# Effects of Muscle Energy Technique with and without sacroiliac belt on pain, muscle strength and quality of life in patients with sacroiliac joint dysfunction - A randomized clinical trial

**Running Head:** Muscle Energy Technique with and without sacroiliac belt in SIJ dysfunction

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## ABSTRACT

**Background:** Sacroiliac joint dysfunction is a widespread cause of lower back pain and thought to result from acquired mechanical instability resulting in stable subluxation with no history of serious injury.

**Objectives:** To see the impact of muscle energy technique with and without sacroiliac belt on pain, muscle strength and quality of life in sacro-iliac joint dysfunction

**Materials and Methods:** This was a randomized clinical trial with sample size of 48 through convenient sampling technique in Begum Akhtar Rukhsana Memorial welfare trust Hospital, Lahore. Duration of the study was 9 months. Participants were allocated into experimental and control groups. Group A received MET with SI Belt and Group B received only MET. SF-36, NPRS and MMT used for Quality of life, Pain and MMT for Muscle strength. SPSS version 24 was used to analyze the results.

**Results:** Mean age of subject in group A and B was 39.38±6.114 and 40.83±6.246. Within group analysis of pre and post intervention values of group A & B showed a p-value <0.05 for NPRS and MMT. But no significant improvement was seen in SF-36 questionnaire with p value >0.05. Independent samples test for between group analyses showed the p value of greater than 0.05.

**Conclusion:** A significant improvement was seen in pain and muscle strength after the treatment in both groups but no significant improvement was found in quality of life. Between-group analyses indicated no significant differences between groups A and B.

**Keywords:** Muscle energy technique, MMT, Numeric pain rating scale, Sacroiliac joint dysfunction

**Trial ID**: The clinical trial was registered to **Iranian registry of clinical trials** and **trial ID = 73779 (https://irct.behdasht.gov.ir/trial/73779) .**

## INTRODUCTION

Low backpain is reported to be the widespread problem in the domain of musculoskeletal problems (1), although it's a common problem but its etiology is still not known in 85% of the cases which is eventually called as non-specific backpain and in almost 10-27% of the cases this backpain is arising from the sacroiliac joint giving it a name as sacroiliac joint dysfunction (2). Non-specific low back pain is not the only contributing factor, pain in sacroiliac joint dysfunction can also be accompanied with lumbar disc herniation or spinal stenosis. Furthermore symptoms mimicking with facet joint syndrome and disc herniation makes it a challenging condition to diagnose. Other than SIJ block there is no other accepted diagnostic method or criteria to diagnose this problem. Pain provocation tests when applied on patients with SIJD , a combined approach to apply FABER or Patrick's Test and Thigh Thrust test yielded more successful results in the diagnosis of SIJD. Authors came to conclusion that the combination of special tests and data taken from patient's evaluation and assessment can better diagnose the condition despite having low clinical value of diagnostic tests (3).

The pain in the lower back region is most frequently results from sacroiliac joint dysfunction (4). The condition is thought to result from acquired mechanical instability resulting in stable subluxation or joint hypermobility with no history of serious injury (5). Mechanical dysfunction can also be described by other terms such as hypokinesia, immobility, mal-alignment, mal-

rotation or joint and in case of unilateral hypokinesia a dynamic manual test such as standing or sitting flexion test and Gillet test will be used, these tests measures the stability of the sacroiliac joint in a range of motion (6). It is generally accepted that 13% of back pain is caused by abnormalities and positioning of the SI joint due to poor SI joint function. SI joint pain also affects the hips, pelvis, and lower extremities (7). Sacroiliac pain affects at least 13% and typically 30% of patients receiving treatment for back pain and frequently encountered hip pain. The prevalence of joint dysfunction has confirmed its assessment and study Sacroiliac joint dysfunction, sudden or it can be caused by repeated trauma or an imbalance in the muscle environment (8).

