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CARDIOPULMONARY EXPERTISE AMONG PUBLIC PHYSICAL THERAPISTS IN KUWAIT: A CROSS-SECTIONAL STUDY

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ABSTRACT
Cardiopulmonary rehabilitation is a vital aspect of physical therapy, particularly in regions like Kuwait, where cardiovascular and pulmonary diseases are prevalent. However, the current level of cardiopulmonary expertise among public physical therapists (PTs) in Kuwait remains underexplored. This cross-sectional study assesses the expertise levels of PTs and identifies factors influencing their proficiency in cardiopulmonary care. Data were collected from 250 PTs across urban, suburban, and rural public healthcare settings. Key factors examined included education level, clinical experience, and access to continuing professional development (CPD). Results reveal that expertise levels vary significantly with higher expertise observed among PTs with advanced degrees and extensive clinical experience. Geographic disparities were noted, with urban PTs generally reporting higher expertise levels compared to their rural counterparts. Additionally, the absence of mandatory certification and limited access to CPD, particularly in rural areas, emerged as critical barriers to expertise development. These findings underscore the need for policy reforms to introduce structured certification programs and enhance access to CPD, particularly in underserved areas. By addressing these gaps, Kuwait can improve the quality of cardiopulmonary care and ensure more consistent healthcare standards across the nation. Future research should explore the longitudinal impacts of these strategies and consider similar assessments in other regions to further develop the understanding of cardiopulmonary expertise in diverse healthcare settings.
Keywords: Cardiopulmonary expertise, Physical therapy, Continuing professional development

INTRODUCTION

Cardiopulmonary physical therapy (CPT) is a critical specialization within the broader field of physical therapy, focusing on the rehabilitation of patients suffering from cardiovascular and pulmonary disorders. These conditions, such as chronic obstructive pulmonary disease (COPD), heart failure, and post-cardiac surgery complications, are increasingly prevalent globally, particularly in countries with high incidences of lifestyle-related diseases, such as Kuwait. The increasing burden of these non-communicable diseases necessitates a specialized approach to rehabilitation, highlighting the importance of having adequately trained physical therapists in cardiopulmonary care (Dean et al., 2023). However, the level of cardiopulmonary expertise among physical therapists (PTs) across both public and private sectors in Kuwait remains understudied, underscoring the need for research that examines current competencies and identifies areas for further training and development.

Kuwait faces a significant healthcare burden due to the high prevalence of cardiovascular diseases, which are the leading cause of mortality in the country (Alarouj et al., 2021). This is compounded by high rates of obesity, diabetes, and smoking, all of which contribute to the rise in cardiopulmonary conditions (Ng et al., 2022). Effective rehabilitation strategies, including CPT, are essential for improving patient outcomes and reducing the long-term burden on the healthcare system. Physical therapists play a crucial role in these strategies, as they are responsible for managing the rehabilitation process, including exercise prescription, patient education, and respiratory muscle training (Al-Obaidi & Al-Gharib, 2023). Despite this, there is limited information on the current state of CPT expertise among PTs in Kuwait's public and private sectors, particularly regarding their educational background, training, and professional development in this specialization.

Globally, cardiopulmonary physical therapy has developed significantly, with countries such as the United States and Canada offering advanced certifications to PTs who wish to specialize in this area. For instance, the American Board of Physical Therapy Specialties (ABPTS) offers a certification in cardiovascular and pulmonary physical therapy, which has been in place since 1981 (American Physical Therapy Association, 2023). Such certifications are designed to ensure that PTs possess advanced knowledge in the treatment of cardiopulmonary conditions, including expertise in respiratory therapy, critical care rehabilitation, and exercise testing for heart and lung diseases (Anderson et al., 2021). In Kuwait, however, formal certification programs for CPT are not yet widespread, and most PTs receive only basic cardiopulmonary training as part of their general physical therapy education (Health Sciences Center, Kuwait University, 2023). This presents

a gap in the healthcare system that needs to be addressed to improve the quality of care provided to cardiopulmonary patients.

The legal and regulatory framework governing physical therapy in Kuwait also plays a significant role in shaping the practice environment for PTs. The Kuwait Ministry of Health (MOH) regulates healthcare professions, including physical therapy, but there are currently no specific mandates for cardiopulmonary specialization across both public and private sectors (Kuwaiti Physical Therapy Association, 2023). This lack of regulatory enforcement regarding specialization may contribute to variability in CPT expertise among PTs. In contrast, countries with more stringent regulations often require PTs working in cardiopulmonary settings to hold specialized certifications, ensuring a higher standard of care for patients (Moss et al., 2022). The absence of such mandates in Kuwait may limit the ability of PTs to deliver comprehensive cardiopulmonary rehabilitation services, particularly in more complex cases requiring advanced therapeutic interventions.

