RESEARCH ARTICLE

Feasibility and effectiveness of exercise-based prehabilitation in patients opting for elective abdominal surgeries: A pre-post study [version 1; peer review: awaiting peer review]

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Abstract

Background: Surgical procedures are accompanied by various complications such as decreased respiratory muscle strength, decreased functional capacity, decreased quality of life, and increased the length of hospital stay. There is a growing body of evidence that indicates that exercise-based prehabilitation offered before major abdominal surgeries can improve the above-mentioned complications. Considering the socioeconomic inequalities, educational characteristics, and healthcare system, which are different in low and lower-middle income countries, it is important to know whether interventions such as prehabilitation are feasible and effective in patients undergoing elective abdominal surgeries. Hence, we set out to determine the role of exercise-based prehabilitation in patients opting for these surgeries.

Methods: In this feasibility study, 71% of the eligible patients agreed to participate. Baseline values of respiratory muscle strength, functional capacity and quality of life were recorded preoperatively, and an exercise-based prehabilitation programme consisting of chest physiotherapy, aerobic exercises and inspiratory muscle training according to the patient's capacity was administered until the day of surgery. A total of 62% of the participants completed the study whose postoperative values and a user satisfaction scale were noted. The feasibility parameters of recruitment rate, dropout rates, adherence events, adverse events and participants satisfaction were evaluated and the differences in the preoperative and postoperative values of respiratory muscle strength, functional capacity and quality of life were calculated using the paired t-test accordingly.

Results: Feasibility was measured using five parameters. All the values were > 50% and above. The secondary variables respiratory muscle strength, functional capacity, and quality of life were not significant.
Conclusions: This study concluded that prehabilitation is feasible and can be effectively delivered to patients scheduled for elective abdominal surgery.

Clinical Trials Registry India registration: CTRI/2021/05/033707 (20/05/2021).

Keywords
Pre-operative exercises, preoperative exercise, prehabilitation, elective abdominal surgeries, surgery, adults

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Abbreviations
ACBT: Active Cycle of Breathing Techniques
FC: Functional Capacity
FET: Forced Expiratory Techniques
HR: Heart Rate
IMT: Inspiratory Muscle Training
LOS: Length of Stay
MEP: Maximum Expiratory Pressure
MIP: Maximum Inspiratory Pressure
PEXT: Preoperative Physical Exercise Therapy
PPC: Postoperative Pulmonary Complications
QoL: Quality of Life
RCT: Randomized Control Trials
RPE: Rate of Perceived Exertion
TEE: Thoracic Expansion Exercises
WHOQOL: World Health Organization Quality of life
6MWT: Six-Minute Walk Test
6MWD: Six-Minute Walk Distance

Introduction

Around 235 million major surgical procedures are performed each year globally.1 This number is constantly growing due to the world’s ageing population, expansion, development of novel surgical methods, and the formation of new surgical facilities across the world.2 Despite several ongoing improvements in perioperative care, major abdominal surgeries are associated with postoperative complications and morbidity, and even in the absence of complications, it is seen that there is a reduction in functional capacity (FC).3,4

Around 35% of patients that endure a major abdominal surgery experience a postoperative complication, with approximately 20-40% reduction in their post-operative physical function.5,6 A deterioration in quality of life (QoL) is observed even without complications.7 It is noted that patients who have experienced complications within 30 days post-surgery have a decreased long-term survival rate.8

Postoperative pulmonary complications (PPC) can be caused due to insufficient inspiratory efforts, inadequate sputum expectoration, and a greater respirational demand that produces inspiratory muscle fatigue.9 The mechanism of PPCs is a decline in lung expansion because of prolonged recumbent positioning, shallow breathing, impaired mucociliary work, diaphragmatic dysfunction, and ineffective coughing.10

Prehabilitation is an umbrella term that includes physical exercises, nutritional support, and stress and anxiety reduction.11,12 The concept of prehabilitation was initially reported in 194213 and came to light post-2011 after the systematic review published by Valkenet et al.12,14 It is an intervention of conditioning a patient in the pre-surgical period to cope with the post-surgery stressors.15 It prepares a patient before major surgery and also, at the same time, aims at reducing postoperative complications, promoting physical activity, and also optimises their psychological well-being.16,17 Prehabilitation before major surgery aims to maintain the normal levels of functionality and attain a faster recovery of the functional status during post-op inactivity.18,19 Until recently, efforts to improve recovery after major surgery in the post-operative period have been the primary focus.20,21 However, the emergence of prehabilitation signifies a change from the impairment-driven, reactive model of care toward an active method that allows a patient to become active partakers in their care.22

Prehabilitation has been found effective in improving postoperative outcomes in studies other than India. There have been improvements in respiratory muscle strength, FC, and QoL, respectively.2,22,23 Differences in how prehabilitation can work in low and low-middle-income countries like India and how feasible it can be could depend on the socioeconomic inequalities, educational factors, and differences in healthcare setups.

