



Research article

The efficacy of TAP block versus ilioinguinal block for post-cesarean section pain management: A systematic review and meta-analysis

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ABSTRACT

Background: Controversy still exists regarding the analgesic efficacy of transverse abdominis plane (TAP) block versus ilioinguinal or iliohypogastric (IL/IH) nerve block for postoperative pain management following cesarean section. This meta-analysis aimed to perform relatively credible pooled results on the efficacy of the TAP versus IL/IH nerve block for postoperative pain management after cesarean section.

Methods: Databases such as: PubMed/MEDLINE, Google scholar, and google were systematically searched. studies compared the analgesic efficacy of TAP versus IL/IH nerve block for postoperative pain management following cesarean section were included. Data were extracted by three reviewers independently by using Microsoft Excel and then exported to STATA™ 16 version statistical software for analysis. We used a random-effects model meta-analysis and the mean difference of analgesic efficacy with a 95 % confidence interval was reported based on Preferred Reporting Items for systematic reviews and meta-analysis (PRISMA).

Results: Five studies with a total of 390 (196 in TAP and 194 in IL/IH) study participants were included in this meta-analysis. No statistically significant difference was observed between the TAP and IL/IH groups in time to first rescue analgesic request, total postoperative analgesic consumption in milligrams of intravenous tramadol equivalence, and post pain severity score at different points of time both rest and movement.

Conclusion: This meta-analysis revealed that both approaches have similar postoperative analgesic efficacy following cesarean section. we recommend that the clinician may consider either approach for post-cesarean section pain management.

1. Introduction

A cesarean section is a surgical approach to giving birth that can prevent maternal and newborn mortality when used for clinical indication. Globally, its rate has increased progressively [1, 2]. In Ethiopia the current cesarean section rate is about 30 % [3]. Cesarean section commonly induces moderate to severe pain for 48 h and with 11.8 % incidence of chronic pain [4]. Post-operative pain treatment aims to provide subjective comfort, inhibit nociceptive impulses, and blunt the neuroendocrine response to pain thus enhancing early restoration of body function [5].

Untreated pain can increase pulse rate, cardiac work, and oxygen consumption, and also it can reduce physical activity and leads to venous stasis and an increased risk of deep vein thrombosis. Furthermore, it may lead to post-operative ileus, nausea, vomiting, urinary retention and may result in prolonged hospital stay [6, 7, 8, 9]. Adequate analgesia is used to protect the peri-operative complications like deterioration of the

circulatory, respiratory and central nervous system from the effects of noxious stimuli [10, 11].

A systemic approach is a commonly practiced analgesia option that could be associated with side effects like pruritus, nausea, and vomiting, sedation, and respiratory depression. It also affects the fetomaternal bond, early breastfeeding of the newborn, and maternal satisfaction [11].

Recently, transversus abdominis plane (TAP) and ilioinguinal/iliohypogastric (IL/IH) nerve blocks are getting more consideration as a possible alternative to provide effective post-cesarean section pain management option [10, 12, 13, 14]. Both TAP and IL/IH nerve blocks are targeting the ilioinguinal and iliohypogastric nerves. The difference between TAP and IL/IH nerve blocks is the former is a compartment block, while the latter is a truncal block.

Controversy still exists regarding the analgesic efficacy of transverse abdominis plane (TAP) block versus ilioinguinal or iliohypogastric (IL/IH) nerve block for postoperative pain management following cesarean section [15, 16, 17, 18, 19, 20].

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Therefore, to reconcile this controversy, we perform this meta-analysis to summarize the existing evidence comparing the analgesic efficacy of TAP and IL/IH blocks in parturients undergoing cesarean section.