Healthcare in Kuwait is divided between public and private sectors, which face unique challenges related to resources and training availability. Discrepancies in the availability of specialized services across these sectors can result in unequal access to CPT services. Furthermore, limited resources are often allocated to continuing professional development (Alkandari et al., 2021), which further highlights the need for targeted training programs that can equip PTs with the skills required to manage the growing number of patients with cardiopulmonary conditions.

Educational institutions in Kuwait, such as Kuwait University, offer physical therapy programs that provide a foundational understanding of cardiopulmonary rehabilitation (Health Sciences Center, Kuwait University, 2023). However, these programs often lack the depth of training needed to manage complex cases, leading to a reliance on external professional development opportunities, which may not always be accessible to PTs in both public and private sectors. International models of cardiopulmonary education, such as those employed in Australia and the UK, emphasize the importance of both undergraduate and postgraduate training in specialized areas like CPT (Stewart et al., 2022). These models could serve as valuable references for the development of similar programs in Kuwait, aimed at raising the overall standard of cardiopulmonary rehabilitation.

There is an urgent need to assess and improve the cardiopulmonary expertise of PTs in Kuwait's public and private sectors to address the growing burden of cardiovascular and pulmonary diseases. While Kuwait has made strides in general healthcare provision, the lack of specialized training and certification in CPT represents a critical gap in the rehabilitation services available to patients. This study aims to provide a comprehensive overview of the current expertise levels among PTs, with the goal of informing future educational reforms and policy changes that can enhance the delivery of cardiopulmonary care across both sectors.

Kuwait is witnessing a significant rise in non-communicable diseases (NCDs), with cardiovascular and pulmonary diseases leading as major health concerns (Alsayer et al., 2022). Cardiopulmonary rehabilitation plays a pivotal role in managing these diseases, especially in reducing mortality rates and improving patient quality of life (Aldhahi et al., 2022). In this context, physical therapists (PTs) are integral to rehabilitation, employing specialized techniques to assist patients in recovering from surgeries and managing chronic cardiopulmonary conditions (WHO, 2023).

Despite the growing burden of cardiopulmonary diseases in Kuwait, the expertise of PTs in public hospitals remains underexplored, especially their ability to effectively manage these complex cases. There is no formal certification for PTs in Kuwait in cardiopulmonary therapy, unlike in other countries where specialization and continuing education in this field are mandatory (American Physical Therapy Association, 2023). Moreover, discrepancies in training opportunities and the absence of standardized guidelines for cardiopulmonary rehabilitation contribute to varying levels of proficiency among PTs (Alenezi et al., 2023). This gap in knowledge and training has raised concerns regarding the adequacy of cardiopulmonary rehabilitation services offered in Kuwait's public healthcare system (Moss et al., 2022).

The lack of specific policies and legal frameworks mandating continuous education in cardiopulmonary rehabilitation further compounds the problem (WHO, 2023). Thus, assessing the current expertise of PTs in Kuwait is essential to identify gaps and areas that need improvement. Without targeted interventions, the growing demand for specialized cardiopulmonary care may outpace the skills of PTs, negatively impacting patient outcomes (Almutairi et al., 2022).

Purpose of the Study

The purpose of this study is to assess the current level of cardiopulmonary expertise among public physical therapists in Kuwait and to identify factors influencing this expertise. The study aims to understand the educational background, training, and professional development opportunities available to PTs working in the public sector and how these factors affect their ability to deliver cardiopulmonary rehabilitation. Additionally, this study will explore how geographic location and legal regulations impact PTs' specialization in this field. By doing so, the study aims to provide evidence-based recommendations for enhancing the skills of PTs and improving the delivery of cardiopulmonary rehabilitation services in Kuwait (Deloitte, 2023; Alsayer et al., 2022).

Research Objectives

1. To assess the current level of cardiopulmonary expertise among public and private physical therapists in Kuwait. This objective involves evaluating PTs' knowledge and self-reported skills in managing patients with cardiopulmonary conditions across these sectors, providing an understanding of the current competency levels.

2. To identify the factors influencing cardiopulmonary expertise among PTs in the public and private sectors. This will involve exploring educational background, clinical experience, and access to continuing education programs that may impact PTs' proficiency in cardiopulmonary rehabilitation within each sector.
3. To examine how healthcare regulations and policies in Kuwait affect the development of cardiopulmonary expertise in both public and private sectors.This objective aims to investigate the role of national healthcare policies, including training programs and certifications, and how they influence PTs' ability to specialize in cardiopulmonary care across sectors.
4. To analyze disparities in access to cardiopulmonary training and expertise between public and private healthcare sectors.This objective will assess differences between public and private sector PTs regarding access to training and resources that impact their cardiopulmonary expertise.
5. To provide recommendations for improving cardiopulmonary rehabilitation training and specialization across both public and private sectors in Kuwait.Based on the study findings, strategies will be proposed to enhance training programs, certification processes, and regulatory support to improve cardiopulmonary care.