Respiratory muscle strength can be improved by incorporating inspiratory muscle training (IMT), a form of exercise to strengthen the respiratory muscles.24 The decrease in the respiratory muscle can lead to decreasing FC. The six-minute walk test (6MWT) is regularly used to determine FC in patients.25

The World Health Organization Quality Of Life (WHOQOL) groups developed the WHOQOL-BREF assessment to analyse QoL across various populations that could be applicable cross-culturally.26 This scale contains four domains: physical health, psychological, social relationships, and environmental domains.26
Feasibility studies are research done before the main study to answer questions about whether an intervention is appropriate for further testing, i.e., they enable researchers to judge whether or not the ideas and findings can be shaped to be relevant for sustainable study.

Previous studies done in prehabilitation have proved that exercise-based prehabilitation is effective in people who undergo abdominal surgeries in general. However, there is a paucity of literature on whether it is feasible to carry out a pre-operative/prehabilitation exercise program and know its effectiveness in the rehabilitation stage in countries like India.

**Methods**

**Study design**

This was a feasibility, a pre-post study conducted in a tertiary care university hospital. All associated study instruments (questionnaires, consent form, etc.) are available in Extended data.

**Ethics statement**

The study was approved by the Scientific and Institutional Ethics Committee on 18th February 2021 (IEC KMC MLR 02-2021/37) and registered in CTRI no. (CTRI/2021/05/033707) on 20th May 2021. The patients who met the inclusion criteria were explained about the study. After the explanation, if the patient agreed to participate, they gave written informed consent.

**Participants**

The patients scheduled for elective surgeries and referred for physiotherapy treatment were screened for the inclusion criteria. The inclusion criteria included patients above 18 years scheduled for elective abdominal surgery. The patients scheduled for laparoscopy surgery or who underwent an emergency or high-risk surgeries were excluded from the study. The patients were recruited for a year from March 2021 to March 2022.

**Outcomes**

The study’s primary outcome was to evaluate the feasibility through recruitment rate, dropout rates, adherence to the rehabilitation rate, adverse events, and patient’s level of satisfaction. These criteria were taken from the research regarding the feasibility studies by El kotob et al. The investigating team found these criteria most suitable for the study.

The secondary outcomes evaluated were respiratory muscle strength using the Micro RPM® and measuring MIP (Maximum Inspiratory Pressure) and MEP (Maximum Expiratory Pressure), and FC through 6MWT done on a 30 m distance back and forth according to the patient’s comfort, and QoL through the WHOQOL-BREF scale.

**Procedure and intervention**

Once the study was explained, the baseline values of respiratory muscle strength: MIP, MEP, FC – 6MWT, and the WHOQOL-BREF scales were noted at the beginning of the study. The participants were admitted to the hospital during the duration of the study and the intervention was administered in the hospital to them. An exercise brochure (English/Kannada) was given by the physiotherapist to the patients on their first day of admission to the hospital and a demonstration of the exercises was shown to them. The exercise protocol contained aerobic exercises, i.e., walking 30min/day at least five times a week (according to the patient’s comfort level), breathing exercises that included patient education, Active Cycle of Breathing Techniques (ACBT), Thoracic Expansion Exercises (TEE), Forced Expiration Technique (FET), and Breathing Control twice per day 10-15 min. Inspiratory muscle training was also done through the Threshold IMT device (Philips MAS Respironics®). The resistance was set based on 20% of their MIP measured during the baseline evaluation. Any Other Chest Physiotherapy as indicated according to the patients’ conditions would also be suggested. Progression was according to the patient’s rate of perceived exertion (RPE). The possible post-operative complications that can develop post-surgery, pre-operative education about smoking cessation, and proper nutrition (if the patient has any other co-morbidities) were also explained. The prehabilitation exercises were given daily to the patient by the physiotherapist for an average of 1-4 days, with a small percentage receiving it for more than five days till the duration of their surgery. Routine postoperative protocol was continued later till the day of discharge. Outcomes measures were retaken post-operatively. On the day of discharge, their post-operative values were taken, and patients were given a user satisfaction scale to document their satisfaction regarding the exercise-based prehabilitation programme. This was filled by the patients that had completed the study. The scale was adapted from a previous study by Piron et al. and modified accordingly to our study. The questionnaire contained 11 questions, of which 1st three were about patients’ willingness to participate, the questions 4th-9th were about the patient therapist’s overall relationship, and the last two were about patients’ general satisfaction with the prehabilitation exercise program.
Data analysis
All the data collected were entered into the Jamovi version 1.6.23 (RRID:SCR_016142) for data analysis. The data were checked for normality. A paired t-test was used to compare the outcomes’ preoperative and postoperative values within the group and analyze the p < 0.05 - statistically significant data.30,31

