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Table of Contents

Original Articles

Review Article

Case Report

Conference Highlights/Scientific Contributions

Review Article

Physiotherapy in Head, Neck, Lung and Breast Cancer Survivors: A Systematic Review.

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ABSTRACT

Background: Cancer is a medical condition where some cells of the body reproduce uncontrollably and metastasize to other parts of the body. This study attempts to review the effect of physiotherapy application on head and neck, lung and breast cancer survivors on important clinical outcomes such as pain, strength, fatigability, coordination, balance, activities of daily living (ADLs), psychosocial aspects, cognitive aspects, and quality of life (QoL)

Methods: A systematic review was conducted following PRISMA guidelines. Scientific articles were retrieved from electronic databases including Cochrane, Medline, EBSCO, Science Direct, Springer and Web of Science. Studies using only experimental design measuring the effectiveness of physiotherapy methods in head and neck, lung and breast cancer patients were selected for the review. Articles from 2012 till date were selected to find a piece of evidence for the latest physiotherapy practice in the last decade.

Results: 19 articles out of 9343 records were selected (Head & Neck HN = 3, Lung LU = 5, Breast BR = 11) which demonstrated that there was a significant effect of various physiotherapeutic techniques on the selected outcomes among patients with head and neck, lung and breast cancer.

Conclusion: In this review study, we conclude that head and neck cancer patients can benefit from physiotherapy exercises and muscle awareness. However, more evidence is needed to prescribe a specific exercise regimen. It was found that a combination of fitness training along with aerobic training has the maximum gain in advanced lung cancer patients. For breast cancer patients, combined aerobic and resistance training along with stretching and relaxation is the current suggested treatment.

Key Words: "Upper Body Cancer", "Physiotherapy", "head and neck cancer", "lung cancer", and "breast cancer".

Introduction:

Cancer is a medical condition where some cells of the body reproduce uncontrollably and metastasize to other parts of the body[1]. Cancers of the upper body include carcinoma of the breast, lung, thyroid, cervical lymph nodes, lip, oral cavity, brain, central nervous system, esophagus, larynx, nasopharynx, oropharynx, salivary glands, vulva, hypopharynx[2]. In the year 2020,19.3 million total new cancer cases were recorded and cancer deaths were estimated to be 10.0 million, for both males and females combined[3]. Cancer death has been reported maximum in Asia at 58.3%, while in Europe total cancer death is estimated at 19.7%.America and Africa reports cancer–related mortality at 14.2% and 7.2% respectively. This variance in mortality rate and incidence could be due to the percentage of population and type of cancer present in a region. In Western Asia, the cancer mortality rate was estimated to be 13.09% in males and 8.38% in females. Specifically, in United Arab Emirates (UAE) cancer was found to be the 3rd leading cause of death[4]. The higher prevalence of cancer patients put a negative impact and huge burden on the national health system not only due to its higher mortality rate but also due to its associated co–morbidities affecting an individual life by. Innovation in the treatment of cancer patients has been a continuous process, which thereby increased the scope of physiotherapy in cancer survivors[5].

Physiotherapy could be a part of cancer treatment adjunct with radiotherapy, chemotherapy or surgery to aid recuperation. There are a variety of therapeutic approaches available to choose from depending upon the

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approach and aims to address patient needs. The patient's often experience physical dysfunction, deficits in muscle strength, altered muscle tone, flexibility and endurance. Physical therapy can recuperate weakness, joint stiffness, soft tissue tightness, swelling/edema, fatigability, balance & coordination thereby ultimately enhancing functional independence and improving overall Quality of life. The role is significantly important to support the patient's recovery in terms of pain, especially in patients that have post–surgical complications such as Post–Mastectomy Pain Syndrome (PMPS) in breast cancer patients[5,6]. Cancer patients can also benefit from physical therapy in resolving secondary complications of the condition[7]. The most commonly used physiotherapy intervention is based on the stages of cancer rehabilitation[8].

While there is significant evidence of physical therapy being offered to patients with a few types of cancer such as breast cancer and cervical lymphoma, there is infinitesimal evidence on the effectiveness of interventions used by physiotherapists for cancer patients. Hence, a review is necessary to establish an evidence–based relationship between the application of physiotherapy to cancer patients and its effectiveness. This study attempts to review the effect of physiotherapy application on head and neck, lung and breast cancer survivors on important clinical outcomes such as pain, strength, range of motion, fatigability, coordination, balance, activities of daily living (ADLs), psychosocial aspects, cognitive aspects, and quality of life (QoL)

Material and Methodology:

Study Design and Criteria

A systematic review was conducted according to PRISMA guidelines[9]. Inclusion criteria focused on all articles published in or after the year 2012 till May 2023 that was available as free full text in English language with interventional study designs only.

Study Variables

All variables that quantified outcome in terms of pain, strength, fatigability, coordination, balance, activities of daily living, psychosocial aspects, cognitive aspects, quality of life, functional ability, the changes in cancer–specific symptoms such as cardiopulmonary measures for head and neck, lung and breast cancer were included into the study.

Search Strategy

Electronic searches were performed to find eligible studies from the databases including Cochrane, Medline, EBSCO, Science Direct, Springer, and Web of Science. The search included potential research conducted during the period from the year 2012 to May 2023. The search strategy and results have been shown using the PRISMA flowchart in Figure 1 below.