MET has been used for years to treat muscular imbalance in the lumbar and the pelvic region such as asymmetry of the pelvis. The knowledge behind MET allows us to know the asymmetrical patterns in the pelvis by contracting the muscles behind the thigh or the muscles that extend the hip on the involved side and moving the sacro-coccygeal area in the pelvis to a corrected position (9). As according to the guidelines of the international society for pain studies sacroiliac problems should preferably be managed without any surgery rather the use of pelvic belts can help reduce pain arising due to SIJ. These belts are quite affordable for the patient with limited side effects as compared to any surgery or medication however there is limited data available to support that clinical reliability of these belts and there are some controversies regarding its use in SIJD (10). Pelvic belts are thought to improve form and force closure as well as neuromotor function. However, there is little proof that the SIJ mobility is decreased by the pelvic belts, and there aren't many patient-controlled studies that detail how they affect the pelvis. When the pelvic belt was applied with moderate strain, the intensity of pain changed slightly but not significantly as compared to the situation without a belt (11).

In 2019, Aditya Vaidya et al explored the compared effects of Mulligan MWM and Muscle Energy Technique in Individuals with anterior Innominate Iliosacral dysfunction. According to the findings of this study, both MET and Mulligan MWM had positive effects in pain reduction and improving functional ability. However, when both groups was compared, the results of Muscle Energy Technique was superior to Mulligan's Mobilisation with Movement (12).

Muscle energy technique when applied with or without sacroiliac belt can play an important in pain reduction, muscle strength gains and quality of life improvement but there is no study available in the literature that compares the effects of muscle energy technique with and without sacroiliac belt thus the aim of this research was to find out the effect of MET with and without sacroiliac belt to check whether which approach is better to reduce pain, to increase muscle strength and improve quality of life with sacroiliac joint dysfunction.

## MATERIALS AND METHODS

It was a Randomized Clinical Trial. Study settings include Begum Akhtar Rukhsana Memorial trust Hospital, Lahore. Duration of the study was 9 months. Total Sample size was 48 with 24 participants in each group. Sample size of the study was calculated by epitool software. Data collection employed a convenient sampling technique..

Patients were assessed for eligibility according to defined selection criteria. The criteria for inclusion in study were patients of age between thirty to fifty years, both genders were included in study, individuals with pain in the lower back, gluteal & groin region, and lower extremity pain for more than four weeks but less than a year, along with participants who tested positive on pain provocation tests. Exclusion criteria of the study were pregnant females, patients suffering from any health problem that makes exercise difficult i.e. SLE (Systemic Lupus Erythmatosus, Multiple sclerosis & Chronic fatigue syndrome, patients with osteoporosis affecting the pelvic and spine region , patients with inflammatory pathology i.e. Ankylosing Spondylitis, Osteoarthritis Hip, Degenerative arthritis, patients with Hip fracture and any spinal surgery history.

Patients were screened to meet inclusion criteria. Consent form was taken from patients then patients were randomly allocated 24 Patients in each group. Patients fulfilling the selection criteria were randomly divided into group A and group B by using the lottery method. It was single-blinded clinical trial. The assessor was not aware of the interventions given to either group. Group A was treated with MET with Sacroiliac belt. Group B was treated with MET without Sacroiliac belt. MET was employed on three different muscles: quadratus lumborum, erector spinae, and piriformis. After positioning, the patient was asked to apply 30% force to resist the therapist's force and hold it for 7 to10 seconds before relaxing for five seconds.

Meanwhile, patient was asked to take deep breath and hold it. When the patient exhaled, the therapist moved the muscle up to the new restriction barrier and held that position for ten to sixty seconds with 3 to 5 repetitions. Along with Muscle energy techniques Group A individuals were received sacroiliac belt which was worn for the period of 2-4 weeks, 8-10 hours a day. The belt was removed during sleeping, bathing, and during exercise sessions. Illustration of muscle energy technique on various muscles are shown in figure 1,2 and 3.

Figure 1 near here

Figure 2 near here

Figure 3 near here

NPRS was used for assessment of pain. Quality of life was measured by Short-form 36 and Manual Muscle Testing was used for measurement of muscle strength.

**Ethical Consideration**

All ethical concerns were taken into account. The study got approval from the institutional review board of "University of Lahore". While conducting the research, all rules established by the ethical committee of "University of Lahore" were followed. An informed consent form was signed by all the study participants prior to data collection. The dignity of all patients was prioritized and all personal data was kept confidential. Throughout the course of the study, the participants had the option to discontinue at any time. The participation of all patients in research was voluntary.