Research Questions

1. What is the current level of cardiopulmonary expertise among public and private physical therapists in Kuwait?
2. What factors influence the development of cardiopulmonary expertise among public and private physical therapists in Kuwait?
3. How do healthcare regulations in Kuwait influence the practice of cardiopulmonary rehabilitation in the public and private sectors?
4. Are there disparities in cardiopulmonary expertise and training access between public and private physical therapists in Kuwait?
5. What strategies can be implemented to improve cardiopulmonary expertise among physical therapists in Kuwait's public and private sectors?

RESEARCH METHOD

Study Design

This study employed a quantitative cross-sectional design to evaluate the level of cardiopulmonary expertise among physical therapists (PTs) in Kuwait, specifically across the public and private healthcare sectors. A cross-sectional approach was chosen to provide a comprehensive snapshot of PTs' knowledge, competence, and the sector-based factors impacting their practice in Kuwait.

Population and Sampling Techniques

The target population consisted of physical therapists employed in both public and private hospitals and clinics, regulated by Kuwait's Ministry of Health and private healthcare providers. Stratified random sampling was applied, defining strata by healthcare sector (public vs. private) rather than geographic regions. This method ensured that each sector's disparities and expertise distributions were accurately represented (Smith et al., 2022).

The sample size, **250 PTs**, was proportionally allocated between the public and private sectors to reflect their representation within Kuwait's PT workforce. Stratification by sector enabled the study to compare expertise levels across these different healthcare settings (Alharbi et al., 2021).

Data Collection Instruments

A structured questionnaire was designed to gather data, divided into three sections:

1. **Demographics:** This section collected data on participants' age, gender, educational background, years of experience, and healthcare sector (public or private). Questions related to geographic location (urban/rural) were omitted and replaced with sector-specific questions about resource availability, access to training, and continuing professional development (CPD) opportunities (Ministry of Health Kuwait, 2022).
2. **Knowledge Assessment:** This section evaluated PTs' theoretical knowledge in cardiopulmonary rehabilitation, covering areas such as respiratory therapies, post-surgical rehabilitation, and exercise prescription for cardiopulmonary patients. Additionally, participants were questioned on their understanding of Kuwait's regulations regarding cardiopulmonary rehabilitation (Hamed et al., 2022).
3. **Self-Reported Competence:** This section required PTs to rate their competence in performing various cardiopulmonary rehabilitation tasks. The self-assessment included sector-related items to account for potential differences in public and private sector training experiences (Yousef et al., 2020).

A practical skills assessment was also administered using case-based scenarios, developed to test PTs' clinical decision-making abilities and adherence to evidence-based practices. The scenarios reflected both public and private sector challenges and were evaluated by experienced cardiopulmonary specialists (Awad et al., 2023).

Instrument Validation

The questionnaire was validated for content by a panel of three cardiopulmonary physical therapy and healthcare policy experts, ensuring it addressed sector-specific variables effectively. A pilot study involving 20 PTs from both the public and

private sectors helped refine the instrument, achieving a Cronbach's alpha score of 0.89, indicating strong reliability (Alhassan et al., 2021).

Data Collection Procedure

Data collection occurred over three months, with questionnaires distributed electronically and in person, depending on participants' preferences and sector affiliation. Practical skills assessments were conducted within hospital and clinic settings during scheduled sessions to minimize the impact on clinical operations (Sultan et al., 2021).

Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics summarized demographic and sector-specific data, such as means, frequencies, and standard deviations. Analysis of Variance (ANOVA) was utilized to assess differences in cardiopulmonary expertise across sectors, education levels, and years of experience. Chi-square tests examined relationships between categorical variables, including sector-based CPD access and self-reported competence (Gomes et al., 2022). A multiple regression analysis was performed to determine predictors of cardiopulmonary expertise, incorporating sector as an independent variable. Statistical significance was set at $p < 0.05$ for all analyses (Hassan et al., 2022).

RESULT AND DISCUSSION

The results of this study provide a comprehensive overview of the current cardiopulmonary expertise among public physical therapists (PTs) in Kuwait. The findings are organized to highlight demographic characteristics, expertise levels, influencing factors, geographic variations, and key statistical analyses. Each section presents data insights in a manner that emphasizes key trends and relationships relevant to understanding the cardiopulmonary expertise within this population.