The search was performed using the conceptual keywords on Cancer and Physiotherapy. The Boolean operator 'AND' was used to combine the words for search and the operator 'OR' was used to find any of the searched terms. The search used keywords such as "Physiotherapy", "Therapeutic", "Rehabilitation" "Upper–Body Cancer", "Head and Neck Cancer", "Lung Cancer" and "Breast Cancer". The following mesh terms under each subject were used to make the search more focused.

A) Physiotherapy: "physiotherapy"[All Fields] OR "physical therapy modalities"[All Fields] OR "physical therapy modalities"[MeSH Terms] OR "physiotherapies"[All Fields] ("physical"[All Fields] AND "therapy"[All Fields] AND "modalities"[All Fields])

B) Cancer: "neoplasms"[MeSH Terms] OR "cancerized"[All Fields] OR "cancer's"[All Fields] OR "cancerated"[All Fields] OR "cancerization"[All Fields] OR "canceration"[All Fields] OR "cancerous"[All Fields] OR "neoplasms"[All Fields] OR "cancer"[All Fields] OR "cancers"[All Fields].

Search Findings Synthesis:

After performing the search, the results were saved and duplicate records were removed. The Boolean operators were used to skim down the records for retrieval. The title and abstracts screening was done by all authors to differentiate and selected the relevant articles based on the eligibility criteria. Following this, full text screening was performed after reaching a consensus on final selection of articles categorized into 3 categories viz. viz. Head and neck cancer, Lung cancer and Breast cancer (Tables 1,2 & 3 respectively). The findings have been discussed explicitly under each subheading.

Results:

Study Selection:

A total of 9949 records were retrieved that included Cochrane (n = 7), Medline (n = 8976), EBSCO (n = 720), Science Direct (n = 176), Springer (n = 54) and Web of Science (n = 16). After removing the duplicates and articles published before 2012 using automated filter tools, 5839 records were selected among which 4781 studies were eliminated after title and abstract screening. Thus, a total of 1058 results were selected for retrieval; however, 35 records could not be retrieved. From the remaining 1023 records, 1004 were further excluded, not meeting the inclusion criteria due to various reasons including irrelevant intervention not related to physical therapy (n =310), language other than English

