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Effectiveness of Aerobic Exercise on Cancer Patients to Improve their Quality of Life

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Abstract

Objective: The purpose of the study is to see an effectiveness of aerobic exercises on cancer patients improving their Quality of Life.

Method: A total 25 subjects were taken according to inclusion and exclusion criteria, Then pre and post Vitals were collected using Pulse oxymeter physical and mental health was measured using short form-12 survey.

Result: The comparison of pre- and post-intervention SF-12 Physical Component Summary (PCS) scores revealed a significant improvement in the participants' physical health. The mean score increased from **34.11 ± 3.17** before the intervention to **54.21 ± 2.07** following the aerobic exercise program. This substantial change corresponds to a 't' value of **27.707**, with a statistically significant p-value of **less than 0.01**. These results strongly indicate that the aerobic exercise program was effective in enhancing the physical health metrics of oral cancer patients, validating the positive impact of the intervention on their quality of life.

Conclusion: The study's statistical analysis indicates a significant positive effect of aerobic exercises on the quality of life of oral cancer patients, as evidenced by a p-value of 0.01. With 60% of participants aged 30 to 80 experiencing physical and mental health challenges, the findings highlight the critical need for effective interventions in this demographic.

Keywords: Aerobic Exercise, Quality of Life, Physical Health, Mental Health.

Introduction

According to the World Health Organization (WHO), cancer is characterized by the rapid and uncontrolled growth of abnormal cells that surpass their normal boundaries, potentially invading nearby tissues and spreading to other organs. This disease can manifest in any tissue or organ of the body, affecting various types of cells [1]. The main categories of cancer include carcinomas, which develop in epithelial cells of organs such as the mouth, esophagus, intestines, and uterus; sarcomas, originating from mesodermal cells in connective tissues like fibrous tissue, fat, and bone; and hematological malignancies like lymphomas, myeloma, and leukemia, which arise from bone marrow and immune system cells. Each type poses unique challenges for diagnosis and treatment, emphasizing the complexity of cancer as a multifaceted disease [1].

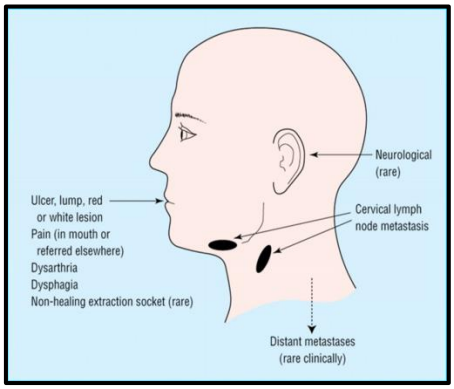
Cancer development is influenced by a myriad of factors, including environmental influences, alcohol consumption, genetic predispositions, dietary habits, occupational exposures, and infections from viruses

and parasites. Additionally, customs, habits, and lifestyle choices play significant roles in increasing cancer risk. The risk factors for developing cancer can be categorized into non-modifiable and modifiable types. Non-modifiable factors include age, age at menarche, age at menopause, and family history, while modifiable factors encompass diet, socio-economic status, and hormonal influences [1].

Oral cancer, specifically oral squamous cell carcinoma (OSCC), is a malignant neoplasm that originates in the lip or oral cavity, with 90% of these cancers arising from squamous cells. This type of cancer is a significant public health concern, particularly for dental surgeons, ranking among the top ten in cancer incidence. Despite advancements in research and treatment, survival rates have seen little improvement in recent years, highlighting the ongoing challenges faced by biomedical science in combating this disease. [4]

Etiologic factors contributing to oral cancer primarily affect individuals who have a genetic predisposition to the disease. Key contributors include tobacco use, with approximately 75% of those diagnosed with oral cancer being smokers, and betel use, which combines betel leaf, tobacco, spices, slaked lime, and areca nut. Alcohol consumption, a diet lacking in fresh fruits and vegetables, and the presence of infective agents such as Candida and certain viruses also play significant roles. Additionally, individuals with immune deficiencies are at increased risk, while exposure to sunlight is a notable factor specifically for lip carcinoma. Oral cancer encompasses malignant neoplasms located on the lip, floor of the mouth, cheek lining, gingiva, palate, or tongue. In India, it ranks among the top three types of cancers, underscoring its prevalence and the urgent need for effective prevention and treatment strategies [5]

Figure 1 Possible Features of Oral Carcinoma



Oral cancer leads to significant damage, with pain being the predominant symptom affecting those diagnosed. This pain can severely impair essential functions such as speech, swallowing, and chewing, profoundly impacting quality of life. While oral cancer is a preventable disease, major risk factors-including tobacco and alcohol—are present in about 90% of cases, exhibiting a synergistic effect on disease development. Other contributing factors include human papillomavirus (HPV) types 16 and 18, as well as ultraviolet (UV) radiation. The pain associated with oral cancer can stem from various sources, including mediators within the tumor microenvironment, inadequate palliative care, and the dense trigeminal innervation of the oral region. Additionally, ongoing oral functions and pain related to treatment, alongside opioid tolerance, can exacerbate the discomfort experienced by patients. Addressing these symptoms and risk factors is crucial for improving outcomes and enhancing the quality of life for individuals affected by this challenging condition [5].

The incidence of oral cancer is particularly high in India and other South and Southeast Asian countries, with squamous cell carcinoma accounting for 90-95% of cases in India. The International Agency for

Research on Cancer has projected a troubling increase in India's cancer incidence, predicting it will rise from 1 million cases in 2012 to over 1.7 million by 2035. This surge is expected to be accompanied by a corresponding rise in mortality, with death rates projected to increase from 680,000 to between 1 and 2 million during the same period. Oral cancer presents numerous challenges, with pain being the most common symptom, often localized in the tongue or floor of the mouth, and accompanied by potential bleeding. Patients may experience persistent sores or irritations that fail to heal, lumps in the mouth or neck, and red or white patches on the gums or tongue. Difficulty in swallowing and chewing, swelling of the jaw or neck, ear pain, loose teeth, unexplained weight loss, and fatigue further complicate the clinical picture. These symptoms not only highlight the physical toll of the disease but also underscore the urgent need for effective prevention, early detection, and comprehensive treatment strategies [6].