**Statistical Analysis**

The data were evaluated and tabulated using SPSS, version 24. The qualitative variables liked gender, were presented with frequency and percentages, bar charts were drawn. The quantitative variables age and numerical pain rating scale were presented with mean and standard deviation. Kolmogorov-Smirnov and Shapiro-Wilk tests (parametric test) were applied to check the normality of data. Independent samples T test was used for between group comparison and Repeated measures ANOVA was used for within group comparison of outcome measures. P-value of less than and equal to 0.05 was considered as significant. Intension to Treat Analysis (ITT) applied to analyze the data of lost to follow-up participants.

**Data availability statement**

The data related to the paper are not accessible to the general public, but upon reasonable request, they can be obtained from the corresponding author.

Figure 4 near hear

## RESULTS

Demographic statistics showed that mean age of the patients in group A was 39.38±6.11 and in group B 40.83±6.24. From a total of 48 participants (24 in each group), in group A 66.7% were males and 33.3% were females. In group B 70.8% patients were males and 29.2% were females (Table 1).

Table 1 near here

Table 2 showed the repeated measures ANOVA test and statistics of Pre and Post Quality of life ,Pain intensity on NPRS and Manual Muscle Testing (MMT) in Group A (MET with SI Belt) and Group B (MET without SI Belt). Within group analysis showed that no significant improvement was seen in the domains of short form 36 questionnaire with p value >0.05. The within group analysis of numeric pain rating scale in group A and group B showed a p value of 0.000, which means a significant improvement was seen in pre and post treatment of both group regarding the alleviation of pain. With group analysis of Manual muscle testing in group A and group B showed p value of 0.044 and 0.03 respectively, which means a significant improvement was seen in muscle strength in pre and post treatment of both groups.

Table 2 near here

Table 3 showed the Independent Samples Test and Statistics of Quality of life, pain and Muscle strength in Group A (MET with SI Belt) and Group B (MET without SI Belt). Between group analysis of Group A (MET with SI Belt) and Group B (MET without SI Belt) showed the p value more than 0.05 therefore there was no significant difference found between groups regarding the quality of life, pain and muscle strength.

Table 3 near here

## DISCUSSION

Back pain most frequently results from sacroiliac joint dysfunction. The condition is thought to result from acquired mechanical instability resulting in stable subluxation or joint hypermobility with no history of serious injury (5). The main objective of the research was to check the effect of muscle energy technique with and without sacroiliac belt in patients with sacroiliac joint dysfunction.

According to the gender distribution, in current study, group A contained 66.7% men and 33.3% women, while group B contained 70.8% men and 29.2% women. It showed a more ratio of males with SIJ as compare to the females. In contrast to this, previous literature showed that females are three to four times higher at risk of sacroiliac joint pain as compare to males (13).

A study was conducted by Hagar H. Shawky et al., to examine the efficacy of MET on postpartum SI dysfunction. The study showed that statistical significant improvement (p value = 0.0001) was seen in METs group in reducing pain on VAS and disability on ODI (14). The results of current study revealed that, within group analysis of numeric pain rating scale in group A and group B showed a p value of 0.000, which means a significant improvement was seen in pre and post treatment of both group regarding the alleviation of pain. Within group analysis of Manual muscle testing in group A and group B showed p value of 0.044 and 0.03 respectively, which means a significant improvement was seen in muscle strength in pre and post treatment of both groups.

In 2015, another research was conducted in Germany to examine the impact of pelvic belt on patients with SIJ Pain's functional parameters and health outcomes. Results of the research showed significant improvement regarding health related QOL in patients with SIJ dysfunction (15). Whereas in current study, repeated measures Anova test showed that no significant improvement was seen in the domains of short form 36 questionnaire for improving quality of life with p value > 0.05.

An experimental study was done to see the impacts of MET in chronic SI joint dysfunction in Cairo Egypt and the results of that research showed that METs decreased the pain intensity and anterior pelvic tilting in patients with chronic sacroiliac joint dysfunction (16). The recent research has checked the effect of METS with and without sacroiliac belt in individuals with SIJ dysfunction. The current result did not measure pelvic tilting but the improvement was see in pain and muscle strength.

According to a research by John Ward, the sacroiliac belt reduced participants' lower back musculoskeletal discomfort. In comparison to participants who did not use a belt, those with LBP who wore a sacroiliac belt had more relaxed muscles (17). In contrast to this, in current research, independent samples test for between Group A (MET with SI Belt) and Group B (MET without SI Belt) showed the p-value>0.05. In current study there was no significant difference was found between both groups regarding the quality of life, pain and muscle strength.