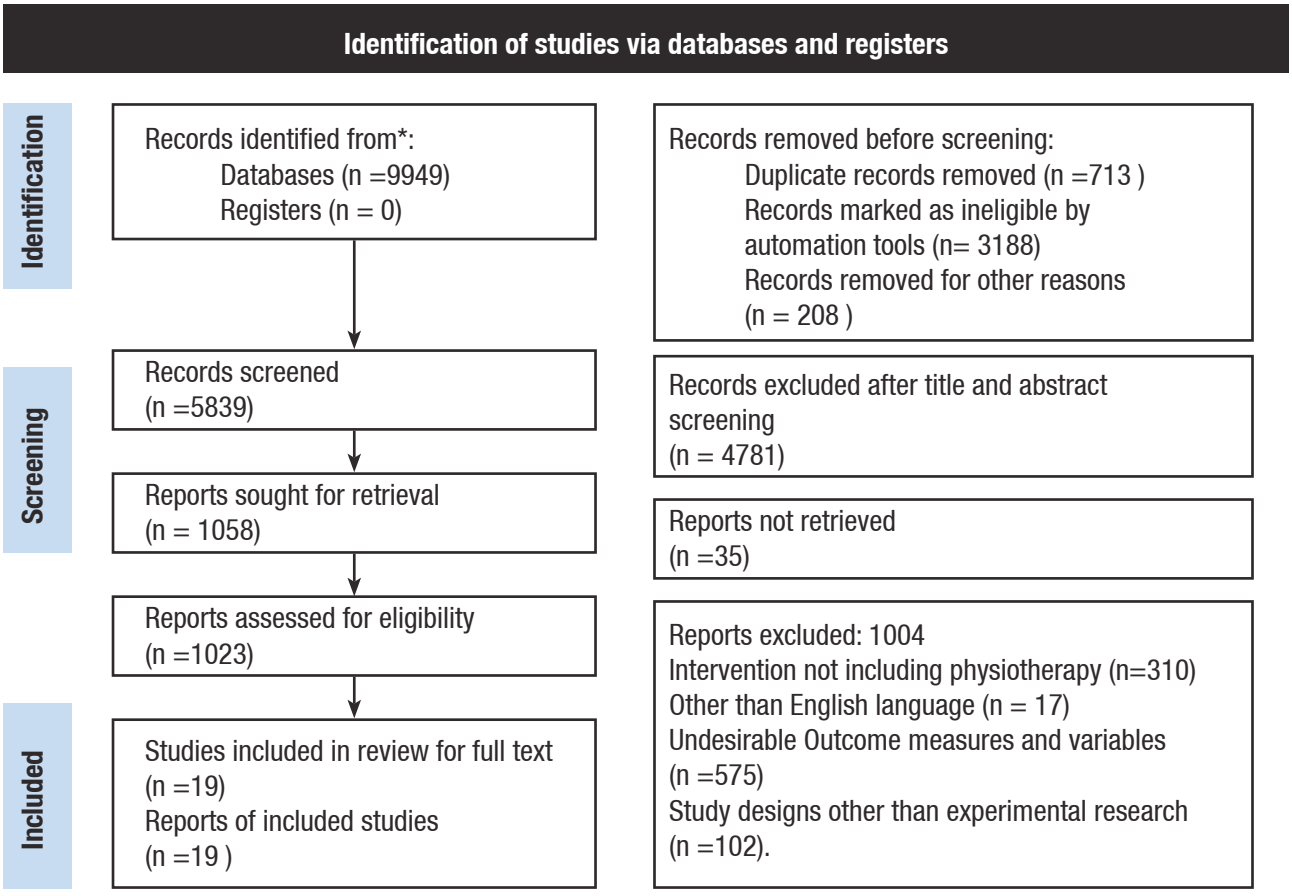

Figure 1. Search results using PRISMA guidelines

(n = 17), irrelevant outcome variables (n = 575), and undesirable methodology and study designs (n = 102). Finally, 19 articles were selected for the review.

Study Characteristics and Findings:

The characteristics and findings of each study under all three categories i.e. Head and neck cancer, Lung cancer, and Breast cancer were individually reviewed based on the participant, outcome variables, outcome measures, intervention, and conclusion. (Tables 1, 2, and 3)

Discussion:

Head and neck cancer studies:

In our review study, we included studies with experimental study design only. We found that swallowing exercises for oropharyngeal cancer (head & neck cancer) demonstrated more improvement than mouth–opening exercises on the quality of life (QoL) measured with EORTC QLQ C–30[10,12]. The specific intervention used by S. F. Hajdú et al. reported improvement in QoL along with improvement in mouth opening (maximal Inter–incisor distance), anxiety and depression (Major Depression Index, SCL–92 Anxiety subscale). The intervention included supervised swallowing exercises 3 times per week along with self–administered individually tailored swallowing exercises, supervised bimodal progressive resistance training(PRT) twice weekly and weekly counseling over phone (Table 1). The exercise was given for 8 weeks and all participants received home follow–up. The participants in this study included patients with cancer of the hypopharynx, oral cavity, larynx or Unknown Primary Tumour (UPT) along with the mentioned oropharyngeal cancer who were also receiving radiotherapy[10]. On the contrary, N.Høgdal et al. did not find any effect of mouth–opening exercises along with home exercises during radiotherapy on quality of life (QoL). However, there were improved scapular muscle activities[12]. Y. H. Chen et al. found significant improvement in terms of active range of motion for shoulder abduction, muscle activity and reduced compensatory scapular movement by training the muscles involved in the alignment of the scapula[11]. Overall, we observed that swallowing exercises and patient awareness of the targeted muscle can demonstrate significant improvement in outcomes. However, a well–explained swallowing exercise regimen is not specified in the current explored literature. indicating a need to develop and evaluate one in the future to be applied as part of therapeutic routine.