Interventions for fatigue in individuals with oral cancer often involve comprehensive physiotherapy programs designed to enhance physical function and overall well-being. These programs typically include active exercises for both the upper and lower limbs, utilizing techniques such as myofascial Release (MFR) and Proprioceptive Neuromuscular Facilitation (PNF) to promote muscle relaxation and coordination [8]. The structured exercise interventions focus on improving flexibility, muscle strength, and endurance, with particular attention to strengthening proximal muscle groups to enhance functional ability.

Moderate-intensity walking and resistance exercises using therabands are commonly incorporated [8], alongside practices like physical exercise, pranayama [10], and Qigong therapy to address distress and fatigue [11]. Edema massage may also be included to alleviate swelling [12]. All structured exercises are carefully reviewed by a cancer rehabilitation core team and adhere to the American College of Sports Medicine's guidelines for exercise testing and prescription, ensuring a safe and effective approach to managing fatigue in oral cancer patients. These interventions not only aim to reduce fatigue but also to improve the overall quality of life for those undergoing treatment [8,10,11,12]

Moderate-intensity walking was recommended for patients as a key component of their exercise regimen, encouraging them to walk at their own pace for 20 minutes, incorporating a mandatory 2-minute warm-up followed by alternating cool-down periods. This walking routine was designed to be performed three to five times a week, promoting aerobic conditioning and overall cardiovascular health. Additionally, minimal to moderate resistance exercises using theraband (grade 2) were structured in line with prudent exercise guidelines to strengthen major muscle groups in the upper limbs. This resistance training program included five sets of exercises: lateral raises, dynamic hugs, chest presses, reverse flies, and lateral pull-downs. Together, these interventions aimed to enhance both aerobic capacity and muscular strength, ultimately improving the physical well-being and functional ability of patients undergoing treatment for oral cancer [8].

In 2020, the global burden of cancer escalated significantly, with an estimated 19.3 million new cases and 9.96 million deaths attributed to the disease. Projections indicate that by 2030, the number of new cancer cases worldwide is expected to rise to 21.6 million, reflecting a stark 53% increase from the latest statistics reported by the World Health Organization in 2012. In 2023, the estimated figures indicate that there will be 1,958,310 new cancer cases and 609,820 cancer-related deaths. Lung and bronchial cancers remained the leading cause of cancer mortality, accounting for approximately 1.46 million deaths in 2022. In 2020, the most common causes of cancer deaths included lung cancer (1.8 million deaths), followed by colon and rectum cancer (916,000 deaths), liver cancer (830,000 deaths), stomach cancer (769,000 deaths), and breast cancer, which represented 11.7% of deaths among females according to the

American Cancer Society. Overall, the burden of cancer continues to be substantial, affecting 9.3 million men, 8.8 million women, and approximately 400,000 children worldwide. These statistics underscore the urgent need for effective prevention, early detection, and treatment strategies globally [1].

Quality of life for cancer patients is significantly influenced by various components, including physical fitness, social functioning, self-esteem, body image, mood, stress response, and an elevated risk of conditions such as heart disease and diabetes. Additionally, psychological distress, particularly depression and anxiety, can profoundly affect their overall well-being. Engaging in aerobic exercises—defined as rhythmic and continuous activities that utilize oxygen and large muscle groups—has been shown to benefit cancer patients by enhancing physical functioning and cardiovascular fitness. These exercises can also improve sleep quality, reduce fatigue, and alleviate symptoms of depression and anxiety [2,4], ultimately contributing to a better overall quality of life. By addressing both physical and mental health aspects, aerobic exercise serves as a valuable intervention for improving the well-being of individuals undergoing cancer treatment [4].

Aerobic exercise offers numerous benefits that extend beyond general fitness, significantly impacting both physical and mental health. It effectively reduces the risk of various health conditions, particularly heart disease, as it challenges the heart and lungs to work harder than usual. This type of exercise is especially beneficial for the brain, helping to alleviate symptoms of depression and anxiety, thereby enhancing overall mental well-being. For the body, aerobic exercise contributes to several key benefits, including the prevention of heart disease and the maintenance of a healthy weight. Additionally, it improves cardiovascular fitness, boosts energy levels, and enhances endurance, making it an essential component of a healthy lifestyle. Overall, integrating aerobic exercise into a regular routine can lead to substantial improvements in both physical health and mental resilience [2].

The principles of aerobic exercise encompass several key concepts that contribute to overall fitness and performance. Fitness itself is a broad term that refers to the ability to perform physical work, which relies on effective cardiorespiratory functioning, muscular strength and endurance, as well as musculoskeletal flexibility. Maximum Oxygen Consumption (Vo2max) serves as a critical measure of the body's capacity to utilize oxygen during intense exercise, typically assessed through activities engaging large muscle groups [2].

Endurance is the ability to sustain physical activity over prolonged periods, encompassing both muscular and cardiovascular endurance, which helps individuals resist fatigue. Conditioning refers to the process of enhancing cardiovascular endurance through structured aerobic exercise training, aimed at increasing the muscles' energy utilization. This improvement is a direct result of heightened levels of oxidative enzymes in the muscles, allowing for more efficient energy production. Finally, adaptation is the principle that both the cardiovascular system and the muscles will adapt to the training stimulus over time, leading to enhanced performance and fitness levels. Together, these principles provide a framework for designing effective aerobic exercise programs that promote health and fitness [2].

Need of study

Given the complex interplay between physical, psychological, and social factors in cancer care, there is a pressing need for detailed research on the effectiveness of aerobic exercise. Such studies can contribute to developing evidence-based exercise programs that not only address physical fitness but also significantly improve mental health outcomes, social functioning, and overall quality of life for cancer patients.

