Cesarean Section Rates and Indications in Turkey: A Systematic Review and Meta-Analysis

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Authors' contributions

This work was carried out in collaboration among all authors. Author AŞ literature review, data extraction, data synthesis, article writing and corrections; Author MÖ to literature review, data extraction, data synthesis and article writing; Author ZK contributed to study design, data synthesis, data interpretation and manuscript revision. All authors have read and approved the final article.

Article Information

Systematic Review

ABSTRACT

Background: The World Health Organization reports that acceptable cesarean section delivery rate would be 10%-15%. High cesarean rates in Turkey constitutes a risk to mother and baby health**.**
Aims: The aim of this study was to determine total and primary cesarean section rates and indications based on the results of studies conducted in Turkey.
Study Design: The aim of this study was to determine total and primary cesarean section rates and indications based on the results of studies conducted in Turkey.
Place and Duration of Study: The study was carried out over the period January 1-31, 2020 by means of a search of Turkish and English literature indexes.
Methodology: The study was carried out over the period January 1-31, 2020 by means of a search of Turkish and English literature indexes. The searching was carried out in the PubMed, Medline, EBSCO, Web of Science, Google Scholar, National Thesis Center, Dergipark, Ulakbim. The data extracted were combined through meta-analysis.

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Results: Data from 31 cross-sectional studies and a total of 479.440 women were included in this systematic review and meta-analysis. It was determined that 177.484 of the women had undergone a cesarean delivery. The meta-analysis indicated that the estimated total cesarean rate was 43% (CI: 0.39-0.47; *P*< .001) while the primary cesarean rate was 26% CI: 0.12-0.47; *P*= .028). It was found that cesarean rates at the training/research hospitals (42%; CI: 0.39-0.45; *P*< .001) and university hospitals (69%; CI: 0.60-0.76; *P*< .001) were higher than at the state hospitals (29%; CI: 0.23-0.37; *P*< .001).It was seen that the estimated rates for the most common indications of cesarean births were, previous cesarean sections 46% (CI: 0.43-0.50; *P*= .051) and fetal distress 19% (CI: 0.15-0.23; P< .001).

Conclusion: The results of the study showed that cesarean rates are generally quite high, particularly at the training/research and university hospitals and that indications are varied.

1. INTRODUCTION

The procedure of cesarean section is performed when a vaginal delivery presents a morbidity or mortality risk for mother or infant or in cases in which vaginal delivery cannot be safely carried out. Cesarean section is thus a surgical intervention intended to preserve the life of both mother and child [1]. The most common indications for primary cesarean delivery include, in order of frequency, labor dystocia, abnormal or indeterminate (formerly, nonreassuring) fetal heart rate tracing, fetal malpresentation, multiple gestation, and suspected fetal macrosomia [2]. The World Health Organization (WHO) reports that a reasonably acceptable cesarean section delivery rate would be 10%-15% [3]. However, the prevalence of cesarean section is above a reasonable level in most countries, both developed and developing nations. This is a tendency that has shown an increase over recent years. In the last 25 years, cesarean section delivery rates in Egypt, Turkey, the Dominican Republic, Georgia and China have climbed by over 30% [3,4]. Approximately 55% of all births taking place in Turkey in 2018 were cesarean section deliveries and it is reported that the primary cesarean rate is 26% [5].

WHO recommends the use of the Robson 10-Group Classification System in the assessment and monitoring of cesarean births and in evaluating the change of cesarean rates over time [3]. The Robson classification is based on five fundamental characteristics of childbirth. These are parity (nullipara, multipara and previous cesarean section deliveries), the start of labor (spontaneous, induced or cesarean section before the start of labor), gestation time (preterm or term), fetal presentation (head, breech or transverse) and number of fetuses (single or multiple) [3]. The Turkish Ministry of Health began to implement the Robson 10-Group Classification System in 2012 [6]. This system ensures that epidemiological data on mother and child are at an optimum level [7].

Among the reasons noted for the increase in cesarean rates in recent years are the advanced age of the mother at the first birth, the high prevalence of obesity, the widespread use of electronic fetal monitoring techniques and consequently the determination of more abnormal/suspicious fetal heart tracing, the implementation of cesarean section in the case of breech presentations, the lesser use of forceps and vacuum, the increase in the use of induction, the preference for cesarean section in the case of preeclamptic or preterm deliveries [8-10]. At the same time, the increase in legal cases brought against obstetricians in recent years in Turkey has also been shown as one of the reasons for the rise in cesarean rates [11].

