The European Research Journal 2023;9(5):1258-1270 Meta-Analysis

DOI: 10.18621/eurj.1261999 *Midwifery*

The effect of aromatherapy on labor pain, duration of labor, anxiety and Apgar score outcome: a systematic review and meta-analysis

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ABSTRACT

Objectives: This study was conducted to conduct a systematic review and meta-analysis of studies examining the effect of aromatherapy intervention on labor pain, duration of labor, anxiety and apgar scores in primiparous women.

Methods: The literature search was conducted in PubMed, CINAHL, Scopus and Science Citation Index (Web of Science) until February 2023. This study is based on the recommendations of the Cochrane guidelines. The data were analyzed using the Review Manager computer program (Version 5.4).

Results: The analysis was completed with 10 studies including 950 primiparous pregnant women. The average pooled results of the studies showed that there was a significant difference in the effect of aromatherapy on labor pain (SMD: -0.68 95% CI: -0.76 to -0.60, Z = 16.32, $p < 0.01$) and duration (SMD: -0.36 95% CI: -0.47 to -0.25, Z = 6.40, $p < 0.00001$) in the latent, active, and transition phase. When the mean results of anxiety scores were examined, it was determined that the difference between the groups was significant (SMD: -15.89 95% CI: -16.78 to -14.99, Z = 34.79, $p < 0.00001$).

Conclusions: While the aromatherapy application used in childbirth reduced the duration and pain of the latent transition and active phase of birth, it was found that it reduced the anxiety of the pregnants in the active and transition phase.

Keywords: Aromatherapy, labor pain, labour, anxiety, Apgar score, meta-analysis

Aromatherapy is one of the main complementary and alternative medicine methods widely used in the world and is a branch of phytotherapy. Aromatherapy is used to ensure the physical and psychological well-being of the individual by using the high concentration of essential oil and smell obtained by distillation of the plant to use the therapeutic properties of the plants [1, 2]. Aromatherapy can reach the cerebral cortex directly through connections extending to the limbic system and hypothalamus through smell. The smell reaching the cortex creates spiritual, physical, and behavioral effects on the individual [3]. The pleasant smell that essential oils and other fragrances give to the environment is used as an encouragement to the

Received: ***March 8, 2023;*** *Accepted:* ***July 4, 2023;*** *Published Online:* ***August 2, 2023***

How to cite this article: *Yıldız Karaahmet A, Bilgiç FŞ. The effect of aromatherapy on labor pain, duration of labor, anxiety and Apgar score outcome: a systematic review and meta-analysis. Eur Res J 2023;9(5):1258-1270. DOI: 10.18621/eurj.1261999*

e-ISSN: 2149-3189

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woman during childbirth. Among the most common types of aromatherapies during childbirth include massage, bathing, and inhalation [1, 2].

Although pregnancy and childbirth are a physiological event, pain due to uterine contractions in the process of action is defined among the strongest pains and is among the important factors that cause many women to fear labor. Therefore, control of labor pain is one of the main goals of the care given to women who give birth [4, 5]. Although scientific studies have not shown its full effectiveness, it is believed that aromatherapy can act as a drug on the brain and nervous system. Aromatherapy is thought to be beneficial in reducing pain and causing relaxation by increasing neurotransmitters and reducing the amount of epinephrine and norepinephrine in the blood [2, 6, 7]. The results of the studies included in a systematic review showed that the aromatherapy applied increased the quality of sleep, increased the pain tolerance during the applied procedures, and reduced the level of pain and anxiety felt. In addition, it has been reported that the application of aromatherapy positively affects vital signs and increases the level of comfort and satisfaction [3]. Although aromatherapy applications are used in various areas of women's health in the literature, the evidence for the effectiveness of the applications is limited. The aim of this analysis is to systematically review and meta-analyze studies examining the effect of aromatherapy intervention on labor pain, duration of labor, anxiety and Apgar score in primiparous women.

For this purpose, analysis questions; (a) What is the effect of the aromatherapy intervention given to primiparous women on labor pain? (b) What is the effect of aromatherapy on the duration of labor? (c) What is the effect of aromatherapy on anxiety at birth? (d) What is the effect of aromatherapy on Apgar score at birth?

METHODS

This study was conducted to conduct a systematic review and meta-analysis of studies examining the effect of aromatreapy intervention on labor pain, duration of labor, anxiety and apgar score in primiparous women. In the preparation of the systematic review and meta-analysis, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis Statement) directive was followed [8]. During the study, literature review, article selection, data extraction and quality evaluation of the included articles were independently performed by two researchers to keep the risk of bias under control. In case of disagreement on any issue, all the researchers came together for a discussion and a final consensus. During the study, there was no situation that would require a deviation from the protocol and the study was concluded in accordance with the protocol entered in the PROSPERO database.

Eligibility Criteria

The following criteria (PICOS) were considered in the selection of the studies to be included in the study:

Participant (P): Primiparous pregnant women

Intervention (I): Aromatherapy

Comparison (C); Pregnant women who are not allowed to aromatherapy during labor.

Results (O); labor pain, duration of labor, anxiety, Apgar score

Study design (S); Randomized controlled experimental studies published in English and Turkish between 2013 and 2023.

Studies examining antenatal or postnatal fear, studies reflecting pregnant women with psychological illnesses, as well as articles using measurement tools that have no validity, and traditional and systematic reviews were excluded.

In addition, reviews, quasi-experimental studies, case reports, qualitative studies, unpublished theses, congress papers and descriptive studies formed the exclusion criteria of the study.

Search Strategy

The literature review for this systematic review was conducted between February and March 2023 using four electronic databases (PubMed, CINAHL, Scopus and WOS). Primipar pregnant women were screened for tocophobia using medical topics or keywords. The keywords were: "birth," OR "childbirth,"OR "labor," AND "pain"OR "labor pain" AND "aromatherapy," OR "essential oils". The search strategy was changed according to the characteristics of each database. In addition, reviews on articles included in systematic reference lists and other previous systematic reviews were checked to reach further studies.

Selection of Studies and Data Extraction

After removing duplicate articles from different databases, two researchers (A.Y.K. and F.Ş.B.) independently conducted a literature review, article selection, data extraction and quality evaluation of the included articles to control the risk of bias during the study. The two independent reviewers first scanned the titles and abstracts to determine which studies met the inclusion and exclusion criteria. Those that met the inclusion criteria or could not be identified from the title/abstract scan were examined for full text, and when consensus could not be reached, the researchers considered the study in common. A data extraction tool developed by the researchers was used to obtain the research data. Two reviewers (A.Y.K. and F.Ş.B.) obtain data on the location and year of the study, year of publication, research design, sample size, inclusion, and exclusion criteria, aromotherapy intervention and delivery pain and duration with this data extraction tool (Table 1).