Materials and Methodology

Materials

1. Consent form.
2. Paper for documentation or worksheet.
3. Pen pencil
4. Pulse oxymeter
5. Android phone, Books, articles, paper

Methodology

1. **Study design**: An Interventional study
2. **Sampling technique:** Convenient sampling
3. **Study setting**: RJS college of Physiotherapy O.P.D. , SJS hospital Physiotherapy O.P.D., SJS hospital Cancer Centre dept.
4. **Study duration:** 6 months
5. **Sample size**: 25 Subjects.
6. **Sampling procedure**: Convenient Sampling

Inclusion Criteria

1. Cancer Site – Head and neck
2. Oral cancer
3. Age group – 30-80years
4. Chemotherapy
5. (10-50) SF – 12 Questionnaire.

Exclusion Criteria

1. Cancer Site – Lung Cancer

Gall bladder

Pancreatic

Gynecological (ovarian, cervical, uterine, vaginal, vulvar).

Blood cancer

Bone cancer

2. Age group – Children
3. Disoriented patients
4. (50-100) score of SF-12 Questionnaire

Procedure

The written consent will be taken from the participants, 25 subjects will be selected randomly based on inclusion and exclusion criteria and each participant's oxygen saturation and pulse rate as well as SF-8 Questionnaire should be collected pre and post exercise.

Aerobic exercises: Patients assigned to the intervention group will attend a supervised program, The exercise program concluded 10 sessions per patient for 10 days was divided into a warm-up period, followed by moderate intensity of aerobic exercises, and finishing with a cool-down period.

- Warm-up period: Warm-up period consist of 5 min of slow walking, marching in place, stepping from side to side, moving the waist level/higher.
- Arm circles -3 minutes exercise, 2 minutes interval
- Trunk rotation- 3 minutes exercise, 2 minutes interval

- Stair climbing – 3 minutes exercise, 2 minutes interval
- Jogging in place – 3 minutes exercise, 2 minutes interval
- Lateral shuffles- 3 minutes exercise, 2 minutes interval
- Brisk walking-3 minutes exercise, 2 minutes interval

➢ Aerobic conditioning programme**:**
Core Components

- Duration: Initial session length: 25-30 minutes.
- Intensity**:** Participants should maintain an exercise intensity of 60-70% of their maximum heart rate. Maximum heart rate can be calculated using the formula: {Maximum Heart Rate} = 220 –{age}
- Monitoring**:** Heart Rate: Monitored using a pulse ximeter to ensure participants stay within the target heart rate zone.
- Subjective Exertion: Participants will use the Borg's CR-10 scale to assess and communicate their perceived exertion levels, aiming for a range between "moderate" to "somewhat hard."

➢ Cool down period: Session should be ended with 5 min of cool-down period remain also consisting of slow walking, upper body stretch.[5]

Figure 2 Marching on Place

Aerobic Conditioning

- Duration**:** Total: 25-30 minutes
- Core Portion: Aerobic Exercises

a) Arm Circles

- Duration: 3 minutes of exercise
- Interval: 2 minutes of rest or light activity
- Instructions: Stand with arms extended to the sides, make small circles, gradually increasing size.

Figure 3 Arm Circles

b) Trunk Rotation
- Duration: 3 minutes of exercise
- Interval: 2 minutes of rest or light activity
- Instructions: Stand with feet shoulder-width apart and rotate the torso side to side.

c) Stair Climbing
- Duration: 3 minutes of exercise
- Interval: 2 minutes of rest or light activity
- Instructions: Use a set of stairs to climb up and down at a steady pace.

d) Jogging in Place
- Duration: 3 minutes of exercise
- Interval: 2 minutes of rest or light activity
- Instructions: Jog in place, lifting knees and pumping arms.

e) Lateral Shuffles
- Duration: 3 minutes of exercise
- Interval: 2 minutes of rest or light activity
- Instructions: Shuffle side to side, staying low and maintaining good form.

f) Brisk Walking
- Duration: 3 minutes of exercise
- Interval: 2 minutes of rest or light activity
- Instructions: Walk at a brisk pace, focusing on posture and stride.
- Total Duration: 25-30 minutes

Figure 4 Lateral Shuffles

Statistical Analysis

Statistical analysis was performed using StatistiXL software version 2.0. A paired t-test was employed to compare pretest and posttest spO2 scores, as the data met the assumptions of normality.

Comparing SpO2 scores between pre and post tests using t-test result for paired dataset

Results
- Pretest Mean (± SD): Mean 96.96 and Std.dev.1.43
- Posttest Mean (± SD): Mean 8.60 and Std. dev.0.65
- t-value: 7.624
- Degrees of Freedom (df): 24
- p-value: 0.000

Interpretation: A significant difference was found between pretest and posttest spO2 scores ($p < 0.05$), indicating that [brief interpretation of what the results imply, e.g., "the intervention led to a statistically significant improvement in spO2 levels"].

Table 1 Descriptive Statistics of spO2 Pre and Post Test Scores

Variable	Mean	Std Dev.	Std Err.	Lower 95% CL	Upper 95% CL	N
SpO2 post-test	98.60	0.65	0.13	98.334	98.866	25
SpO2 pre-test	96.96	1.43	0.29	96.370	97.550	25

Table 2 1-tailed t-Test (SpO2 - posttest > SpO2 - pretest)

Ho. Diff	**Mean Diff.**	**SE Diff.**	**'t' value**	**DF**	**'p' value**
0.000	1.640	0.215	7.624	24	0.000

Inference

The results of the paired t-test indicate a significant difference between the pretest and posttest spO2 scores. The calculated t-value of 7.624 is significant with a p-value less than 0.01**.**