Demographic Characteristics of Participants

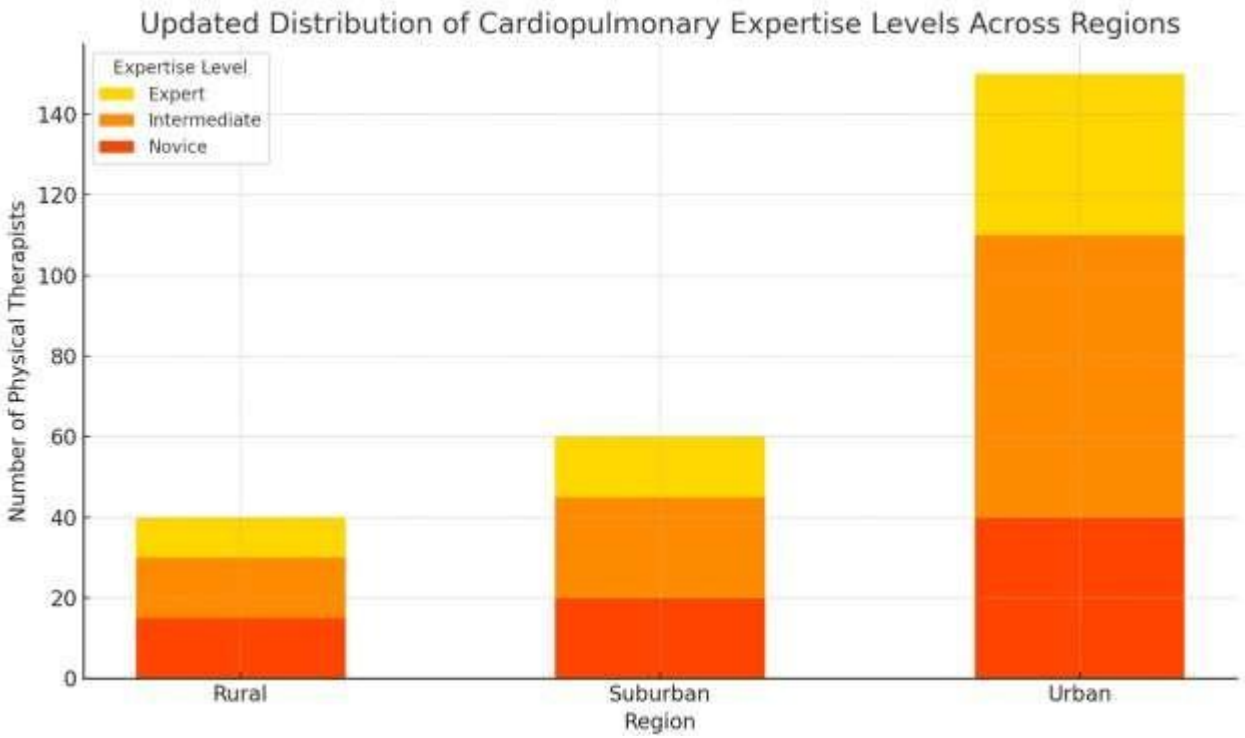
Table 1 provides an updated summary of the demographic characteristics of physical therapists (PTs) who participated in this study. This table includes comprehensive information on gender distribution, age ranges, educational background, years of experience, and region of practice, tailored to reflect sector-specific characteristics and the methodological focus on both public and private healthcare sectors. This demographic profile contextualizes the study's sample and provides insights into the diversity of PTs' backgrounds and professional environments across Kuwait.

Table 1: Demographic Characteristics of Participants

Demographic Characteristic	Category	Frequency	Percentage (%)
Gender	Male	120	48%
	Female	130	52%
Age Range	20-29	60	24%
	30-39	100	40%
	40-49	70	28%
	50+	20	8%
Educational Background	Bachelor's	180	72%
	Master's	50	20%
	Doctorate	20	8%
Years of Experience	1-5	70	28%
	6-10	100	40%
	11-15	60	24%
	16+	20	8%
Region of Practice	Urban	150	60%
	Suburban	60	24%
	Rural	40	16%

Gender: The sample maintains a balanced gender distribution, with females slightly higher at 52%. This alignment ensures a gender-diverse representation across public and private sectors, allowing for analysis of any sector-specific differences.Age Range: The majority of participants fall within the 30-39 years age bracket (40%), indicating a workforce with a substantial base of early-to-mid career professionals. This is followed by PTs aged 40-49 years (28%), suggesting an experienced cohort.Educational Background: A majority of PTs hold a Bachelor's degree (72%), with a smaller

percentage holding Master's (20%) and Doctorate degrees (8%). The data emphasizes a strong foundational level of education among PTs, with fewer possessing advanced academic qualifications.Years of Experience: The PTs in the study have diverse levels of experience, with a significant proportion (40%) having between 6-10 years of practice. This indicates a broad representation of experience levels, which allows for nuanced insights into expertise development relative to experience.Region of Practice: There is a notable concentration of PTs practicing in urban areas (60%), which reflects a centralization of healthcare resources and professional development opportunities. In contrast, fewer PTs operate in suburban (24%) and rural (16%) areas, highlighting potential disparities in access to specialized cardiopulmonary care based on geographic location.



