatigue and mental changes⁽²⁾. Additionally, married patients with HF indicated that they received more social support than unmarried patients, which led to greater medication adherence^(3, 26).

Psychological Factors

Psychological distress, depression, and anxiety are significantly associated with poorer medication adherence. A negative relationship exists between medication adherence and threat to human dignity⁽²⁷⁾.

Higher self-efficacy is associated with better medication adherence, while lower self-efficacy is associated with reduced adherence⁽¹⁵⁾.

Psychological factors can adversely affect self-care behaviors, resulting in decreased medication adherence and unhealthy lifestyle choices⁽²⁸⁾. The results demonstrated that psychological distress negatively influences medication adherence⁽²⁹⁾. These findings are compatible with the results of earlier studies^(30, 31). It has been documented that distress impacts illness behavior, controllable risk factors, and therapeutic management⁽²⁹⁾.

Open communication and a trusting relationship with healthcare providers (doctors or nurses) are associated with better medication adherence. Patients who feel comfortable asking questions without fear are more likely to adhere⁽¹⁴⁻¹⁶⁾. Building trust and engaging in open dialogue, especially soon after diagnosis, can enhance acceptance of treatment and improve adherence in conditions like hypertension⁽³²⁾. In addition, our results are in line with a study by Gallagher et al.⁽³³⁾, which found a significant association between social support and self-care management in HF patients.

Treatment and Disease-Related Factors

The presence of chronic comorbid diseases is often linked to lower medication adherence. Specifically, having three or more comorbidities was associated

with reduced nonadherence in one study^(2, 9, 16, 19-21, 25). Comorbidities increase healthcare costs, including medications and hospital visits, and can also lead to lower income due to decreased productivity from heart failure and related conditions⁽⁹⁾. Previous studies also reported that HF patients who had chronic disease comorbidity showed nonadherence to their medication^(3, 20, 25).

Polypharmacy, or taking multiple medications, is generally linked to lower adherence due to the difficulties in managing a complex drug regimen^(2, 16, 19, 20, 25, 34). Patients with multiple health conditions often face polypharmacy, leading to more side effects and difficulty managing their medications, which can decrease adherence⁽³⁵⁾. Pill burden, can negatively impact adherence in chronic illness patients, especially with multiple comorbidities, as managing and remembering multiple medications becomes more challenging^(36, 37).

Patient Related Factors

Health literacy significantly contributes to medication adherence. Lower health literacy leads to poorer health outcomes and lower medication adherence⁽¹⁷⁾.

Forgetting to take medication is consistently reported as a primary reason for nonadherence, with rates ranging significantly across studies. It is the most common reason for partial adherence after hospitalization⁽³⁸⁾. Factors such as health literacy and forgetfulness play a crucial role in influencing medication adherence. Despite the presence of a theoretical association, generally, prior research on the relationship between health literacy levels and medication adherence is inconclusive yet^(39, 40). The findings of this systematic review revealed a paucity of literature addressing health literacy, with only one article explicitly incorporating the topic within its text⁽¹⁷⁾. Further research is needed to clarify the relationship between medication adherence and health literacy, as this connection remains poorly understood.

As noted, Forgetting to take medication was the most frequently cited reason for non-adherence in the

current study. Once again, these data are congruent with those of similar studies, which give forgetfulness rates ranging from 50 % to 84.9 %⁽⁴¹⁻⁴³⁾. The reason for non-adherence is critical because each dosage missed increases patients' risk of disease progression, secondary diseases and other health disadvantages⁽³⁸⁾.

Limitation and Strengths

This review analyzed 15 cross-sectional studies relying on self-reported data, which limits the ability to establish causality and may introduce biases. Future research should include longitudinal and interventional studies for more comprehensive and robust insights into medication adherence.

Conclusion

Medication adherence is complex but crucial for heart failure treatment, as it reduces mortality, hospitalizations, and improves quality of life. Nurses should consider influencing factors when developing care plans, as non-adherence is often hidden and unreported but can be modified through evaluating patients' beliefs and experiences to overcome barriers.

Acknowledgement: The author sincerely thanks the esteemed professors for their invaluable guidance and support, which were essential for the successful completion of this research.

Financial Support: This research was financially supported by the Research Deputy of Mashhad University of Medical Sciences.

Conflict of Interest: There are no conflicts of interest to declare.

Authors' Contributions: Conceptualization: A.D. Methodology: A.H and Z.M. Validation: A.H and Z.M. Data Curation: A.D. Writing- Original Draft Preparation: A.D and Z.M. Writing- Review & Editing: A.D and A.H and Z.M. Supervision: A.H and Z.M. Project Administration: A.D

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Strengthening Primary Healthcare: ASHA Workers' Role in Service Delivery and Quality

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How to cite this article: Kumari N, Divya, Patyal S. Strengthening Primary Healthcare: ASHA Workers' Role in Service Delivery and Quality. International Journal of Nursing Care / Vol 13 No. 2, July - December 2025

Abstract

Purpose: This study examines the role of ASHA workers in enhancing rural healthcare services and assesses the impact of ASHA schemes in selected villages. The study hypothesised that acceptability, counselling, availability and support services are significantly contributing to service delivery. Further service delivery has significant impact on quality of health services. Furthermore the mediating role of service delivery between four drivers and quality of health services is also assessed to develop various strategies that can contribute to strengthening primary healthcare.

Methodology: Both primary and secondary data sources were utilized, with primary data collected through a self-structured questionnaire and in-depth interviews. Using purposive sampling, 90 respondents from ten villages participated, with responses measured on a five-point Likert scale. Data analysis was conducted using the PLS technique.

Findings: The findings reveal that acceptability and counselling significantly influence service delivery, while availability and support services do not. Additionally, service delivery significantly impacts the quality of healthcare services. To assess the mediating role of service delivery, Baron and Kenny's (1986)¹ procedure was applied. The results indicate that service delivery mediates the relationships between counselling and healthcare quality, as well as between acceptability and healthcare quality. However, no mediating effect was found between availability and healthcare quality, nor between support services and healthcare quality.

Implications: By identifying these key factors, the research provides valuable insights for policymakers and healthcare administrators to refine ASHA training programs, prioritize counselling initiatives, and strengthen community engagement strategies, ultimately enhancing the effectiveness of rural healthcare services.

Keywords: Accredited Social Health Activists (ASHAs), Health Services, Rural healthcare.

Introduction

In low and middle-income countries (LMICs), the Community health workers (CHWs), a type of front-line health worker (FLHWs), have been widely recognised as a vital part of primary healthcare teams². Health systems in both LMICs (low- and middle-income countries) and high-income countries

(HICs) are progressively employing community health workers (CHWs) services to meet population health needs, enhance service access, reduce health inequities, and improve health system performance and efficiency. In the economic planning of India, the rural development programmes occupy prominent position, as nearly three – fourth of its population resides in villages which represents

real India³. One of the substantial component that contribute to development of rural people is good health, provision for health should be considered a fundamental human right, and attainment of highest level of health is a most important social goal⁴. Despite significant progress in recent decades, public health challenges in India remain vast, evolving, and growing at an unprecedented rate. Following the implementation of various health programs and policies, the Government of India launched the National Rural Health Mission (NRHM) on April 12, 2005. This initiative was later expanded into the National Health Mission (NHM) to provide accessible, affordable, and accountable healthcare facilities, particularly to the poorest households living in remote rural areas. The NHM aims to deliver comprehensive and integrated primary healthcare, with a special focus on the rural poor, women, and children. A key strategy of the mission was the introduction of Accredited Social Health Activists (ASHAs) at the village level. The Ministry of Health and Family Welfare defines ASHAs as community health activists whose primary role is to raise awareness, mobilize communities for health planning, and promote accountability in healthcare services⁵.

ASHA workers are the initial point of contact between the health officials and the community women, the primary responsibilities performed by community health workers include encouraging women to give birth in the hospitals, inspiring family planning through surgical sterilization, treating basic illness, keeping demographic records, improving village sanitation⁵. The functioning of ASHA workers works both as a paramedical staff and social engineers for the rural and urban marginalized communities work from the past few years and emerged as a non-market arrangements⁶ and has been involved in diverse health plans and not confined them to only motherly and child health-care services^{7,8} (GoI, 2021). Health care workers play an important part is very important in building health capacity in context to health communication, so to get the better results it is necessary that the ASHA workers are strengthened through the training programs to improve communication skills⁹.

The Accredited Social Health Activists (ASHAs) were among the six recipients of the World Health Organization Director-General's Global Health Leaders Award in May 2022, recognized for their significant contributions to protecting and promoting health¹⁰. As of 2020, India had approximately 980,000 ASHA workers, achieving a ratio of one ASHA per 979 rural residents. These workers serve as a crucial link between communities and the public health system, providing vital health services. ASHAs play a pivotal role in connecting marginalized communities to these health facilities, thereby enhancing the reach and effectiveness of healthcare services in rural areas. This study aims to examine the role of ASHAs in enhancing the quality of health services for rural populations through sub-centres, assess the effectiveness of ASHA initiatives, and raise public awareness about these programs.

Hypothesis Development

Acceptability, Counselling, Availability, Support Services and Service Delivery

Governments today are making extensive efforts to provide personalized healthcare services to the general population through ASHA workers. While designing, assessing, and implementing healthcare interventions, **acceptability** is a key factor that must be given due consideration, as most healthcare programs are multifaceted in nature. It refers to the degree to which a service is considered appropriate, socially acceptable, or tolerable by individuals and communities. It also signifies the alignment between clients' attitudes toward healthcare providers' personal and professional characteristics and the actual attributes of those providers^{11,12}. In the context of ASHA workers, acceptability is influenced by factors such as their gender, language, and cultural background, which play a crucial role in fostering trust, dignity, and effective healthcare service delivery.

Counselling is another critical aspect of ASHA workers' roles. Counselling skills—both verbal and nonverbal—enhance communication and the ability to provide effective guidance¹³. From a healthcare

perspective, counselling plays a crucial role in both physical and psychological well-being. Healthcare counselling aims not only to treat medical conditions but also to improve individuals' overall quality of life. It encompasses promoting good health, preventing diseases, addressing mental health challenges, and encouraging healthy behaviors and lifestyles. ASHA workers build this trust by connecting communities to functional healthcare services, thereby strengthening their role as key health advisors^{14,15}.

Availability of ASHA workers is essential in ensuring continuous access to healthcare. By actively involving local communities in health planning and service utilization, ASHA workers help decentralize healthcare services, empowering people to take charge of their well-being⁸. To enhance service delivery, it is vital to involve communities in the recruitment process and in defining ASHA workers' responsibilities. This engagement strengthens the link between communities and formal healthcare systems, improving healthcare outcomes¹⁶.

Support services and **service delivery** further shape the impact of ASHA workers. To meet the growing healthcare demands of the population, adequate resources, workforce availability, and appropriate skill development are necessary. Healthcare benefits must be provided promptly, ensuring that recipients can access services when needed. Special attention should be given to individuals with disabilities, travellers, and those residing in remote, disaster-prone, or conflict-affected areas.

H1: Acceptability (H1a), Counselling (H1b), Availability (H1c) and Support Services (H1d) contribute significantly to Service Delivery

Service Delivery and Quality of Health Services

In the era of globalization, healthcare service providers face intense competition due to the industry's shift toward managing healthcare systems and addressing challenges such as overcapacity¹⁷. Service quality and patient satisfaction have become critical concerns, with research confirming the

significant impact of perceived service quality on the success or failure of healthcare organizations.^{18,19, 20}

The perception of service quality is a key determinant of healthcare organizations' success, as it directly influences patient satisfaction^{21,22} and hospital profitability^{23,24}.

Donabedian (1996)²⁴ defines healthcare service quality as "the application of medical science and technology in a manner that maximizes its benefit to health without correspondingly increasing the risk." Studies have also indicated that ASHA workers provide better services to beneficiaries with education up to or below the secondary level compared to those who are either illiterate or more highly educated. However, challenges remain, as ASHA workers are not always fully adherent to new service-related norms. Despite this, most ASHA workers remain committed to their roles, particularly when incentivized, such as through institutional deliveries²⁵.

Healthcare quality is characterized by the provision of effective and safe care, embedded in a culture of excellence, and aimed at achieving optimal health outcomes²⁶. However, accessibility remains a crucial factor—without adequate availability of health workers, service utilization cannot be ensured. Additionally, even when healthcare workers are present, the acceptability of their services determines whether communities will seek care.

H2: Service Delivery has Significant Impact on Quality of Health Services

Service Delivery and Quality of Health Services

The effectiveness of healthcare service delivery is influenced by various factors, including acceptability, counselling, availability, and support services. Service delivery plays a mediating role in determining the overall quality of healthcare services, as it bridges the gap between community needs and healthcare accessibility. Acceptability refers to the extent to which healthcare services align with the cultural, social, and personal preferences of the community. A higher level of acceptability leads

to greater trust and utilization of healthcare services. However, effective service delivery is necessary to translate acceptability into measurable improvements in healthcare quality. If healthcare services are widely accepted but not efficiently delivered, their impact remains limited. Therefore, service delivery is expected to mediate the relationship between acceptability and quality of health services. Counselling, particularly in areas such as maternal health, family planning, and disease prevention, is a critical component of community healthcare programs. ASHA workers play a significant role in educating individuals about health risks, available treatments, and preventive measures. However, for counselling to enhance healthcare quality, effective service delivery mechanisms must be in place to ensure that individuals can access the necessary healthcare resources. Hence, service delivery mediates the relationship between counselling and quality of health services. Availability refers to the presence of healthcare infrastructure, medical staff, and essential supplies. While availability is a fundamental aspect of healthcare provision, it does not automatically ensure improved health outcomes. The efficiency of service delivery mechanisms, such as streamlined patient referrals, reduced waiting times, and proper utilization of resources, determines whether healthcare quality improves. Therefore, service delivery is expected to mediate the relationship between availability and quality of health services. Support services such as transportation, referral networks, and emergency medical care, enhance healthcare accessibility. However, the presence of support services alone is insufficient; they must be effectively integrated into the healthcare system through efficient service delivery mechanisms. For instance, even if ambulance services are available, delays or inefficiencies in deployment may reduce their impact on healthcare quality. Thus, service delivery mediates the relationship between support services and quality of health services. Based on the above discussions, the study hypothesizes that service delivery acts as a mediator between acceptability, counselling, availability, and support services, and the overall quality of healthcare services.

H3: Service Delivery mediates the relationship between Acceptability (H3a), Counselling (H3b), Availability (H3c) and Support Services (H3d) and Quality of Health Services

Research Methodology and Data Analysis

Measurement items Development

The scale items were developed in order to measure the role of ASHA for the upliftment of health services under NHM, with a detailed discussion with the academicians and investigation from the past review of literature and hence, the language was modified. Four main dimensions i.e. support services (7), Acceptability (5), Availability (8) and Counselling (18). were identified and Five point Likert scale has been used for the sake of uniformity ranging from strongly disagree (1) to strongly agree (5). A pilot testing has been done in order to maintain consistency, easiness of understanding, questions sequence and context suitability in the questionnaire and interviewed with ASHA workers, FMPW and villagers. Hence, refined and finalised the scales for all variables based on their feedback.

Sample and Data Collection

Keeping in view the objectives of the research, purposive sampling technique were adopted in collection of primary data from the ten villages of Garnai; Garnai is a large village located in Udhampur Tehsil of Udhampur district, Jammu and Kashmir with total 530 families residing. The Garnai village has population of 2916 of which 1532 are males while 1384 are females as per Population Census 2011. The women villagers who visit to the sub - centre on 1st and 4th Wednesday of the month were contacted. The data collection was done by investigator himself with the help of semi - structured questionnaire. The 90 respondents are selected for final survey on the basis of pretesting. The demographic profile of the samples is shown in Table 1.