Mean value of Pre-test SpO2: 96.96

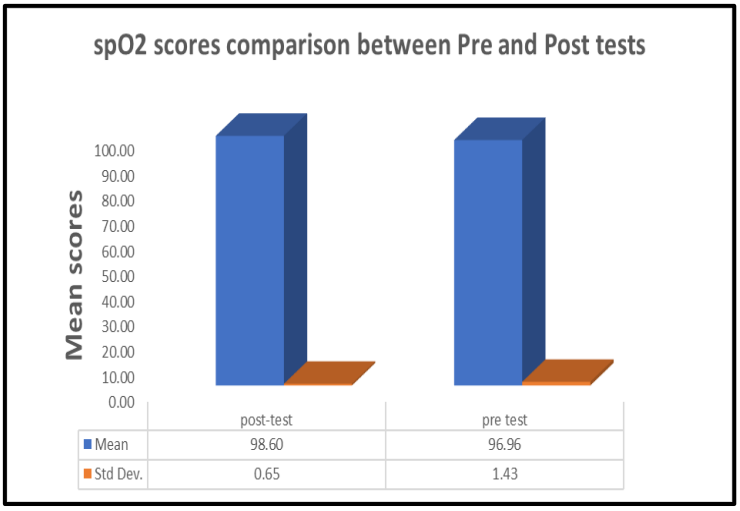
Mean value of Post-test SpO2: 98.6

This indicates that the mean Post-test spO2 score is significantly higher than the mean Pre-test score.

Conclusion

The intervention was successful in increasing spO2 scores, as evidenced by the significant improvement in the post-test results.

Figure 5 Comparison Between Pre and Post Test Scores



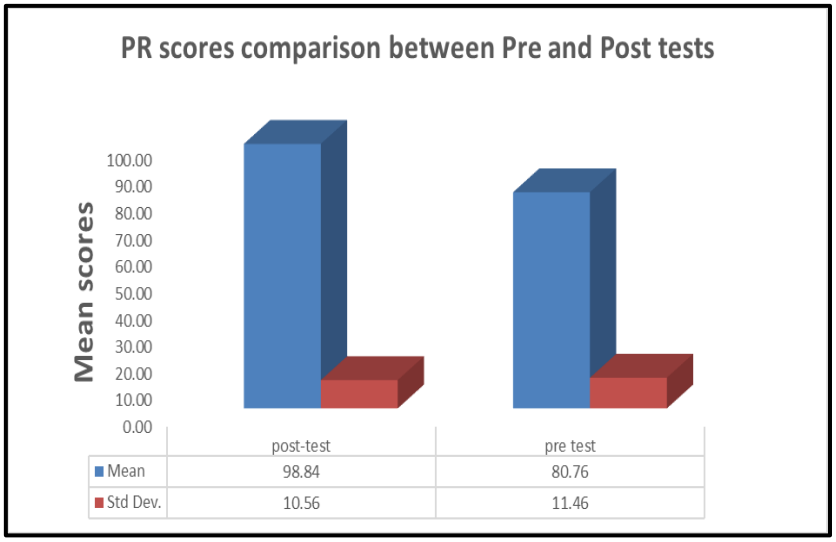
Comparing PR scores between pre and post tests using t-test result for paired dataset

Table 3 Descriptive Statistics for Pulse Rate Pre and Post Test Scores

Descriptive Statistics						
Variable	**Mean**	**Std Dev.**	**Std Err**	**Lower 95% CL**	**Upper 95% CL**	**N**
Pulse Rate – post test	98.84	10.56	2.11	94.480	103.200	25
Pulse Rate – pretest	80.76	11.46	2.29	76.029	85.491	25

Table 4 P-value table for Pulse Rate					
Ho. Diff	**Mean Diff.**	**SE Diff.**	**'t' value**	**DF**	**'p' value**
0.000	18.080	1.606	11.257	24	0.000
			Significant		'p' < 0.01

Figure 6 Comparison Between PR Pre and Post Test Scores



Inference

The results from the paired t-test demonstrate a significant difference between the pretest and posttest pulse rate (PR) scores. The calculated t-value of 11.257 is significant, with a p-value less than 0.01.

Mean Pre-test PR: 80.76

Mean Post-test PR: 98.84

This indicates that the mean post-test PR score is significantly higher than the mean pretest score.

Conclusion

The intervention was successful in increasing the PR scores, as evidenced by the significant improvement in the posttest results.

Comparing PCS scores between pre and post tests using t-test result for paired dataset

Table 5 Descriptive Statistics for PCS Pre and Post Test Scores

Variable	Mean	Std Dev.	Std Err	Lower 95% CL	Upper 95% CL	N
PCS – posttest	54.21	2.07	0.41	53.353	55.061	25
PCS – pretest	34.11	3.17	0.63	32.804	35.425	25

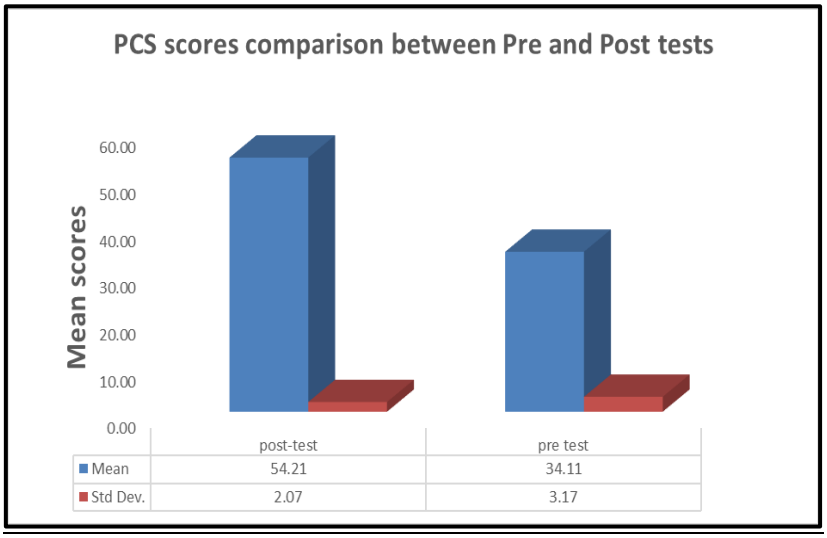
Table 6 1-tailed t-Test (PCS - posttest > PCS - pretest)

Ho. Diff	**Mean Diff.**	**SE Diff.**	**'t' value**	**DF**	**'p' value**
0.000	20.092	0.725	27.707	24	0.000
			Significant		'p' < 0.01

Based on the results, we can conclude that the intervention effectively increased the PCS (Physical Component Summary) scores, as indicated by the significant difference between pre-test and post-test scores.The 't' value of 27.707 with a p-value less than 0.01 suggests that the improvement in scores is statistically significant.