Statistical Analysis

Meta-analysis was performed using Review Manager 5.4 (The Nordic Cochrane Center, Copenhagen, Denmark) for data analysis. The heterogeneity between the studies was evaluated using Cochran's Q test and Higgins' I^2, and it was accepted that I^2 greater than 50% showed significant heterogeneity. Accordingly, random effect results were considered when I^2 was greater than 50%, and fixed effect results were considered if it was less than the value. Odds ratio (OR) for categorical variables, mean difference (MD) and standardized mean difference (SMD) for continuous variables were calculated. MD or SMD, along with the corresponding 95% confidence interval (CI), is appropriately pooled for continuous variables based on whether the results are measured on the same scales. All tests were calculated from two-pronged tests, and a p value of less than 0.05 was considered statistically significant.

Risk of Bias

The quality of the articles in randomized controlled trials and the Version 2 of the Cochrane Risk-of-Bias tool (RoB-2) were used for randomized trials. All selected articles were independently conducted by an author (A.Y.K.) using the Cochrane tool to assess the risk of nepotism. The criteria outlined in the Cochrane Handbook for Systematic Investigations of Interventions are; were classified into six areas: ((random sequence generation (selection bias), allocation obfuscation (selection bias), blinding of participants and staff (performance bias), blinding of outcome evaluation (detection bias), handling of missing outcome data (attrition bias), selective outcome reporting (notification bias), and other potential sources of bias (conflict of interest and funding sources)). The risk of bias for each area is classified as "low risk", "high risk" or "uncertain risk" according to the decision criteria in the "bias risk" assessment tool.

RESULTS

Through electronic database research and manual search, 4932 articles were found. After repeated registrations, 4900 articles were evaluated. Titles and abstracts were read to identify relevant articles, review articles, protocols, duplications, different populations, and 4856 articles were removed because they did not meet the inclusion criteria. The remaining 71 full texts were evaluated for eligibility. 10 RCT articles were included in the analysis because they met the desired criteria (Fig. 1).

Study Characteristics

The characteristics of the studies are summarized in Table 1. This systematic review and meta-analysis included 10 studies conducted in five countries, involving a total of 950 primiparous pregnant women for the effect of aromatherapy on labor pain. Study data were found in five different countries in Egypt [9], Indian [10], Thailand [11], Turkey [12], and Iran [13-18]. All studies included in this systematic review and meta-analysis included primipar pregnant women in the study. The design of all his works included in the meta-analysis is RCT. In all articles included in the study, aromatherapy was evaluated in the latent, active, and transitional phase for relieving labor pain [9-18]. While the pregnant woman in the control group was left blank in most of the articles, plesabo in one study [16], normal salline in one study [14], distilled water in two studies [13, 17], massage alone versus aromatherapy massage in three studies [9, 10, 18] in one study Entonox gas [15] was given. While all the groups in the study were completed with two groups,

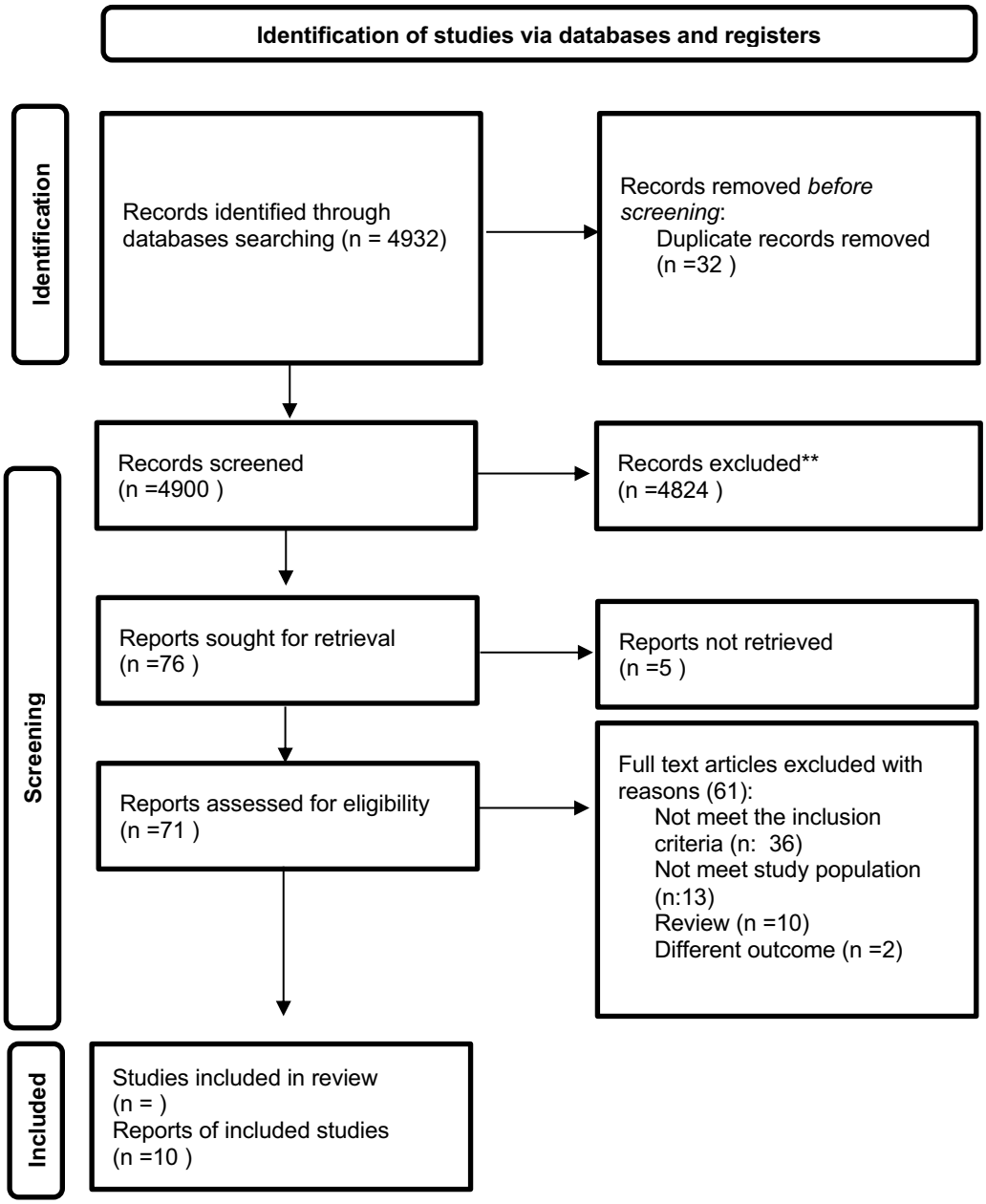

Fig. 1. PRISMA flow diagram. PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