Table 1. Demographic Profile of the Respondents

Particulars	Name	Frequency	Percentage(%)
Village	Gangal	10	11.11
	Lota Garnai	15	16.67
	Upper Garnai	9	10.00
	Kriya	4	04.44
	Dela	9	10.00
	Nagallia	7	07.78
	Bishora	8	08.89
	Padder	10	11.11
	MulgalBai	8	08.89
	TundayTlay	10	11.11
	Total	90	100.0
Age	Below 25	41	45.55
	25 - 30	29	32.23
	30 - 35	10	11.11
	35 above	10	11.11
	Total	90	100.0
Qualification	Primary	18	20.00
	Secondary	17	18.88
	Higher Secondary	30	33.33
	Graduate	20	22.22
	Post Graduate	15	16.66
	Total	90	100.0
Income	Below 5000	36	40.0
	5001 -2000	36	40.0
	2001 -3000	9	10.0
	3000 above	9	10.0
	Total	90	100.0
Asha Visit to Eligible Women After Delivery	Immediate after delivery	52	57.80
	Twice a Week	26	28.90
	After a Week	7	07.80
	Within a month	5	05.60
	Total	90	100.0
Asha Visit to Eligible Women After Delivery	Twice	25	27.80
	Thrice	27	30.00
	4 - 5 times	27	30.00
	More than 7 times	11	12.20
	Total	90	100.0

Source: Authors' Findings

Data Analysis and Results

Cronbach alpha and composite reliability values are examined in order to find the dimension and factor wise reliability.

Cronbach alpha: The recorded alpha values as 0.679 (Acceptability) and 0.899 (Counselling), 0.897 (Availability), 0.888 (Support Services), 0.719 (Quality of health services) and 0.9 (Service delivery) which are above the threshold value of 0.6.

Measurement model analysis: The measurements and structural model area assessed by using partial least squares (PLS). PLS can ensure more theoretical parsimony and less model complexity²⁷ and is flexible in handling both reflective and formative constructs²⁸. The smallest sample size to be required by PLS should be at least 10 times the number of items present in the largest construct²⁹. Our sample size of 90 was sufficient for the use of the PLS technique. The number of statements retained in each dimension was support services (4), Acceptability (3), Availability (3), Counselling (6), Quality of health services (2) and Service delivery (4).

Item factor loadings, average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha are used to evaluate convergent validity. The commonly accepted cut-off values are 0.50 for AVE and 0.60 for factor loadings, CR, and Cronbach's alpha. Table 2, exhibit that convergent validity is acceptable for all constructs in the present study. The CR values and Cronbach's alphas for all constructs exceed 0.7, factor loadings for all items are above 0.7, and the AVE for each construct surpasses 0.5. The degree to which different constructs are distinct from one another is measured by discriminant validity. To assess this, we examined factor correlations and verified that the correlation between each pair of constructs was lower than the square root of their respective AVE²⁹ (Chin et al., 2003). The variance inflation factors (VIFs) in Table 2, all of which are below the threshold of 10³⁰, suggesting that multicollinearity is not an issue in this study. Acceptability, counselling, accessibility, support services, and service delivery can therefore be thought of as formative constructs.

Table 2. Measurement Model Results

Dimensions	Indicators Loadings	VIF	Psychometric Properties
Acceptability			Mean = 4.05, S.D = 0.673, SKEWNESS = -2.532, KURTOSIS = 7.720 AVE = 0.609 CR =0.823 Cronbach’s Alpha = 0.679
ASHA cooperative and easily approachable to community	0.768	1.282	
ASHAs sharing cordial relation with village community	0.772	1.338	
Rural Community listening and taking ASHA seriously	0.8	1.344	
Availability			Mean = 4.24, S.D =.766, SKEWNESS = -1.593, KURTOSIS = 3.997 AVE= 0.829 CR=0.936 Cronbach’s Alpha = 0.897
Free availability of medicines during pre/post pregnancy	0.899	2.463	
Availability of medicines for child care	0.893	2.851	
Pregnancy Registration by the ASHA Workers	0.939	3.881	

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Counselling			Mean = 4.19, S.D = 0.680, SKEWNESS = -2.538, KURTOSIS = 7.938 AVE = 0.665 CR = 0.922 Cronbach's Alpha = 0.899
Immunization to child	0.784	2.167	
Health problems of Teen agers and solutions	0.844	2.67	
Meeting with of newly married women	0.767	1.877	
Keeping the baby warm	0.88	3.34	
Counseling by ASHA for institutional delivery	0.808	2.413	
Counseling on breastfeeding from ASHA	0.804	2.154	
Support Services			Mean = 4.15, S.D = 0.673, SKEWNESS = -2.851 KURTOSIS = 9.591 AVE = 0.665 CR = 0.888 Cronbach's Alpha = 0.832
Accompanying women for institutional delivery	0.849	1.964	
Visiting newborn for advice/care	0.853	2.021	
Transport facilities	0.809	1.895	
Women met by ASHA (≥3 times) during antenatal period	0.744	1.491	
Service Delivery			Mean=4.22, S.D = 0.655, SKEWNESS = -3.209 KURTOSIS =11.040 AVE = 0.770 CR = 0.930 Cronbach's Alpha = 0.900
Dispensing of Vitamin a Pills	0.851	2.604	
Selection of health centres for delivery	0.899	3.173	
Post delivery care	0.883	3.069	
Birth registration	0.876	3.051	
Quality of Health Services			Mean = 4.45, S.D = 0.831, SKEWNESS = -2.327, KURTOSIS = 6.221 AVE = 0.663 CR = 0.797 Cronbach's Alpha = 0.499
providing quality health services	0.755	1.124	
good services	0.869	1.124	

The scale's discriminant validity is demonstrated by the fact that the square roots of the AVEs for each construct are greater than their correlations with other constructs, as shown in Table 3. The

heterotrait-monotrait (HTMT) ratio of correlations was examined to further assess discriminant validity. The results indicate that all construct values meet the threshold of 0.85³¹ or 0.95³².

Table 3. Discriminant Validity

Dimensions	Acceptability	Availability	Counselling	Quality of Health Services	Service Delivery	Support Services
Acceptability	-	-	-	-	-	-
Availability	0.912	-	-	-	-	-
Counselling	0.989	0.92	-	-	-	-
Quality of Health Services	1.229	0.784	0.806	-	-	-
Service Delivery	1.011	0.816	0.943	0.889	-	-
Support Services	0.976	0.844	0.929	0.946	0.901	-

Testing Structural model analysis: To assess the statistical significance of the weights of first-order constructs and path coefficients, the bootstrapping procedure was performed²⁹. All path coefficients are significant at the 1% level, as shown in Table 4, substantiating the hypothesized relationships. The results indicate that acceptability has a significant direct relationship with service delivery (SRW = 0.095, $p = 0.004$), as does counselling (SRW = 0.145,

$p = 0.001$) leading to the acceptance of H1a and H1c. However, availability, (SRW = 0.088, $p = 0.959$) and support services (SRW = 0.119, $p = 0.107$) do not significantly contribute to service delivery, resulting in the rejection of H1b and H1d. Additionally, service delivery has a significant impact on the quality of healthcare services (SRW = 0.155, $p = 0$), confirming H2.

Table 4. Hypothesis testing results (Direct effects)

Hyp	Relationships	R ²	f ²	SRW	T statistics	P values	Class Interval	
							LLCI	ULCI
H1a	Acceptability -> Service Delivery	0.274	0.269	0.095	2.871	0.004	0.077	0.442
H1b	Availability -> Service Delivery	0.005	-0.006	0.088	0.052	0.959	-0.168	0.18
H1c	Counselling -> Service Delivery	0.478	0.447	0.145	3.3	0.001	0.221	0.757
H1d	Support Services -> Service Delivery	0.192	0.222	0.119	1.61	0.107	0.011	0.451
H2	Service Delivery -> Quality of Health Services	0.605	0.586	0.155	3.91	0	0.214	0.788

Source: Authors' Findings

Testing of the mediating effect: We followed Baron and Kenny's¹ (1986) procedure to test the mediating role of service delivery. First, we examined the direct effects of acceptability, counselling, availability, and support services on the quality of healthcare services. Next, we tested the indirect effects of these factors by considering service delivery as a mediator.

As shown in Table 5, the results indicate that service delivery mediates the relationship between counselling and quality of healthcare services ($p = 0.002$) and acceptability and service delivery ($p = 0.025$). Hence hypothesis 3b & 3c is accepted. However, service delivery does not mediate the relationships between availability and quality of healthcare services ($p = 0.959$), nor between support services and quality of healthcare services ($p = 0.182$). Hence hypothesis 3a & 3d are rejected.

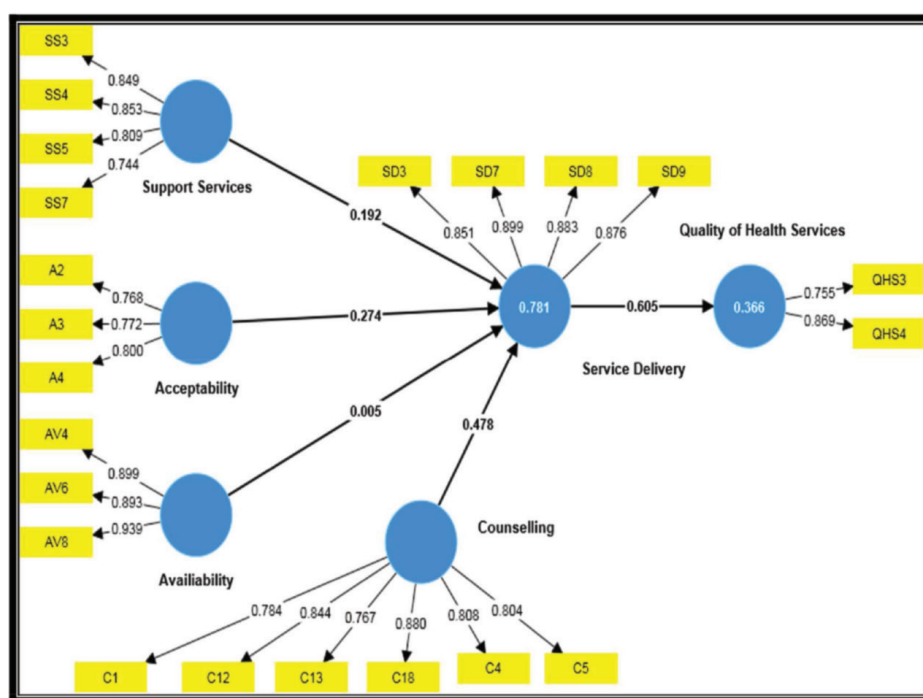
Table 5. Indirect Effect

Hyp	Relationships	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
H3a	Availability -> Service Delivery -> Quality of Health Services	0.003	-0.002	0.053	0.052	0.959

Continue....

H3b	Counselling -> Service Delivery -> Quality of Health Services	0.289	0.257	0.093	3.121	0.002
H3c	Acceptability -> Service Delivery -> Quality of Health Services	0.165	0.163	0.074	2.249	0.025
H3d	Support Services -> Service Delivery -> Quality of Health Services	0.116	0.135	0.087	1.336	0.182

Source: Authors' Findings



Source: Authors' Findings

Discussion and Implications

The study highlights the need for continuous monitoring and improvement in healthcare services to ensure effective delivery. ASHA (Accredited Social Health Activist) workers play a pivotal role in implementing healthcare programs and have the potential to contribute significantly to a more efficient and improved healthcare system in the country.

The research findings indicate that ASHA workers have achieved a high level of acceptability in the study area. A growing number of residents

are seeking their assistance and guidance for various health concerns. This acceptance is attributed to their ability to bridge the gap between communities and formal healthcare institutions, making healthcare more accessible, affordable, and approachable for rural populations. According to Nair et al. 2010³³ ASHA workers act as mediators, ensuring that healthcare services reach the most vulnerable sections of society, especially women and children.

One of the key reasons for the high acceptability of ASHA workers is their deep integration within the community. As local residents themselves,

they understand the cultural, social, and economic dynamics of the people they serve. This familiarity fosters trust and encourages community members to approach them for healthcare advice and services³⁴.

The study further establishes that ASHA workers are key contributors to improving the quality of healthcare services. Their presence has enhanced healthcare accessibility at the grassroots level, fostering greater community engagement and participation in healthcare programs. Their efforts in health awareness, preventive care, and maternal-child health services underscore their indispensable role in strengthening rural healthcare systems.

Research stated that ASHA workers serve as first points of contact for healthcare in many remote areas where medical facilities are scarce. ASHA workers act as intermediaries between communities and healthcare systems, improving maternal and child health service delivery and ensuring the inclusion of marginalized populations³⁵.

Despite their commendable efforts, ASHA workers face several challenges, including work overload, inadequate incentives, safety concerns, and resistance from traditional beliefs in some communities. Addressing these challenges through better training, increased financial support, and policy interventions can enhance their effectiveness.

Managerial Implication

The ASHA workers are playing a very vital role in the reproductive and child health care and creating the awareness about better health services in the study area. The ASHA workers playing a crucial role during the immunization drive and by emphasizing on the role immunization on child survival, promoting reproductive health, safe motherhood, ensure the birth of the healthy child, birth spacing and family planning of the child.

The study reveals that there is a need of family counselling centre at each sub - centre. Also appointing gynecologists at sub - centre level will also help for rural women. According to Gopi and Rozario (2015)³⁶ it is important to equalize the targeted population of all the ASHA workers, if

possible revise the targeted population according to the density of the respective communities. ASHA should conduct more medical camps and seminars to make people more aware.

A medicine kit to ASHA must be provided at the earliest to help the village people better and promptly. Training should be provided to ASHA's to enhance their knowledge and skill ³⁷

ASHA are assisting women for immunization and supplementary nutrition, counselling on eating food, maintain cleanliness, provide escort to pregnant women for delivery in hospital, and refer TB, malaria, leprosy cases to sub centre. But the primary role of registration& encouraging the women for availing institutional delivery was largely missed by the ASHA.

The study affirms that ASHA workers are indispensable to the rural healthcare system, playing a transformative role in maternal and child healthcare, immunization programs, and overall health promotion. Their high level of acceptability and trust within communities underscores their effectiveness in improving public health outcomes. By addressing healthcare disparities, promoting preventive care, and acting as vital links between communities and healthcare institutions, ASHA workers contribute significantly to India's public health framework.

However, to maximize their impact, there is a pressing need for continuous monitoring, training, financial support, and policy improvements. Investing in ASHA workers' capacity-building and addressing the challenges they face can further strengthen rural healthcare and enhance the quality of life for millions of people. By doing so, ASHA workers can continue to play a crucial role in bridging healthcare gaps and ensuring equitable healthcare access for all.

The study underscores the importance of continuous monitoring and support for ASHA workers to further enhance healthcare service delivery. The study recommend continuous skill development programs can equip ASHA workers with updated medical knowledge and enhance their service delivery capabilities. Providing timely

payments, incentives, and recognition for their contributions can boost their motivation and efficiency. Improved coordination between ASHA workers and higher-level healthcare facilities can ensure timely medical interventions for severe cases. Encouraging local community members to actively participate in healthcare initiatives can strengthen the acceptability and effectiveness of ASHA workers. The use of mobile health (mHealth) applications for record-keeping, tracking immunization schedules, and patient monitoring can streamline healthcare delivery.

Limitation and Future Research

To conclude, this study identifies the various dimensions such as acceptability, counselling, availability and support services which impact the service delivery of ASHA Workers. The study also empirically validates the effects of acceptability, counselling, availability and support services on Quality of health services and also exhibit about the important role of service delivery for the understanding the relationship. The results provide theoretical precision about the quality of health services in context to the rural areas. The findings of the study also provide an insight problems and challenges faced by the ASHA workers in providing services to the rural people as well as the obstacles faced by the rural people in receiving the services of the ASHA workers. The present study has several limitations that can be addressed in future research. The study is limited to villages covered by one sub centre of Garnai, the validity of our findings may be limited. In future more sub centers can be contacted for future research with increased sample size and can replicate the study replicate the with different groups and also can be extended across various regions, states to establish the validity of NHRM schemes. Presently only villagers are contacted in future ANM, FMPW and workers. Our study does not consider the factors that may moderate the relationship among acceptability, counselling, availability and support services on Quality of health services.

Source of Funding: Self

Conflict of Interest: There is no conflicts of interest, financial or otherwise.

Ethical Clearance: We affirm that this research adheres to the highest ethical standards.

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Perceived Stigma Associated with Tuberculosis (TB) among Patients and Attitude of Caregivers Towards Affected Person in Selected areas of Surat District, Gujarat

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How to cite this article: Nilam Rathod, Rani Shetty, . Perceived Stigma Associated with Tuberculosis (TB) among Patients and Attitude of Caregivers Towards Affected Person in Selected areas of Surat District, Gujarat. International Journal of Nursing Care / Vol 13 No. 2, July - December 2025

Abstract

Introduction: Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, primarily affects the lungs and is a leading cause of global mortality, total of 1.25 million people died from tuberculosis (TB) in 2023 (including 161 000 people with HIV). The disease disproportionately impacts low- and middle-income countries, with a significant burden among men. TB spreads through airborne transmission, but most exposed individuals do not develop active disease. Stigma plays a crucial role in shaping societal attitudes towards TB, affecting patients and their families through fear of discrimination and exclusion. This study examines perceived TB stigma among patients and their household contacts.