The post-test mean score of 54.21 being higher than the pre-test mean score of 34.11 further reinforces the conclusion that the intervention was successful in enhancing the PCS scores.

Figure 7 PCS Scores Comparison Between Pre and Post-Tests.*



Comparing MCS scores between pre and post tests using t-test result for paired dataset

Table 7 Descriptive Statistics for MCS Pre and Post Test Scores

Variable	Mean	Std Dev.	Std Err	Lower 95% CL	Upper 95% CL	N
MCS - posttest	56.60	2.56	0.51	55.548	57.661	25
MCS - pretest	32.17	3.85	0.77	30.581	33.761	25

Table 8 1-tailed t-Test (MCS - posttest > MCS - pretest)

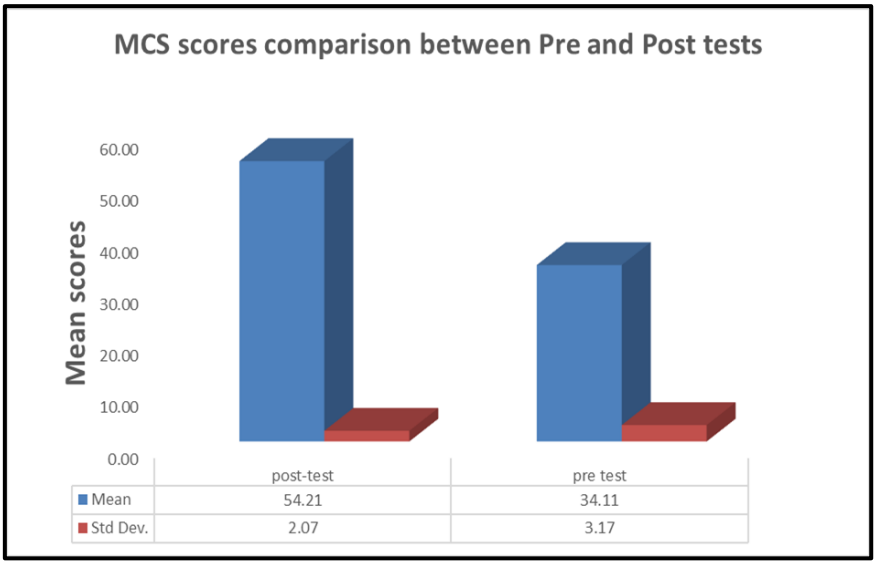
Ho. Diff	Mean Diff.	SE Diff.	't' value	DF	'p' value
0.000	24.434	0.991	24.655	24	0.000
			Significant		'p' < 0.01

Based on the results you've provided, the following inferences can be drawn:

1. **Statistical Significance**: The 't' value of 24.655 indicates a highly significant difference between the pre-test and post-test scores, with a p-value less than 0.01. This suggests that the results are unlikely to be due to chance.
2. **Mean Comparison**: The post-test mean score of 56.6 is substantially higher than the pre-test mean score of 32.17. This indicates a positive change in the MCS scores following the intervention.
3. **Effectiveness of Intervention**: The data supports the conclusion that the intervention was successful in increasing the MCS scores, as evidenced by the significant difference and the increase in mean scores.

Overall, these findings suggest that the intervention had a beneficial impact on the MCS scores.

Figure 8 MCS Scores Comparison Between Pre and Post-Tests.



Discussion

health problems were in age of 30-80 years. The Mean and Standard Deviation values of the pre SF-12 The conducted study aims to find out the **"**Effectiveness of Aerobic Exercises on Cancer patients improving their Quality of Life**"** selecting a sample size of 25 participants based on specific inclusion and exclusion criteria cancer patients having physical barriers and mental health issues measured using Short Form-12 before and after the intervention given to check the difference in pre and post exercise scores.SF-12 Questionnaire is one of the commonly used valid and reliable tool in measuring the physical components as well as mental components which is most widely used physical and mental assessment scale, the original version contains 12 items(SF-12v1) pertaining the symptoms of physical and mental components this scale has 12 questions with one or two questions per health domain a score above 50 indicates a better than average health related quality of life, while scores below 50 suggest below average health.

The results of the study revealed significant improvements in vital signs, including SpO2 levels and pulse rate, alongside enhancements in both physical and mental health among participants. This age group, ranging from 30 to 80 years, is particularly vulnerable to cancer, which can severely detract from their quality of life. The findings highlight that these patients frequently contend with various challenges, such as diminished physical fitness, social functioning, self-esteem, and body image issues, as well as mood disturbances, heightened stress responses, and an increased risk of comorbidities like heart disease and diabetes. Additionally, psychological distress, particularly depression and anxiety, is

prevalent in this population. The positive changes observed in the study suggest that aerobic exercise can serve as a vital intervention, addressing not only the physical aspects of health but also contributing to improved mental well-being. These outcomes underscore the importance of comprehensive care strategies that integrate physical activity as a means to enhance overall quality of life for cancer patients, ultimately fostering resilience and better health outcomes during and after treatment.

The Statistical analytic data of physical component summary results denoted p-value 0.01 which denotes of significant positive effect of aerobic exercises on oral cancer patients improving their quality of life. According to demographic data 60% of oral cancer patients had physical and mental PCS score rating (34.11±3.17) and post interventional SF-12 PCS score (54.21±2.07) of subjects were compared which demonstrated significant reduction in post SF-12 PCS scale score. The 't' value of 27.707 and a p-value less than 0.01 strongly suggest that the results are statistically significant. This means that the likelihood of these results occurring by chance is extremely low, reinforcing the validity of the findings. The significant improvement in scores suggests that the aerobic exercise program was effective in enhancing physical health metrics among participants. This could have implications for similar programs aimed at improving physical fitness in various populations. It might be beneficial to explore the long-term effects of the program, how different intensities or types of aerobic exercise compare, and the potential psychological benefits associated with improved physical health.