2. Methods

2.1. Study setting and search strategies

This systematic review and meta-analysis was conducted to estimate the effectiveness of TAP block versus IL/IH nerve block in a parturient who gives birth by cesarean section. Databases such as: Hinari, PubMed/MEDLINE, Google scholar, and google search were used to identify potential studies. A hand search was applied to identify additional literature by using key terms and cross-references. All searches were limited to the English language and studies were published within ten years. The search was performed on 28-31/3/2021 from all databases. Medical subject heading or entry terms “Pregnant Women” OR “Gravidity” OR “Mothers” OR “Obstetrics” OR “Women” OR “Female” AND “TAP block” OR “transverse abdominis plane block” AND “IL/IH block” OR “IL/IH block” OR “ilioinguinal block” OR “hernia block” AND “time to first analgesia request” OR “total analgesia consumption” OR “pain severity score” were used. The results were further restricted by free full text and human species. This meta-analysis was registered in PROSPERO with a registration number of CRD42020144553.

2.2. Eligibility criteria

We used **PICO** (Population: parturient who gave birth by cesarean section, Intervention: TAP block, Control: IL/IH block/hernia block, Outcome: analgesic efficacy in terms of time to first analgesic request, total analgesic consumption, and pain severity score) approach to include and exclude studies.

2.2.1. Inclusion criteria

This systematic review and meta-analysis included articles that met the following criteria: All studies conducted on the efficacy of TAP block versus ilioinguinal block for post-cesarean section pain management and articles published with the English language which has free full text were included.

2.2.2. Exclusion criteria

Studies that did not report time to first analgesic request, total postoperative analgesic consumption, and postoperative pain severity scores were excluded. Studies lacking appropriate data and failure to reply from the corresponding authors within three weeks were excluded too.

2.3. Outcome measurement

The main outcome of interest for this meta-analysis was to estimate the mean difference of TAP block versus ilioinguinal block for post-cesarean section pain management in terms of time to first analgesic request, total postoperative analgesic consumption, and postoperative pain severity scores. The pooled results were summarized by using mean difference with 95 % confidence interval.

2.4. Quality assessment and data extraction

The quality of the studies was critically appraised by the Joanna Briggs institute assessment tool established for randomized controlled trial and cohort studies [21]. The quality of all the included studies was graded as “high quality”.

Authors’ names with a year of publication, study design, type of anesthesia, block approach, sample size, postoperative analgesia regimen, and outcome variables were extracted. The titles and abstracts

of all identified literature in the searches were reviewed by three authors. Included studies were reviewed by three authors independently, and decisions were made regarding selection/rejection. The disagreements arising were resolved by the discussion of all the authors.

2.5. Statistical analysis

Microsoft Excel spreadsheet was used to extract the necessary information from each study. The extracted data was imported to STATA™ version 16.0 software for analysis. The mean differences of time to first analgesic request, total postoperative analgesic consumption in milligram of intravenous tramadol equivalent, and severity of postoperative pain scores in NRS were determined by the random-effects model using DerSimonian-Laird weight [22]. The effect size or mean difference with a 95 % confidence interval was presented using forest plots or tables.

2.6. Heterogeneity and publication bias

The I^2 statistic test was used to evaluate the presence of heterogeneity between studies [22]. Subgroup analysis by using study design (cohort versus Randomized controlled trial), and nerve block approach (landmark versus Ultrasound-guided technique) was performed to minimize heterogeneity. Since the number of included studies were small, we did not conduct publication bias analysis [23].

3. Results

3.1. Search strategy

In this systemic review and meta-analysis, a total of 335 articles were identified through different databases search. One hundred twenty-three (123) articles were left after removing duplication. The remaining 123 articles were screened for their title and abstract based on which 117 articles were excluded. From the remaining six articles, one article was excluded for reasons. Finally, five potential articles had been included for qualitative and quantitative synthesis (Figure 1) [24].