Results
Participant characteristics
The study has been reported per the Consolidated Standards of Reporting Trials (CONSORT) extension for pilot and feasibility study32,33 (see Figure 1 and Reporting guidelines48).

Figure 1. The Consolidated Standards of Reporting Trials (CONSORT) extension for Pilot and Feasibility Trials.
A total of 170 patients were screened, with 56 participants eligible based on the screening for inclusion criteria. Of these 56 participants, 40 consented to participate in this study, with a mean age of 51.5 years (Table 1). Of the 40 eligible to participate, 25 participants completed the exercise based prehabilitation in this study. Their ages ranged from 37 to 74, with their mean age being 49.8 years (Table 2). The data associated with the participants is available in *Underlying data*.

### Feasibility characteristics

In this study, feasibility criteria were categorized and measured based on these five criteria:

1. Recruitment rate
2. Dropout rates
3. Adherence to the rehabilitation rate
4. Adverse events
5. Participants’ level of satisfaction

### Table 1. Demographics of the total participants that agreed to participate.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number (N)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean±SD</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>40</td>
<td>37</td>
<td>74</td>
<td>51.5±9.71</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>15</td>
<td></td>
<td></td>
<td>37.5</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>25</td>
<td></td>
<td></td>
<td>62.5</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. Demographics of the total participants that completed the study.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number (N)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean±SD</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>25</td>
<td>37</td>
<td>74</td>
<td>49.8±9.73</td>
<td></td>
</tr>
<tr>
<td>BMI (body mass index)</td>
<td>25</td>
<td>15.06</td>
<td>35.190</td>
<td>22.84±4.50</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>7</td>
<td></td>
<td></td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>18</td>
<td></td>
<td></td>
<td>72</td>
<td></td>
</tr>
</tbody>
</table>

A total of 170 patients were screened, with 56 participants eligible based on the screening for inclusion criteria. Of these 56 participants, 40 consented to participate in this study, with a mean age of 51.5 years (Table 1). Of the 40 eligible to participate, 25 participants completed the exercise based prehabilitation in this study. Their ages ranged from 37 to 74, with their mean age being 49.8 years (Table 2). The data associated with the participants is available in *Underlying data*.

### Figure 2. Total patients screened.
**Recruitment rate**

A total of 170 patients were screened, with 56 patients meeting the inclusion criteria (Figure 2) and 114 excluded. These 114 patients were excluded based on the exclusion criteria, i.e., 1. patients undergoing high risk, emergency, laparoscopic surgeries, or 2. having musculoskeletal/neurological impairments. A total of 84% of these 114 patients were received post-operatively, underwent emergency surgeries, and had to be excluded as they had not received prehabilitation. The rest (14%) were excluded as their planned surgery was laparoscopic surgery, and the last 2% were not included since they did not match the age criteria (Figure 3).

From the 56 patients who met the inclusion criteria, 40 agreed to participate in the study, and 16 denied/did not consent to participate, making the recruitment rate 71% (Figure 4).

**Dropout rate**

62% patients of the 40 that consented to participate completed the study and the remaining 38% dropped out of the study (Figure 5). The reasons for dropout of patients are explained in Figure 6.

**Adherence**

The adherence was reported to be 62%, as the remaining 38% of the patients could not complete the study due to the reasons explained in Figure 6.