The similar study conducted by **Fabiana Reis and Ana Carolina Caporali Pereira et al 2024**, This study aims to determine The impact of a physical exercise program on quality of life, fatigue, physical performance, and level of physical activity in patients with cancer-An observational longitudinal study, Study was completed during the time duration of 3 months aged till 58 years. Exercises used were aerobic exercises, resistance exercise and flexibility exercises. In aerobic During exercise the patients were monitored for heart rate, blood pressure, Scale of Perceived exertion and oxygen saturation. Quality of life was assessed using the score Short Form-36 Health Survey (SF-36) score pre (464±157) and post score (573±144), Piper Fatigue Scale pre score (46±2.2) and post score (1.8±2.1), International physical activity questionnaire. At the end patient showed significant gain in QOL ($p<0.0001$) physical performance ($p<0.0001$) and improvement in fatigue ($p<0.0001$).the result of study confirmed exercise program are an important tool in rehabilitation of patients with cancer and that an initial supervised exercise program in combination with follow-ups can help increase the levels of the physical activity of this population [12].

Kerry S. Courneya, Lee W. Jones et al 2009, done a randomized controlled trial- The Effects of Aerobic Exercise on Physical Functioning and Quality of Life in Lymphoma Patients. 12 weeks of supervised aerobic exercise training and their primary end point was patient-rated physical functioning and assess the end points like QOL, psychosocial functioning, cardiovascular fitness, and body composition. Oxygen consumption (VO_{2peak}) was monitored during the aerobic exercise training, they assessed also analyzed the total FACT-An and the Fatigue subscale. Happiness was assessed by the Happiness scale14; depression by the short-form (SF) Center for Epidemiological Studies-Depression scale15; anxiety by the SF, lymphoma symptoms by the lymphoma subscale from theFACT17; and general health by the single item from the SF1218 asking respondents to rate their health from poor to excellent. At post-intervention, AET was superior to UC for patient-rated physical functioning (P =.012), overall QOL (P =.021), fatigue (P=.013), happiness (P=.004), and depression. Change in VO2peak mediated the effect of the intervention on patient physical functioning but not psychosocial functioning. Improvements in lean body mass may also have implications for improved physical

functioning, disease risk, and survival.30 Improvement inVO2peak mediated the effects of AET on patient physical functioning and was borderline significant for fatigue. The conclusion was the aerobic exercise training did not improve QOL or fatigue [13].

The statistical analytic data of mental Component Score (MCS) in a study or evaluation, focusing on the significance of the differences between pre-test and post-test results. The post-test MCS value (56.60) is significantly higher than the pre-test MCS mean value (32.17). This indicates an improvement in the mental health component after the intervention. If the difference between the pre-test and post-test scores is statistically significant (commonly assessed using a p-value<0.01), it suggests that the observed change is unlikely to be due to chance. This improvement could suggest that the intervention was effective in enhancing mental health or cognitive functioning among the participants might be beneficial to explore factors that contributed to this change, such as the specific interventions used, participant demographics, or other variables that could influence mental health outcomes.

Li-Tian, Hui J. Lu et al, 2016 conducted a meta-analysis of randomized controlled trials on effects of aerobic exercise on cancer-related fatigue which included sample size of 26 participants 13 breast cancer patients, 2 in colorectal cancer patients, 3 in prostate cancer patients, 2 in nasopharyngeal carcinoma patients and 2 hematological malignancies, 1 in gynecologic cancer patients, the mean age was 40-70 years, the exercises interventions were supervised or home-based, varied from 15-50mins,and took place 2-5 times/week for 6-24weeks Intensity was calculated based on the % heart rate reserve (%HRR), the %maximal oxygen consumption (VO_{2max}), or the % heart rate maximum were which had small but statistically significant beneficial effect, suggesting that the aerobic exercise could mitigate CRF(SMD =-0.22, 95%CI(-0.39,-0.04),p=0.01) [14].

The cross sectional study was conducted by **Myung-Kyung Lee and and Jihyun Oh et al, 2021** among 126 gastric cancer patients the age of >19 years, Patient health questionnaire of 9 items version was used as well as Health Related Quality of Life (HRQOL) were used to find out the prevalence of depression among the gastric cancer patients. The collected data were analyzed using SAS 9.4 version. The objective of the study was to report outcomes of regular aerobic exercise in gastric cancer Univariate Analyses: Association between Socio-demographic Characteristics and Both Depression and HRQOL Women had more severe depression (p = 0.013) and lower physical (p = 0.001), role (p = 0.003), emotional (p = 0.002), cognitive (p = 0.018), and social functioning (p = 0.024) than men. Depression was seen less in males due having a job was associated with higher physical (p = 0.014) and social functioning (p = 0.017). The results indicate that these patients had a significant decline in global QOL and role, emotional, and social functioning compared to those without depression. Thus, if the patients' depression was to improve, their global QOL and role, emotional, and social functioning, could also be improved. Although few studies have examined the relationship between depression and HRQOL in patients with gastric cancer, the findings of previous studies on other types of cancer have supported the negative association between depression and HRQOL [15].

Conclusion

The positive changes observed in the study indicate that aerobic exercise can serve as a crucial intervention, addressing not only physical health concerns but also contributing to improved mental well-being. These outcomes highlight the necessity for comprehensive care strategies that integrate physical activity to enhance the overall quality of life for cancer patients. By fostering resilience and better health out-

comes during and after treatment, aerobic exercise can play a vital role in supporting cancer patients on their journey towards recovery.

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Avoid using Roman numbers anywhere.