3.2. Characteristics of included studies

In this systematic review and meta-analysis, a total of 390 parturient were included from five studies with a sample size ranging from 32 [19] to 124 [17]. The time to first analgesic request among the included studies varied from 409 ± 206 min [18] to 1327 ± 960 min [17] in the TAP group while it varied from 300 ± 204.44 min [19] to 1504 ± 834 min [17] in IL/IH group. Regarding study design, three studies employed an RCT [15, 18, 19] and the remaining two were cohort studies [16, 17] (Table 1).

3.3. Meta-analysis

3.3.1. Time to first analgesia request

Five studies with a total of 390 (196 in TAP and 194 in IL/IH) study participants were included to estimate the mean difference time to first rescue analgesia request following cesarean section. The mean difference among included studies was -14.97 with 95 % CI (-157.13, 127.20). There was a significant heterogeneity across the included studies ($I^2 = 75.98$ %, $P = 0.001$). Therefore, random effect models were used to determine the mean difference between groups among study participants. The overall mean difference of first-time rescue analgesic requests was not statistically significant between groups (Figure 2).

3.4. Subgroup analysis

Subgroup analysis was done to detect the potential source of heterogeneity by using the nerve block technique (landmark versus

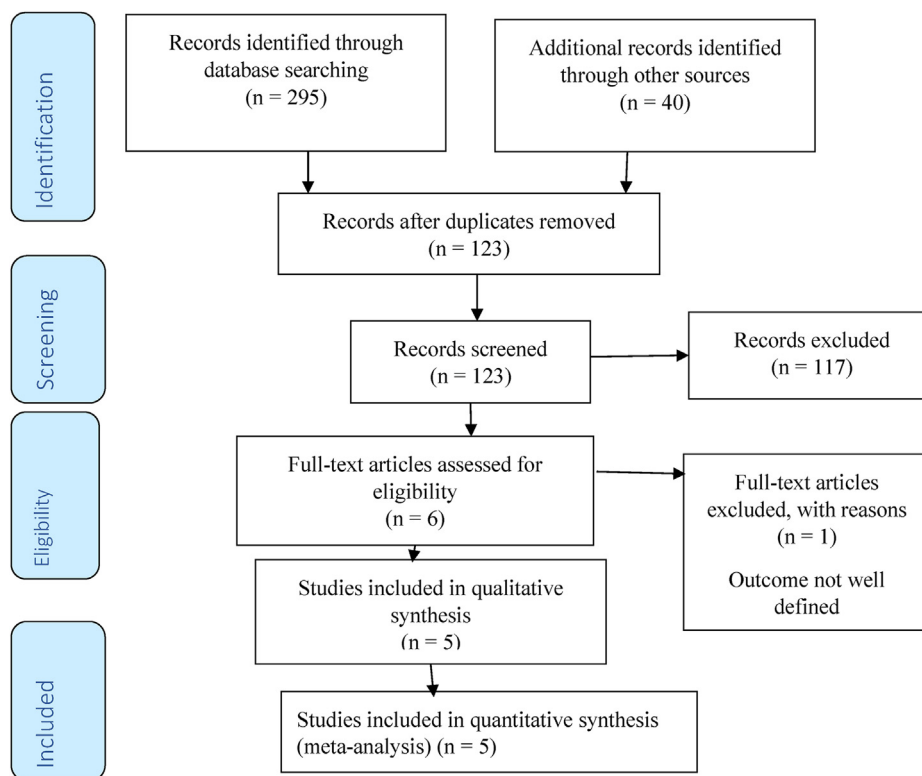


Figure 1. PRISMA flow diagram showing search strategies.

Table 1. Characteristics of studies included in the systematic review and meta-analysis of the efficacy of TAP block versus ilioinguinal block for post-cesarean section pain management, 2021.