Methodology: This cross-sectional study employed a quantitative approach to assess perceived stigma associated with tuberculosis (TB) among patients and evaluate caregivers' attitudes towards affected individuals in Bardoli taluka. Using the Raosoft sample size calculator, 148 TB patients undergoing DOT therapy were recruited through non-probability purposive sampling. Inclusion criteria were patients over 18 who understood Gujarati, Hindi, or English, while those with deafness and dumbness and mentally challenged were excluded. Data collection involved socio-demographic and medical information, as well as the Modified Explanatory Model Interview Catalogue (MEMIC) stigma scale for patients and the Explanatory Model Interview Catalogue (EMIC) for caregivers. Data were collected via face-to-face interviews from May 28 to July 3, 2024, each lasting 15-20 minutes.

Result: The study finds that most TB patients are young, male (56.1%), married (77.0%), and Hindu (88.5%), with many laborers earning Rs. 5001–10,000 (42.6%). Nearly all have pulmonary TB (98.6%) and high treatment compliance (89.2%). Stigma is prevalent, with 35.8% hiding their condition, 46.6% feeling a loss of self-respect, and 38.5% experiencing shame. Caregivers, mostly females (58.8%), share similar concerns. The mean stigma score is 20.76 (SD = 6.41), with a moderate positive correlation ($r = 0.587$) between stigma and caregiver attitudes. While stigma is not linked to patient demographics, caregiver attitudes significantly vary with income.

Conclusion: Based on the findings of the study, it was concluded that the stigma negatively impacts family dynamics and employment. Stigma level linked to care giver's perceptions of TB care.

Key words: Perceived, Stigma, Attitude, Tuberculosis, Care givers

Introduction

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, primarily affects the lungs and is a leading cause of global mortality. Total of 1.25 million people died from tuberculosis (TB) in 2023 (including 161 000 people with HIV). Worldwide, TB has probably returned to being the world's leading cause of death from a single infectious agent, following three years in which it was replaced by coronavirus disease (COVID-19). It was also the leading killer of people with HIV and a major cause of deaths related to antimicrobial resistance. In 2023, an estimated 10.8 million people fell ill with TB worldwide, including 6.0 million men, 3.6 million women and 1.3 million children. TB is present in all countries and age groups. TB is curable and preventable. Multidrug-resistant TB (MDR-TB) remains a public health crisis and a health security threat. Only about 2 in 5 people with drug resistant TB accessed treatment in 2023. US\$ 22 billion is needed annually for TB prevention, diagnosis, treatment and care to achieve the global target by 2027 agreed at the 2023 UN high level-meeting on TB¹.

The disease disproportionately impacts low- and middle-income countries, with a significant burden among men⁴. TB spreads through airborne transmission, but most exposed individuals do not develop active disease. Stigma plays a crucial role in shaping societal attitudes towards TB, affecting patients and their families through fear of discrimination and exclusion.

Objectives

1. To assess perceived stigma associated with TB among patients diagnosed with the same.
2. To find out attitude of caregivers towards affected patients diagnosed with TB.
3. To find correlation between the level of stigma and attitude of caregivers.
4. To find the association of level of stigma and attitude of caregivers with their selected sociodemographic variables.

Need for The Study

Existing literature indicates a high prevalence of stigma among TB patients in India. For instance, a study conducted in Puducherry reported that 69.3% of TB patients experienced some form of stigma, with 52.6% reporting participation restriction due to stigma¹⁵. Similarly, research in Delhi revealed that 45.5% of TB patients perceived stigma from family and friends, and 58.2% faced stigma at the workplace.

In Surat district, there is a dearth of data on the prevalence and impact of TB-related stigma. Given the region's unique cultural and socioeconomic landscape, it is imperative to assess the extent of stigma and its associated factors among TB patients. Moreover, understanding the attitudes of caregivers towards TB patients is crucial, as their support and perceptions can influence treatment adherence and patient well-being¹⁹.

Therefore, this study aims to assess the perceived stigma associated with TB among patients and evaluate the attitudes of caregivers towards affected individuals in selected areas of Surat district, Gujarat. The findings will provide valuable insights to inform targeted interventions and policies aimed at reducing stigma and improving the quality of care for TB patients in the region.

Methodology

This cross-sectional study employed a quantitative approach to assess perceived stigma associated with tuberculosis (TB) among patients and evaluate caregivers' attitudes towards affected individuals in Bardoli taluka. Using the Raosoft sample size calculator, 148 TB patients undergoing DOT therapy were recruited through non-probability purposive sampling at 95% confidence level and 5% margin of error. Inclusion criteria were patients over 18 who understood Gujarati, Hindi, or English, while those with deafness and dumbness and mentally challenged were excluded. Data collection involved socio-demographic and medical information, as well as the Modified Explanatory Model Interview Catalogue (MEMIC) stigma scale for patients and the

Explanatory Model Interview Catalogue (EMIC) for caregivers. The EMIC demonstrated high reliability, with Cronbach's alpha coefficients of 0.74 for patients and 0.90 for caregivers. Data were collected via face-to-face interviews from May 28 to July 3, 2024, each lasting 15-20 minutes. Statistical analysis included range, mean, standard deviation, median, and mean percentage to evaluate stigma levels and caregiver attitudes.

Result

The study finds that most TB patients were under 30, predominantly male (56.1%), married (77.0%), and Hindu (88.5%), with many working as laborers

earning Rs. 5001-10,000 (42.6%). Nearly all have pulmonary TB (98.6%) and exhibit high treatment compliance (89.2%). Caregivers are mostly aged 31 to 40 (30.4%) and female (58.8%). Stigma is significant, with 35.8% of patients wanting to hide their condition, 46.6% feeling a loss of self-respect, and 38.5% experiencing shame. Additionally, 42.6% believe their community would show less respect, and 34.5% worry about their children's social standing. Caregivers also express concerns, with 43.9% believing individuals with TB prefer to conceal their status. Overall, the data highlights the pervasive stigma and social anxiety surrounding TB, impacting both patients and their families.

Table 1. Item wise analysis of Explanatory Model Interview Catalogue (EMIC) stigma scale, adapted for TB affected people **N=148**

SL. No.	ITEMS	YES		POSSIBLY		UNCERTAIN		No	
		f	%	f	%	f	%	f	%
1	If possible, would you prefer to keep people from knowing about TB?	53	35.8	31	20.9	16	10.8	48	32.4
2	Have you discussed this problem with the person you consider closest to you, the one whom you usually feel you can talk to most easily?	28	18.9	15	10.1	59	39.9	46	31.1
3	Do you think less of yourself because of this problem? Has it reduced your pride or self-respect?	19	12.8	50	33.8	41	27.7	38	25.7
4	Have you ever been made to feel ashamed or embarrassed because of this problem?	18	12.2	43	29.1	30	20.3	57	38.5
5	Do your neighbours, colleagues or others in your community have less respect for you because of this problem?	16	10.8	33	22.3	36	24.3	63	42.6

Continue....

6	Do you think that contact with you might have any bad effects on others around you even after you have been treated?	34	23.0	40	27.0	28	18.9	46	31.1
7	Do you feel others have avoided you because of this problem?	36	24.3	35	23.6	30	20.3	47	31.8
8	Would some people refuse to visit your home because of this condition even after you have been treated?	19	12.8	52	35.1	35	23.6	42	28.4
9	If they knew about it would your neighbors, colleagues or others in your community think less of your family because of this problem?	19	12.8	48	32.4	31	20.9	50	33.8
10	Do you feel that your problem might cause social problems for your children in the community?	51	34.5	53	35.8	22	14.9	22	14.9
11A	Do you feel that this disease has caused problems in getting married? (Unmarried only)	20	13.5	9	6.1	4	2.7	115	77.7
11B	Do you feel that this disease has caused problems in your marriage? (Married only)	26	17.6	43	29.1	12	8.1	67	45.3
12	Do you feel that this disease makes it difficult for someone else in your family to marry?	35	23.6	50	33.8	35	23.6	28	18.9
13	Have you been asked to stay away from work or social groups?	35	23.6	28	18.9	35	23.6	50	33.8
14	Have you decided on your own to stay away from work or social group?	29	19.6	32	21.6	28	18.9	59	39.9
15	Because of TB people think you also have other health problems	21	14.2	55	37.2	20	13.5	52	35.1

Table 2. Item wise analysis of Explanatory Model Interview Catalogue (EMIC) stigma scale for the care givers, adjusted for TB. **N=148**

SL. No.	ITEMS	YES		POSSIBLY		NO/ DON'T KNOW	
		f	%	f	%	f	%
1	Would a person with TB keep others from knowing, if possible?	65	43.9	49	33.1	34	23.0
2	If a member of your family had TB, would you think less of yourself, because of this person's problem?	28	18.9	67	45.3	53	35.8
3	In your community, does TB cause shame or embarrassment?	22	14.9	37	25.0	89	60.1
4	Would others think less of a person with TB?	25	16.9	42	28.4	81	54.7
5	Would knowing that someone has TB have an adverse effect on others?	42	28.4	75	50.7	31	20.9
6	Would other people in your community avoid a person affected by TB?	51	34.5	48	32.4	49	33.1
7	Would others refuse to visit the home of a person affected by TB?	35	23.6	61	41.2	52	35.1
8	Would people in your community think less of the family of a person with TB?	36	24.3	63	42.6	49	33.1
9	Would TB cause problems for the family?	83	56.1	34	23.0	31	20.9
10	Would a family have concern about disclosure if one of their members had TB?	46	31.1	63	42.6	39	26.4
11	Would TB be a problem for a person to get married?	59	39.9	57	38.5	32	21.6
12	Would TB cause problems in an on-going marriage?	54	36.5	61	41.2	33	22.3
13	Would having TB cause a problem for a relative of that person to get married	37	25.0	68	45.9	43	29.1

Continue....

14	Would having TB cause difficulty for a person to find work?	40	27.0	79	53.4	29	19.6
15	Would people dislike buying food from a person affected by TB?	23	15.5	85	57.4	40	27.0

Table 3 provides details on the perceived stigma associated with tuberculosis (TB) among 148 patients. The dataset, which spans a range from 3 to 35, reveals a mean of 20.76, indicating the average value is relatively central within this range. The standard deviation of 6.40 suggests a moderate level of variability among the data points. The median, at 22.0, further supports the central tendency of the dataset, showing that half of the values fall below this point. Additionally, a mean percentage of 46.1 reflects the overall proportionate representation of the data, highlighting its significant variability in the level of stigma perceived by the patients.

Table 3. Range, mean, standard deviation, median and mean percentage of perceived stigma associated with TB among TB affected patients

N = 148

Range	Mean	Standard deviation	Median	Mean percentage
3-35	20.76	6.40	22.0	46.1

Table 4 provides a summary of the caregivers' attitudes towards TB. The scores for caregivers' attitudes range from 2 to 28. The average score is 14.74, with a standard deviation of 4.57, indicating a moderate level of variability in attitudes among caregivers. The median score is 15.0, which is close to the mean, suggesting that the data is fairly

symmetrically distributed around the average score. The mean percentage, which represents the average attitude score as a percentage of the maximum possible score, is 49.1%. This percentage reflects that, on average, caregivers' attitudes are about halfway between the minimum and maximum possible scores, indicating a generally moderate attitude towards TB.

Table 4. Range, mean, standard deviation, median and mean percentage of care giver's attitude

N = 148

Range	Mean	Standard deviation	Median	Mean percentage
2-28	14.74	4.57	15.0	49.1

Table 5 describes the relationship between stigma experienced by TB patients and the attitudes of their caregivers. The mean stigma score is 20.76 with a standard deviation of 6.41, while the correlation coefficient (r value) between stigma and caregiver attitude is 0.587. This indicates a moderate positive correlation, meaning that as stigma levels increase, caregivers' attitudes tend to become more positive. The p-value is less than 0.001, suggesting that this correlation is statistically significant. The data reveal a significant moderate positive relationship between the stigma experienced by TB patients and the attitudes of their caregivers.

Table 5. Correlation between stigma associated with TB affected patients and care giver's attitude

N = 148

Variables	Mean	Standard deviation	Coefficient of correlation (r value)	Type of correlation	p value
Stigma	20.76	6.41	0.587	Moderate positive	<0.001***
Care giver's attitude	14.74	4.57			

Table 6. Association of level of stigma with selected socio-demographic variables among TB affected patients**N = 148**

Sl. No	Demographic variables	Patient Stigma score		Total	χ^2 test
		$\leq$ Median (≤ 22.0)	$>$ Median (> 22.0)		
1	Age in years				$\chi^2=3.270$, df=4, p=0.514(NS)
	≤ 30	28	16	44	
	31-40	19	20	39	
	41-50	13	12	25	
	51-60	17	10	27	
	> 60	9	4	13	
2	Gender				$\chi^2=0.170$, df=1, p=0.680(NS)
	Male	47	36	83	
	Female	39	26	65	
	Transgender				
3	Marital status				$\chi^2=3.022$, df=2, p=0.221(NS)
	Married	64	50	114	
	Unmarried	15	11	26	
	Widower/widow	7	1	8	
4	Religion				$\chi^2=4.242$, df=2, p=0.120(NS)
	Hindu	75	56	131	
	Muslim	11	4	15	
	Christian				
	Others	0	2	2	
5	Educational qualification				$\chi^2=4.373$, df=4, p=0.358(NS)
	No formal Education	12	11	23	
	Primary	58	33	91	
	Secondary	2	1	3	
	Higher secondary	12	16	28	
	Under graduate and above	2	1	3	
6	Occupation				$\chi^2=7.945$, df=4, p=0.094(NS)
	Self Employed	20	21	41	
	Govt. Job	0	1	1	
	Private job	12	14	26	
	Laborer	44	19	63	
	Farmer	10	7	17	
7	Monthly income				$\chi^2=0.121$, df=3, p=0.989(NS)
	Rs. 3000 to 5000	21	15	36	
	Rs. 5001 to 10,000	37	26	63	
	Rs. 10,001 to 15, 000	26	19	45	
	Rs. 15000 and above	2	2	4	

Continue....

8	Diet				$\chi^2=2.416$, df=1, p=0.120(NS)
	Vegetarian	28	13	41	
	Mixed	58	49	107	
10	Diagnosis of Tuberculosis (To be recorded from medical records)				
10.1	Type of Tuberculosis				$\chi^2=1.462$, df=1, p=0.227(NS)
	Pulmonary	84	62	146	
	Extra Pulmonary	2	0	2	
10.2	Duration				$\chi^2=3.249$, df=3, p=0.355(NS)
	<1 Month	19	17	36	
	1 to 3 Months	35	17	52	
	3.1 to 6 Months	24	23	47	
	6.1 Months and above	8	5	13	
10.3	Treatment				$\chi^2=0.026$, df=1, p=0.873(NS)
	First line	81	58	139	
	Second line	5	4	9	
10.4	Compliance to treatment				$\chi^2=1.519$, df=1, p=0.218(NS)
	Yes	79	53	132	
	No	7	9	16	
10.5	Drug resistance				-
	MDR				
	XDR				
	No drug resistance	86	62	148	
11	History of suffering from any disease (Any Comorbidity).				$\chi^2=1.523$, df=1, p=0.217(NS)
	Yes, then please specify_____.	7	2	9	
	No	79	60	139	
12	History of taking any medication.				$\chi^2=2.300$, df=1, p=0.129(NS)
	Yes, then please specify_____.	6	1	7	
	No	80	61	141	

NS- Not Significant

Table 7. Association of caregiver attitude score with selected socio-demographic variables

N= 148

Sl. No	Demographic variables	Caregiver attitude score		Total	χ^2 test
		$\leq$ Median (≤ 15.0)	$>$ Median (> 15.0)		
1	Age in years				$\chi^2=4.750$, df=4, p=0.314(NS)
	≤ 30	21	11	32	
	31-40	23	22	45	
	41-50	19	24	43	
	51-60	14	8	22	
	> 60	4	2	6	
2	Gender				$\chi^2=0.770$, df=1, p=0.380(NS)
	Male	36	25	61	
	Female	45	42	87	
3	Marital status				$\chi^2=0.337$, df=1, p=0.562(NS)
	Married	70	60	130	
	Unmarried	11	7	18	
4	Religion				$\chi^2=0.140$, df=1, p=0.709(NS)
	Hindu	74	60	134	
	Muslim	7	7	14	
5	Educational qualification				$\chi^2=4.753$, df=4, p=0.314(NS)
	No formal Education	13	9	22	
	Primary	56	43	99	
	Secondary	1	1	2	
	Higher secondary	7	13	20	
	Under graduate and above	4	1	5	
6	Occupation				$\chi^2=3.557$, df=4, p=0.469(NS)
	Self Employed	23	28	51	
	Govt. Job	4	4	8	
	Private job	10	8	18	
	Laborer	33	21	54	
	Farmer	11	6	17	
7	Monthly income				$\chi^2=13.720$, df=3, p=0.003**
	Rs. 3000 to 5000	18	18	36	
	Rs. 5001 to 10,000	46	20	66	
	Rs. 10,001 to 15, 000	12	25	37	
	Rs. 15000 and above	5	4	9	
8	Relationship with client.				$\chi^2=2.169$, df=3, p=0.538(NS)
	Parents	18	22	40	
	Brother/sister	5	3	8	
	Spouse	45	33	78	
	Others	13	9	22	

NS- Not Significant, **- Significant at 0.01 level

There was no significant association found between stigma of patients affected with TB with their selected sociodemographic variables while there is a significant association between caregiver attitudes and monthly income found, indicating that attitudes vary with income levels.