not intervention and control groups, in two studies [12, 17] conducted a study with three groups. Pregnant women in the intervention group applied the following aromatherapy oils for labor pain; Lavander in six studies [9, 10, 12, 13, 15, 18], rosa in one study [14], essential oil in one study [169, Salvia and Jassimine in a study, and lavender, geranium rose, citrus and jasmine oils in one study were presented depending on participant preference [11]. The entire pregnant population included females (primiparous) who would give birth for the first time. In all studies, labor pain scores were considered as the primary outcome. In six of the studies, birth time [9-12, 17, 18] maternal anxiety in two [9, 14], five reported apgar scores [11, 13, 14, 16, 17].

Primary Outcomes

In Fig. 2, the results of the meta-analysis of the effect of aromatherapy on labor pain were presented as Forest Pilot. In four of the studies, labor pain was associated with the Numeric Rating Scale (NRS) [11, 13, 14, 16] with VAS in six [9, 10, 12, 15, 17, 18].

Table 1. Study characteristics

References, Country	Study Design	Study Period	Data Collection Tools	Age	Sample Size/ Parite	Aromatherapy Type	Aromatherapy Time and Method	Stage of intervention	Labor Pain (VAS Score)	Labor duration (min+hours)	Anxiety, Apgar scores
Lamadah [9], Egypt	RCT	June - September 2013	VAS	**N\A**	**Aromatherapy:** 30 **Control**: 30 Primiparous	Researchers' selections (lavender oil dissolved)	40 minutes back massage	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 7.0 ± 0.11 Active Phase: 6.4 ± 0.20 Transitional Phase: 7.7 ± 0.17 **Control** Latent Phase: 8.1 ± 0.14 Active Phase: 8.9 ± 0.19 Transitional Phase: 9.6 ± .50	**Aromatherapy:** Latent Phase (hours): 2.73 ± 1.05 Active Phase (min): 23.60 ± 15.35 Transitional Phase (min): 36.63 ± 8.05 **Control:** Latent Phase (hours): 3.17 ± 1.23 Active Phase (min): 27.23 ± 2.21 Transitional Phase (min): 24.93 ± 8.37	**Aromatherapy** Latent Phase: 55.47 ± 9.91 Active Phase: 38.40 ± 6.53 Transitional Phase: 36.63 ± 8.05 **Control** Latent Phase: 50.40 ± 5.75 Active Phase: 45.13 ± 9.10 Transitional Phase: 44.07 ± 9.95
Raju[10], Indian	RCT	December 2012-March 2013	VAS	**N\A**	**Aromatherapy:** 30 Control: 30 Primiparous	Researchers' selections (lavender oil dissolved)	N\A Back massage	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 6.2 ± 0.13 Active Phase: 7.5 ± 0.21 Transitional Phase: 8.3 ± 0.47 **Control** Latent Phase: 8.6 ± 0.5 Active Phase: 9.0 ± 0.34 Transitional Phase: 9.6 ± .21	**Aromatherapy**: Latent Phase (hours): 11.55 ± 2.4 Active Phase (hours): 1.5 ± 0.33 Transitional Phase (hours): 0.28 ± 0.02 **Control:** Latent Phase (hours): 14.58 ± 2.9 Active Phase (hours): 1.58 ± 0.37 Transitional Phase (hours): 0.30 ± 0.05	**N\A**
Tanvisut [11], Tayland	RCT	December 2015-December 2016	NPS	**Aromatherapy:** 26.54 ± 4.69 **Control**: 24.92 ± 4.31	**Aromatherapy:** 53 **Control:** 53 Primiparous	Researchers' selections (Aroma oil)	Diffused water	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 1.88 ± 2.24 Active Phase: 3.82 ± 2.45 Transitional Phase: 5.45 ± 2.28 **Control** Latent Phase: 2.60 ± 2.21 Active Phase: 4.39 ± 2.10 Transitional Phase: 5.62 ± 2.10	**Aromatherapy:** Latent Phase (min) 775.6 ± 334.9 Active Phase (min): 30.2 ± 28.1 Transitional Phase (min): 36.63 ± 8.05 **Control:** Latent Phase(min): 669.7 ± 463.7 Active Phase(min): 23.6 ± 20.4	**N\A**
Karatopuk[12], Turkey	RCT	February 2021-April 2021	VAS	**Aromatherapy massage**: 21.32 ± 2.73 Aromatherapy inhalasion: 20.61 ± 2.38 **Control:** 20.92 ± 3.02	**Aromatherapy massage**: 37 **Aramoterapy inhalasion:** 44 **Control:** 40 Primiparous	Researchers' selections (Lavender oil)	15 minutes massage 3 minutes inhalasion	Latent Phase Active Phase Transitional Phase	**Aromatherapy massage** Latent Phase: 1.54 ± 0.65 Active Phase: 2.81 ± 0.88 Transitional Phase: 4.46 ± 1.41 **Aromatherapy inhalasyon** Latent Phase :1.89 ± 0.92 Active Phase: 4.0 ± 1.45 Transitional Phase: 6.34 ± 1.60 **Control** Latent Phase :3.20 ± 0.99 Active Phase: 6.68 ± 1.07 Transitional Phase: 9.08 ± 0.73	**Aromatherapy massage** Latent Phase: 8.51 ± 1.95 Active Phase: 2.68 ± 0.58 Transitional Phase: 1.92 ± 0.83 **Aromatherapy inhalasyon** Latent Phase: 8.45 ± 1.78 Active Phase: 2.84 ± 0.71 Transitional Phase: 2.11 ± 0.84 **Control** Latent Phase: 9.43 ± 1.72 Active Phase: 2.73 ± 0.45 Transitional Phase: 2.13 ± 0.76	**N\A**
Yazdkhasti [13], Iran	RCT	September 2011-January 2012	NPS	**Aromatherapy:** 18.26 ± 2.83 **Control:** 19.13 ± 2.56	**Aromatherapy:**60 **Control:** 60 Primiparous	Researchers' selections (Lavender oil)	3 minutes massage and inhalasion	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 6.1 ± 2.3 Active Phase: 6.7 ± 2.0 Transitional Phase: 7.93 ± 2.1 **Control** Latent Phase: 7.7 ± 2.1 Active Phase: 8.6 ± 1.6 Transitional Phase: 9.4 ± 1.1	**Aromatherapy:** Active Phase (min): 170.2 ± 91.08 Transitional Phase (min): 59.4 ± 35.4 **Control:** Active Phase (min): 181.5 ± 93.6 Transitional Phase (min): 48.66 ± 23.5	**Aromatherapy** 1st min Apgar score: 8.8 ± 0.37 5th min apgar score: 9.9 ± 0.35 **Control** 1st min Apgar score: 8.7 ± 1.01 5th min apgar score: 9.7 ± 1.01