![Patients excluded](image1)

**Figure 3. Reasons for exclusion.**

![Patients meeting inclusion criteria](image2)

**Figure 4. Patients meeting inclusion criteria.**
Adverse events
The prehabilitation exercise program was given to the patients during the hospital stay from the day of admission to surgery and continued postoperatively. No adverse events were reported during the duration of the exercise protocol.

Participant satisfaction
Lastly, the user satisfaction scale was based on the Likert scale, and above satisfactory scores (3+) were obtained for the questions. A summary of their responses with scoring is given in Table 3.

Respiratory muscle strength
The Mean for MIP preoperatively was 30.320 cm H₂O, and the postoperative was 25.360 H₂O (p=0.008). The MEP preoperatively was 30.080 H₂O and postoperatively 25.120 H₂O (p<0.001). Both the MIP and MEP have shown a decline in the postoperative period (Table 4) (Figure 7).

Functional capacity
The FC was measured using the 6-minute walk test (meters), and the distance was compared preoperatively and postoperatively. The mean distance was 306.712 meters preoperatively, and 213.080 meters postoperatively (p<0.001), which showed a significant decrease in the preoperative and postoperative distance walked by the patients (Table 4) (Figure 8).
Table 3. User satisfaction scale.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I was willing to participate in the prehabilitation session.</td>
<td></td>
<td></td>
<td></td>
<td>5(20%)</td>
<td>8(32%)</td>
</tr>
<tr>
<td>2</td>
<td>I was willing to update my daily treatment through telephonic calls.</td>
<td>-</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>The prehabilitation session was easy to understand and participate in.</td>
<td></td>
<td></td>
<td></td>
<td>1(4%)</td>
<td>22(88%)</td>
</tr>
<tr>
<td>4</td>
<td>The therapist did not spend time with me.</td>
<td>17(68%)</td>
<td>8(32%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The therapist roughly explained the treatment I will receive.</td>
<td></td>
<td></td>
<td>3(12%)</td>
<td>18(72%)</td>
<td>4(16%)</td>
</tr>
<tr>
<td>6</td>
<td>The therapist treated me respectfully.</td>
<td></td>
<td></td>
<td></td>
<td>14(56%)</td>
<td>11(44%)</td>
</tr>
<tr>
<td>7</td>
<td>The therapist listened to all my concerns.</td>
<td></td>
<td></td>
<td>2(8%)</td>
<td>15(60%)</td>
<td>8(32%)</td>
</tr>
<tr>
<td>8</td>
<td>The Therapist advice on ways I could avoid problems.</td>
<td></td>
<td></td>
<td>3(12%)</td>
<td>19(76%)</td>
<td>3(12%)</td>
</tr>
<tr>
<td>9</td>
<td>The therapist advised on ways and gave detailed instruction regarding the future program.</td>
<td></td>
<td></td>
<td></td>
<td>22(88%)</td>
<td>3(12%)</td>
</tr>
<tr>
<td>10</td>
<td>I was overall satisfied with the treatment.</td>
<td></td>
<td></td>
<td></td>
<td>15(60%)</td>
<td>10(40%)</td>
</tr>
<tr>
<td>11</td>
<td>I would recommend it. For prehabilitation before surgery.</td>
<td></td>
<td></td>
<td>2(8%)</td>
<td>23(92%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Comparisons of outcomes preoperatively and postoperatively.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Preoperative (Mean±SD)</th>
<th>Postoperative (Mean±SD)</th>
<th>t-values</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIP</td>
<td>30.3±17.7</td>
<td>25.4±12.6</td>
<td>2.902</td>
<td>0.008</td>
</tr>
<tr>
<td>MEP</td>
<td>30.1±14.0</td>
<td>25.1±11.0</td>
<td>4.165</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>6MWD</td>
<td>307±128</td>
<td>213±107</td>
<td>5.600</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>WHOQOL BREF D1</td>
<td>55.9±13.5</td>
<td>56.1±13.5</td>
<td>-0.440</td>
<td>0.664</td>
</tr>
<tr>
<td>WHOQOL BREF D2</td>
<td>56.1±14.3</td>
<td>56.4±14.4</td>
<td>-0.629</td>
<td>0.536</td>
</tr>
<tr>
<td>WHOQOL BREF D3</td>
<td>62.8±11.6</td>
<td>62.8±11.6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>WHOQOL BREF D4</td>
<td>69.2±11.4</td>
<td>69.9±10.7</td>
<td>-1.000</td>
<td>0.327</td>
</tr>
</tbody>
</table>

SD=Standard deviation; MIP=Maximal inspiratory pressure; MEP=maximal expiratory pressure; 6MWD=Six-minute walk distance; WHOQOL-BREF=World Health Organization Quality of life-BREF Scale; D1=Physical health; D2=Psychological; D3=Social Relationships; D4=Environment.