Author	Publication year	Study design	Sample size (TAP, IL/IH)	Type of anesthesia	Nerve block approach	TAP dose	IL/IH dose	The postoperative pain management protocol	Quality of evidence
S. Abiy et al. [15]	2020	RCT	36,36	Spinal	Land mark	40 ml of 0.25 % of bupivacaine	32 ml of 0.25 % of bupivacaine	Tramadol IV, 1 mg/kg, pethidine IM PRN	High
Ahemed et al. [16]	2018	Cohort	51,51	Spinal	Land mark	40 ml of 0.25 % of bupivacaine	32 ml of 0.25 % of bupivacaine	No protocol	High
Kiran, et al. [18]	2017	RCT	30,30	Spinal	Ultrasound guided	40 ml of 0.25 % of bupivacaine	20 ml of 0.25 % of bupivacaine	1gramIV, paracetamol, 50mgIV, diclofenac	High
Roshbeik MY et al. [19]	2021	RCT	17,15	Spinal	Ultrasound guided	20 ml of 0.5 % of bupivacaine	20 ml of 0.5 % of bupivacaine	No protocol	High
JIN et al. [17]	2019	Cohort	62,62	CSE	Ultrasound guided	20 ml, 0.375 % ropivacaine or 0.3 % levobupivacaine	20 ml,0.375 % ropivacaine or 0.3 % levobupivacaine	PCA and supplementary morphine	High

CSE: Combined spinal-epidural, IV: Intravenous, IL/IH: Ilioinguinal/Iliohypogastric, PCA: Patient control analgesia, RCT: Randomized control trial, TAP: Transversus abdominis plane.

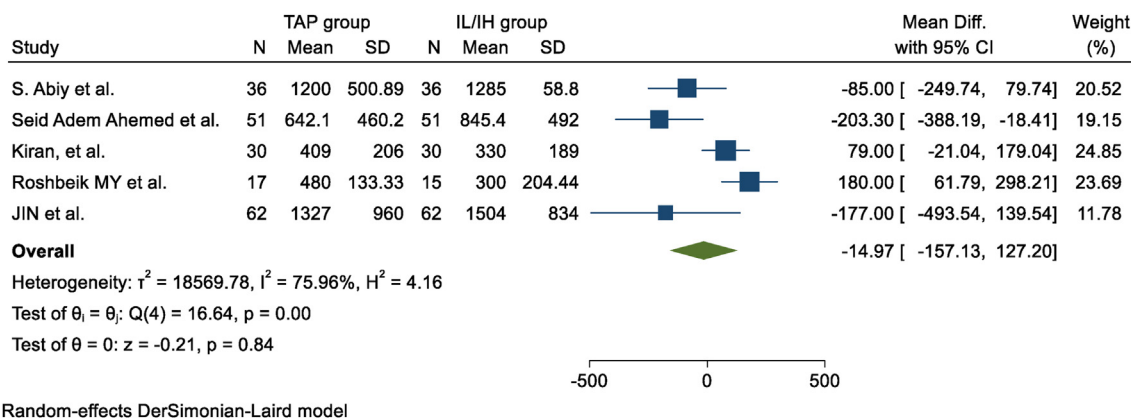


Figure 2. Time to first rescue analgesia request in minute.