Table 1 Continued. **Study characteristics**

References, Country	Study Design	Study Period	Data Collection Tools	Age	Sample Size/ Parite	Aromatherapy Type	Aromatherapy Time and Method	Stage of intervention	Labor Pain (VAS Score)	Labor duration (min+hours)	Anxiety, Apgar scores
Hamdamian [14], Iran	RCT	N\A	NPS	**Aromatherapy:** 25.87 ± 5.17 **Control**: 26.24 ± 5.15	**Aromatherapy:** 58 **Control:** 58 Primiparous	Researchers' selections (R. damascene oil)	3 minutes inhalasion	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 3,25 ± 1,02 Active Phase: 5,11 ± 0,71 Transitional Phase: 6,69 ± 0,47 **Control** Latent Phase: 6,36 ± 1,02 Active Phase: 8,42 ± 0,50 Transitional Phase: 9,78 ± 0,42	**Aromatherapy:** Latent Phase (min): 37,18 ± 4,38 Active Phase (min): 47,27 ± 3,16 Transitional Phase (min): 55,82 ± 3,82 **Control:** Latent Phase (min): 38,91 ± 4,78 Active Phase (min): 47,09 ± 3,93 Transitional Phase (min): 54,54 ± 3,76	**Aromatherapy** Latent Phase: 35,14 ± 5,95 Active Phase: 46,12 ± 4,23 Transitional Phase: 55,14 ± 3,42 **Control** Latent Phase: 39,5 ± 8,28 Active Phase: 65,33 ± 4,78 Transitional Phase: 75,51 ± 3,55
Azizi Salimeh [15], Iran	RCT	June to September 2015	VAS	**Aromatherapy:** 26.7 ± 5.5 **Control:** 25.8 ± 5.5	Aromatherapy: 63 Control: 63 Primiparous	Mothers' selections (Lavander oil)	3 minutes inhalasion	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 4.7 ± 1.8 Active Phase: 5.1 ± 1.9 Transitional Phase: 5.9 ± 1.9 **Control** Latent Phase: 6.02 ± 2.04 Active Phase: 6.5 ± 2.1 Transitional Phase: 6.9 ± 2.2	N\A	**N\A**
Saeieh [16], Iran	RCT	March 2007-June 2008	NRS	**N\A**	**Aromatherapy:** 63 **Control:**63 Primiparous	Researchers' selections (essential oil)	Every 30 minutes inhalasion	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 4.98 ± 0.93 Active Phase: 5.79 ± 1.13 Transitional Phase: 6.35 ± 1.63 **Control** Latent Phase: 6.68 ± 1.28 Active Phase: 7.23 ± 1.54 Transitional Phase:7.71 ± 1.38	**N\A**	**Aromatherapy** 1st min Apgar score: 8.77 ± 0.37 5th min apgar score: 9.97 ± 0.17 **Control** 1st min Apgar score: 8.67 ± 0.56 5th min apgar score: 9.95 ± 0.21
Kaviani [17], Iran	RCT	October 2009-March 2010	VAS	**N\A**	**Salvia:** 52 **Aromatherapy:** 52 **Control:** 52 Primiparous	Researchers' selections (Jasmine oil)	15 minutes inhaliasion	30 min after the intervention 60 min after the intervention	**Salvia:** 30 min after: 3.19 ± 1.1 60 min after: 4.31 ± 0.9 **Aromatherapy** 30 min after: 2.46 ± 0.87 60 min after: 4.0 ± 0.84 **Control** 30 min after: 3.17 ± 1.2 60 min after: 3.98 ± 1.27	**Salvia:** First stage: 493.6 ± 59.8 Second stage: 46 ± 7.2 **Aromatherapy** First stage: 460.3 ± 65.5 Second stage: 44.3 ± 7.6 **Control** First stage: 509.3 ± 60.1 Second stage:49.83 ± 8.6	Salvia: 1st min Apgar score: 8.9 ± 0.44 5th min apgar score: 9.98 ± 0.15 Aromatherapy 1st min Apgar score: 8.88 ± 0.53 5th min apgar score: 9.96 ± 0.2 Control 1st min Apgar score: 8.98 ± 0.15 5th min apgar score: 10.0 ± 0.0
Zahra [18], Iran	RCT	March 2007-June 2008	VAS	**Aromatherapy:** 22.63 ± 3.48 **Control**: 26.66 ± 3.67	**Aromatherapy:** 30 **Control:** 30 Primiparous	Researchers' selections (a Lavander oil)	60 min back massage	Latent Phase Active Phase Transitional Phase	**Aromatherapy** Latent Phase: 3.20 ± 1.2 Active Phase: 5 ± 0.78 Transitional Phase: 6.16 ± 0.54 **Control** Latent Phase: 4.2 ± 1,02 Active Phase: 6.7 ± 0,50 Transitional Phase: 7.53 ± 0,42	**Aromatherapy** Latent Phase: 4.05 ± 1.95 Active Phase: 29± 10.46 Transitional Phase: 5.66 ± 2.66 **Control** Latent Phase: 5.21 ± 2.52 Active Phase: 42.36 ± 13.86 Transitional Phase: 5.86 ± 2.52	N\A

PC = Placebo group, AG = Aromaterapy group, CG = Control Group, RCT = Randomized Control Trial, PW = Primiparous Woman, MG = Massage Group, VAS = Visual Analogue Pain İntensity Scale, NRS = Numeric Pain Rating Scales

The Effect of Aromatherapy on Labor Pain

In all the studies examined, the authors reported results on the effect of aromatherapy on labor pain. The average pooled results of the studies showed that the effect of aromatherapy on labor pain was significant difference in the latent phase (SMD: -0.53 95% CI: -0.67 to -0.36, Z = 7.58, $p < 0.0001$) in the active phase (SMD: -0.84 95% CI: - 0.98 to -0.69, Z = 11.29, $p < 0.00001$) and in the transition phase (SMD: -0.69 95% CI: -0.83 to -0.55, Z = 9.66, $p < 0.00001$) (Fig. 2). When the mean results of the pain assessment were examined, there was a significant difference between the groups (SMD: -0.68 95% CI: -0.76 to -0.60, Z = 16.32, $p < 0.01$).