## CONCLUSION

The study concluded that, there was a significant improvement seen in pain and muscle strength in both groups (Group A = MET with SI Belt) & (Group B= MET without SI Belt) but no significant improvement was seen in quality of life. Between groups analysis showed that no significant difference was found between group A and B. Muscle energy technique is equally effective with and without sacroiliac belt in improving muscle strength and reducing pain in patients with sacroiliac joint dysfunction.

## LIMITATIONS

- One of the limitations of the study was the small sample size; further studies should be done with large samples to generate more accurate results.
- Another limitation of this study was the tool to check for muscle strength i.e., Handheld Dynamometer, which is an expensive instrument with more accuracy than Manual Muscle Testing and it could not be used due to limited finances.

## RECOMMENDATION

- Further new researches are encouraged to be done in future using the same outcome measures but with different muscle groups e.g. abdominal oblique, levator ani and coccygeus group as these muscle could be effected as a result of Sacroiliac joint Dysfunction
- Future research should be done with longer follow up to create more generalized results

**Conflict of interest:** None

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**Authors' Contribution**

GE contributed to conception and design FT and SSB contributed to data collection AM and RI contributed to data analysis and interpretation AA contributed to article drafting and critical analysis of article and proof reading. All authors have read and approve the final version of manuscript.

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**Table 1: Demographic Statistics**

| Age of Participant | | | Gender of participants | |
|---|---|---|---|---|
| **Group A (MET with SI Belt)** | Mean | 39.38 | Male | 16(66.7%) |
| | Std. Deviation | 6.114 | Female | 8(33.3%) |
| | Range | 20 | Total | 24(100.0%) |
| **Group B (MET without SI Belt)** | Mean | 40.83 | Male | 17(70.8%) |
| | SD | 6.246 | Female | 7(29.2%) |
| | Range | 19 | Total | 24(100.0%) |

**Table 2: Repeated Measures ANOVA Test and Statistics**

| Groups | | Within group p value |
|---|---|---|
| **Physical functioning** | Group A | 0.243 |
| | Group B | 0.948 |
| **Role limitation due to physical health** | Group A | 0.806 |
| | Group B | 0.782 |
| **Energy/fatigue** | Group A | 0.367 |
| | Group B | 0.174 |
| **Emotional wellbeing** | Group A | 0.252 |
| | Group B | 0.360 |
| **Social functioning** | Group A | 0.386 |
| | Group B | 0.491 |
| **Pain in SF 36** | Group A | 0.920 |
| | Group B | 0.981 |
| **Emotional wellbeing** | Group A | 0.252 |
| | Group B | 0.360 |
| **General health** | Group A | 0.967 |
| | Group B | 0.949 |
| **Health change** | Group A | 0.806 |
| | Group B | 0.523 |
| **Pain Intensity on NPRS** | Group A | 0.000 |
| | Group B | 0.000 |
| **Manual Muscle Testing (MMT)** | Group A | 0.044 |
| | Group B | 0.03 |