Figure 7. Comparison of maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) preoperatively and postoperatively.
Quality of life

QoL was measured using the WHO-QOL BREF scale. The WHOQOL BREF is a shorter form of the WHOQOL. This scale includes scoring based on four domains: physical health, psychological health, social relationships, and environmental aspects. The results showed that there was no statistically significant improvement seen (Table 4 and Figure 9).

Discussion

The goal of this study was to determine the feasibility and efficacy of prehabilitation as part of a routine rehabilitation programme in patients undergoing elective abdominal surgeries. The current study focused on four key outcomes of feasibility, respiratory muscle strength, FC, and QoL.

Feasibility in terms of research refers to how people who carry out a study or intervention can practically do so in the actual world. Feasibility may focus on developmental research, as in developing a feasibility study. Feasibility studies are pieces of research done before the main study to answer whether a study can be done or not. It estimates the critical parameters needed to construct the main study. Feasibility studies can be conducted for four primary purposes, i.e., process assessment, resource assessment, management, and scientific basis to plan RCT. In line with the aforementioned purposes, alongside outcomes mentioned by El-Kotob et al., our study had five outcomes: recruitment rate, dropout rates, adherence to the rehabilitation rate, adverse events, and user satisfaction scale.

The recruitment rate is defined as the number of eligible patients who consented to participate in study. A total of 170 patients were screened over the duration of 12 months, with 56 meeting the inclusion criteria and 40 agreeing to participate in the study. According to these results, around 71% of the eligible patients were willing to begin an exercise program prior to elective abdominal surgeries. Other comparable trials showed mixed results, some reporting a recruitment rate of 85%, some 45%, and some as low as 20%.

Figure 8. Comparison of 6MWD (Six-Minute Walk Distance) preoperatively and postoperatively.

Figure 9. Comparison of quality of life scores preoperatively and postoperative (WHOQOL-BREF=World Health Organization Quality of life-BREF Scale).

Quality of life

QoL was measured using the WHO-QOL BREF scale. The WHOQOL BREF is a shorter form of the WHOQOL. This scale includes scoring based on four domains: physical health, psychological health, social relationships, and environmental aspects. The results showed that there was no statistically significant improvement seen (Table 4 and Figure 9).
Dropout rates are those who agreed to participate in the study but were unable to complete it owing to a variety of circumstances. 38% of the individuals in our study dropped out due to unavoidable reasons. Surgery cancellation accounts for 60% of dropouts, scheduled surgery being modified by 20%, and 7% of included individuals being diagnosed with coronavirus disease 2019 (COVID-19), ultimately leading to cancelled surgery and increasing the dropout rate. The outcomes of our study are consistent with the findings of Martin et al., who determined that the reasons for patients dropping out were unavoidable circumstances.41

Another component analysed in feasibility was adherence, which according to the WHO, was defined as “the degree to which the person’s behaviour corresponds with the agreed recommendations from a health care provider”. Any therapeutic intervention’s effectiveness relies on the patient’s ability to keep up with the prescribed therapy. In this study, adherence was assessed through the exercise protocol administered in a supervised environment by a physiotherapist in the hospital-based setup. All the patients recruited for the prehabilitation program were admitted to the hospital prior to the surgery. 62% of the participants who completed the study adhered to the program compared to the rest of the 38% who did not adhere. According to a previous study, patients who were given prehabilitation activities face-to-face had a higher adherence rate of 93%, compared to 64% for those given prehabilitation exercises as unsupervised home exercises.40 Lack of social support from family and friends and the patient’s lack of belief in the merits of the exercises have been identified as plausible factors for low adherence in prior trials when prehabilitation was available.41

Adverse events were not reported in our study. Only one of the trials by Martin et al. reported short-term adverse events during the cardiopulmonary exercise testing during the assessment.41

Another variable assessed in feasibility was the level of satisfaction among patients who finished the exercise-based prehabilitation. The user satisfaction scale addressed three distinct factors, namely, 1. their willingness to participate, 2. the patient-therapist interaction, and 3. their overall satisfaction with the treatment. The scoring was based on the Likert scale and was adapted from a similar study.13 The scoring for the 11 questions was 3+ above 48% of participants strongly agreed that they were willing to participate in exercises preoperatively, and 88% agreed that the exercises were easy to understand and follow. Above satisfactory scorings in the questions that assess the therapist-patient relationship parameters were noted. The third criteria presented that 60% of the participants were satisfied and 40% extremely satisfied with the preoperative exercises, and 92% of them would thoroughly recommend the program.