Author	Study Participants	Outcome Variable	Outcome measure	Intervention	Conclusion
S.F. Hajdú et al. 2021[10]	Sample size: n=235 Control Group (CG): n=115 Intervention Group (IG): n=120 Patients with cancer in hypopharynx, oropharynx, larynxor unknown primary (UPT), oral cavity that were undergoing radiotherapy treatment and were of age ≥18 years.	Swallowing outcomes	Penetration Aspiration Scale (PAS) score by flexible endoscopic evaluation of swallowing (FEES) Gargle FOIS score Tube dependence Mouth opening Pain, Numeric Pain Rating Scale (NPRS) Whistle	CG: Usual care (Supervised swallowing exercises 3 times weekly) only. IG: usual care (Supervised swallowing exercises 3 times weekly) + Self–administered individually tailored swallowing exercises– up to 10 reps, 3 times daily (keeping diary) + Supervised bimodal PRT twice weekly + weekly counseling by phone. Swallowing Exercises: Reaching tongue back and forth; tongue to cheek, tongue to mouth corners, resistance to tongue, gargle, yawn, mouth opening, jaw side–to–side, jaw undershot, Valsalva, Shaker exercise, Mendelsohn maneuver, Masako maneuver, Effortful swallow. Bimodal Progressive Resistive Training (PRT): 6 exercises for lower limbs, upper body, and core in a fixed progression model. Week 1–3: 70% of 1Repetition Maximum (RM); 8 reps; 2 sets, Week 4–6: 85% of 1RM; 5 reps; 3 sets	Significant effects found on Health–Related Quality of Life (HRQOL), mouth opening, anxiety and depression, however no effect on swallowing safety
		Physical function	30 second sit to stand Performance status Weight		
		Quality of Life	The European Organization for Research and Treatment core quality of life question–naire (EORTC) QLQ C–30 The EORTC core quality of life questionnaire Head and Neck (EORTC QLQ–H&N35) The M.D. Anderson Dysphagia Inventory (MDADI)		
		Mood	Major Depression Index Symptom Checklist (SCL–92) Anxiety subscale		
Y. H. Chen et al. 2020[11]	Sample size: n=38 CG: n=18 IG: n=20 Patients diagnosed newly with oral cancer, subjects with neck dissection that were having all of the clinical signs of accessory nerve shoulder dysfunction, age 20– 65 years.	Shoulder Behavior	Active Range of Motion (AROM) of shoulder abduction	CG: conventional physical therapy 60 minutes session, 5 days a week while in hospital; 1 day a week after discharge. + home–programs – 60 mins/day; without any information about the muscle involved in alignment of scapula IG: conventional physical therapy + home–programs– 60 mins/day; with information about the muscle involved in alignment of scapula by verbal cues and manual contact. Conventional physical therapy: Pain management + scar massage + stretching + AROM and Passive Range of Motion (PROM) of shoulder joint Home program: Specific scapular strengthening exercises; Upper Trapezius + Middle Trapezius + Lower Trapezius + Serratus anterior.	Improved AROM of shoulder abduction, muscle economy, and reducing compensatory scapular muscle activities.
		Shoulder Pain	visual analog scale (VAS)		
		Muscle Activities	Root Mean Square (RMS) of Surface EMG Maximum Voluntary Isometric Contraction (MVIC)		
N. Høgdal et al. 2015[12]	Sample size: n= 100 CG: n=36 IG: n=40 Patients with cancer of oral cavity / oropharynx undergoing radiotherapy	Maximal interincisor distance (MID)	TheraBite Range of Motion Scale	IG: exercises once a week for 45 minutes during the radiotherapy treatment period. The radiotherapy treatment lasted for 5 – 6 weeks, depending on the treatment dosage, which was 66 – 70 Gy For home training, all patients in the exercise group performed program of 7 exercises. Each exercise was carried out with 5 reps and should be performed five times /day + use sugar free chewing gum five times a day for up to 10 minutes +2 months after radiotherapy, the patients were instructed to self–administered lymph drainage and exercises for the following 10 months. CG: Treatments and advices offered by the oncologist and other healthcare providers +mouth opening exercises by a nurse for approximately 10 minutes prior to the onset of radiotherapy.	Early supervised exercises combined with self–care treatment focused on mobility exercises to minimize trismus do not appear to provide extra benefits in patients with cancer of the oral cavity or oropharynx when compared to standard care during curative radiotherapy.
		Cervical ROM	Acumar Single Digital Inclinometer,		
		Tissue tightness	Likert scale		
		HRQOL	EORTC QLQ–C30		

Table 1: Head and Neck Cancer studies

Author	Participants	Outcome Variable	Outcome measure	Intervention	Conclusion
A. Rutkowska et al. 2021[13]	Sample size: n=26 CG: n=8 IG: n=18 Stage IIIB or stage IV NSCLC patients, disqualified from surgery, undergoing chemotherapy with ability to perform 6MWT; Eastern Cooperative Oncology Group performance status 0–1.	Quality of Life	Short Form (36) Health Survey (SF–36) St. George's Respiratory Questionnaire (SGRQ), Functional Assessment of Cancer Therapy–Lung (FACT–L)	CG: No exercises. IG: two 2□week supervised in–hospital exercise training camps with 1 week interval. Training camps: 30 min of fitness and respiratory exercises while monitoring HR and SpO2 + 30 min of prolonged exhalation exercise, resisted diaphragm strengthening exercises and exercises to increase costal or chest breathing + 20–30 mins cycle ergometer or treadmill training individualized to 30% to 80% of peak work rate according to 6MWT(6 minute walk test) and Spirometry + Weighted exercise at 40% – 70% of 1RM + 45 mins Nordic walking (depending on weather and health condition of the patient) + 20 mins Schultz autogenic training	No significant improvement in Quality of Life(QoL), however significant deterioration in the CG in terms of physical wellbeing.
M. Jonsson et al. 2019[14]	Sample size: n=107 CG: n=53 IG: n=54 Patients undergoing elective thoracic surgery for lung cancer and are able to perform the lung function and walking test.	Physical Capacity	6MWT (6 minute walk test)	CG: Standard Care. IG: Standard care + pre– postoperative physiotherapy + Discharge counseling Standard care: given by nursing staff regarding pain management, general nursing, help with mobilization during ADLs/ambulation. Preoperative training: 5–10 minutes of counseling on benefit of physiotherapy + post–operative breathing techniques; Deep breathing exercises, safe huff/cough methods (supporting incision for pain relief). Postoperative training: 10–30–minute session once or twice daily till discharge; Individualized early mobilization: sitting upright on the day of surgery, ambulation on the first postoperative day + Deep breathing exercises using positive expiratory pressure (PEP) with the Rium breathing exercise; hourly 10 reps, 3 sets with 1 min rest in between the sets ended with supported coughing + Exercises for shoulder & thoracic range of motion(ROM) : shoulder elevation, shoulder flexion, horizontal shoulder abduction with hands at the neck while taking a deep breath, and thoracic rotation; 2 times daily, 5 reps Discharge counseling: patients individually advised to: continue breathing exercises at home with Positive expiratory pressure(PEP) following same regimen 4–5 times per day, till pain on deep breathing subsides + stay physically active by performing moderate level physical activity 150 minutes per week and by minimizing sedentary behavior.	No significant effects found on physical activity, lung function or physical capacity.
		Subjectively Reported Physical Activity.	International Physical Activity Questionnaire Modified for the Elderly (IPAQ–E)		
		Objectively Measured Physical Activity	Accelerometer (ActiGraph, model GT3X+)		
		Lung Function	Spirometer (MicroLab ML3500)		
		Dyspnea	Modified Medical Research Council Dyspnea Scale,		
		Pain	NPRS		
B. C. Brocki et al. 2013[15]	Sample size: n=78 CG: n=37 IG: n=41 Patients radically operated, aged > 18 years, are living within 80km radius from the hospital.	Health Related Quality of Life	36–Item Short Form Health Survey version 2 (SF–36)	CG: Post–Operative counseling + Home exercises IG: Supervised exercise program + Home exercises + Post–Operative counseling. Supervised exercise program: One session a week for 10 weeks, 15 min warming up; 20 min aerobic exercise; 15 min muscle strength training; 10 min cooling down. individualized according to submaximal exercise test. Home exercises: given 3 weeks post–operative, Strength training minimum 2x week + daily 30 min walk/bicycle ride at RPE:11–12 and recording of the exercises in training diary. CG received home exercises individually. the instruction on home exercising was given individually. Postoperative counseling: 3 individual one–hour sessions given by nurse, 3 weeks – 4 months after surgery.	Slight improvement on short–term aspects of HR QoL, no evidence in long–term aspects of HR QoL, Lung Function or functional capacity.
		Functional Exercise Capacity	Six Minute Walk Test (6MWT)		
		Lung Function	Spirometry		