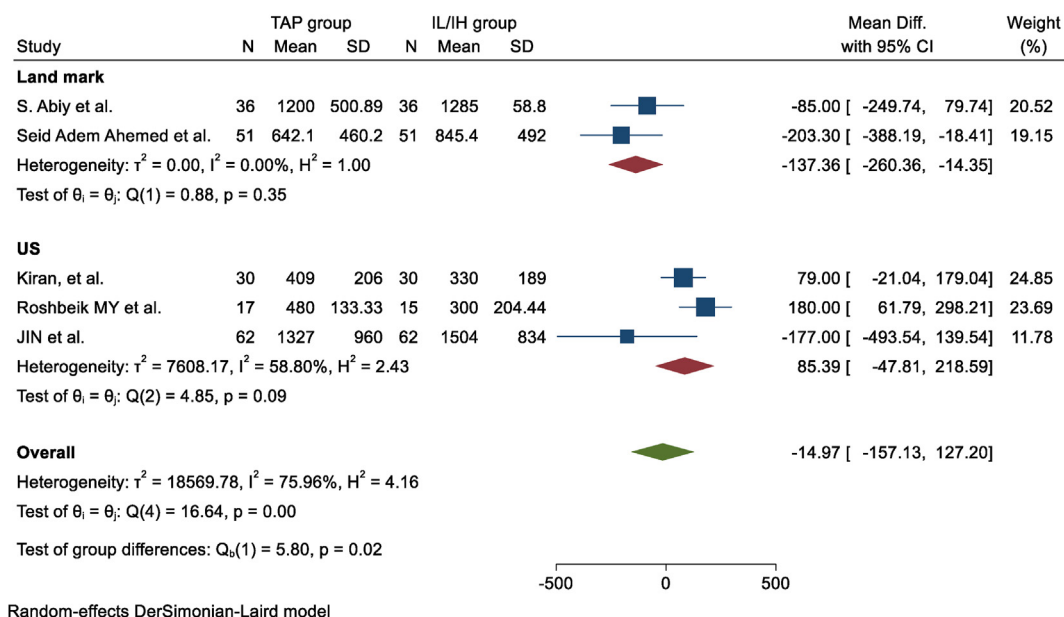


Figure 3. Subgroup analysis by nerve block techniques.

ultrasound-guided) and study design (cohort versus randomized control trial). After subgroup analysis, landmark technique and cohort study design showed the lowest heterogeneity, while the highest heterogeneity was detected in the randomized control trial group (Figures 3 and 4).

3.4.1. Total postoperative analgesia consumption in intravenous tramadol equivalent

All studies report total analgesic consumption within 24 hours, while only two studies report within 48 hours. The total postoperative analgesia consumption in intravenous tramadol equivalent was calculated [25]. The mean difference of total analgesia consumption at different cut-off time points within 24 and 48 h were not statistically significantly different between the TAP and IL/IH groups (p-values >0.05) (Figures 5 and 6).

3.4.2. Pain severity score

Pain severity score was assessed by numeric rating scale both at rest and movement at different cut-off time points for 48 h postoperatively. The mean difference of pain severity score at different time points both at rest and movement had no statistically significant difference between groups (p-values >0.05). Pain severity score during rest at 2 h and 24 h has no statistically significant heterogeneity within studies (Tables 2 and 3).

4. Discussion

Currently, there is no single gold standard for post-C/S pain management modality. There are several options and choices are made by resource availability, institutional protocols, and individual preferences [26].