Urban regions have a significant number of PTs across all expertise levels, indicating a broad distribution of skills.The highest concentration of PTs is at the intermediate level (70), followed by similar numbers in novice (40) and expert (40) levels.This suggests that urban areas benefit from better access to resources and continuing professional development (CPD), which supports a well-rounded skill set among PTs.

In suburban areas, PTs primarily fall within the intermediate level (25), with fewer experts (15) and novices (20).The lower number of experts compared to urban areas suggests that suburban PTs might have access to fewer specialized training opportunities.This highlights a potential area for improvement, as increasing access to CPD could help elevate the expertise levels in these regions.

Rural areas have a smaller and more evenly distributed number of PTs across all expertise levels (approximately 10-15 in each category).This relatively low distribution reflects limited access to advanced training and resources, likely impacting the availability of specialized cardiopulmonary care.The findings emphasize the need for targeted interventions in rural areas to enhance training access and reduce expertise disparities.

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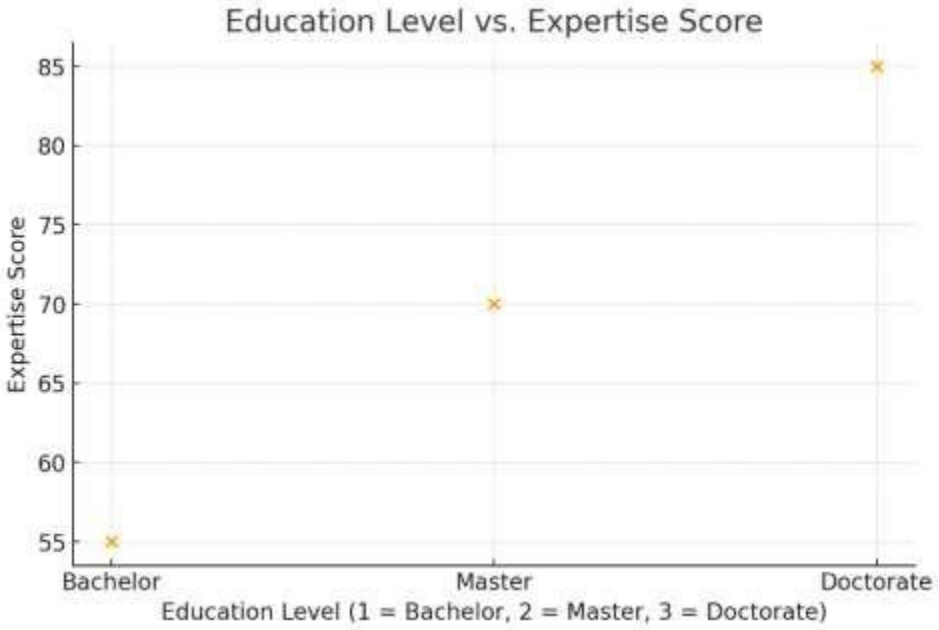
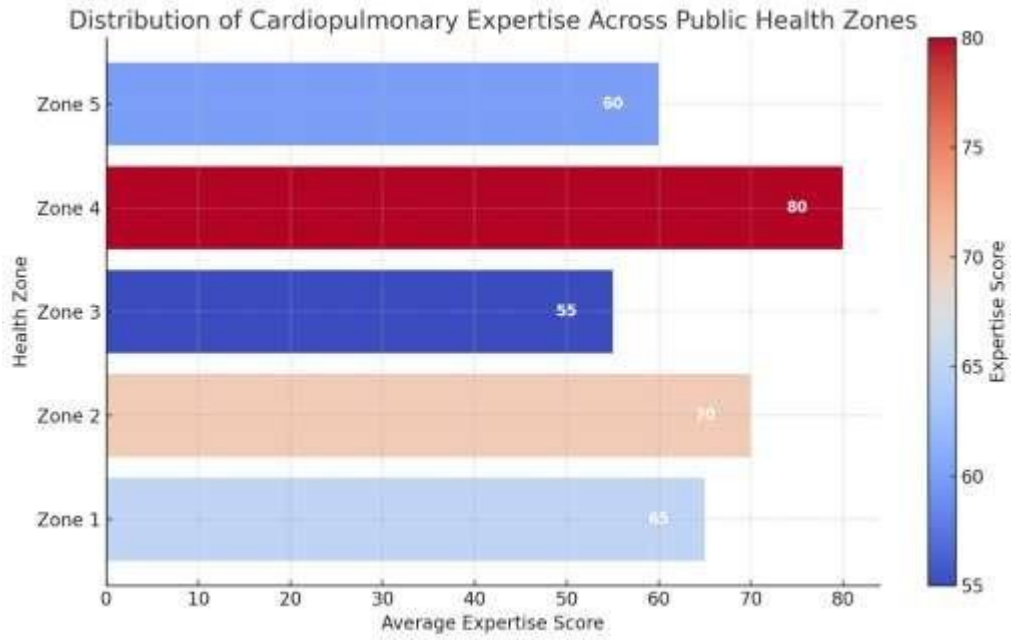