H. M. Dhillion et al. 2017[16]	Sample size: n=62 CG: n=27 IG: n=35 Patients of advanced lung cancer having performance status (PS) ≤ 2 and > 6 months life expectancy and are able to complete 6MWT	Fatigue	Functional Assessment of Chronic Illness Therapy – Fatigue(FACT–F)	IG: Physical activity program + General health education materials CG: General health education materials General health education materials: cancer–specific exercise (Move Your Body) + nutrition (Eat For Health) Physical activity (PA) program: 8 supervised weekly exercise sessions individualized to patient ability consisting aerobic and home–based exercises along with a PA diary + behavior change program. Session included 1h: ~ 45–min PA + ~ 15–min behavior support.	Despite good adherence not enough increase in physical activity of the IG compared to the CG, no difference of improvement in terms of fatigue or QoL.
		QoL	EORTC–QLQ–C30 Lung Cancer 13 (LC–13)		
		Psychosocial function	General Health Questionnaire–12 Distress Thermometer FACT–Cognition		
		Dyspnea	Shortness of Breath Questionnaire		
		Sleep quality	Pittsburgh Sleep Quality Index		
		Physical Capacity	6–MWT Senior's fitness test Hand grip strength Actigraph GT1M accelerometers Active Australia questionnaire Sedentary Behavior Questionnaire Activities of daily living (ADL) Instrumental activities of daily living (iADL)		
		Pulmonary function	FEV1 FVC		
M. Quist et al.2015[17]	Sample size: n=71 Patients ≥18 years of age with confirmed with stage IIIb–IV NSCLC and SCLC–ED; and were undergoing chemotherapy; World Health Organization performance status of 0, 1, or 2	Aerobic capacity	VO2peak	IG: supervised group training: 2x weekly, 1.5 hours sessions, supervised by a physiotherapist, given to groups of 10,12. Warmup exercises+ strength training + fitness Training + stretching + relaxation (15–20 minutes) Warmup exercises: 10 mins stationary cycling (60%–90% HRmax of patient). Strength training: Technogym machines used 3 series of 5 to 8 sets, with load 70%–90% of 1RM; Exercises: lateral machine (latissimus dorsi), chest press (pectoral muscles), abdominal crunch (rectus abdominis), leg extension (quadriceps femoris), Leg press (lower extremity), and lower back press (erector spinae). Fitness training: 85% – 95% HRmax of patient; interval training on stationary bicycles; 10–15 minutes. Stretching: 5–10 minutes large muscle groups.	Improvement in aerobic capacity (VO2peak, strength), functional capacity, anxiety level, and emotional well–being but not their HR QoL.
		Muscle strength	1RM tests		
		Functional capacity	6MWD (6 minute walk distance)		
		lung capacity	FEV1		
		HR QoL and cancer–related symptoms	FACT–General FACT–L		
		Anxiety and depression	HADS		
		Fatigue	Piper Fatigue scale		
		Physical activity	VO2 max, muscle strenght by dynamometer		