- Avoid Italic style.
- Document need to be in single column layout.
- Set 1.60 cm left and right page margin, and set 1.20 cm top margin, and set 0.60 cm bottom margin.
- Do not give after or before margins to paragraphs; instead, add empty paragraph between two paragraphs to make them separate.
- No first line indent for any paragraph except numbered or bulleted paragraphs. Set “Before Text Indent” to the size of approx 3 spaces between text and numbering/bullets for numbered/bulleted paragraphs.
- Set line spacing to 1.15 everywhere.
- If index of content is added then use the word processor's tool/feature to create the index. (The tool/feature automatically generates the index of content based on the headings. Index of content generated with this tool keeps the page numbers updated even if headings' page change because of change in formatting or insertion/deletion of content.)
- Do not add page breaks.
- A parenthetical “statement” at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical “sentence” is punctuated within the parentheses.) Similarly, whether to put a punctuation mark at within quotes or after closing quote depends on the quote/sentence; if the text is part of a sentence then put the end punctuation mark after closing quotation mark; and if the quoted text is an independent sentence then put punctuation mark inside the quotation marks.
- It is better to write in passive voice; for example, instead of “We observed that ... ”, use “It is observed that ... ”.
- Before submitting your research paper, please get it proof-read, by a person having good command over the language used, for spelling and grammatical mistakes, and proper punctuation marks. Authors will be asked to correct the mistakes if there are low amount of mistakes; but research paper will be rejected if there are too many mistakes.
- Paragraph(s) of Conclusion is not necessary, however it is preferred. One should not replicate the content of Abstract in the Conclusion section.

1. Prepare Your Paper Before Styling

- Before you begin to format your paper, first write and save the content as a separate text file.
- Keep your text and graphic files separate until the text has been formatted and styled.
- There should not be 2 or more spaces or blank lines consecutively in the document.
- Do not use hard tabs; use indentation.
- Finally, complete content and organizational editing before formatting.

2. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract.

3. Units

- Use either SI or CGS as primary units. (SI units are preferred.) English units may be used as second-

ary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5 inch disk drive".

- Avoid combining SI and CGS units, such as current in ampere and magnetic field in oersted. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: "Wb/m^2" or "webers per square meter", not "webers/m^2". Spell out units when they appear in text: ". . . a few henries", not ". . . a few H".
- Use "cm^3", not "cc".
- Add space between amount and unit; for example - use "12 cm" instead of "12cm".
- Use upper or lower case properly according to the unit.

4. Equations

- Use equation editor feature of your word processing software to create equation if equation contains division, or multiple lines.
- Equations should be left aligned.
- It would be better to give serial numbers for the equations. Equation serial numbers, within parentheses, can be put after half the width of the page.
- If there are multiple equations, and serial numbers are assigned to them, then position all the equation serial numbers at a same tab stop.
- Do not give italic style to equations.
- Use × sign/character for multiplication sign (instead of *), and ÷ sign/character for division sign (instead of /) in equations which are not inserted using an equation editor.
- Add a blank paragraph before and after each equation.
- Use same font size as normal paragraph for the equations.
- Use a zero before decimal points: "0.25", not ".25".

$(a + b)^2 = a^2 + b^2 + 2ab$ (1)

$$y^4 + \frac{xy}{2} = \frac{x^3}{3} - xy^2 + y^2 - \frac{1}{7} \quad (2)$$

5. Headings

- Headings to be formatted with same font family and font size as normal text.
- Only apply bold style to the headings; no underline, no italic.
- Headings can be numbered or without numbering. It is recommended to use only numbers for numbered heading - means - do not use Roman and Alphabets for numbering headings. Hierarchical numbering (for example - 1.1, 1.1.2) may be used for sub-headings.
- Set "Keep with next paragraph" checkbox checked in the paragraph's settings/options for all the headings, to avoid heading in one page and its content on the next page.
- Do not add colon at the end of the headings.

6. Figures and Tables

- Add captions/headings for figures and table using their "caption" option/setting.
- Do not format captions with bold or italic or underline style; use same style as normal paragraphs.
- Do not apply background color(s) to cells/rows/columns of tables.
- Center align figures, tables and captions.
- It would be better to give numbers to figures and tables.
- Use Title Case for the captions.
- Set height and width of the cells in tables to minimum required. Tables should be "fit to content".

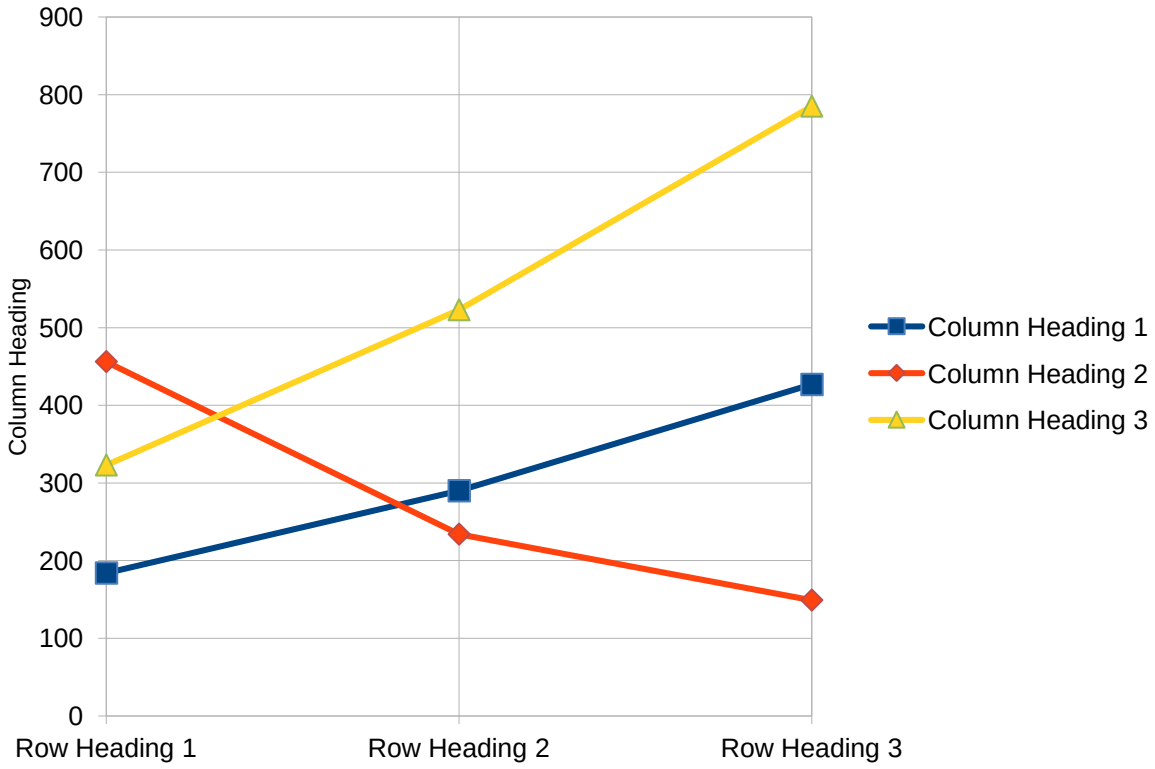
- It would be better to provide caption above the figures and tables rather than below them.
- Instead of using short text like “Fig. 1”, use full text like “Figure 1” in captions.
- If figures or images are smaller than half the width of the page then multiple consecutive figures and images may be put in one line. Use table to add multiple figures or images in one line/row.
- Do not write text in the same line as of any figure or table (no wrap).
- Set “bold” style for the column/row headings and footer in the table.
- Use same font size as normal paragraphs for tables' content. However, if table is wider than the available space in the page then set 10 pt font size for the table's content. If table is wider even after setting 10 pt font size then authors may consider breaking the table.
- Specify height and width in the same original proportions for images - they shouldn't be stretched or squeezed disproportionally. And images need to be clear with fine resolution.
- Add blank paragraphs above and below the figures and tables.