Discussion

The present study result reveals that most are under 30 which is supported by study done by Swarna S. K. Kallepalliet al, Anand et al (30.51±11.3years)¹⁸ and Kamble et al (31.5±11.5 years).^(15, 16) predominantly male (56.1%) which is supported by studies by Kamble et al, Sunil et al and Aryal et al.^(15,17), married (77.0%) which is supported by study done by Kamble et al, and Aryal et al.^(15,17), and Hindu (88.5%) supported by study done by Swarna S. K. Kallepalliet al.¹⁸ A significant portion has completed primary education (61.5%) and works as labourers (42.6%), with most earning between Rs. 5001 and 10,000 (42.6%) which is similar to study done by Swarna S. K. Kallepalliet al.¹⁸ Clinically, 98.6% have pulmonary TB, with high treatment compliance (89.2%) and no drug resistance reported. Caregivers, mainly aged 31 to 40 (30.4%) and female (58.8%), share similar demographic traits, with many also being labourers or self-employed. The EMIC stigma scale data represents that patients prefer to keep their status hidden, experiencing feelings of shame and diminished self-respect. The EMIC stigma scale analysis reveals that (43.9%) believe individuals with TB prefer to hide their condition. While 45.3% wouldn't judge a family member with TB. Community views are largely negative, with 60.1% acknowledging shame and 54.7% believing others would judge affected individuals. This stigma affects family dynamics, marriage prospects, and employment, highlighting an urgent need for intervention. The perceived stigma among patients shows positively correlating with care giver's attitude ($r = 0.587$). However, stigma levels do not significantly relate to socio-demographic factors, except for a notable association between caregiver attitudes and monthly income, indicating that income influences perceptions and attitudes towards TB care.

Limitations

- This study is limited to selected areas within Surat district, Gujarat. Therefore, the findings may not be generalizable to patients with Pulmonary Tuberculosis in other regions of Gujarat or in different states or countries.
- The study includes a specific sample size of 148 patients. Participants are selected from certain health facilities or communities within Surat district, which may not represent the entire population of TB patients in the district.
- The focus is exclusively on patients diagnosed with Tuberculosis. Other respiratory diseases are excluded from the study.
- The study assesses the stigma and care giver's attitude at a single point in time or over a limited duration. Long-term impacts of TB or changes in stigma score or care giver's attitude over time are not addressed.

Recommendations

- The study can be repeated on the large-scale sample to validate and for better generalization of the findings.
- Comparative study can be done in urban, rural and tribal areas to assess level of stigma and care giver's attitude towards TB adjusted patient.
- Ongoing research and policy implementation for care and counselling should be integrated into health centres to raise TB awareness, reduce stigma, and eliminate barriers to care.
- Enhancing public knowledge about the effectiveness of anti-TB treatment can help diminish stigmatizing attitudes, prevent delays in diagnosis and treatment, and ultimately reduce TB-related morbidity and mortality.
- Comprehensive health education aimed at changing attitudes through community involvement is essential. Planning initiatives like family sensitization, community awareness campaigns, and emotional support for TB patients are crucial for reducing stigma and improving patient compliance.
- Support from community members, recovered patients, and others can aid in de-stigmatizing TB.

Conclusion

Based on the findings of the study, it was concluded that the stigma negatively impacts family dynamics and employment. Stigma level linked to care giver's perceptions of TB care.

Conflict of Interest: There was no conflict of interest reported.

Source of Funding: This study was self-funded.

Ethical Consideration: The permission was obtained from the CDHO, Surat, Gujarat with ref No. 1578. Study was approved by Institute ethics Committee with ref No. MBNC/231/2024-25. The Researcher had taken consent from the patients with Tuberculosis and their caregivers meeting the inclusion criteria.

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Work-Stress Related Factors & Intention to Leave among Oncology Nurses in Bahrain

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How to cite this article: Shaima Hamad Faraj, Zahrin Binti Ahmad Noorani, Mohamed Alhasan, Asma Essa Al Tameem, Fatema Isa Makahla, Deepa Rajendra Prasad, Alaa Alma. Work-Stress Related Factors & Intention to Leave among Oncology Nurses in Bahrain. International Journal of Nursing Care / Vol 13 No. 2, July - December 2025

Abstract

Oncology nursing is a challenging profession characterized by high emotional and physical demands. Nurses in this field frequently encounter unique stressors that can adversely affect their well-being and job performance, leading to high turnover rates and compromised patient care. This study investigates the work stress and turnover intentions experienced by oncology nurses in a Bahrain oncology centre.

Using a cross-sectional descriptive design, data were collected from registered oncology nurses providing direct care to cancer patients through a convenience sampling method. Participants were recruited from various inpatient and ambulatory oncology units, and all eligible nurses were invited via email. The study utilized a structured questionnaire consisting of three sections: demographic and professional characteristics, the Revised Nursing Stress Scale (RNSS) to evaluate stressors, and the Nurses' Turnover Intention Scale (TIS-6) to assess turnover intentions. Ethical approval was obtained, ensuring participant anonymity and informed consent.

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 26.0, applying descriptive statistics and various statistical tests to explore relationships between variables. Results revealed significant work stress among oncology nurses, driven by factors such as high workloads, emotional demands, inadequate staffing, and ethical dilemmas.

The findings highlight the critical nature of work stress in oncology nursing, underscoring its implications for both nurse well-being and patient care quality. Understanding the factors contributing to this stress is essential for developing effective interventions aimed at enhancing nurse resilience and improving care outcomes. This study emphasizes the need for further research and targeted strategies to mitigate work-related stress among oncology nurses.

Keywords: Oncology nurse, Work stress, anxiety, cancer, stress factors, intention to leave, nurses turn over.

Introduction

Work stress is a critical issue within the nursing profession, particularly among oncology nurses who

face unique and demanding challenges¹. This study aimed to explore the factors related to work stress and intention to leave among oncology nurses at an oncology centre in Bahrain, utilizing a cross-sectional

descriptive design. By employing a convenience sampling method, data were collected from registered nurses providing direct care to cancer patients across various inpatient and ambulatory care units. The targeted sample size was determined based on the feasibility and available resources for the study. The data collection instrument consisted of three main sections. The first section focused on demographic and professional characteristics, capturing details such as age, gender, years of experience, education level, and other relevant information. The second section featured the RNSS, which uses a 4-point Likert-type scale with nine subscales to evaluate the frequency of various stressors. The third section included the Nurses' TIS-6, designed to assess turnover intention through a five-point Likert scale. Ethical approval was granted by the institutional review board at the study center, and participants' identities were kept confidential.

Oncology nurses play a pivotal role in caring for cancer patients, providing essential physical, emotional, and psychological support throughout their treatment journey. However, the nature of their work exposes them to a range of stressors that can adversely affect their well-being and job performance. The consequences of work stress among oncology nurses can include burnout, decreased job satisfaction, increased turnover rates, and compromised patient care quality^{2,3,4}.

Several factors contribute to work stress within this profession. High workloads and time pressures are common challenges faced by oncology nurses. The demanding nature of their responsibilities, including managing complex patient cases and providing emotional support, can lead to significant stress. Inadequate staffing further exacerbates this issue, as nurses struggle to meet the diverse needs of their patients within limited timeframes^{5,6}.

Moreover, oncology nurses frequently encounter patient suffering and death, which can be emotionally draining and lead to compassion fatigue. Ethical dilemmas related to end-of-life care and treatment decisions add another layer of complexity to their roles, contributing to elevated

stress levels. Organizational factors, such as limited control over work processes, insufficient autonomy, and inadequate support from colleagues and supervisors, can also intensify feelings of frustration and helplessness among nurses⁷.

Understanding the interplay of these factors is essential for developing effective strategies to mitigate work stress among oncology nurses. Addressing these concerns is crucial not only for the well-being of the nurses but also for maintaining the quality of care provided to patients. By identifying and analyzing the contributing factors, targeted interventions can be implemented to support nurses in managing work-related stress and promoting resilience⁸.

In conclusion, work stress among oncology nurses is a significant concern that requires urgent attention. This study highlights the complex interplay of various stressors that these healthcare professionals face, ranging from high workloads and emotional challenges to organizational issues. By providing a comprehensive overview of the current knowledge regarding work stress, fatigue, anxiety, and turnover among oncology nurses, this study aims to inform future research and intervention development. Ultimately, understanding and addressing these challenges is vital for enhancing the well-being of oncology nurses and ensuring the delivery of high-quality patient care.

Material and Methods

This study investigates work-related stress and turnover intention among oncology nurses in Bahrain, aiming to identify key factors influencing their professional experiences. A cross-sectional descriptive design was chosen for this research to gather data at a single point in time, allowing for an in-depth exploration of these issues within the context of oncology care.

The study was conducted at an oncology center in Bahrain, where a convenience sampling method was employed to recruit participants from various inpatient and ambulatory care oncology units. The inclusion criteria required participants to be registered nurses actively providing direct care to

cancer patients. All eligible oncology nurses at the center received an invitation to participate via email, and the targeted sample size was determined based on the feasibility and available resources for the study.

Data collection was facilitated through a structured questionnaire consisting of three main sections. The first section captured demographic and professional characteristics, including participants' age, gender, years of experience, education level, and other relevant professional details. The second section featured the RNSS, a 4-point Likert-type scale with nine subscales designed to evaluate the frequency of various stressors experienced by nurses. The third section included the Nurses' TIS-6, which assesses turnover intention on a five-point Likert scale, ranging from disagree (1 point) to agree (5 points). Permissions for the use of these scales were secured from their respective authors prior to the study. Ethical approval was obtained from the institutional review board at the study center (**Approval Number:** RMS-KHUH /P&PEC/ 2023-696). To ensure confidentiality, no identifying information was collected from participants.

Data collection involved sending emails to eligible nurses through the research department. Before the collection process, participants were informed about the study's purpose, and informed consent was obtained. They were assured that their participation was voluntary, with the right to withdraw at any

time prior to data collection. Efforts were made to minimize any potential risks to participants' well-being, and the study adhered to relevant ethical guidelines. Participants were given sufficient time to complete the questionnaires, and researchers provided their contact information for any inquiries or clarifications.

Once data collection was complete, the responses were coded and entered into the SPSS version 26.0 for analysis⁹. Descriptive statistics, including frequency, percentage, and standard deviation, were utilized to summarize the demographic data. For non-parametric variables, the Kruskal-Wallis test was applied, while one-way ANOVA and t-tests were used for parametric data. The Spearman's rank correlation assessed relationships between continuous variables, and Chi-square and Fisher's exact tests were conducted to evaluate associations between categorical variables.

In summary, this methodology provides a comprehensive framework for understanding the work stressors and turnover intentions of oncology nurses in Bahrain. By employing a cross-sectional descriptive design and utilizing validated scales, the study aims to yield valuable insights into the challenges faced by these healthcare professionals. The findings will inform strategies to enhance nurse retention and improve the overall work environment within oncology care settings.

Tables and Figures

Table 1. Nurses' demographic characteristics are represented as frequencies and percentages, N (%):

Demographics	N (%)
Gender:	
▪ Male	28 (17.4)
▪ Female	133 (82.6)
Age (year):	
▪ Median (Interquartile Range)	29 (24 – 33)
▪ Minimum – Maximum	20 – 51

Continue....

Nursing qualification:	
▪ Diploma	33 (20.5)
▪ Bachelor's degree	122 (75.8)
▪ Master's degree	6 (3.7)
Nationality:	
▪ Bahraini	84 (52.2)
▪ Non-Bahraini	77 (47.8)
Years of working experience in patient care:	
▪ Median (Interquartile Range)	5 (3 – 9)
▪ Minimum – Maximum	0.2 – 28
Years of practicing as oncology nurse in current organization:	
▪ Median (Interquartile Range)	3 (2 – 4)
▪ Minimum – Maximum	0.2 – 14
Receiving training or attending workshop on work stress management since qualifying and working in nursing profession:	
▪ Yes	50 (31.1)
▪ No	111 (68.9)
Primary area of working:	
▪ Hematology Unit	33 (20.5)
▪ Palliative Unit (4M, 3M)	27 (16.8)
▪ Adult Hematology-Oncology	26 (16.1)
▪ Palliative Unit (4G)	22 (13.7)
▪ Medical Oncology	19 (11.8)
▪ Other	34 (21.1)
Current Position:	
▪ Staff Nurse	111 (69.0)
▪ Practical Care Assistance (PCA)	29 (18.0)
▪ Nurse/Deputy Manager	10 (6.2)
▪ Other	11 (6.8)

Other primary areas of working: Education, pain nurse, shift services, administration, out-patient clinic, chemotherapy day care unit, BMT unit, radiation oncology unit, and others.

Other current positions: Health care assistance (HCA), Practical care Assistance (PCA), educator, supervisor, directors, pain nurse and others.

Table 2. Revised Nursing Stress Scale (RNSS) Scores, represented as Median (Interquartile Range) or Mean $\pm$ Standard deviation:

Subscale	Median (Interquartile Range)	Total score
Subscale 1: Death and dying	8 (6 – 12)	18
Subscale 2: Conflict with Providers	4 (2 – 5)	12
Subscale 3: Inadequate Preparation	8 (6 – 10)	24
Subscale 4: Problems with Peers	4 (1 – 6)	12

Continue....

Subscale 5: Problems with Supervisors	8 (3 – 13)	30
Subscale 6: Workload	20 (14 – 30)	45
Subscale 7: Uncertainty Concerning Treatment	6 (3 – 7)	18
Subscale 8: Communication with Patients and Their Families	12 (9 – 17)	30
Subscale 9: Discrimination	0 (0 – 2)	9
	Mean $\pm$ Standard Deviation	Total score
Total stress scores for all subscales combined	76 $\pm$ 36	198

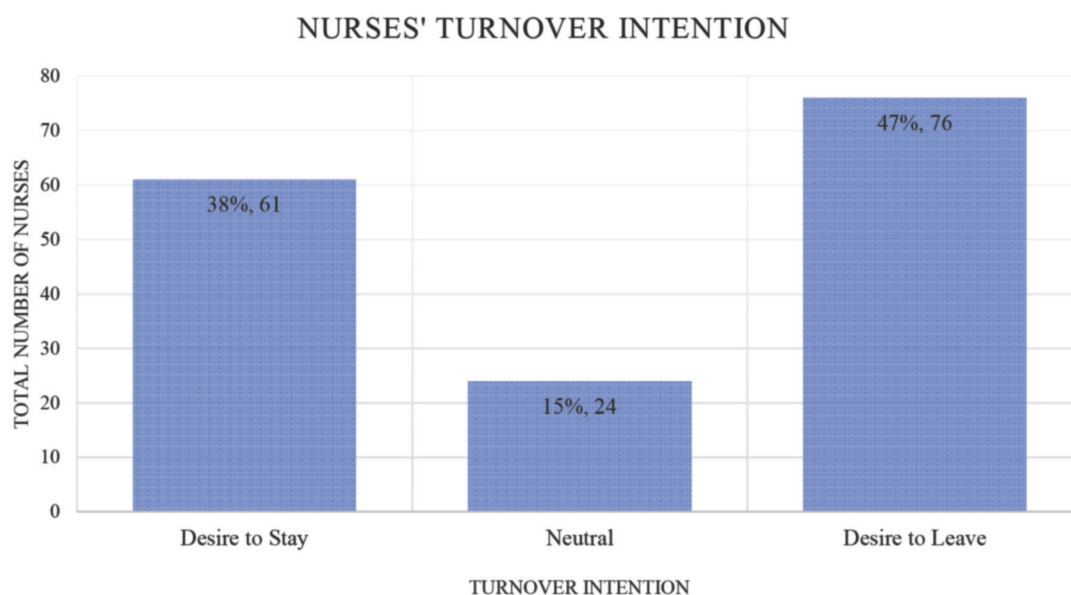


Figure 1: Nurses' Turnover Intension, represented as frequencies and percentages

There was a statistically significant difference in medians for conflict with providers among the groups, with nurses who were neutral in their turnover intentions experiencing higher conflict compared to the other groups. Workload, stress from patients and their families, and the total stress

scores for all subscales combined showed statistically significant differences in medians and means, with nurses desiring to leave reporting higher stress levels compared to the other groups, as represented in Table 3. Association between demographics and RNSS is represented in Table 4.