Table 2: Lung Cancer studies

Author	Participants	Outcome Variable	Outcome measure	Intervention	Conclusion
A. E. Hiensch et al.2020[18]	Sample size: n=86 CG: n=29 Aerobic IG: n=27 Resistance IG: n=30 Patients > 18 Years of age with breast cancer undergoing adjuvant chemotherapy	Inflammatory markers	Real time PCR software	IG: exercise training 3 d after the second chemotherapy session + 60–min exercise sessions, twice weekly, on nonconsecutive weekdays for 16 wk AT–HIIT group – consisted of 20 min of moderate–intensity aerobic exercise at an RPE of 13–15 + followed by 3 3–min bouts of high–intensity intermittent aerobic exercise at an RPE of 16–18 interspersed with 1 min low–intensity active recovery. RT–HIIT group – consisted of eight resistance exercises followed by the 3 3–min bouts of high–intensity intermittent aerobic exercise CG: Received only information about physical activity but no supervised exercise training.	Resistance Training–High Intensitive Interval Training (RT–HIIT) when combined with chemotherapy have been suggested as useful therapies for reducing chemotherapy–induced inflammation and fatigue.
		Fatigue	Piper Fatigue scale		
		Physical activity	VO2 max, muscle strenght by dynamometer		
A. Gandhi et al. 2020[19]	Sample size: n=44 CG: n=22 IG: n=22 Patients > 18 Years of age with breast cancer undergoing adjuvant chemotherapy	Fatigue	Brief Fatigue Inventory(BFI Scale)	CG: Physical Activity recommendations + standard chemotherapy regimen. IG: Moderate Aerobic Exercise + standard chemotherapy regimen. Physical activity recommendations: three 10–min walks, five days a week, total 150 mins/ week. Moderate Aerobic Exercise: Target of 10,000 steps, 5 days a week with 5% weekly increase in the number of steps. Standard chemotherapy regimen: 4 cycles of 3 weekly doxorubicin + cyclophosphamide → 4 cycles of 3 weekly, docetaxel.	Improvement in functional capacity, QoL, % of skeletal mass and prevention in deterioration of fatigue levels.
		QoL	Functional Assessment of Cancer Therapy—Breast (FACT–B scale)		
		Functioning	Use a diary to weekly record symptoms such as dyspnoea, excessive fatigue, palpitations etc.		
		Body composition	HBF 375 Bio–electrical Impedance Analyzer		
C. M. D. Conwright et al.2018[20]	Sample size: n=91 CG: n=45 IG: n=46 Survivors > 18 Years of age with breast cancer within 6 months of completing adjuvant treatment.	Muscle strength	1 RM, 10 RM method	CG: Usual Care (no exercise) IG: 3 supervised one–on–one exercise sessions/week. Combine Session day: Aerobic + resistance exercise ~ 80 min; Aerobic session day: ~ 50 min of aerobic exercise.	improved quality of life and physical fitness.
		Bone mineral density	dual energy x–rayabsorptiometry(DXA) scans		
		QoL	FACT–B scale		
		Cardiovascular fittness	Single–stage submaximal treadmill test		
G. Ammitzbøll et al. 2019[21]	Sample size: n=158 CG: n=76 IG: n=82 Women treated for primary breast cancer with axillary lymph node dissection in the Preventive Intervention for Lymphedema after Breast Cancer	Lymphedema	Arm Volume by water displacement	IG : consists of 2 phases Phase 1 at 3rd Post Op wk – 20 wks twice weekly supervised exercise in groups & once weekly self–administered at home or any exercise facility with load of 7RM from baseline + monthly progression of <60% intensity of 1RM from 12th week. Phase 2 at 3rd Post Op wk–30 wks of self–administered exercises 3 times weekly. CG: No interventions received but exercised ad participated in municipality–led rehabilitation programs without restrictions.	There is no evidence that PRT helps prevent arm lymphedema in the first year after Breast cancer, the findings support the usefulness and safety of resistance training for patients, particularly women at high lymphedema risk.
		Strength	Dynamic muscle strength – 7–repetition maximum Isometric muscle strength–determined by dynamometry		
		Movement	Goniometery		
		ILMD	DXA		

H. M. Fisher 2017[22]	Sample size: n=240 CG: n=120 IG: n=120 Women diagnosed with non–metastatic stage 0–IIIb breast cancer.	Physical activity	Seven–Day Physical Activity Recall Questionnaire	CG: 1–day psycho–educational control seminar on CBSM, IG: CBSM 2 hours/week for 10 weeks. CBSM: structured, manualized psychosocial intervention + relaxation (muscle relaxation and imagery) + cognitive behavioral therapy.	increased physical activity may decrease FRDI and enhance depressed symptoms and functional QoL in women receiving breast cancer therapy, except psychosocial intervention
		Fatigue	Fatigue Symptom Inventory(FSI)		
		Depression	Hamilton Rating Scale for Depression (HRSD)		
		QoL	FACT–B		
I. C. Villanueva et al. 2012[23]	Sample size: n=66 CG: n=33 IG: n=33 Patients finished breast cancer treatment during the study period	Pain	Visual Analogue Scale (VAS)	CG: usual care . IG: WATER therapy program: 24 sessions (3 times/week over 8 weeks) of low–intensity exercises in a warm pool (32°C). Each session included 10–minute warm–up period; 35 minutes of aerobic, low–intensity endurance, and core stability training; and a 15–minute cool–down period (stretching and relaxation).	treatment program was successful in relieving neck and shoulder/axillary pain and reducing the presence of TrPs; however, no significant changes in generalized pressure pain hyperalgesia were detected.
		Pressure pain sensitivity	Pain Pressure Threshold (PPT)		
J. Heiman et al. 2020[24]	Sample size: n= 400 CG: n=200 IG: n=200 Women of 18 years age or older scheduled for surgery for confirmed or suspected breast cancer.	Physical recovery	Self–administered questionnaires.		
		Mental recovery	Centre for Clinical Interventions (CCI)	IG : Routine care + standard discharge recommendation + Individual advice + follow–up telephone calls. CG :Routine care + standard discharge recommendation Only. Standard discharge recommendation: early mobilization + shoulder movement Individual advice: moderate intensity aerobic physical activity for 30 min/day; 2 wks prior surgery –4 wks post operatively + diary; to mark performance of the recommended activity. Follow–up telephone calls: 2 calls By physiotherapist; 1 preoperative + 1 postoperative intervention period.	Intervention with recommended non–supervised physical activity before and after breast cancer surgery does not improve recovery after 4 weeks of surgery.
K. Bloomquist et al. 2019[25]	Sample size: n=153 Women referred to adjuvant chemotherapy for stage I–III breast cancer	lymphedema status, lymphedema symptoms, upper extremity strength, quality of life	extracellular fluid, inter–arm volume % difference, numeric rating scale 0–10, 1 RM, EORTC– BR23	HG: HIGH group supervised for 12–weeks divided in to 2 6wks protocol. First 6 weeks multimodal sessions which include high + low intensity exercise Following 6 weeks high intensity + aerobic exercises moderate to high intensity + resistance training of 1 RM max LG: Low intervention group received home individualized programme for walking supported by pedometer and one–on–one consultations + achieve 10000 steps/day	physically inactive breast cancer survivors can benefit from super vised heavy–load resistance exercise during chemotherapy without increasing lymphedema risk.