Table 3: Table Type Styles

	Column Heading 1	**Column Heading 2**	**Column Heading 3**
Row Heading 1	184	456	323
Row Heading 2	290	234	523
Row Heading 3	427	149	785
Total	901	839	1631

The above data is pictured in the next graph.

Figure 9: Temperature After Each Pass



7. Some Common Mistakes

- Using 0 (Zero) or O with superscript formatting for the degree symbol used for temperature (Celsius/Fahrenheit), angle (including latitude-longitude). (Proper usage: Use the degree symbol: °.)
- Add a full-stop/period after “et”. (Proper usage: There is no period after the “et” in the Latin abbreviation “et al.”.)
- Improper use of “i.e.” and “e.g.”. (Proper usage: The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.)

8. References

References within Main Content of the Research Paper

1. Enclose the citation number in square brackets, for example: [1].
2. Where appropriate, include the names of authors and publication year of the referenced research paper or book, enclosed within round bracket; e.g.: (Rupert Wesley, 2017)
3. The reference numbers need to be within same referenced text sentence; i.e., the reference numbers must be before full stop mark of the sentence.
4. Multiple reference numbers can be provided in one square bracket: [1, 2]. Add a comma and a space between each reference numbers.
5. When referring to a reference, if you want to use its reference number then, do not use “Ref. [3]” or “reference [3]”; only write reference number like this: “[3]”.
6. Do not use reference citations as nouns of a sentence; e.g., not “as the author explains in [1]”, specify “as Rupert Wesley (2017) explains”.
7. If there are more than one author, write only one author's name, and use “et al.” for other authors; e.g., (Rupert Wesley, et al., 2017).
8. If multiple references can be linked with above format then write other author(s) names to distinguish the references.

References in the Reference List at the End of the Research Paper

1. Reference' details may be added in foot-note (at the end of the page on which reference is mentioned) or in end-note (at the end of the research paper). Either use foot-note or end-not, do not mix. Use end-note if any of the references is referred in more than one paragraphs. End-note is most preferred for list of references.
2. Use “1.” numbering format.
3. Do not format any part of the reference with italic style.
4. There must not be any broken link.
5. If website address is provided, it must link/point to the exact research paper or book, i.e., do not just provide www.xyzsite.com; provide full URL with “http://” or “https://” and the path to the exact page like https://www.xyzsite.com/books/path/to/book/abc-book. Write URL after all other details of the reference.
6. Separate each part (authors' names, title, edition, publisher's name, (month and) year of publication, volume number, issue number, pages to-from) of a reference with commas. Write full-stop at the end of each reference. However, if there is a URL, then write full-stop before the URL. And do not write full-stop after the URL.

7. Research papers that have not been published, even if they have been submitted for publication, should be cited as "(unpublished)" [4].
8. Research papers that have been submitted for publication, but waiting for being accepted or rejected, should be cited as "submitted for publication".
9. Research papers that have been accepted for publication, but not yet specified for an issue or haven't been published, should be cited as "to be published".
10. Titles of referenced articles need to be either in the Title Case or Sentence case. Do not write any title only in UPPER CASE or only in lower case.
11. Any of the below format may be used for authors names (please be consistent for all references) (4th format is most preferred):
    - Roger Robert Federer, Leonardo Wilhelm DiCaprio, Donald John Trump
    - Roger R. Federer, Leonardo W. DiCaprio, Donald J. Trump
    - Roger F., Leonardo D., Donald T.
    - Roger R.F., Leonardo W.D., Donald J.T.
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    - The first name first, then a space (only if the first character of the middle name isn't given, full middle name is given or no middle name is given), then optionally middle name, then a space, then the last name.
    - No comma between first name, middle name and last name of each author.
    - Separate the authors' names with a comma and a space. Do not write "and" before the last author's name.
13. Please do not write journal/publisher's name with abbreviations, write full name; or acronym may be used if the publisher is well-known with the acronym.

Example of List of References

1. Roger R.F., Leonardo W.D., Donald J.T., "Title of Our Research Paper", Name of the Publisher/Journal, April 2015, 7 (3), 129–151.
2. Jack C.M., "Electromagnetic Effects on the Different Kinds of Water", Journal of Electromagnetic Effects, 1992, 2 (4), 47–76.
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