Table 3. Association between turnover and intensions to leave among oncology nurses, represented as Median (Interquartile Range) or Mean $\pm$ Standard deviation:

RNSS Subscale:	Turnover Intention			P-value
	Desire to Stay	Neutral	Desire to Leave	
Subscale 1: Death and dying				
Median (IQR)	8 (6 – 11)	10 (7 – 12)	8 (7 – 12)	0.369
Minimum - Maximum	0 – 18	2 – 17	2 – 18	

Continue....

Subscale 2: Conflict with Providers				
Median (IQR)	4 (2 – 5)	5 (4 – 8)	3 (2 – 5)	0.013*
Minimum - Maximum	0 – 12	1 – 9	0 – 12	
Subscale 3: Inadequate Preparation				
Median (IQR)	8 (6 – 10)	9 (6 – 11)	8 (6 – 11)	0.791
Minimum - Maximum	0 – 24	2 – 16	0 – 20	
Subscale 4: Problems with Peers				
Median (IQR)	4 (0 – 5)	4 (2 – 6)	4 (1 – 6)	0.393
Minimum - Maximum	0 – 12	0 - 9	0 – 12	
Subscale 5: Problems with Supervisors				
Median (IQR)	6 (2 – 11)	9 (4 – 12)	9 (3 – 15)	0.309
Minimum - Maximum	0 – 30	1 – 20	0 – 28	
Subscale 6: Workload				
Median (IQR)	16 (12 – 28)	20 (16 – 29)	24 (16 – 34)	< 0.01**
Minimum - Maximum	0 – 41	9 – 32	0 – 45	
Subscale 7: Uncertainty Concerning Treatment				
Median (IQR)	6 (3 – 7)	6 (4 – 8)	6 (3 – 8)	0.344
Minimum - Maximum	0 – 16	0 – 14	0 – 18	
Subscale 8: Patients and Their Families				
Median (IQR)	10 (7 – 14)	12 (11 – 16)	14 (10 – 22)	< 0.01**
Minimum - Maximum	0 – 28	3 – 22	0 – 30	
Subscale 9: Discrimination				
Median (IQR)	0 (0 – 2)	2 (0 – 3)	0 (0 – 2)	0.052
Minimum - Maximum	0 – 6	0 – 6	0 – 9	
Total stress scores for all subscales combined				
Mean ± Standard Deviation	67 ± 35	78 ± 27	82 ± 38	0.048*Ψ
Minimum - Maximum	7 – 183	32 – 136	4 – 181	

*Significant p-value <0.05

**Significant p-value <0.01, P-value was calculated using Kruskal-Wallis Test and One Way ANOVA Ψ as appropriate.

Table 4. Association between demographics and Revised Nursing Stress Scale (RNSS) Scores, represented as Median (Interquartile Range) or Mean ± Standard deviation

Demographics	N (%)	RNSS score	P-value
Gender:			
▪ Male	28 (17.4)	75.7 ± 30.7	0.979
▪ Female	133 (82.6)	75.5 ± 36.8	
Nursing qualification:			
▪ Diploma	33 (20.5)	86.6 ± 46.3	0.071
▪ Bachelor's degree	122 (75.8)	73.5 ± 31.9	
▪ Master's degree	6 (3.7)	56.5 ± 35.1	

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Nationality:			
▪ Bahraini	84 (52.2)	88.3 ± 36.8	< 0.01**
▪ Non-Bahraini	77 (47.8)	61.6 ± 28.9	
Receiving training or attending workshop on work stress management since qualifying and working in nursing profession:			
▪ Yes	50 (31.1)	66.8 ± 34.1	0.037*
▪ No	111 (68.9)	79.5 ± 35.9	
Primary area of working:			
▪ Hematology Unit	33 (20.5)	78.7 ± 41.7	0.622
▪ Palliative Unit (4M, 3M)	27 (16.8)	82.4 ± 32.4	
▪ Adult Hematology-Oncology	26 (16.1)	72.8 ± 30.8	
▪ Palliative Unit (4G)	22 (13.7)	80.5 ± 35.5	
▪ Medical Oncology	19 (11.8)	71.6 ± 39.2	
▪ Other	34 (21.1)	68.1 ± 34.4	
Current Position:			
▪ Staff Nurse	111 (69.0)	71.9 ± 32.0	0.006**
▪ Practical Care Assistance (PCA)	29 (18.0)	90.2 ± 46.5	
▪ Nurse/Deputy Manager	10 (6.2)	94.9 ± 24.0	
▪ Other	11 (6.8)	56.3 ± 31.6	

*Significant p-value <0.05

**Significant p-value <0.01, P-value was calculated using T-Test and One Way ANOVA as appropriate.

Nationality had a statistically significant difference in stress scores with Bahraini nurses having a higher stress scores compared to non-Bahraini nurses. Nurses who did not receive training or attend workshops on work stress management had a higher stress scores compared to those who did. The current position had a statistically significant difference with stress scores, with practical care assistance and nurse/deputy manager having a higher stress score than other positions, as shown in Table 4.

There is a statistically significant negative correlation between age and years of working experience in patient care with the RNSS score, as nurses getting older and gaining more years of experience, their stress scores tend to decrease.

Association between turnover intentions and nurses' demographics is represented in Table 6.

Table 5. Correlation between Revised Nursing Scale Score (RNSS) and nurses' demographics:

Demographics:		RNSS score
Age (year)	Rs	- 0.289
	p	0.000**
Years of working experience in patient care	Rs	- 0.268
	p	0.001**
Years of practicing as oncology nurse in current organization	Rs	- 0.085
	p	0.281

**Significant p-value <0.01, P-value was calculated using Spearman's rank correlation coefficient.

Table 6. Association between Turnover intentions and nurses' demographics, represented as frequencies and percentages, N (%):

Demographics	Turnover Intention			P-value
	Desire to Stay	Neutral	Desire to Leave	
Gender:				
▪ Male	10 (16.4)	4 (16.7)	14 (18.4)	0.959
▪ Female	51 (83.6)	20 (83.3)	62 (81.6)	
Nursing qualification:				
▪ Diploma	13 (21.3)	5 (20.8)	15 (19.7)	0.739
▪ Bachelor’s degree	46 (75.4)	17 (70.8)	59 (77.6)	
▪ Master’s degree	2 (3.3)	2 (8.3)	2 (2.6)	
Nationality:				
▪ Bahraini	33 (54.1)	15 (62.5)	36 (47.4)	0.403
▪ Non-Bahraini	28 (45.9)	9 (37.5)	40 (52.6)	
Receiving training or attending workshop on work stress management since qualifying and working in nursing profession:				
▪ Yes	23 (37.7)	5 (20.8)	22 (28.9)	0.274
▪ No	38 (62.3)	19 (79.2)	54 (71.1)	
Primary area of working:				
▪ Hematology Unit	14 (23.0)	4 (16.7)	15 (19.7)	0.550
▪ Palliative Unit (4M, 3M)	11 (18.0)	3 (12.5)	13 (17.1)	
▪ Adult Hematology-Oncology	7 (11.5)	3 (12.5)	16 (21.1)	
▪ Palliative Unit (4G)	7 (11.5)	4 (16.7)	11 (14.5)	
▪ Medical Oncology	8 (13.1)	1 (4.2)	10 (13.2)	
▪ Other	14 (23.0)	9 (37.5)	11 (14.5)	
Current Position:				
▪ Staff Nurse	45 (73.8)	12 (50.0)	54 (71.1)	0.080
▪ Practical Care Assistance (PCA)	10 (16.4)	5 (20.8)	14 (18.4)	
▪ Nurse/Deputy Manager	2 (3.3)	2 (8.3)	6 (7.9)	
▪ Other	4 (6.6)	5 (10.8)	2 (2.6)	

P-value was calculated using Chi-square and Fisher's exact test as appropriate.

No statistically significant association was found.

Table 7. Association between turnover intentions and nurses' demographics, represented as Median (Interquartile range)

Demographics	Turnover Intention			P-value
	Desire to Stay	Neutral	Desire to Leave	
Age:				
Median (IQR)	29 (24 – 34)	26 (23 – 34)	29 (25 – 33)	0.728
Minimum - Maximum	20 – 47	20 – 51	20 – 45	
Years of working experience in patient care:				
Median (IQR)	5 (3 – 9)	4 (1 – 12)	6 (4 – 8)	0.841
Minimum - Maximum	0.2 – 16	0.3 – 28	0.3 – 25	

Continue....

Years of practicing as oncology nurse in current organization:				
Median (IQR)	3.5 (2.5 – 4)	3 (1 – 5)	3 (2.3 – 4)	0.839
Minimum - Maximum	0.2 – 14	0.3 – 7	0.3 – 10	

P-value was calculated using Kruskal-Wallis Test.

No statistically significant difference was found.

Results and Discussion

Oncology nursing is a demanding field where professionals face significant challenges that affect their well-being and job satisfaction. A major concern is work-related stress, which is prevalent among oncology nurses due to factors like high patient acuity, emotional demands, long hours, and ethical dilemmas. These stressors can lead to burnout, decreased job performance, and increased turnover intentions.

Identifying the factors that contribute to work stress and their impact on turnover intentions is essential for healthcare organizations and policymakers. By addressing these factors, targeted interventions can be implemented to improve nurse retention and well-being in oncology settings.

This study explores the work stressors influencing turnover intention among oncology nurses in Bahrain, examining the interplay between organizational, interpersonal, and individual factors. A comprehensive literature review was conducted to contextualize our findings within existing research on this topic.

We surveyed 161 registered oncology nurses, primarily female (133) and with an average age of 29. Most held a bachelor's degree, and 84 were Bahraini nationals. While they averaged 5 years of nursing experience, their specific experience in oncology was only 3 years. Notably, 111 did not attend stress management workshops, indicating a gap in professional development.

Our findings revealed an overall stress score of 198 on the RNSS, indicating significant stress levels. Alarming, 76% of nurses expressed intentions to leave their positions, highlighting a critical issue for retention. This underscores the

need for targeted interventions to address stress and improve job satisfaction, ultimately enhancing workforce stability and patient care quality in oncology nursing. In this section, we will discuss various themes, using the current study results to compare and correlate with other recent published studies, further elucidating the complexities of work stress and turnover intentions among oncology nurses.

1. Managing Stress and Turnover Intentions Among Oncology Nurses

Our analysis reveals critical insights into the stressors and turnover intentions among oncology nurses, highlighting the complex dynamics of the healthcare environment. A significant finding is that nurses with neutral turnover intentions reported more conflict with healthcare providers than those who expressed a clear desire to leave or stay. This suggests that ambivalence regarding job retention can lead to disengagement and interpersonal conflicts, creating a challenging work atmosphere. Additionally, factors such as workload and stress from patient interactions were notably higher among those considering leaving their positions. This aligns with findings from Smith et al. (2022), which identified workload and interpersonal conflicts as primary contributors to both stress and turnover¹⁰.

Demographic analysis further underscores these challenges, revealing that Bahraini nurses experience higher stress levels compared to their non-Bahraini peers. This disparity may stem from cultural and systemic influences that affect workplace dynamics. Our findings are consistent with Roberts et al. (2022), which highlighted that younger and less experienced nurses report elevated stress levels, exacerbating the overall stress within the nursing workforce.

Moreover, the lack of participation in stress management training among nurses contributes significantly to their stress levels, emphasizing the importance of professional development initiatives¹¹.

Recent research by Jackson et al. (2023) corroborates these findings, indicating that nurses who engage in targeted stress management programs report lower levels of burnout and higher job satisfaction. Additionally, the study found that mentorship programs significantly improve retention rates among novice nurses, suggesting that structured support is crucial in mitigating stress¹².

These insights stress the necessity for targeted interventions that address specific oncology-related stressors and demographic factors. Implementing structured stress management programs, alongside cultural competency training, could foster a healthier work environment and improve job satisfaction. Additionally, enhancing communication and conflict resolution strategies within teams could alleviate some of the pressure nurses face, ultimately reducing turnover intentions.

2. The Impact of Age, Experience, and Work Environment on Stress and Job Satisfaction

Our study showcases a clear correlation between age, experience, and work-related stress, reinforcing the notion that these factors significantly influence job satisfaction and retention. Consistent with Smith et al. (2022) and Johnson & Lee (2023), our findings indicate that older and more experienced nurses report lower stress levels, suggesting they develop more effective coping strategies over time^{10,13}. This protective effect of experience highlights the need for healthcare organizations to support the professional growth of younger nurses, ensuring they acquire the skills necessary to manage stress effectively.

Conversely, our findings reveal that nurses with neutral turnover intentions faced heightened conflict with healthcare providers, a point supported by Thompson et al. (2021). This relationship suggests that those who are uncertain about their job commitment may be less engaged, leading to increased tensions in professional relationships. Furthermore, our analysis indicates that the primary working area does not significantly influence turnover intentions, which

contradicts previous research emphasizing the critical role of the work environment¹⁴. For instance, studies by Poku et al. (2022) and Malinowska-Lipień et al. (2023) have demonstrated that a supportive work environment significantly affects turnover intentions and job satisfaction^{15,16}.

Adding to this discourse, Nguyen et al. (2023) found that while work environment plays a role, personal coping mechanisms and support systems within teams can significantly buffer the effects of stress. Their study suggests that interventions aimed at fostering peer support can enhance job satisfaction and reduce turnover intentions, regardless of the work environment¹⁷.

This discrepancy in findings calls for further exploration into how different work environments—such as oncology units compared to emergency departments—impact nurse retention and job satisfaction. Understanding the unique challenges and stressors associated with various specialties can inform targeted interventions that improve workplace conditions. Additionally, fostering a culture of support and recognition within teams can enhance job satisfaction and empower nurses to remain committed to their roles.

3. The Interplay of Nationality, Stress, and Organizational Factors

The findings of this study reveal a significant relationship between turnover intentions and nationality, with Bahraini nurses reporting higher stress levels than their non-Bahraini counterparts. This observation resonates with the work of Smith et al. (2022), which emphasizes the importance of cultural factors in shaping workplace stress and turnover intentions. The unique experiences of Bahraini nurses, including potential discrimination and differences in workplace support, must be acknowledged, and addressed to improve retention¹⁰.

However, the focus on nationality-related stress contrasts with research by Khan & Ali (2023), which posits that organizational variables, such as management practices and overall job satisfaction, are more critical predictors of turnover intentions. This suggests that while stress is a significant factor,

the broader organizational context plays a vital role in shaping nurses' decisions to stay or leave their positions¹⁸.

Key predictors identified in our study include discrimination, social support, and organizational commitment, reinforcing the findings of Lee et al. (2023), which highlight the importance of management support in reducing turnover intentions¹⁹. Additionally, recent findings from Al-Mansoori et al. (2023) emphasize that inclusive workplace policies significantly enhance job satisfaction and retention rates, particularly among culturally diverse nursing teams²⁰.

The emphasis on nationality-related stress suggests a need for deeper investigation into how these factors intersect with organizational practices and policies, particularly in a culturally diverse workplace. Organizations should consider implementing policies that promote inclusivity and support for all staff members, recognizing the unique challenges faced by nurses from different backgrounds.