Second Outcomes

In Fig. 3, the results of the meta-analysis of the effect of aromatherapy on the duration of birth were presented as Forest Pilot. Six of the studies reported results on the duration of birth in the active, latent, and transitional phase of labor [9-12, 17, 18]. No scales were used for the duration of birth. In Fig. 4, the effect of aromatherapy on maternal anxiety is presented in a forest chart of the meta-analysis. In two of the studies, information was provided about the outcomes of maternal anxiety in the active, latent, and transitional phase of delivery [9, 14]. Spielberger state-trait anxiety questionnaire was not used to assess maternal anxiety.

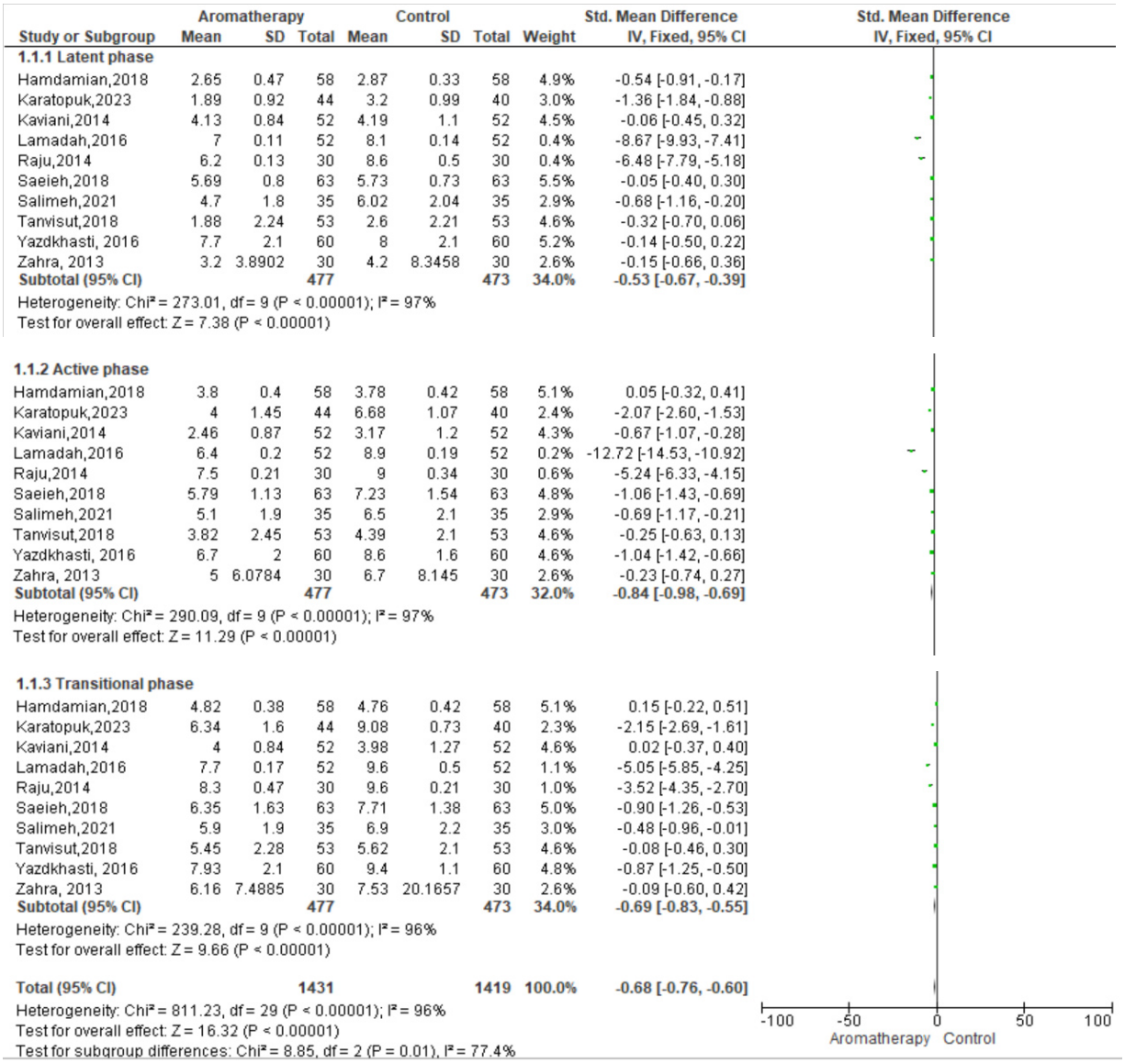

Fig. 2. Meta-analysis results on the effect of aromatherepy on the pain of labor: (1.1.1) latent phases (1.1.2.) active phases, (1.1.3) transtional phases

The Effect of Aromatherapy on the Duration of Labor

In the seven studies examined, the authors reported results on the effect of aromatherapy on the duration of labor. The average pooled results of the studies showed that the effect of aromatherapy on duration of labor was a significant difference in the latent phase (SMD: -0.48 95% CI: -0.69 to -0.26, Z = 4.36, $p < 0.0001$) in the active phase (SMD: -0.20 95% CI: - 0.38 to -0.02, Z=2.14, $p = 0.03$) and transition phase (SMD: -0.44 95% CI: -0.62 to -0.26, Z = 4.74, $p < 0.00001$) (Fig. 3). When the mean results of the duration evaluation were examined, it was determined that the difference between the groups was significant (SMD: -0.36 95% CI: -0.47 to -0.25, Z = 6.40, $p < 0.00001$). The studies had high heterogeneity.

The Effect of Aromatherapy on Anxiety

In the two studies examined, the authors reported results on the effect of aromatherapy on anxiety. The average pooled results of the studies showed that the effect of aromatherapy on anxiety was not significant in the latent phase (SMD: -1.52 95% CI: -3.77 to -0.74, Z = 1.32, $p < 0.19$), while there was a significant difference in the active phase (SMD: -17.33 95% CI: -18.89 to -15.78, Z = 21.85, $p < 0.00001$) and in the transition phase (SMD: -19.40 95% CI: -20.66 to -18.15, Z = 30.25, $p < 0.00001$). When the mean results of anxiety scores were examined, it was determined that the difference between the groups was significant (SMD: -15.89 95% CI: -16.78 to -14.99, Z = 34.79, $p < 0.00001$). There was high heterogeneity among the studies included in the study (Fig. 4).