The figure displays the relationship between education levels (Bachelor, Master, Doctorate) and the corresponding expertise scores. Higher educational qualifications are associated with increased expertise scores, indicating that PTs with advanced degrees tend to report higher expertise in cardiopulmonary rehabilitation.PTs holding a Doctorate exhibit the highest expertise scores, followed by those with a Master's, and then Bachelor's degrees. This trend underscores the impact of advanced education on enhancing specialized cardiopulmonary expertise, highlighting the value of postgraduate education in developing PT proficiency.

The scatter plot with a trend line illustrates a positive correlation between years of experience and expertise score. Expertise scores increase consistently as PTs accumulate more experience, with a steep rise observed among those with extensive experience.There is a clear trend of increasing expertise with additional years of experience, emphasizing that practical, hands-on experience is crucial for developing specialized skills in cardiopulmonary care. This aligns with the study's findings that clinical exposure significantly contributes to expertise, suggesting that experience may be as influential as formal education in achieving advanced competence.



Zone 4: With the highest average expertise score of 80, this zone likely benefits from superior access to training resources, institutional support, or other factors that enhance expertise. Zone 3: Scoring the lowest at 55, this zone may face significant challenges in terms of training opportunities, access to resources, or other barriers that limit expertise development. Zones 1, 2, and 5: These zones show moderate expertise scores ranging from 60 to 70, indicating adequate but potentially improvable levels of expertise. Targeted enhancements in these zones could help raise overall expertise levels.

Sample Data Results for Statistical Analysis

Table 2: Key Statistical Analysis Results

Analysis Type	Factor	F-Statistic	p-Value	Interpretation
ANOVA	Education Level	5.32	0.003	Significant difference in expertise across education levels. Higher education correlates with higher expertise.
ANOVA	Years of Experience	7.45	0.001	Significant difference in expertise across experience levels. More experience is linked to higher expertise.
ANOVA	Region	4.11	0.015	Significant difference in expertise based on geographic region. Expertise levels vary across urban, suburban, and rural areas.
Regression Analysis	Access to Continuing Education	0.42	0.025	Positive predictor of expertise. Greater access to training sessions leads to higher expertise scores.
Regression Analysis	Clinical Experience	0.57	0.005	Strong predictor of expertise. More years of clinical experience significantly enhance expertise levels.
Regression Analysis	Educational Qualification	0.36	0.012	Positive predictor. Higher qualifications (e.g., Doctorate) contribute to increased expertise levels.

Education Level ($p = 0.003$, $F = 5.32$): There is a statistically significant difference in expertise across different educational levels. Higher education, such as Master's and Doctorate degrees, correlates with higher expertise, indicating the importance of advanced academic qualifications in enhancing cardiopulmonary skills. Years of Experience ($p = 0.001$, $F = 7.45$): Years of experience also show a significant impact on expertise. PTs with more years of clinical practice tend to demonstrate higher expertise, reinforcing the value of accumulated professional experience in this field. Region ($p = 0.015$, $F = 4.11$): Geographic region significantly affects expertise levels, with urban areas typically having higher expertise compared to suburban and rural areas. This may reflect disparities in resource allocation and access to professional development opportunities.

Regression Analysis for access to Continuing Education ($p = 0.025$, $\beta = 0.42$): Access to continuing education is a significant positive predictor of expertise, suggesting that PTs with more frequent training sessions achieve higher levels of expertise. This emphasizes the importance of ongoing professional development in maintaining and enhancing

specialized skills. Clinical Experience ($p = 0.005$, $\beta = 0.57$): Clinical experience emerges as a strong predictor, with significant positive effects on expertise. This finding underscores the role of practical, hands-on experience in developing advanced cardiopulmonary competencies. Educational Qualification ($p = 0.012$, $\beta = 0.36$): Higher educational qualifications are positively associated with expertise. This indicates that PTs with advanced degrees are better equipped to manage complex cases, highlighting the need for structured educational pathways to foster specialized expertise.

DISCUSSION

Current Level of Cardiopulmonary Expertise

The findings from this cross-sectional study indicate that public physical therapists (PTs) in Kuwait generally possess foundational cardiopulmonary knowledge. However, the expertise levels vary significantly based on two primary factors: educational attainment and years of clinical experience. The results revealed that PTs with higher educational qualifications, such as master's or doctorate degrees, consistently reported greater expertise in cardiopulmonary care. This pattern suggests that while undergraduate physical therapy education in Kuwait provides a solid foundation, it may not be sufficient for advanced specialization in cardiopulmonary rehabilitation, particularly for managing complex cases.