Moreover, our analysis found no significant demographic associations with turnover intentions, suggesting that workplace dynamics may play a more pivotal role than previously thought. Future research should explore these non-demographic influences, such as workplace culture, management support, and peer relationships, to develop effective retention strategies that cater to the unique challenges faced by nursing professionals.

In conclusion, our findings underscore the complex interplay between stress, turnover intentions, age, experience, and organizational factors. These insights highlight the necessity for personalized, culturally sensitive interventions aimed at enhancing nurses' well-being and retention. By addressing both individual and systemic factors, healthcare organizations can create a more supportive environment that ultimately benefits both nurses and patients. Future efforts should focus on fostering a culture of collaboration, continuous professional development, and open communication to mitigate stress and improve job satisfaction within the nursing workforce.

Limitations of the Study

The study faced several limitations. We encountered difficulties in gathering the necessary study tools, as many authors did not respond initially to requests for approval. Additionally, the hospital was undergoing a merger with other institutions under a single management, which complicated the approval process and delayed our ability to proceed with the study.

Conclusion

In conclusion, this study sheds light on the significant and multifaceted challenges faced by oncology nurses in Bahrain, particularly regarding work-related stress and its correlation with turnover intentions. Our findings reveal that high levels of stress, driven by factors such as patient acuity, emotional demands, and inadequate support, not only threaten the well-being of these healthcare professionals but also jeopardize the quality of patient care.

The alarming statistic that 76% of surveyed nurses expressed intentions to leave their positions underscores the urgent need for targeted interventions. These interventions should focus on managing stressors specific to oncology nursing, improving workplace culture, and providing robust support systems. The lack of participation in stress management training highlights a critical gap in professional development that must be addressed to equip nurses with effective coping strategies.

Moreover, our exploration of the interplay between demographic factors, such as age and nationality, and organizational influences reveals that a one-size-fits-all approach is insufficient. The unique experiences of Bahraini nurses necessitate culturally sensitive interventions that recognize and accommodate their specific challenges.

To foster a more supportive work environment, healthcare organizations must implement structured stress management programs, enhance communication, and conflict resolution strategies, and promote inclusivity within teams. By prioritizing the mental health and job satisfaction of oncology

nurses, organizations can improve retention rates, thereby ensuring that experienced and committed professionals remain in the field.

Ultimately, the insights garnered from this research call for a comprehensive approach to tackle work stress among oncology nurses. Future efforts should aim to cultivate a culture of collaboration and continuous professional development, enhancing the resilience of nursing professionals and improving the overall quality of care for patients. Addressing these critical issues is not just beneficial for nurses; it is imperative for the health and stability of the healthcare system.

Source of Funding: Nil

Conflict of Interest: Nil

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Assessing Oncology Nurses' Knowledge about Physical Exercise for Cancer Patients Under Treatment: A Cross -Sectional Study

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How to cite this article: Shaima Hamad Faraj. Assessing Oncology Nurses' Knowledge about Physical Exercise for Cancer Patients Under Treatment: A Cross -Sectional Study. International Journal of Nursing Care / Vol 13 No. 2, July - December 2025

Abstract

Background: Cancer is a major health crisis worldwide. Advanced cancer treatment improves patients' survival rate; however, the quality of life (QOL) is compromised due to treatment side effects. Cancer-related-fatigue (CRF) is frequently experienced (80-90%). At the study site, quality department audit report shows frequent interruption during cancer treatment due to high CRF levels. In 2021, a total of 188 patients withheld their radiation treatment due to CRF. No published study found sufficiently addressing oncology nurses' knowledge level on the benefits of Physical Exercise (PE) for cancer patients during treatment in Kingdom of Bahrain. Study aimed to assess the current knowledge level of oncology nurses regarding the PE for cancer patients undergoing treatment:

Objectives/purpose: This study was to measure the associations between participants' demographic characteristics and their level of knowledge regarding PE for patients with cancer. The study aimed to assess the current knowledge level of oncology nurses regarding the PE for cancer patients undergoing treatment.

Methods: An online questionnaire, adopted from Roberta Anderson, was administered to assess oncology nurses' knowledge. Online survey shared with all oncology nurses (324 nurses) chosen through convenience sampling for the descriptive cross- sectional study at the Oncology Center in Bahrain. 185 responses out of the 244 recorded were effectively completed and analyzed. Data was analyzed using SPSS version 25; descriptive analyses were utilized to describe the demographic characteristics and level of knowledge, and parametric inferential statistics was used to measure the association between variables.

The Results: Sample size offers 177 participants (5% margin error and 95% confidence level). Participants demonstrated low level of knowledge (42.2%) regarding PE for oncology patients. Demographic characteristics were not associated with the knowledge level. Firstly, the statistical analysis showed a weak correlation between participants' knowledge level and length of clinical experience ($p < 0.0001$).

Secondly, the correlation between the length of the oncology clinical experience and participant's knowledge indicated weak correlation ($p = 0.006$). Finally, participants who reported to have received previous training on PE for cancer patients scored significantly higher ($p = 0.020$).

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Submission: Mar 13, 2025

Revision: May 22, 2025

Published date: Aug 7, 2025

Conclusion and Implementation: The study has successfully assessed the current knowledge level of oncology nurses on PE benefits for cancer patients. The statistical treatment of data has demonstrated the correlations between the dimensions explored. The study result will incorporate evidence-based guidelines on PE for cancer patients into formal education programmes to be implemented as strategy.

Keywords: Nurses, oncology, Knowledge, Physical exercise, Patients, and treatment

Introduction

Cancer is a major global health crisis and is among the foremost causes of death in high-income countries. Worldwide, around 3.91 million cancer cases and 1.93 million deaths due to cancer were recorded in 2020. PE reduces CRF considerably¹. Although cancer diagnosis and treatment have advanced and succeed in extending patients' survival rate, the QOL for patients has not been significantly enhanced³. Detecting the side effects in the early stages of cancer helps in relieving suffering and enhancing patients' QOL⁴.

Friedenreich, Ryder-Burbidge and McNeil in 2021 found that PE was associated with a decreased risk for some malignancies, such as colorectal, breast and lung cancers⁵. In addition, offering meticulously constructed programs of moderate to aggressive PE for cancer patients can improve patients' QOL and cardiovascular fitness, reducing CRF and visceral fat mass⁶. Moreover, Ferioli et al. (2018) emphasized that cancer-specific persistence was shown to be improved through PE⁷. However, concerns raised due to the lack of PE counselling for cancer patients because of insufficient knowledge among oncology nurses, who are patients' main point of contact and play an important role in patient education.⁸

In response to the current Coronavirus Disease (COVID-19) pandemic, Grazioli et al. (2020) noted that despite the expanding body of evidence regarding PE benefits for cancer patients either during or after treatment, the pandemic circumstances presented a major impediment to PE for patients. That study suggested a new approach involving engaging oncology patients in proper and successful online home-based PE courses. Healthcare providers should therefore feel comfortable and knowledgeable in

recommending an online PE program for patients under their care⁹. The present thesis focused on nurses' knowledge and awareness of PE for cancer patients.

Fatigue is classified as the most common side effect experienced by cancer patients and has a major impact on patients' QOL. CRF differs from fatigue because of its severity and perseverance, which is not relieved through rest or sleep. The European Society for Medical Oncology (ESMO) (2020) reported that 25%–99% of patients with cancer suffer from CRF¹⁰. CRF is described as “a distressing, persistent, subjective sense of physical fatigue that is not proportional to the recent activity and interferes with usual functioning”¹¹. Most (80%–90%) patients with cancer undergoing chemotherapy experience CRF. In addition, 21%–80% of those undergoing radiotherapy and 37%–71% of those receiving immunotherapy experience CRF¹².

Hilfiker et al. (2018) found that PE may reduce CRF associated with cancer treatment. Furthermore, that study suggested that maintaining an exercise routine was important to enhance QOL, decrease treatment-induced cardiovascular toxicity, and CRF among cancer patients. Those authors reported that PE counselling for patients positively reduce CRF in 63% of cases¹³.

Because oncology nurses are the primary point of contact to assist cancer patients during the treatment journey, their knowledge on PE benefits should be evaluated to ensure good quality information is delivered to patients¹⁴. Okechukwu (2021) investigated nurses' awareness of the physiological processes underlying the advantageous effects of exercise therapy and found there was insufficient knowledge regarding the PE benefits for cancer patients among nurses¹⁵. Similarly, Veen et al. (2017) conducted a cross-sectional study to assess

oncology nurses' knowledge about the PE benefits and found that 46% of oncology nurses had insufficient knowledge when providing advice about PE to patients¹⁶. Schmitz et al. (2019) discussed the American College of Sports Medicine (ACSM) (2018) guidelines that focus on the value of assessing nurses' knowledge and skills to expand PE among cancer patients through education¹⁷.

In the oncology center in which the present study was conducted, the hospital quality department aimed to maintain a high-quality of patient care in the face of a continuous increase in the number of patients. In 2021, the oncology center had 47,220 outpatient clinics visits, with 4,290 newly referred cases and 2,179 admissions. The underlying causes of recurrent admissions suggests that patients are readmitted or admitted because of severe side effects, which often involve fatigue or pain. Those side effects negatively affect patients' QOL and interrupt their treatment plans. The delay in treatment varied depending on the underlying causes and the patient's condition.

Unfortunately, despite the number of patients delaying their treatment because of CRF, the center did not use a specific form to assess patients' CRF level during their treatment. However, nurses were performing their own assessments when reporting CRF level through their nursing notes. In addition, no clear guidelines that could be implemented to reduce patients' CRF level were available. The challenges facing oncology nurses working in the center when advising patients about PE and managing CRF were identified by the present researcher from the findings published by the center's quality department. Moreover, in addition to the lack of a specific scale to assess fatigue, there was no established PE program for cancer patients at the center, and no specific guidelines available to nurses to guide them in educating patients about PE.

To the researcher's knowledge, no studies that assessed oncology nurses' knowledge regarding PE benefits for cancer patients have been published in Kingdom of Bahrain. The present research will therefore be important for nursing practice because it aimed to establish baseline information on current

knowledge in this area among oncology nurses. The findings of this study may contribute to improving nursing practice in the studied oncology department. In addition, the results of the study may be used to establish and implement a strategy to enhance oncology nurses' knowledge and awareness of the benefits of PE for cancer patients. For example, a potential strategy is developing a training and education program to ensure that nurses can educate patients about PE.

This study aims to assess the current level of knowledge among oncology nurses regarding the PE benefits for cancer patients undergoing treatment. The main objective of this study was to measure the associations between participants' demographic characteristics and their level of knowledge regarding PE for patients with cancer. While the research question that this study set out to answer was: "What is the level of knowledge among oncology nurses regarding PE for patients with cancer undergoing treatment?".

Incidence of Cancer

Cancer is a major global health crisis and is classified as a leading cause of death and a vital impediment to extending life¹⁸. In 2019, the WHO reported that cancer was the first or second leading cause of death in those aged 70 years in 112 of the 183 countries studied. Cancer & anticancer treatment can generate various symptoms that effects patients' QOL¹⁹

Cancer Treatment Side Effects and Impact on Quality of Life

Although cancer diagnoses and treatment modalities have been developed and are successful in extending patients' survival, their QOL has not been significantly enhanced^{20, 21}.

Nayak et al. (2017) reported that this study experiments have shown that improvement in side effects experienced by cancer patients were linked to a marked improvement in their QOL²². Therefore, research relating to QOL among oncology patients receiving cancer treatments has increased over the past few years.

A cross-sectional study that involved 120 patients with cancer found that patients reported low QOL during their chemotherapy treatment, which was considered a stressful therapy that influenced both mental and physical well-being.²³

Cancer Related Fatigue

Overall, 25%–99% of patients with cancer experience CRF²⁴. To date, the main factors that cause CRF remain unknown. However, in 2012, the Centers for Disease Control and Prevention indicated that CRF level can be defined by several traits: (1) when it happens progressively, (2) when it is alleviated by rest, and (3) when it lasts more than 6 months²⁵.

Price and Sikora (2020) reported that while all cancer treatments affect QOL, fatigue is known to be the most common side effect related to cancer treatment²⁶. Fabi et al. (2020) discussed the difference between CRF and other types of fatigue, as CRF severity and perseverance was not relieved through rest or sleep²⁷. Charalambous and Kouta (2016) reported that CRF is an unbearable symptom in cancer patients since it is constant, destructive, and enduring. In that study, 66.9% of patients had a high CRF score²⁸.

Physical Exercise

Physical inactivity is the leading modifiable cause of the burden of illness attributable to non-communicable diseases such as cancers. Nearly 80% of cancer patients have low levels of PE.^{29,30}

Escalante (2021) qualitative study revealed a range of non-pharmacological interventions which helps in improving CRF among cancer patients. That study concluded that some of cancer patients preferred to rest and minimize their daily activities assuming that exercise would worsen their symptoms; however, PE was able to recover CRF symptoms and increase their functional capacity to enhance their QOL³¹. Furthermore, Kessels, Husson and van der Feltz-Cornelis (2018) emphasized that although PE is the most efficient non-pharmacological interventions for treating CRF, the processes by which exercise decreased CRF have not been clarified³². Moreover,

Feroli et al. (2018) reported a significant number of studies involving cancer patients after treatment that showed PE drastically reduced CRF by 32% or 38%³³.

Avancini et al. (2020) described the PE advantages for cancer patients such as improving fatigue level, QOL, cardiorespiratory health, strength, and psychological condition³⁴.

An intervention comparison study by Twomey et al. (2018) divided participants into two groups (active control vs. tailored exercise) to assess CRF severity before and after a PE intervention. That study showed that although both groups had several benefits post-intervention, the active control group showed higher positive effects on QOL by reducing patients' CRF level. Similar trial study Witlox et al. (2018) emphasized that enabling PE during and after cancer treatment improved short- and long-term health outcomes with lower levels of CRF (around a 63.3% reduction) among cancer patients³⁵.

As COVID-19 pandemic formed a major impediment to patients engaging in PE, Grazioli et al. (2020) developed an approach to engage oncology patients in PE via a proper and successful online home-based course. That study involved supervised home-based exercise for 2 hours per week and reported improvement on both patients QOL (70%) and fatigue level (66%)³⁶.

Meneses-Echávez, González-Jiménez and Ramírez-Vélez (2015) study participants (48 patients) enhanced their CRF symptoms post supervised exercise. Nurses have an important role in facilitating implementation of a PE strategy³⁷. Abbott and Hooke (2017) indicated that oncology patients accepted advice about managing CRF and the benefits of PE from oncology nurses, meaning they were the first point of contact to assist patients during their treatment journey³⁸.

Oncology Nurses' Role in Physical Exercise

Findings from one study revealed that only 25%–40% of patients with cancer followed PE advice (Haussmann et al., 2018). Therefore, Büntzel et al. (2017) recommended patient education on the benefits of PE as a useful method to overcome CRF³⁹.

To verify the relationship between the importance of PE among cancer patients and the role of oncology nurses, Okechukwu (2021) investigated the value of oncology nurses in promoting PE among patients through raising their awareness of the physiological processes underlying the advantageous effects of exercise therapy⁴⁰.

McFarland et al. (2021) used the 2016 National Comprehensive Cancer Network (NCCN) guidelines to treat CRF, which highlighted PE interventions as an effective method to treat CRF among cancer patients. Oncology nurses using NCCN guidelines during patient visits has had encouraging and optimistic outcomes. Nurses should follow structured guidelines when providing PE advice to patient⁴¹.

Okechukwu (2021) asserted that educating patients was a major role of oncology nurses that needs to be implemented during patient visits. Therefore, nurses must be aware of specific exercise recommendations and follow-up with patients before, during, and after cancer treatment⁴². Furthermore, Bourmaud et al. (2017) noted that nurses are in a favourable position to deliver information⁴³.

Oncology Nurses' Knowledge Regarding Physical Exercise

A study by Nadler et al. (2017) reported that approximately 80% of nurses were not aware of any exercise guidelines for cancer. This indicated that nurses were not able to fulfil their role because of their low knowledge⁴⁴.

Shing (2017) conducted a cross sectional study involving 115 oncology nurses. That study found that 52% of those nurses reported they were involved in exercise therapy counselling, but 78% of those nurses had a belief that PE moderately reduced CRF among breast cancer patients⁵². Moreover, that study found that when nurses used a clear structure such as the "Get up and Get moving" campaign, which was created by the oncology nursing society (ONS) in 2016⁴⁶, during their role implementation, there was positive motivation between nurses and patients during PE therapy. Finally, a recent study by McCourt et al. (2021) reported similar findings, with nearly

48.6% of nurses having poor understanding about their role and the benefits of PE despite stating that they were routinely giving PE advice to patients⁴⁷.