**Table 3 : Independent Sample Test and Statistics**

| | Group | Mean | Std. Deviation | DF | P value |
|---|---|---|---|---|---|
| **Pre-Physical functioning** | Group A | 61.21 | 20.547 | 46 | .624 |
| | Group B | 68.38 | 20.872 | 45.989 | |
| **Post physical functioning** | Group A | 67.0417 | 19.34465 | 46 | .339 |
| | Group B | 68.7083 | 21.01858 | 45.687 | |
| **Pre role limitation due to physical health** | Group A | 67.33 | 20.493 | 46 | .294 |
| | Group B | 66.42 | 16.914 | 44.403 | |
| **Post role limitation due to physical health** | Group A | 66.1250 | 18.73688 | 46 | .171 |
| | Group B | 64.7917 | 21.95644 | 44.890 | |
| **Pre role limitation due to emotional problem** | Group A | 72.54 | 17.988 | 46 | .239 |
| | Group B | 67.50 | 20.747 | 45.094 | |
| **Post role limitation due to emotional problem** | Group A | 72.8750 | 19.85012 | 46 | .244 |
| | Group B | 75.0000 | 16.85488 | 44.822 | |
| **Pre energy/fatigue** | Group A | 77.63 | 16.691 | 46 | .692 |
| | Group B | 61.75 | 17.598 | 45.872 | |
| **Post energy/fatigue** | Group A | 72.7500 | 17.06573 | 46 | .338 |
| | Group B | 68.8750 | 19.96369 | 44.913 | |
| **Pre emotional wellbeing** | Group A | 65.04 | 19.284 | 46 | .748 |
| | Group B | 70.46 | 20.701 | 45.771 | |
| **Post emotional well-being** | Group A | 71.7917 | 18.85178 | 46 | .286 |
| | Group B | 65.7917 | 16.08937 | 44.892 | |
| **Pre social functioning** | Group A | 63.79 | 18.969 | 46 | .636 |
| | Group B | 65.04 | 17.620 | 45.752 | |
| **Post social functioning** | Group A | 68.542 | 17.7053 | 46 | 1.000 |
| | Group B | 68.542 | 17.7053 | 46.000 | |
| **Pre pain in SF 36** | Group A | 67.33 | 18.384 | 46 | .181 |
| | Group B | 67.79 | 21.197 | 45.098 | |
| **Post pain in SF 36** | Group A | 67.958 | 19.5303 | 46 | 1.000 |

| | | | | | |
|---|---|---|---|---|---|
| | Group B | 67.958 | 19.5303 | 46.000 | .748 |
| **Pre emotional wellbeing** | Group A | 65.04 | 19.284 | 46 | |
| | Group B | 70.46 | 20.701 | 45.771 | .286 |
| **Post emotional well-being** | Group A | 71.7917 | 18.85178 | 46 | |
| | Group B | 65.7917 | 16.08937 | 44.892 | .636 |
| **Pre general health** | Group A | 67.38 | 17.915 | 46 | .229 |
| | Group B | 67.96 | 20.681 | 45.083 | |
| **Post general health** | Group A | 67.6250 | 19.65311 | 46 | 1.000 |
| | Group B | 67.6250 | 19.65311 | 46.000 | |
| **Pre health change** | Group A | 64.04 | 17.924 | 46 | .754 |
| | Group B | 69.42 | 18.701 | 45.917 | |
| **Post health change** | Group A | 65.4583 | 19.06506 | 46 | 1.000 |
| | Group B | 65.4583 | 19.06506 | 46.000 | |
| **Pre treatment NPRS score** | Group A | 7.0833 | 1.74248 | 46 | .193 |
| | Group B | 6.5833 | 1.34864 | 43.279 | |
| **Post treatment NPRS score** | Group A | 2.1250 | 1.19100 | 46 | .493 |
| | Group B | 2.6250 | 1.13492 | 45.893 | |
| **Pre treatment MMT score** | Group A | 2.4167 | 1.17646 | 46 | .050 |
| | Group B | 2.9167 | .88055 | 42.614 | |
| **Post treatment MMT score** | Group A | 3.1667 | 1.04950 | 46 | .560 |
| | Group B | 3.8750 | .85019 | 44.100 | |

**Figure 1 METS on Quadratus Lumborum:** Lewit technique was used for Quadratus Lumborum muscles where the therapist stands behind the side lying patient, at waist level. The patient has the uppermost arm extended over the head to firmly grasp the top of the table and on an inhalation adduct the uppermost leg until the practitioner palpates strong quadrates activity elevation of around 30 degrees usually. The patient holds the leg in this manner isometrically allowing gravity to provide resistance. After 10 seconds of contraction the patient allows the leg to hang slightly behind him over the back of the table. The therapist straddle this and cradling the pelvis with both hands leans back to take out all the slack and to ease the pelvis away from the lower ribs during an exhalation. The stretch should be held for 30 seconds.

**Figure 2 METS on Erector Spinea:** For Erector Spinae the patient sits on a treatment table leg hanging over the side. The therapist stands behind the patient placing his one knee on the table close to the patient, at the side towards which side bending and rotation will be introduced. The therapist moves the patient into flexion, side bending and rotation over the therapist's knee. After taking the patient to a comfortable limit of flexion he is asked to look towards the direction from which rotation has been made while holding the breath for 7-10 seconds.