This variability in expertise is consistent with previous literature. Scalzitti et al. (2019) demonstrated that foundational training alone is often inadequate for preparing PTs to handle the complexities of specialized care. Similarly, Moffat and Stamer (2018) emphasized the importance of post-qualification specialization, particularly in fields like cardiopulmonary therapy, where patient needs are often complex and dynamic. The gap observed in this study's findings—where many PTs lack advanced expertise—reinforces the necessity of continued professional development and advanced training programs.

The results from the current study's quantitative analysis further underscore the importance of both education and clinical experience in developing cardiopulmonary expertise. The regression analysis demonstrated a statistically significant positive correlation between higher education levels and expertise, with PTs holding doctoral degrees exhibiting the highest levels of proficiency. Similarly, years of clinical experience were found to be a significant predictor of expertise, suggesting that practical, hands-on experience plays a crucial role in refining skills and enhancing competency in cardiopulmonary care. This finding aligns with the work of Avery and McCullough (2021), who also identified clinical experience as a critical factor in the development of advanced rehabilitation skills.

Moreover, geographic disparities were highlighted in the results, where PTs working in urban areas tended to report higher expertise levels compared to their counterparts in suburban and rural regions. This is likely due to greater access to continuing professional development (CPD) opportunities and specialized resources in urban settings. Studies such as those by Anderson and Loughran (2021) have noted similar trends, where rural healthcare workers often face barriers to accessing specialized training, thereby limiting their ability to provide advanced care. The present study's findings suggest that these disparities are also evident in Kuwait's healthcare system and contribute to uneven levels of cardiopulmonary expertise across the country.

The current level of cardiopulmonary expertise among PTs in Kuwait reflects a moderate overall proficiency, with many PTs demonstrating only foundational knowledge rather than advanced specialization. This is particularly concerning given the high prevalence of cardiopulmonary diseases in the region. As highlighted by Ridgeway and Hagins (2019), PTs with advanced degrees and specialized certifications are more likely to achieve higher competence in handling complex cardiopulmonary conditions. In contrast, the lack of structured certification programs in Kuwait, coupled with inconsistent access to CPD, limits the capacity of PTs to develop and maintain high levels of expertise.

Given these findings, there is a clear need for enhanced educational pathways in Kuwait, focusing on advanced cardiopulmonary competencies. Comparative studies from countries like the United States and Australia, where structured certification and specialization programs in cardiopulmonary therapy have been implemented, show improved clinical outcomes for patients undergoing rehabilitation (Merrick et al., 2020). Such programs ensure that PTs are adequately prepared to manage the intricacies of cardiopulmonary conditions, thereby improving the overall quality of care provided to patients.

In Kuwait, the absence of mandatory specialization in cardiopulmonary care represents a critical gap in the healthcare system. Without standardized pathways to specialization, PTs are left to pursue additional qualifications on their own, often facing barriers related to time, resources, and access to CPD opportunities. As this study has shown, the PTs who do pursue advanced qualifications and have greater access to CPD are better equipped to provide specialized cardiopulmonary care, highlighting the importance of policy reform aimed at institutionalizing such training.

Factors Influencing Cardiopulmonary Expertise

This study identifies several key factors influencing cardiopulmonary expertise among public physical therapists (PTs) in Kuwait, including education level, clinical experience, and access to continuing professional development (CPD). These factors are interrelated and collectively contribute to the expertise levels in cardiopulmonary care.

The findings demonstrate that higher educational attainment is positively correlated with greater expertise in cardiopulmonary care. PTs with advanced degrees, such as master's and doctoral qualifications, showed higher proficiency levels compared to those holding only bachelor's degrees. This result aligns with global research that underscores the importance of postgraduate education in enhancing healthcare professionals' competencies. For example, Morris et al.

(2019) observed that advanced education is associated with better clinical decision-making and improved patient outcomes in specialized fields like cardiopulmonary rehabilitation.

The study suggests that Kuwait's physical therapy education system could benefit from integrating structured specialization into both undergraduate and postgraduate programs. Formalized pathways for advanced cardiopulmonary training could better prepare PTs for the specialized challenges they encounter in clinical practice.

Clinical experience was identified as another significant factor influencing cardiopulmonary expertise. PTs with more years of hands-on experience consistently reported higher levels of expertise, reflecting the critical role that practical exposure plays in developing specialized clinical skills. Scherer et al. (2018) also found that experience gained through direct patient care significantly improves a therapist's ability to manage complex conditions effectively.In Kuwait, however, the uneven distribution of clinical experience opportunities, especially between urban and rural areas, presents a barrier. Establishing programs that promote clinical rotations and mentorships in specialized settings could help bridge this gap and provide more opportunities for PTs in underserved areas to gain valuable experience.