In total, 111 oncology nurses completed a survey to assess their knowledge and attitudes which observed inadequate knowledge about PE. Another quantitative survey reported that regardless of the identified benefits of PE oncology nurses did not usually recommend exercise for their patients. That study found that approximately 80% of those nurses were not aware of any exercise guidelines for cancer patients. Another cross-sectional study that assessed oncology nurses' knowledge in same regard found that 46% of nurses had insufficient knowledge when promoting PE. Factors associated with recognizing insufficient knowledge about PE were being younger, having a lower level of education, and using oncology guidelines less often^{30,44,45,48,49,50}.

Likewise, McCourt et al. (2021) assessed oncology nurses' knowledge about PE guideline recommendations through an online survey that included questions on PE for cancer patients⁴⁷. Nearly 48.6% of nurses had poor knowledge, although they stated that they were routinely promoting PE to their patients. Those findings showed nurses were unfamiliar with the suggested guidelines. This highlighted a gap in international and local literature regarding oncology nurses' knowledge about the benefits of PE for cancer patients with cancer⁵¹.

Oncology Nurses' Training & Education Needs Regarding Physical Exercise

Okechukwu (2021) emphasized barriers to implementing PE in this population, including the absence of education and lack of proper resources⁴². Therefore, advanced training on PE must be implemented for oncology nurses, including specific exercise recommendations and follow-ups before, during, and after cancer treatment.

The importance of including structured training programs in oncology organizations for nurses has been well documented. Importantly, if oncology nurses increase their PE expertise and take opportunities to regularly publicize PE, they

can increase patients' PE levels and improve their health^{29,30}. Shing (2017) suggested that difficulties associated with PE promotion facing nurses may be addressed through educational programs. In particular, that study suggested using the "Get up and Get moving" campaign created by the ONS in 2016 as a reference for nurse education⁵².

Materials and Methods

Research Paradigm

The positivist paradigm is a view that assumes that truth exists autonomously of human behaviour and mind, which requires the researcher to be impartial when gathering quantifiable objective and visible data. A positivist paradigm is best suited for quantitative research as it allows objective examination of the study variables⁵³. Therefore, a positivist paradigm was used for the present research.

In the literature reviewed for this study, 20 of 32 quantitative studies used the positivism paradigm with successful research outcomes. Therefore, the aim and objective of this study assessing oncology nurses' level of knowledge about the benefits of PE for oncology patients could only be achieved using a quantitative approach. The chosen quantitative method with data collected using a self-report questionnaire could successfully meet the study aim and objective and answer the research question.

Research Method

A quantitative research approach is a type of research method that concentrates on the collection of numerical data⁵⁴. This study used quantitative research method to collect and analyse data to answer the research question. A quantitative approach was deemed the most suitable method for this study as it allowed analysis of participants' demographic characteristics and detection of patterns in the findings, rather than merely identifying these characteristics, and explaining their implications.

Research Design

A research design is the plan that sets out the methods used to obtain the required information⁵⁵. A cross-sectional descriptive research design is a commonly used design, especially in studies where data are collected with self-report surveys⁵⁶. Therefore, the present research used a cross-sectional design to assess participants' knowledge and associated factors, with data collected in an online survey. This design allowed this study to be conducted in a reasonably short timeframe and within a limited budget. In addition, it allowed effective collection of baseline information about the study population.

Population and Sampling

Convenience sampling is a common method of sampling that is often used in research involving residents and hospitals. This sampling method is inexpensive, and not as time consuming as other sampling approaches⁵⁷. This study used convenience sampling to select the study sample.

Approximately 324 oncology nurses were working in the inpatient and outpatient units in the study setting. The required sample size was calculated after considering the necessary effect size to give strength to the study findings. The final sample was drawn from the population that met the inclusion and exclusion criteria. The sample size was calculated using a sample calculator with a 5% margin of error and 95% confidence level; this indicated that 177 participants were needed for this study. The primary advantage of this sampling method was that it was inexpensive and did not take a large amount of time. A consent form and information leaflet have been provided to all participants prior to the start of data collection and participation.

Inclusion Criteria

This study targeted registered oncology nurses who worked in the center under study. The inclusion criteria were registered oncology nurses who worked in inpatient and outpatient units irrespective of their years of working experience, gender, age, level of education, nationality, and position.

Result

SPSS software was used for the present analyses. Descriptive and inferential tests were performed using t-tests and ANOVA (parametric testing).

Response Rate

The Survey Monkey link to the study questionnaire was shared with 324 nurses from the studied oncology center. In total, 185 questionnaires were completed and submitted, which gave a response rate of 57%.

Demographic Characteristics

Descriptive statistics (e.g., frequency and percentage) were used to describe the study variables. The sample comprised 185 oncology nurses. Most participants were female (n=130, 70.3%). The mean age was 29.9 years and those aged 20–30 years represented the dominant group (n=119, 64.3%) (Table 1). Two-thirds of the sample were non-Bahraini nurses (n=123, 66.5%). Most participants held a bachelor's degree (n=170, 91.9%).

Table 1. Participants' demographic characteristics (N=185)

Variable	Category	Frequency	Percentage (%)
Gender	Male	55	29.7
	Female	130	70.3
Age, years	20–30	119	64.3
	31–40	59	31.9
	≥41	7	3.8
Education	Diploma	7	3.8
	Bachelor's degree	170	91.9
	Master's degree	8	4.3
Nationality	Bahraini	62	33.5
	Non-Bahraini	123	66.5

Work Experience and Previous Training Related to Physical Exercise

This section describes participants' work experience and previous training related to PE for patients with cancer which is summarized in table 2. Descriptive statistics (e.g., frequency and percentage)

were used to describe the study variables. Most participants reported they had overall work experience as a nurse of 1–10 years (n=161, 87%) with mean of 6.4 years. In addition, most participants reported they had 1–4 years of work experience in the oncology field (n=166, 89.7%) with mean of 2.4 years.

Table 2. Participants' work-related characteristics (N=185)

Items	Yes		No	
	n	(%)	n	(%)
Training on the role of physical exercise for patients with cancer	123	(66.5)	62	(33.5)
Information received regarding prescribing exercise for patients with cancer	101	(54.6)	84	(45.4)
Knowledge of ACSM or ONS exercise guidelines	55	(29.7)	130	(70.3)
Prior knowledge about exercise prescription for patients with cancer	102	(55.1)	83	(44.9)
Access to resources to educate patients about physical exercise	83	(44.9)	102	(55.1)

Most participants reported that they had received training on the benefits of PE for patients with cancer (n=123, 66.5%). More participants had received

information regarding exercise prescription for patients with cancer compared with those that had not received such information. Nearly three-quarters

of the sample did not have any knowledge about the ACSM or ONS exercise guidelines (n=130, 70.3%). Just over half of the participants reported that they

had prior knowledge about exercise prescription for patients with cancer (n=102, 55.1%), and slightly more than half indicated they had access to resources to educate patients about PE (n=102, 55.1%) (Table 3).

Table 3. Participants' previous training on PE (N=185)

Variable	Category	Frequency	Percentage (%)
Work experience as a nurse, years	1–10	161	87.0
	≥11	24	13.0
Work experience in oncology, years	1–4	166	89.7
	≥5	19	10.3

Knowledge

This section sought to answer the research question by examining participants' level of knowledge about PE for patients with cancer (expressed descriptively) for each of the 10 knowledge items and as an overall score out of 10 points. Finally, the reliability of the instrument used to assess participants' knowledge is demonstrated.

Knowledge About Physical Exercise

Descriptive statistics (e.g., frequency and percentage) were used to evaluate participants'

responses to each of the 10 knowledge items. Overall, participants had a low level of knowledge regarding PE for oncology patients as only 42.2% of the answers to the 10 items were correct. The difference between the proportion of correct and incorrect answers was statistically significant (pooled frequency 1070, 57.8%, $p < 0.0001$) according to chi-square test ($X^2 = 43.3$, $df = 1$, $p < 0.0001$). The item that had the highest percentage of correct responses was "Main benefit of prescribing exercise to patients with cancer," as 120 (64.9%) participants gave the correct answer. However, the item with the fewest correct answers was "Examples of moderate exercise" (n=35, 18.9%).

Table 4. Participants' knowledge about PE (N=185)

Item	Incorrect n (%)		Correct n (%)	
Percentage of cancer patients experience fatigue during their treatment	130	(70.3)	55	(29.7)
Main benefit of prescribing exercise to patients with cancer	65	(35.1)	120	(64.9)
How often should patients with cancer exercise during treatment	104	(56.2)	81	(43.8)
When is it safe for patients with cancer to exercise	67	(36.2)	118	(63.8)
High-risk patients who should be medically cleared and supervised during exercise	102	(55.1)	83	(44.9)
Moderate exercise	78	(42.2)	107	(57.8)
Examples of moderate exercise	150	(81.1)	35	(18.9)
Moderate-risk patients which should be medically cleared before and supervised during exercise	127	(68.6)	58	(31.4)
Organizations recommend physical exercise for cancer survivors in both active treatment and during the survivorship phase of cancer care	147	(79.5)	38	(20.5)
The indication of score of 10 on the Rate of Perceived Exertion scale	100	(54.1)	85	(45.9)
Pooled frequency (%)	1070 (57.8)		780 (42.2)	
p-value	<0.0001*			

*Statistically significant difference with the chi-square goodness of fit test ($X^2 = 43.3$, $df = 1$, $p < 0.0001$) at alpha 0.05.

Knowledge Score out of 10 Points

This section expresses participants' level of knowledge as a score out of 10 points. The mean knowledge score was 4.2 out of 10 points. There

was noticeable heterogeneity in participants' scores, which was reflected by relatively high standard deviation of 1.9 points and a wide score range of 0 to 9 points (Table 5).

Table 5. Participants' knowledge scores out of 10 points (N=185)

Mean	Median	St. Deviation	Minimum	Maximum	Range	95% CI
4.2	4	1.9	0	9	9	3.9–4.5

CI, confidence interval.

Classification of participants according to their knowledge scores using K-mean cluster analysis revealed three well defined groups: a minority group and two majority groups. A minority of participants (14%, n=26) had the highest knowledge level with a

mean knowledge score of 7.2 points. A majority group (47.5%, n=88) had an average level of knowledge with a mean score of 4.9. The remaining 71 (38.3%) participants had the lowest level of knowledge with a mean score of 2.2 points (Table 6).

Table 6. Participants' knowledge scores using K-mean cluster analysis (N=185)

Group	n (%)	Mean	St. Dev.	Minimum	Maximum
Low knowledge	71 (38.5)	2.9	0.8	0	3
Average knowledge	88 (47.5)	4.9	0.7	4	6
High knowledge	26 (14)	7.2	0.5	7	9

Reliability Assessment of the Study Instrument

A survey comprising 10 multiple choice items (one correct answer option) was used to assess participants' knowledge about PE for patients with cancer. The reliability of this instrument was assessed

using the Kuder-Richardson index for internal consistency because the responses were classified dichotomously (either "correct" or "incorrect"). The assessment revealed that this scale had suboptimal reliability of 0.44 as quantified by the Kuder-Richardson index.

Table 7. Reliability assessment of the study instrument (Kuder-Richardson index)

Scale	No. items	Kuder-Richardson index	Interpretation
Knowledge scale	10	0.44	Suboptimal reliability

Association Between Participants' Knowledge and Demographic Characteristics

None of participants' demographic characteristics were significantly associated with the level of knowledge. However, there were some non-significant relationships. Although both males and females had low knowledge, females had slightly

higher knowledge scores on average when compared with males (4.4 ± 1.9 vs. 3.8 ± 1.7 ; $p=0.066$). In addition, the mean knowledge score showed a tendency to increase as participants' age increased ($p=0.173$), and both non-Bahraini participants and those with a master's degree had better knowledge than their counterparts. Table 8 shows these associations.

Table 8. Participant's knowledge versus demographic characteristics (N=185)

Variable	Category	Knowledge score (Mean $\pm$ SD)
Gender	Male	3.8 $\pm$ 1.7
	Female	4.4 $\pm$ 1.9
	p-value	0.066*
Age, years	20–30	4 $\pm$ 2
	31–40	4.5 $\pm$ 1.8
	$\geq$ 41	4.9 $\pm$ 0.7
	p-value	0.173**
Education	Diploma	4.3 $\pm$ 1.5
	Bachelor's degree	4.2 $\pm$ 1.9
	Master's degree	5.1 $\pm$ 1.4
	p-value	0.387**
Nationality	Bahraini	3.8 $\pm$ 1.8
	Non-Bahraini	4.4 $\pm$ 1.9
	p-value	0.060*

*Statistically nonsignificant differences with t-test of independent samples at alpha 0.05. SD, standard deviation.

Association between Knowledge and Years of Work Experience (General/Oncology Nursing)

A weak, positive, and statistically significant correlation between participant's length of clinical experience and their knowledge about PE for oncology patients ($r=0.274$, $p<0.0001$). Overall, as participants' experience (in years) increased, their level of knowledge increased. This relationship was

modeled with simple linear regression that returned a statistically significant model ($F=14.8$, $df=1$, $p<0.0001$). According to this analysis, as participant's experience increased by 1 year, their knowledge increased by 0.3 points. The length of work experience had a small effect on participants' knowledge as shown by the small effect size ($r^2=0.07$). Figure 2 presents a scatter plot displaying the relationship between years of work experience and participants' level of knowledge.

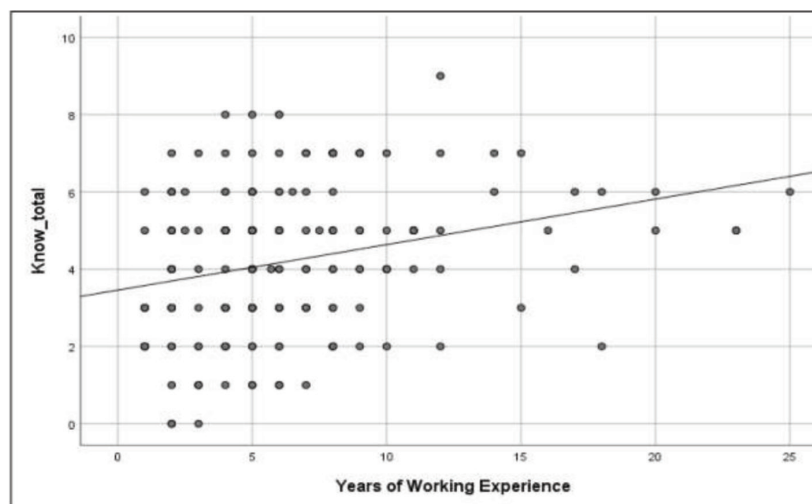


Figure 2: Relationship between participants' level of knowledge and years of work experience (N=185)

Second, the relationship between participant's years of experience as an oncology nurse showed a weak, positive, and statistically significant correlation with their knowledge about PE for oncology patients ($r=0.201$, $p=0.006$). As participants' experience (in years) increased, their level of knowledge increased. This relationship was modeled with simple linear regression that returned a statistically significant model ($F=7.6$, $df=1$,

$p=0.006$). According to this analysis, as participants' experience in oncology increased by 1 year, their knowledge increased by 0.2 points. The length of work experience in oncology had a small effect of participants' knowledge as reflected by the small effect size ($r^2=0.035$). Figure 3 presents a scatter plot of the relationship between years of work experience as an oncology nurse and participants' level of knowledge.