**Figure 3 METS for Piriformis:** The patient was in supine position, the leg to be treated was placed into flexion at the hip and knee so that the footrest on the table lateral to the contra lateral knee. The angle of hip flexion did not exceed 600. The therapist placed one hand on the contralateral axis to prevent pelvis motion while the other hand placed against the laterally flexed knee as this was pushed into resisted. abduction to contract piriformis for 7-10 seconds.

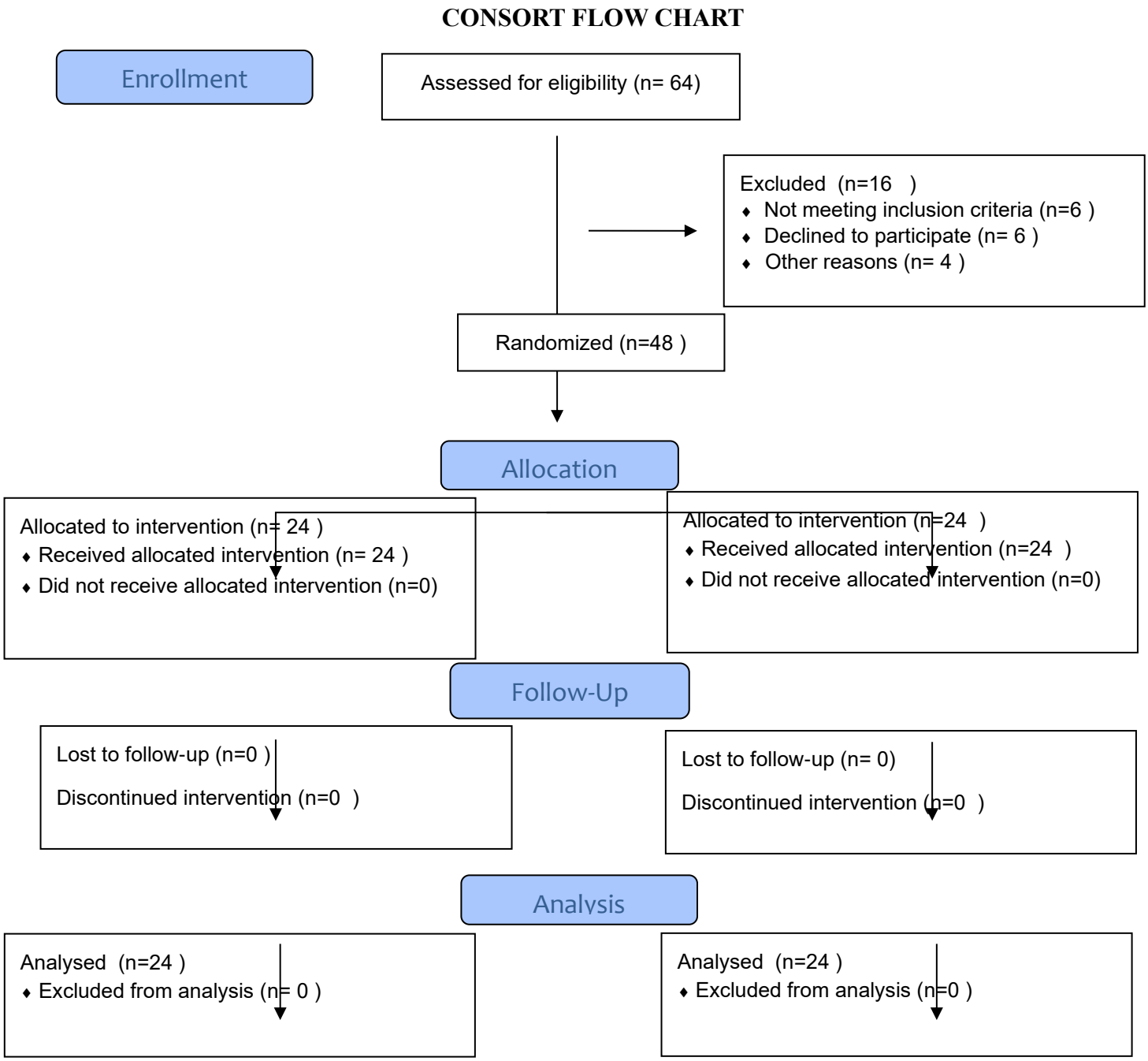


Figure 4: Consort Flow Chart