K. Gokal et al. 2018[26]	Sample size: n=50 CG: n=25 IG: n=25 breast cancer patients treated with chemotherapy	cognitive functioning	cognitive failures questionnaire (CFQ)	IG : 12 weeks walking of 30 mins 5 times/week CC:12 weeks usual care + home based low intensity walking 3 to 5 time /week	beneficial in protecting against perceived cognitive decline.
N. Mutrie et al. 2012[27]	Sample size: n=148 All women who had participated in the original study and who had agreed to being contacted again	physical and psychological functioning.	Quality of Life (FACT) questionnaire, Beck Depression Inventory (BDI), positive and negative affect scale (PANAS), body mass index (BMI), 7–day recall of physical activity from the Scottish Physical Activity Questionnaire–2 (SPAQ), 12–min walk test and assessment of shoulder mobility.	CC: home based 12 weeks 150 mins of leisure time physical activities 5 days/weeks .IG: 12 week programme of 150 mins of moderate intensity aerobic exercise 5 days/week	lasting implications for physical and psychological functioning.
P. Cormie et al. 2016[28]	Sample size: n=21 62 ± 10 years old, with breast cancer–related lymphedema (BCRL) participated in the study.	markers of exercise–induced muscle damage and inflammation, Lymphedema status, associated symptoms	Venous blood samples, bioimpedance spectroscopy and arm circumferences, Visual Analogue Scales	IG : 6 weeks 6 standard resistance exercises targeting all the major muscle groups in the upper body The high–load trial involved sets of 6 to 8 RM+ 3 sets 10 reps/day. CC: Usual medical care + 6 weeks 3 standard resistance exercises all major groups upper body. . The low–load –trial involved sets of 15 to 20 RM 3 sets 10 reps/day.	The magnitude of acute exercise–induced inflammation following upper–body resistance exercise in women with BCRL does not vary between resistance exercise loads.

Table 3: Breast Cancer studies

Lung Cancer:

All studies exploring the effects of pulmonary rehabilitation on lung cancer patients found no significant effects of physiotherapy on QoL & and Lung functions, except one study by B. C. Brocki et al. (2013) reporting significant short–term effects of pulmonary rehabilitation on the health–related QoL with improved 36–Item Short–Form Health Survey version 2 (SF–36) scores[13–17]. It was also found that the application of an individually tailored exercise program on post–operative lung cancer patients has no significant effect on physical ability & physical capacity. However, it is important to note the difference between the interventions given. The study conducted by M. Jonsson et al.(2019) applied pre and post–operative physiotherapy along with discharge counseling and the intervention was only given till patient discharge. B. C. Brocki et al.(2013) study applied a combination of supervised exercise program, home exercises and postoperative counseling for 6 weeks post–surgery which resulted in significant short–term effects on QoL and pain. With the suggested findings, the intervention did not show long–term improvement with the given exercises despite good adherence to the home program[14,15]. H. M. Dhillion et al.(2017) and M. Quist et al.(2015) explored advanced lung cancer patients that had a performance status of less than 2 and a life expectancy of more than 6 months. Both studies included patients who were able to complete 6MWT. The outcome measure and evaluation time was similar for both the studies making the comparison easier. It was observed that the use of combined aerobic and fitness training is better than aerobic training only. We observed that there were significant effects reported with combined therapy in terms of aerobic capacity (VO2 peak, strength), functional capacity, anxiety level, and emotional well–being while aerobic training alone showed a slight improvement in physical ability (Active Australia questionnaire and Sedentary Behavior Questionnaire) scores[16,17]. With the same related findings, a study recommended that the best intervention for advance lung cancer patients is supervised group training which combined warm up exercises (60%–90% HRmax of the patient), strength training (with load 70%–90% of 1RM), fitness training (85% – 95% HRmax of the patient), stretching and relaxation which were all individually tailored.[17]. In the future researchers can evaluate the effectiveness of this same protocol which could be tested for postoperative patients with a well–defined therapeutic intervention for benign lung cancer patients who have undergone thoracotomy.