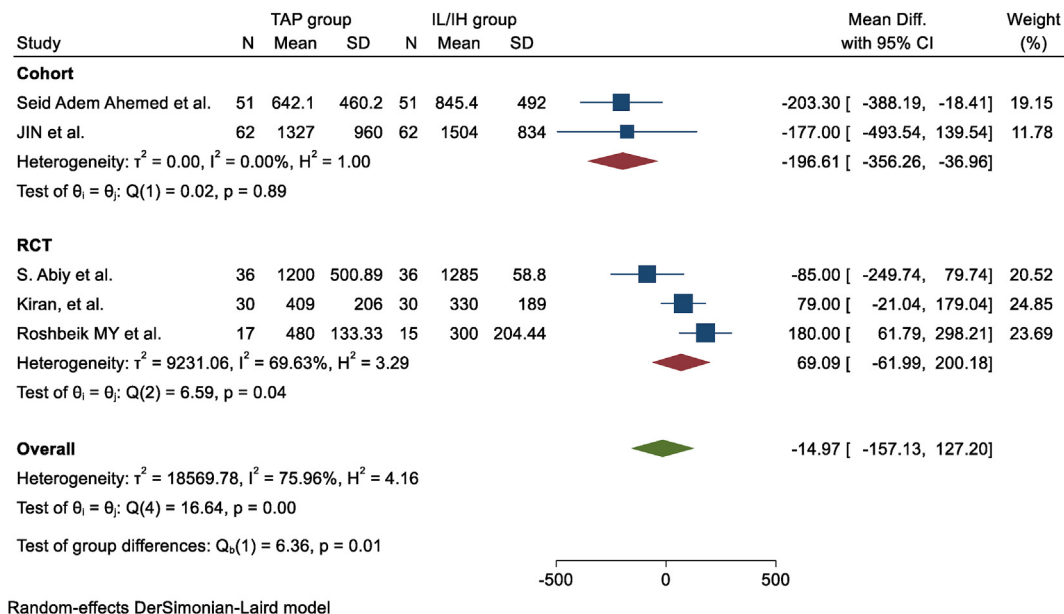
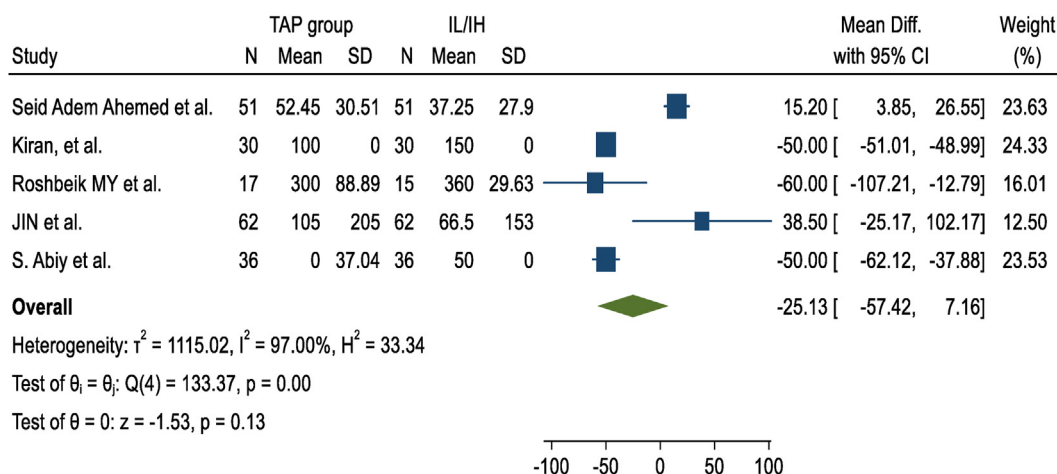
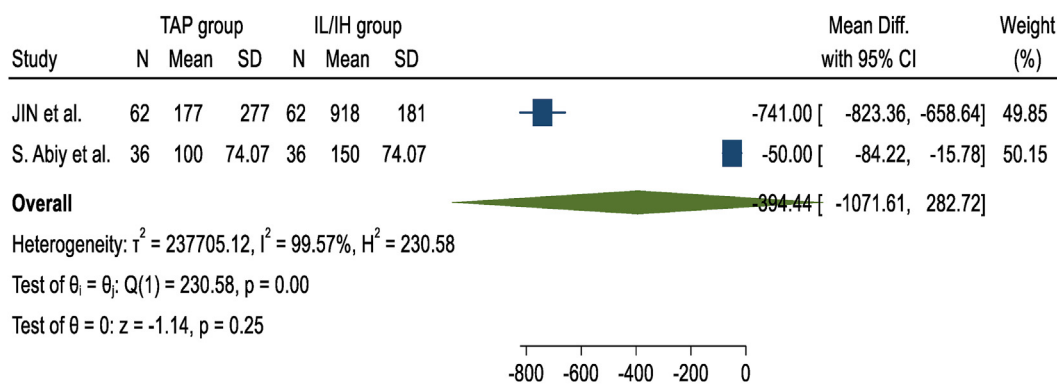


Figure 4. Subgroup analysis by study design.



Random-effects DerSimonian-Laird model

Figure 5. Intravenous equivalent total tramadol consumption at 24 h postoperatively.