The Effect of Aromatherapy on Apgar Score After Newborn

In the five studies examined, the authors reported

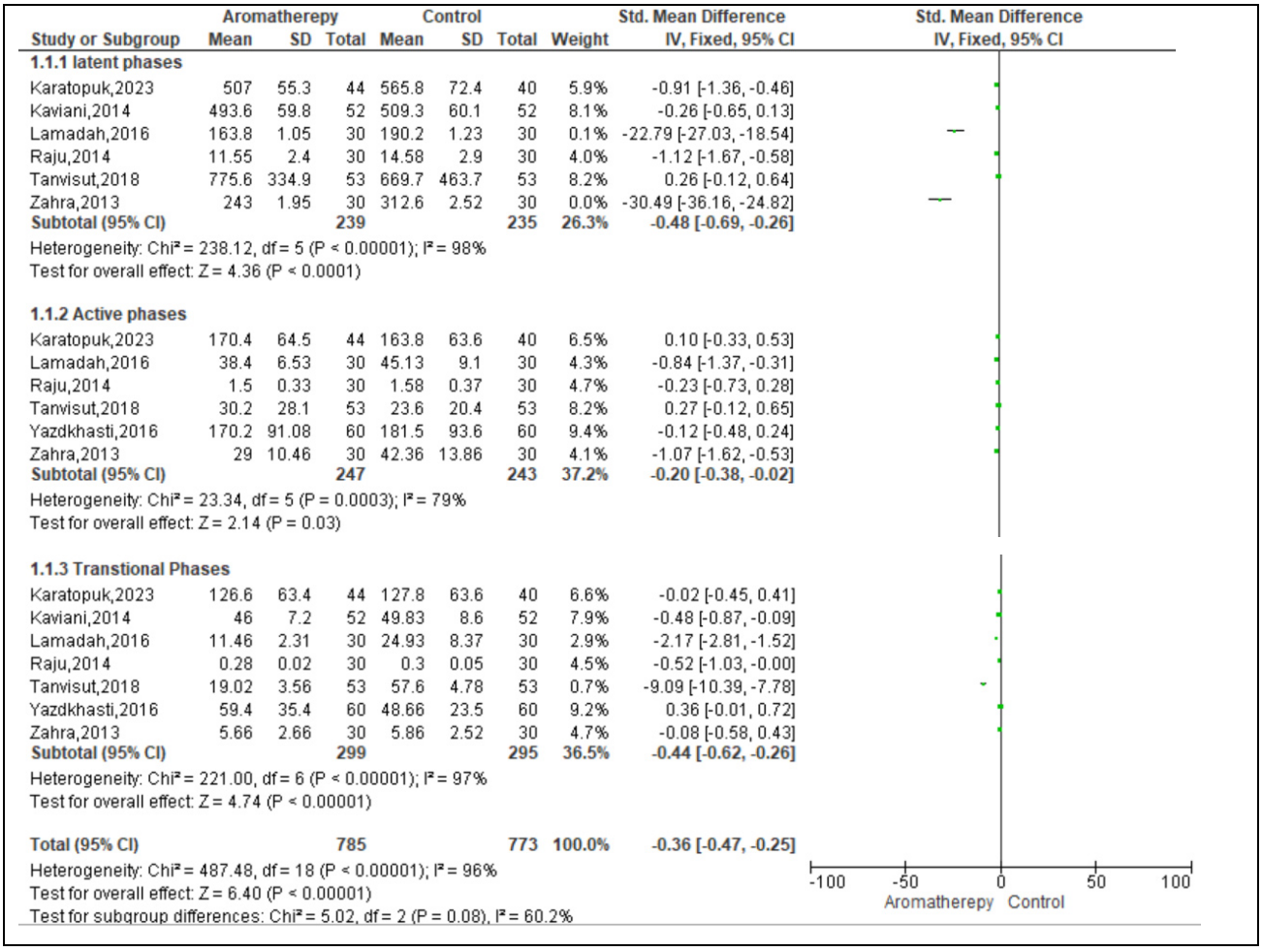

Fig. 3. Meta-analysis results on the effect of aromatherepy on the duration of labor: (1.1.1) latent phases (1.1.2.) active phases, (1.1.3) transtional phases

results on the effect of aromatherapy on the Apgar score in the postpartum period. The mean pooled results of the studies showed that the effect of aromatherapy on apgar score was significant in the first minute (SMD: -0.20 95% CI: -0.36 to -0.03, Z = 2.27, *p* p = 0.02) and that there was no significant difference in the fifth minute (SMD: -0.12 95% CI: -0.29 to -0.05, Z = 1.42, *p* = 0.16). When we looked at the average results of the Apgar scores, it was determined that the difference between the groups was not significant (SMD: -0.16 95% CI: -0.28 to -0.04, Z = 2.61, *p* = 0.54). There was high heterogeneity among the studies included in the study (Fig. 5).

Risk of Bias Assessment

All studies have identified an adequate method for randomly assigning participants to aromatherapy groups [9-18]. For this reason, we evaluated these studies in this area as a low risk of nepotism. Three studies reported adequate allocation confidentiality using sequentially numbered and sealed opaque envelopes and evaluated them at risk of under-favoritism error [11, 13, 18]. One study was judged to be at high risk [9] and other studies to be at risk of uncertainty bias due to insufficient information or lack of mention of factors [10, 12, 15-17]. In the three studies included in the meta-analysis, participants and researchers who participated in the experiment were assessed at low risk of bias in this area while providing information about their blindness to the study [13-15]. The other seven studies were not possible for the participants and researchers who participated in the experiment to be blind to the study, so all studies were evaluated at risk of bias in blinding participants and employees, and this was considered when interpreting the findings [9-12, 16-18]. Two studies are at low risk of blinding outcome evaluation [15, 16]. Other studies have also evaluated the outcome evaluation without blinding it and as having a high risk of favoritism error [9-14, 17, 18]. In all studies [9-18] was found to have a low risk of attrition because the work stoppages were balanced between the intervention and control groups or because there were few releases that would not affect the study. In all studies [9-18] included in the meta-analysis, they were assessed at risk of reporting low bias because they discussed the reported significant results, including negative outcomes, and matched those reported in their records. For each study included, we described important concerns regarding other possible sources of bias that had not previously been addressed in the above categories. Specifically, we looked for a declaration of conflict of interest and a source of funding. Six of the included studies reported no other risk of bias [10-13, 17, 18].