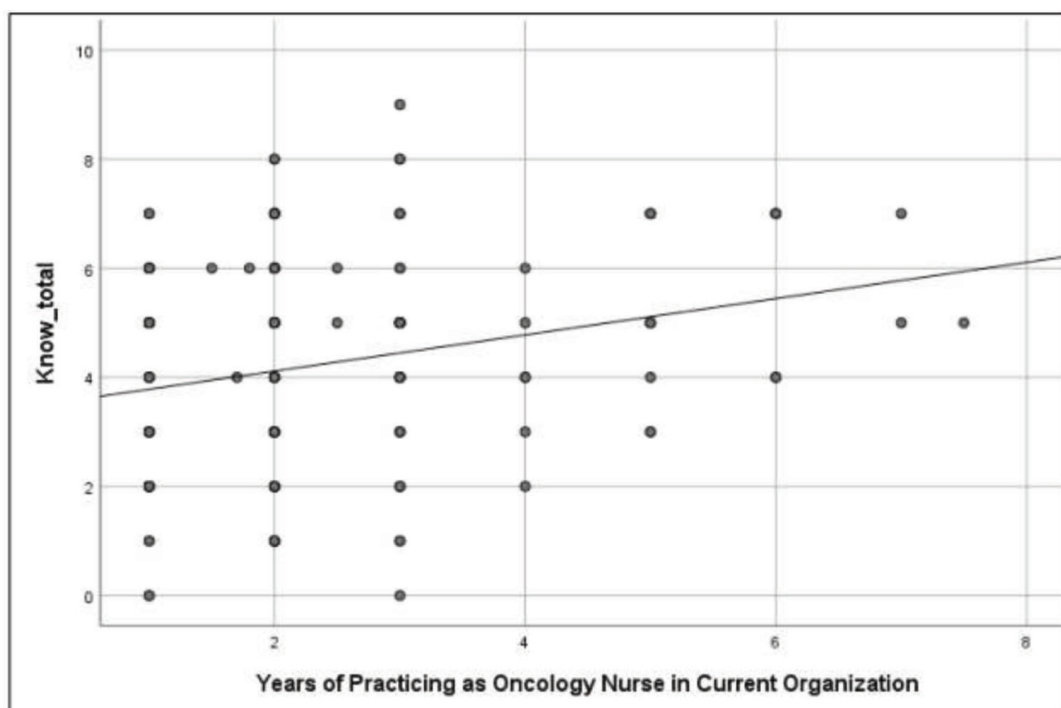


Figure 3: Relationship between participants' level of knowledge and years of work experience in oncology (N=85)

Association Between level of Knowledge and Previous Training

Participants who reported that they had received training on the role of PE for patients with cancer had significantly higher knowledge scores than their counterparts who did not have the same training (4.5 ± 1.8 , $p=0.020$). Surprisingly, those who reported that they did not have access to resources to educate patients about PE had significantly higher knowledge scores than those had access to such resources (4.5 ± 1.8 ,

$p=0.045$). There were no significant associations for the remaining items in the knowledge scale (Table 9).

Finally, chi-square tests were used to explore associations between levels of knowledge and prior training, and participants' demographic variables (years of experience, gender, age, nationality, and level of education). K-mean cluster analysis was used to examine the current level of knowledge among oncology nurses in regard to the benefits of PE for patients with cancer.

Table 9. Participants' level of knowledge and prior training (N=185)

Question	category	Knowledge score (Mean $\pm$ SD)
Training on the role of physical exercise for patients with cancer	Yes	4.5 $\pm$ 1.8
	No	3.7 $\pm$ 2
	p-value	0.020*
Information received regarding prescribing exercise for patients with cancer	Yes	4.4 $\pm$ 1.9
	No	4.1 $\pm$ 1.9
	p-value	0.331
Knowledge about ACSM or ONS exercise guidelines	Yes	4.2 $\pm$ 1.9
	No	4.2 $\pm$ 1.9
	p-value	0.940
Prior knowledge about exercise prescription for patients with cancer	Yes	4.2 $\pm$ 1.9
	No	4.2 $\pm$ 1.9
	p-value	0.997
Access to resources to educate patients about physical exercise	Yes	3.9 $\pm$ 2
	No	4.5 $\pm$ 1.8
	p-value	0.045*

*Statistically significant differences with t-tests at alpha 0.05. SD, standard deviation.

Previous Training on Physical Exercise

Participants were divided into two groups based on their responses to the survey question regarding previous training (group "YES" that had received training and group "NO" that had not received

previous training). There were significant differences in the level of knowledge for participants who reported that they had received training on the role of PE for patients with cancer ($p < 0.0001$) and those who did not have prior knowledge about the ACSM or ONS exercise guidelines ($p < 0.0001$) (Table 10).

Table 10. P-values for participants with previous training on PE (N=185)

Question	p-value
Training on the role of physical exercise for patients with cancer	<0.0001*
Information received regarding prescribing exercise for patients with cancer	0.272
Knowledge about ACSM or ONS exercise guidelines	<0.0001*
Prior knowledge about exercise prescription for patients with cancer	0.217
Access to resources to educate patients about physical exercise	0.217

*Statistically significant differences with a chi-square test of goodness of fit at alpha 0.0.

Overall, the results revealed that there was low level of knowledge regarding the benefits of PE for oncology patients among participating nurses as only 42.2% of the responses to the 10 knowledge questions were correct. There was a statistically significant association between prior training and participants'

knowledge level. There was also a weak positive correlation between participants' length of clinical experience in oncology and their level of knowledge regarding PE for oncology patients. However, none of the participants' demographic characteristics were significantly associated with their level of knowledge.

The results are discussed in more detail and in relation to extant literature in the Discussion chapter.

Discussion

Nurses' Knowledge About Physical Exercise

The limited knowledge among oncology providers (i.e., nurses) regarding the presence and practical aspects of implementing PE guidelines was identified by Nadler et al. (2017) as the most substantial barrier to providing patient education on the benefits of PE. That study showed that 42% of participating nurses were able to correctly identify PE guidelines⁴⁴.

The present study revealed that only 42.2% of the participating oncology nurses were able to correctly answer the 10 questions related to the benefits of PE for patients with cancer. This result suggested that nurses had a low level of knowledge regarding the benefits of PE for patients with cancer.

Nurses' low level of knowledge as found in the present study was also consistent with the study by van Veen et al. (2017) that indicated 46% oncology nurses had insufficient knowledge about the benefits of PE for patients with cancer. That study found that the factors underlying insufficient knowledge among nurses were young age and poor education⁴⁸.

In the present study, the item covering the main benefit of prescribing exercise for patients with cancer had the most correct responses (64.9%). However, participants showed inadequate knowledge (18.9%) when they were asked to give examples of moderate exercise. This highlighted a gap in nursing practice at the study hospital, as nurses were not able to identify PE examples despite being aware of the benefits of prescribing PE for their patients. Burdick et al. (2015) also highlighted the lack of suitable knowledge about current recommendations and PE guidelines, such as the time (minutes) needed for PE per week and the proper exercise type for each patient⁵⁸.

Furthermore, the present study found that nearly three-quarters of participants were unaware of the ACSM or ONS exercise guidelines (n=130, 70.3% vs.

29.7%). Nadler et al. (2017) also indicated that 48% of participants reported that they did not know about Canada's Physical Activity Guidelines, and 69% were not aware of any exercise guidelines at all⁴⁴.

McCourt et al. (2021) showed that 72 of 156 professionals (mostly oncology nurses) were aware of PE guidelines, although 33% (n=64) were not aware of any guidelines. The most frequently cited barriers for nurses to adhere to or facilitate the use of guidelines included their lack of knowledge about the presence of guidelines, work pressure, lack of training, lack of resources, and motivational setting^{59,60}.

Factors Influencing Knowledge

A recent study by Pueyo-Garrigues et al. (2022) identified several factors that may influence an individual's level of knowledge, such as the absence of education or training during their career advancement, shortages of time and high workloads, years of working experience, and younger age. In the present study, factors that were linked with participant's level of knowledge were their years of experience, age, gender, education level, and previous education or training, although some of these associations were not significant⁶¹. Similarly, Parajuli and Hupcey (2021) and Sharour (2020) noted that factors that may influence oncology nurses' level of knowledge included demographic aspects, educational level, years of working experience, previous education or training, level of adherence to the guidelines, and the current clinical location^{62,63}.

In terms of participants' gender, 130 (70.3%) participants in this study were female (N=185 participants in total). This finding was inconsistent with other studies such as those by Wake et al. (2021) which showed the opposite as male nurses had higher knowledge by 3.09 points than females (54.7% of the study participants were female)⁶⁴.

The mean age of participants in the present study was 29.9 years and the majority (64.3%) were aged 20–30 years. This study found that the knowledge score appeared to increase as participants' age increased; however, this linear relationship did not

reach statistical significance ($p=0.173$). Similarly, Tamang et al. (2020) found a higher percentage of sufficient knowledge among nurses aged 50+ years (85.7%), which was linked with their positive attitude to gaining more knowledge and more years of work experience.

Moreover, the majority of participants in the present study held a bachelor's degree ($n=170$, 91.9%). However, the association between knowledge and higher education (e.g., master's degree) was not significant ($p=0.387$). Gigli et al. (2020) and Tamang et al. (2020) found that nurses with higher certification showed greater knowledge when compared with noncertified nurses ($p<0.05$). However, nurses with specialist certification had significantly better knowledge compared with those without specialist certification^{65,66}.

In the present study, there was a weak, positive, and statistically significant correlation between participants' length of clinical experience and their knowledge about PE for oncology patients compared with others. In that study, 90.1% of the nurses had >13 years of work experience, but only 22.1% of those nurses had training; these nurses showed more positive attitudes and better knowledge compared with those who had not received training. Tamang et al. (2020) found that nurses with more than 5 years of work experience (84%) had a higher level of knowledge than those with less experience⁶⁶.

In the present study, two-thirds of nurses in the study sample were non-Bahraini ($n=123$, 66.5%). Although they formed the biggest portion of the study sample, there was no association between participants' nationality and their level of knowledge ($p=0.060$). This finding was inconsistent with Ou et al. (2020) who found participants' ethnicity was an independent influencing variable for knowledge, as nurses with Han ethnicity had higher knowledge than other ethnicities. Furthermore, Almutairi, Adlan and Nasim (2017) found that mean knowledge scores varied between 4.76 and 5.42 based on participants' country of birth where they received their education.

In terms of previous training about the role of PE for patients with cancer, 66.5% of the participants in the present study had received training on PE; these participants scored significantly higher on the knowledge scale ($p=0.020$). Tamang et al. (2020) and Admass et al. (2020) showed similar results whereby participants who had received training (81.4%) had higher knowledge scores than those who did not receive any previous training^{66,67}.

Participants in the present study who reported that they had previously received information about prescribing exercise for patients with cancer were more knowledgeable than those who stated the opposite; however, the difference was not statistically significant (54.6% vs. 45.4%). Kyei-Frimpong et al. (2021) evaluated the plan of pre and post education sessions on study participants' confidence during exercise prescription in clinical practice. They found that after the information was delivered to participants, there were substantial increases in participants' confidence when prescribing exercise ($p<0.05$, 89%)⁶⁸. Conversely, Kleemann et al. (2020) found that 92% of their study participants did not receive any formal training or information about exercise prescription⁶⁹.

Most participants in the present study had general work experience of 1–10 years (87%) with a mean of 6.4 years. In addition, most participants had 1–4 years of work experience in the oncology field (89.7%) with mean of 2.4 years. In other words, as participants' experience (in years) increased, their level of knowledge increased. van Veen et al. (2017) considered years of work experience as a dependent variable along with participants' age, education level, gender, and specialty⁴⁸. Their study did not link years of experience with knowledge among oncology nurses as the collected data were nationwide from a diverse group of oncology nurses with various education experiences and different years of work experience. Pühringer (2017) found an association between years of working experience and the level of knowledge. Nurses with more than 25 years working experience were more likely to have no difficulties in promoting PE to their patients⁷¹.

Previous studies made recommendations to address this practice gap. For example, Okechukwu (2021) suggested developing a hospital-based training system to promote oncology nurses' level of knowledge about PE⁴². While, Alderman et al. (2020) highlighted the need for a training program for oncology nurses to improve QOL and overall well-being among patients with cancer³⁰. This study showed that participants' gender, years of working experience, and level of education were linked with participant's level of knowledge about PE. However, participants' other demographic characteristics were not associated with their level of knowledge.

Impact of Training

The lack of sufficient knowledge to deliver PE was highlighted as an obstacle. Teaching and training opportunities have been observed to have various positive consequences for learners, such as development in clinical practice, self-confidence, enthusiasm, and problem solving⁶⁹.

The present study showed that most participants reported that they had received training and received information in regard prescribing PE for patients with cancer (66.5%). The difference between participants that had received information to others (54.6% vs 45.4%) was not statistically significant. Despite this finding, only 42.2% of the participants were able to correctly answer the 10 questions related to the benefits of PE for cancer patients. The difference between the percentages of correct and incorrect answers was statistically significant ($p=0.0001$). Oppositely, van Veen et al. (2017) study participants reported insufficient knowledge level on PE for cancer patients 46% due to low education and training in this regard 95%.⁴⁸

Alderman et al. (2020) reported that 40%–59% of their study participants (oncology nurses) were not providing any PE recommendations to their patients which indicates an insufficient level of knowledge among participants although they played a crucial role in improving patients' health outcomes. However, the effect of education on knowledge has not been fully investigated, which highlights the need

for additional research to explore the association between knowledge and education.

In regard to prior knowledge about exercise prescription for cancer patients, over half of the participants in the present study reported that they had prior knowledge (55.1%). Anderson (2018) study results offered opportunity for enhancement of the level of knowledge among oncology nurses². 12/14 participants showed significant progress in their level of knowledge at post-test after receiving information compared with the same group pre-test. This indicated that an insufficient level of knowledge among nurses was associated with a lack of information and training, which impacted their quality of care.

Therefore, oncology nurses 6.8% of the study participants showed a lack of training or management on exercise instruction, insufficient education materials for patients, and an inability to promote PE to patients as they had not received prior information. Keogh et al. (2017) indicated that oncology nurses were considerably more likely to cite low level of knowledge depending on their organization placement and their years of working experience⁷⁰.

Nearly three-quarters of the sample in the present study did not have any knowledge about the ACSM or ONS exercise guidelines (70.3 vs. 29.7%). This response rate was comparable with Williams et al. (2015), who reported that 36% of their participants were oblivious of any standard of living guidelines and 51% did not know of any current PE guidelines for patients with cancer⁷³.

In addition, Shimizu et al. (2023) found that 48.6% of participants were unaware of the relevant PE guidelines (the Japanese Association of Cancer Rehabilitation guideline). However, participants who reported being educated on the PE recommendations had better knowledge than other participants. Therefore, to facilitate implementation and use of those guidelines, that study highlighted various factors such as the importance of guideline accessibility at the facility, circulation of the revised guidelines to all healthcare workers and providing education or training programs on PE⁷².

More than half of the participants in the present study reported that they had access to resources to educate patients on PE (55.1%). The relationship between access to resources and patients' health outcomes was discussed by Alderman et al. (2020)³⁰, who found only 32% of oncology nurses were aware on how to access PE resources to educate their patients. Mina et al. (2018) also showed the importance of offering oncology nurses an access point to resources for cancer-specific exercise programs⁷³.

Conclusion

This research recommends several strategies to enhance CRF and improve patients' QOL:

Fatigue Assessment Scale: Implement a scale like the ECOG-PS to identify training gaps and ensure appropriate interventions.

Nurse Training: Provide targeted training on the benefits of PE for cancer patients and the impact of CRF on QOL.

Encourage Teamwork: Foster collaboration among nurses to promote knowledge exchange on PE.

Educational Program: Develop an evidence-based, online educational program to improve understanding of PE's benefits, especially during the COVID-19 pandemic.

Specialist Collaboration: Work with physiotherapy trainers to create a simple PE program for cancer patients that physicians can refer to.

The use of Survey Monkey for data collection poses a risk of information bias, as participants might have accessed PE information while completing the survey. The instrument's reliability was low (0.44), affecting internal validity. Convenience sampling, while facilitating recruitment, limits generalizability and may introduce bias, as more interested individuals may have participated. Additionally, modifying an existing assessment tool due to a lack of suitable options could impact validity, despite efforts to ensure clarity.

Participants in this study displayed a low overall knowledge of the benefits of PE for cancer patients. Their knowledge levels were not significantly influenced by demographic factors such as gender, though females showed slightly higher scores. Knowledge appeared to increase with age, but this was not statistically significant.

In contrast, education and prior training programs significantly impacted knowledge levels; participants who received prior training scored higher. Additionally, there was a weak but significant correlation between years of clinical experience in oncology and knowledge about PE, indicating that increased experience correlates with greater knowledge. The findings should be interpreted considering the study's limitations. Based on the results, implications for nursing practice, education, and management were discussed, along with recommendations for further research and PE training for oncology nurses. The research project has no funds or conflicts of interest.

Conflict of Interest: The research project has no funds or conflicts of interest.

Ethical Clearance: Institutional Review Board gave approval to this study 26 October 2021. Ref no.21-46

Source of Funding: Nil

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