Random-effects DerSimonian-Laird model

Figure 6. Intravenous equivalent total tramadol consumption at 48 h postoperatively.

Transverse abdominis plane block and ilioinguinal/iliohypogastric nerve blocks have been used as part of multimodal analgesia for postoperative pain management after cesarean section. However, their relative efficacy is still uncertain. This systemic review and meta-analysis revealed that there was no statistically significant difference between the two blocks in terms of time to first rescue analgesic request, total postoperative analgesic consumption, and pain severity score at different points of time both at rest and movement.

The mean difference of time to first rescue analgesia request for TAP and IL/IH block in minutes among included studies was -14.97 with 95 % CI: -157.13, 127.20, p-value 0.84. Even though the time to first rescue analgesia request for TAP block is 14.97 more than the IL/IH block, there is no statistically significant difference between the blocks. In line with our study primary studies found that the time to first rescue analgesia request

has no statistically significantly different between groups [15, 17]. This might be due to their comparative effectiveness in analgesic duration.

The mean difference of total analgesic consumption in milligram of intravenous tramadol equivalent at 24 and 48 h among included studies were -25.13, 95 % CI: -57.42, 7.16, p-value 0.13 and -394.44 95 % CI: -107.61, 282.72, p-value 0.25 respectively. The statistical insignificance might be justified by their comparable postoperative pain severity score at different points in time.

The mean difference of postoperative pain severity score in NRS at 2,4,6,8,12,24, and 48 h among included studies were not statistically significant between groups both at rest and movement, p-values > 0.05. In line with our finding, a meta-analysis done by Zhou Y et al. 2019 following hernia repair surgery showed a similar result concerning postoperative pain severity score [27].

Table 2. The mean difference of pain severity score at rest between TAP and IL/IH nerve block.

Time of measurement	Number of studies	Heterogeneity with I^2 , p-value	MD with 95%CI	p-value
At 2 h	3	0.00 %, 0.77	-0.10 (-0.46–0.26)	0.60
At 4 h	5	74.52 %, 0.001	-0.10 (-0.55–0.35)	0.66
At 6 h	4	82.7 %, 0.001	-0.20 (-0.74–0.34)	0.46
At 8 h	4	82.37 %, 0.001	0.16 (-0.45–0.76)	0.61
At 12 h	4	82.37 %, 0.001	0.16 (-0.45–0.76)	0.61
At 24 h	5	38.96 %, 0.16	0.16 (-0.08–0.41)	0.19
At 48 h	2	98.89 %, 0.001	-0.07 (-3.66–3.51)	0.97

CI: Confidence interval, MD: Mean difference.

Table 3. The mean difference of pain severity score at movement between TAP and IL/IH nerve block.

Time of measurement	Number of studies	Heterogeneity with I^2 , p-value	MD with 95%CI	p-value
At 2 h	2	89.86 %, 0.001	-0.48 (-1.46–0.5)	0.33
At 4 h	2	89.86 %, 0.001	-0.48 (-1.46–0.5)	0.33
At 6 h	3	77.57 %, 0.01	0.53 (-0.08–1.14)	0.09
At 8 h	4	60.2 %, 0.05	0.33 (-0.12–0.77)	0.15
At 12 h	4	95.29 %, 0.001	0.14 (-0.83–1.11)	0.78
At 24 h	4	95.29 %, 0.001	0.14 (-0.83–1.11)	0.78

CI: Confidence interval, MD: Mean difference.

5. Conclusion

This meta-analysis found no significant differences in the time to first request for rescue analgesia, postoperative analgesic consumption, and post-operative pain score following cesarean section between TAP block and IL/IH block.

6. Limitation

This systematic review and meta-analysis showed the pooled efficacy of the two abdominal field blocks with limited number of studies.

Declarations

Author contribution statement

Tikuneh Yetneberk: Conceived and designed the experiments; Performed the experiments.

Diriba Teshome: Analyzed and interpreted the data.

Basaznew Chekol: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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