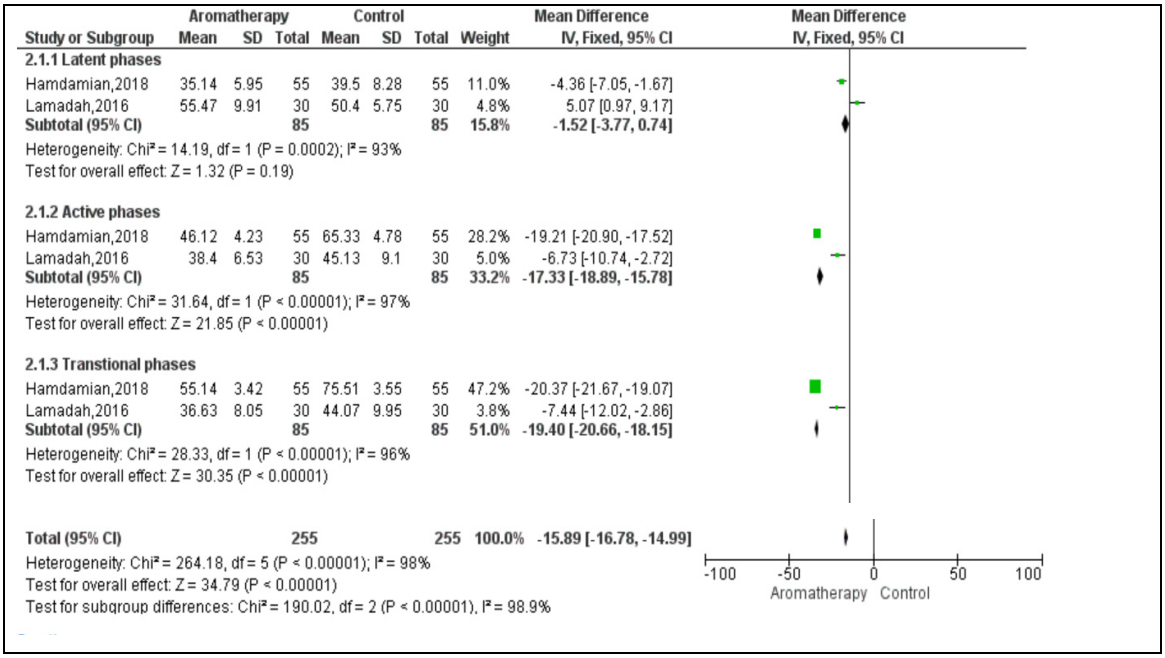

Fig. 4. Meta-analysis results on the effect of aromatherepy on the anxiety score: (2.1.1) latent phases (2.1.2.) active phases, (2.1.3) transtional phases

DISCUSSION

This study was conducted to conduct a systematic review and meta-analysis of studies examining the effect of aromatherapy intervention on labor pain, delivery time, anxiety and apgar score in primiparous women. As a result of this analysis, it was found that the aromatherapy application used in childbirth reduced the duration and pain in the latent transition and active phase of birth, while reducing the anxiety of pregnant women in the active and transition phase and increasing the apgar first minute score.

Labor pain is one of the most severe pains and is considered a complex physiological phenomenon that includes psychological, emotional, spiritual, and physical dimensions [19]. In this study, it was found that aromatherapy intervention reduced labor pain in the latent, transition and active phase. A methalytic study similarly reported to reduce labor pain [20]. In a systematic review, it was found that aromatherapy reduced labor pain [21]. Also, of the studies included in this study, Lavander in six studies [9, 10, 12, 13, 15, 18], rosa in one study [14], BC essential oil in one study [16], Salvia and Jassimine in a study, and lavender, geranium rose, citrus and jasmine oils in one study were presented depending on participant preference [11]. Rose essential oil has long been known to be effective in the reproductive system in women and has been shown to be effective in reducing pain and anxiety during childbirth [14]. Yazdkhasti *et al*. [13] reported that lavender essential oil aromatherapy may be an effective and beneficial treatment option for pain management among pregnant women. In the review published by Tabatabaeichehr and Mortazavi [22] it was reported that the most mentioned essential oil in the studies is lavender, which can be used as a single essential oil or in combination with other essential oils. The literature and study findings are in line with the literature and lavender oil was found to be the most used oil in the management of labor pain. However, the lack of a standard for applications suggests the need for more randomized controlled methodological studies.

Although the birth process is seen as a natural process, the woman who gives birth is faced with serious physiological changes, as well as discomfort, tension and sensory changes that will force her. Due to these changes, women state that they want to use more non-pharmacological methods [2, 11]. As a result of this analysis, it was found that the application of aromatherapy during childbirth reduced anxiety in women during the transition and active phase of labor.