The secondary outcomes of our studies were to assess the effectiveness of the exercise-based prehabilitation post-surgery. One of the secondary outcomes included respiratory muscle strength, measured using global measures of MIP and MEP. These significant pressures can be achieved during maximal inspiration and expiration against an obstructed airway, respectively.24,44 The MIP measures inspiratory muscular strength created by a sub-atmospheric pressure, whereas the MEP is a supra-atmospheric pressure developed by abdominal and intercostal muscle effort.43,45 In our study, the mean MIP preoperatively is 30.3 cm H2O and postoperative is 25.4 cm H2O and MEP preoperatively is 30.1 cm H2O and postoperatively is 25.1 cm H2O which shows that there is a decline in the preoperative and postoperative values.

Six min walk test was used to analyse FC. The 6MWT is a submaximal exercise test that measures aerobic capacity and endurance. The distance covered in 6 minutes is utilized as the outcome to compare improvements in performance capability.46 In our study FC was computed through the 6MWD that showed a mean of 307 meters preoperatively and 213 meters postoperatively.

Reduced respiratory muscle strength, pain caused postoperatively due to surgery, or even the fact that patients received treatment for less than two weeks preoperatively, i.e., patients could not be admitted/received early preoperatively for an average of four days, could be the possible reasons for the decline in postoperative outcomes. In a previous study conducted by Kulkarni et al., they found that IMT is effective and has significant improvement when compared preoperatively and postoperatively.10 Prehabilitation exercise programs were planned and administered to patients who had more than two weeks until their procedures in this study.10,40,41 Many participants were eliminated from Martin et al.’s study because of these criteria.41 Because there was no established criterion for how many days before prehabilitation patients should be included in our trial, we included all participants who had been referred to us prior to surgery.

The WHOQOL-BREF scale, a condensed version of the WHOQOL-100, was used to assess QoL. The WHOQOL-BREF scale consists of 26 questions and contains four domains: physical health, psychological, social relationships, and environment.20,47 There was no significant statistical improvement seen.
Future recommendations
Well-powered research is aided by high rates of recruitment, adherence, retention, and patient satisfaction. Future studies can have a well-planned duration for prehabilitation so that the patients are able to get the maximum impact of these exercises. Rather than having a heterogeneous population, studies can be done on a specific type of procedure, condition, or surgical incisions. Future possibilities for greater application of prehabilitation through telerehabilitation in these specific settings could also be considered.

Limitations
This feasibility pre-post-study had certain drawbacks. The first constraint was the number of days, i.e., the days prior to prehabilitation were not well specified. In this study, the majority of patients had prehabilitation for 1-4 days on average, with only a small percentage receiving it for more than five days. The second hurdle was the referral system or the inability to receive the patients sooner. Because the patients could not be received/recruited earlier and did not have more than 14+ days, the effectiveness and why there is a decline in outcomes cannot be clearly noted. Another drawback of the current study is that it was carried out in a single-site tertiary care hospital, with treatment restricted to patients admitted to the facility. As a result, possible issues with applicability, techniques, and recruiting were undetected.

Conclusions
It can be concluded that exercise-based prehabilitation is feasible and can effectively be delivered to patients scheduled for elective abdominal surgery. All the feasibility criteria taken into consideration have been met (>50%). With the recruitment rate of the patients that were approached being 71%, it can be stated that patients that were eligible were willing to participate. However, in order to establish the prehabilitation programs efficacy, a future study must be conducted with a homogenous group and a larger sample size, taking into account the hurdles encountered.

Data availability
Underlying data

This project contains the following underlying data:
- Feasibility and Effectiveness of Exercise-based Prehabilitation on Patients opting for Elective Abdominal Surgeries Raw data.csv.

Extended data

This project contains the following extended data:
- Feasibility Questionnaire.pdf
- Informed consent form.pdf
- Patient information sheet.pdf
- Prehabilitation exercise protocol.pdf

Reporting guidelines

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References


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