Breast Cancer:

Physical therapy in breast cancer treatment has a considerable amount of evidence for improving certain problems in survivors. The treatment provided has shown effects on lymphedema, fatigue, physical activity, stress levels, strength and pain. The study conducted by A. E. Hiensch et al.(2020) suggested the effects of moderate–

intensity aerobic and high–intensity interval training, while A. Gandhi et al.(2020) also evaluated aerobic exercise at moderate intensity and found improved QoL (FACT–B SCALE), muscle strength, increase in fatigue levels among breast cancer who were undergoing adjuvant chemotherapy[19,28]. Another study by C. M. D. Conwright et al.(2018) also used aerobic exercise as an intervention along with resistance exercise which resulted in significant improvements in QoL, stress, fatigue and physical fitness. However, findings from J. Heiman et al. (2021) did not correlate with C. M. D. Conwright et al.(2018) in terms of physical activity (PA) as there was only a limited increase in the level of PA. The reason could be attributed to the difference in intervention which was self–administered aerobic exercises only[18,20]. K. Bloomquist et al.(2019) also added evidence in favor of aerobic exercises where low, moderate to high intensity and resistance training of 1 repetition max (RM) in combination had significant improvement in muscles strength but there was no difference found in the volume of lymphedema[24]. A significant number of breast cancer patients suffer from psychosocial and cognitive symptoms where evidence shows different results of physical therapy interventions. H. M. Fisher et al.(2018) used such an intervention by combining relaxation techniques like muscle relaxation and imagery with cognitive behavioral therapy, assertiveness training, coping effectiveness training and anger management therapy. Whereas the study conducted by N. Mutrie et al.(2012) showed significant improvement in Psychosocial and cognitive aspects along with improved QoL and physical activity with moderate–intensity aerobic exercise given 5/days a week[22,26]. Moreover, K. Gokal et al.(2018) exhibited a 12–week intervention of walking for 30 mins/day 5 times a week, which improved cognitive ability[25]. Only one study on water therapy displayed the effects of physical therapy in breast cancer; it was conducted by I. C. Villanueva et al.(2012) following a water therapy program as an intervention that consisted of low–intensity exercises in a warm pool (32°C). Each session included a 10–minute warm–up period; 35 minutes of aerobic, low–intensity endurance, and core stability training; and a 15–minute cool–down period (stretching and relaxation).This resulted in a decrease in cancer–related pain, relieving neck and shoulder/axillary pain (VAS) ,however, no significant changes in generalized pressure pain hyperalgesia were noticed[23].

To summarize, evidence on effect of physiotherapy in head and neck, lung and breast cancer patients is inconsistent in terms of specific regimens and outcomes.

Conclusion:

From this review study, we conclude that head and neck cancer patients can benefit from swallowing exercises and muscle awareness. However, more evidence is needed to denote a specific exercise regimen. Furthermore, a combination of warm–up exercises, strength training, fitness training, stretching and relaxation has the most gains in advanced lung cancer patients. Breast cancer patients benefit from combined aerobic and resistance training along with stretching and relaxation.

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Highlights:

- Identifies the latest evidence for head and neck, lung and breast cancer rehab using physical therapeutic techniques
- A first–of–its–kind study at the United Arab Emirates

Scope for conducting experimental research in the given area in UAE.

Abbreviations:

Quality of life (QOL)
Range of motion (ROM)
Control Group (CG)
Intervention group (IG)
Weeks (wks)
Health related quality of life (HRQOL)
Penetration aspiration score (PAS)
Fiberoptic endoscopic evaluation of swallowing (FEES)
Functional Oral Intake Scale (FOIS).
Numerical pain rating scale (NPRS)
MD Anderson Dysphagia Inventory (MDADI)
Repetition (Rep)
progressive resistance training (PRT)
One Repetition maximum (1RM)
Active range of motion (AROM)
Electromyograph (EMG)
Maximum Voluntary Isometric Contraction (MVIC)
Maximal interincisor distance (MID)
Short Form (36) Health Survey (SF–36)
St. George's Respiratory Questionnaire (SGRQ),
Functional Assessment of Cancer Therapy–Lung (FACT–L)
Six minute walk test (6MWT)
International Physical Activity Questionnaire Modified for the Elderly (IPAQ–E)
positive expiratory pressure (PEP)
Physical activity (PA)
Activities of daily living (ADL)

Instrumental activities of daily living (iADL)
Forced expiratory volume in 1 second (FEV1)
Forced vital capacity (FVC)
Hospital Anxiety and Depression Scale (HADS)
Dual energy x–ray absorptiometry (DEXA)
Charlson Comorbidity Index (CCI)
Cognitive functioning questionnaire (CFQ)
Beck Depression Inventory (BDI)
Positive And Negative Affect Scale (PANAS)
Unknown primary Tumor (UPT)

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