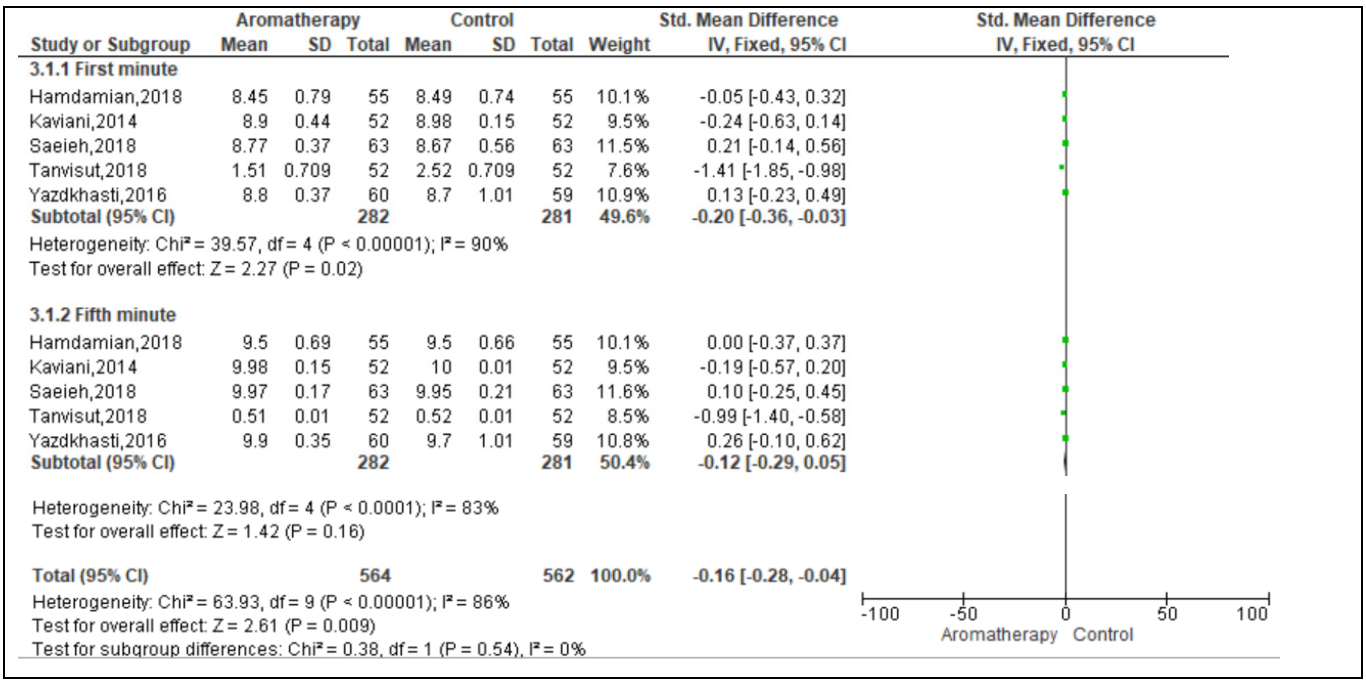

Fig. 5. Meta-analysis results on the effect of aromatherepy on the apgar score: (3.1.1) first minute (3.1.2.) Fifth minute

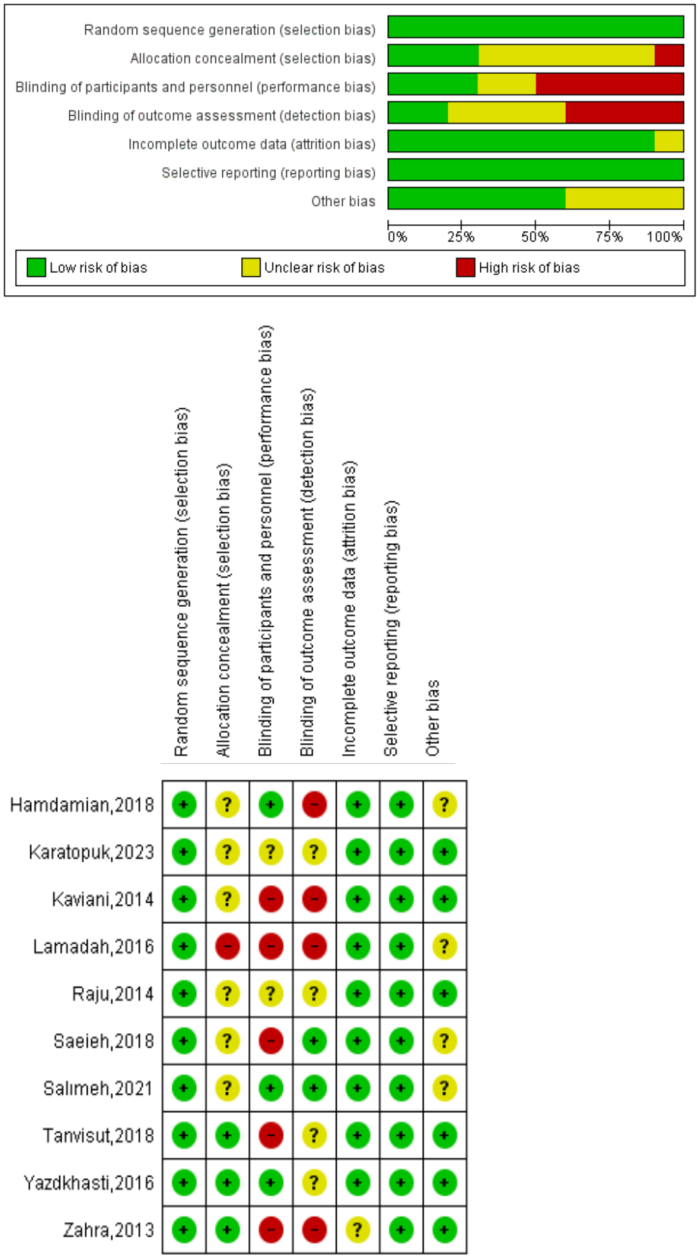

Fig. 6. Risk of bias domains: ROB-2, ROB-2: Risk-of-Bias tool for randomized trials.

In a systematic review study, it was shown that chamomile essential oil during labor significantly reduced anxiety in women during the first stage of labor [23]. As a result of this analysis, it was found that the first minute apgar score increased and shortened the duration of delivery in the group that underwent aromatherapy. This suggests that the positive effect on the duration of labor is reflected in the apgary. In a methalytic study, it was reported that aromatherapy applied at birth did not affect the apgar score [20]. In one study, it was reported that there was no difference between the two groups between the mean duration of the active phase and the second phase of birth [13]. The results of aromatherapy on anxiety, duration of delivery and newborn health at birth are very limited. More work is needed to establish evidence.

When the temporal evolution of publications is evaluated, it is an increasing trend, especially in the last seven years. This is because aromatherapy is increasingly sought by people for complementary me-

dicinal treatments that are low-cost, sustainable, and proven effective. In addition, WHO promotes the addition of complementary medicine to the health services of member states due to the important role of this practice. In addition, due to the side effects and cost-benefit associated with drugs, people are looking for natural treatments [21, 24, 25].

CONCLUSION

As a result of this analysis, it was found that aromatrapy application as the primary output reduced the pain of labour. As a secondary output, it was found to shorten the duration of labor, reduce anxiety in the active and transitional phase, and increase the first minute apgar scores of the newborn. The most preferred essential oil was lavender and rose oil. However, studies need to improve methodological quality to provide high-quality evidence. Although this meta-analysis study showed positive results regarding the use of aromatherapy for labor pain relief, most comparisons of the subgroups showed high heterogeneity, as the interventions were performed by different methods. This reinforces the need for standardization of experimental procedures performed in studies to provide safe evidence for the application of aromatherapy in pain management. In addition, more studies based on standardized methodology for duration, anxiety, comfort, and cardiovascular health outcomes other than labor pain alone are recommended.

Authors' Contribution

Study Conception: AYK, FŞB; Study Design: AYK; Supervision: AYK; Funding: N/A; Materials: AYK; Data Collection and/or Processing: AYK; Statistical Analysis and/or Data Interpretation: AYK, FŞB; Literature Review: AYK, FŞB; Manuscript Preparation: AYK, FŞB and Critical Review: AYK, FŞB.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

Financing

The authors disclosed that they did not receive any grant during conduction or writing of this study.

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