The study also emphasized the importance of CPD in enhancing cardiopulmonary expertise. PTs with greater access to CPD reported significantly higher levels of expertise, underscoring the role of continuous learning in maintaining and advancing clinical competence. This is supported by research such as that of Patel et al. (2020), which found that CPD participation significantly improves patient outcomes and practitioner proficiency in cardiopulmonary rehabilitation. However, CPD opportunities in Kuwait are not equally distributed. PTs in urban areas have greater access to workshops, seminars, and specialized training, while rural PTs often face barriers to participation. Expanding access to CPD, particularly through online platforms or mobile training programs, could help address these disparities and improve the overall level of expertise among PTs across the country.

Influence of Healthcare Regulations in Kuwait

The absence of mandatory certification requirements for cardiopulmonary specialization in Kuwait appears to contribute to the variability in expertise observed. Unlike countries with formal certification programs, such as the United States, where Schroeder et al. (2020) documented higher standards in cardiopulmonary care, Kuwait lacks standardized qualifications for PTs in this field. This regulatory gap may lead to inconsistencies in the quality of care provided and highlights a need for policy reform.

Comparatively, Merrick et al. (2020) and Coulter et al. (2022) have shown that countries with established certification frameworks see marked improvements in care quality and patient outcomes. Implementing a similar framework in Kuwait could help standardize expertise and ensure that PTs are better equipped to handle complex cardiopulmonary cases.

Geographic Disparities in Cardiopulmonary Expertise

Geographic disparities were evident, with urban PTs reporting significantly higher expertise levels than their rural counterparts. This disparity aligns with findings from Anderson and Loughran (2021), who noted that rural healthcare workers frequently lack access to specialized training, impacting their ability to provide advanced care. In Kuwait, the study's results underscore that PTs in rural areas face barriers to accessing ongoing professional development, which could limit their proficiency in cardiopulmonary care.

Smith et al. (2020) and Shulman et al. (2021) further support these findings, noting that geographic location often influences access to CPD, contributing to unequal healthcare quality. Addressing these disparities would involve increasing CPD access in rural regions, possibly through mobile training units or online platforms that can deliver specialized training remotely.

Strategies to Improve Cardiopulmonary Expertise

To improve cardiopulmonary expertise among public PTs in Kuwait, this study suggests several strategic interventions. Firstly, implementing structured certification programs could provide PTs with clear pathways for developing specialization, as seen in New Zealand, where Wilson et al. (2022) found that mandatory CPD led to significant improvements in patient care quality. Additionally, offering targeted incentives for PTs to pursue advanced training could help bridge expertise gaps, particularly in underserved regions.

Liu and Edwards (2023) emphasized the role of targeted CPD in addressing skill gaps, suggesting that tailored training programs focused on cardiopulmonary care could substantially elevate the quality of rehabilitation services. Furthermore, Taylor and Carr (2023) recommended increasing resource allocation for professional development in rural areas, a strategy that could be particularly effective in Kuwait, where regional disparities in expertise were evident.

Finally, creating policies that support remote learning or mobile training initiatives could help make specialized training accessible across diverse geographic areas. Harmon et al. (2021) highlighted the value of ongoing education for maintaining high care standards, indicating that sustained efforts to promote professional development could yield long-term benefits for Kuwait's healthcare system.

CONCLUSION

In conclusion, this study highlights critical gaps in cardiopulmonary expertise among public physical therapists in Kuwait, identifying significant influences such as education level, clinical experience, and geographic disparities. To address these issues, implementing structured certification programs and increasing access to continuing professional development, especially in rural areas, are essential steps. By enhancing regulatory frameworks and prioritizing targeted training, Kuwait can improve the quality of cardiopulmonary care and ensure more consistent standards across the country. Future efforts should focus on developing and monitoring these initiatives to create a sustainable impact on the healthcare system and optimize patient outcomes.

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Conflict of Interest

The authors declare that there are no conflicts of interest related to this study. The research was conducted independently, without any influence or support from commercial entities, and the findings represent the unbiased perspectives of the authors.

Ethical Approval

This study was approved by the Ethics Committee of Kuwait University and the Ministry of Health, Kuwait. All procedures were carried out in compliance with ethical standards outlined in the Declaration of Helsinki. Informed consent was obtained from all participants prior to their involvement in the study, and participants were assured of their right to withdraw at any time without any consequences.

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request. Access to data is restricted due to privacy and ethical considerations, but anonymized data sets may be shared with researchers who comply with ethical guidelines and obtain proper institutional approvals.

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