When used effectively, cesarean section surgery can be a life-saving procedure but it can also have an adverse impact on the health of both mother and child. Negative effects on maternal health include exposure to and complications of anesthesia, postpartum hemorrhaging, infection, abnormal placenta presentation, and prolongation of the hospital stay. Negative effects on infant health include respiratory problems, an increased need for neonatal intensive care services, prolonged hospital stay and infection. The procedure also has a negative impact on the bonding between mother and child and on breastfeeding [12]. Moreover, compared with vaginal delivery, cesarean delivery calls for a 50% increase in costs and, depending upon the extent of stay at the hospital, this rise in costs signifies a serious burden on the country's economy [13].

Midwives have an important responsibility in increasing the numbers of vaginal births and thereby reducing cesarean rates. At each stage of pregnancy and childbirth, midwives can take an active role in helping women develop a positive attitude toward vaginal childbirth in the effort to avoid preventable cesarean deliveries and reduce the demand for elective cesarean section procedures. Furthermore, midwives in their decision-making positions during childbirth have the capacity to diminish cesarean rates by shortening the medical process. In countries such as the Netherlands, Sweden, Norway and Finland where midwives take an active part in childbirth, cesarean rates are reported to be between 15%-20%. It is also noted that in these countries, maternal as well as fetal mortality rates are quite low [3,14]. It can be said then that the rise in cesarean rates in recent years can be reduced by strategic steps that can be taken and supported through the leading efforts of midwives.

Bringing down cesarean rates is among global health goals. The literature reports various initiatives that can be used to reduce cesarean rates. These interventions may be cited as prenatal education, childbirth support, deliveries led by midwives, mobilization and positioning, late admittance into the delivery room, identifying dystocia, continuous intrapartum supportive care, the use of a partogram, vaginal delivery after a previous cesarean, a multidisciplinary approach to childbirth and evidence-based applications [12,15-21]. All of these practices lie within the scope of midwifery and can be integrated into current midwifery care practices, along with the monitoring of outcomes in an effort to reduce cesarean rates.

WHO reports that rates above 10%-30% are not associated with diminished maternal-fetal mortality [3]. The Turkish Ministry of Health calls attention to the high cesarean section rates and has implemented some legislation geared to reduce these rates. These initiatives can be cited as the limitations placed in the performance system related to primary cesarean rates, the opening of pregnancy education classes and the efforts to make these more widespread, the establishment of mother-friendly hospital procedures, the use of the Robson Pregnancy Classification system, emergency obstetric care training and other training programs designed to empower midwives. The fact that studies indicate that such measures are not effective in decreasing cesarean rates was supported in our own study results [6].

The steadily increasing trend in rising cesarean rates signifies an important health issue. There are national databases available on cesarean section deliveries. There are also numerous articles that contain reports on local results. Based on these local study results, the need was felt to uncover additional national data on cesarean rates and indications that would make it possible to evaluate these varied data according to the type of health institution and region of the country. The decision was therefore made to carry out this systematic review and meta-analysis. The data obtained may contribute to future studies as well as to the current literature conducted on reducing cesarean rates.

1.1 Aim and Research Questions

This systematic review and meta-analysis aimed to determine Turkey's cesarean section rates and indications. The research questions were the following: (1) What is Turkey's cesarean rate? (2) What is the distribution of this rate according to years, regions and types of health institutions? (3) What are the indications reported for cesarean section? (4) What is the distribution of these indications according to the Robson 10-Group Classification System?

2. MATERIALS AND METHODS

This systematic review and meta-analysis was developed and carried out based on the PRISMA Statement (Checklist for Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [22,23]. To reduce the possible risk of bias in our study, the literature scan, article selection, data extraction and article quality evaluation were carried out independently by the first and second authors and each step was checked by the third author. Differences of opinion between the authors were sorted out through discussion. Furthermore, in order to ensure that the entire process was conducted appropriately and at high quality, all of the authors participated in a session in which a pilot implementation was carried out on a subject not included in the present study and the steps of searching, article selection, data extraction and article quality evaluation were handled, after which the differences between knowledge and opinions were eliminated through discussions.

2.1 Eligibility Criteria

The plan for the meta-analysis was to include studies published in both Turkish and English over the period 2008-2019. Studies of the nature of qualitative, experimental and systematic review design were excluded from the scope of the analysis. The suitability of the studies was determined in the light of the following inclusion criteria (PEOS). Population: Women giving birth. Exposure: Cesarean section delivery. Conclusions: Cesarean delivery and Cesarean indications, the Robson 10-Group Classification System. Study design: Cross-sectional research.
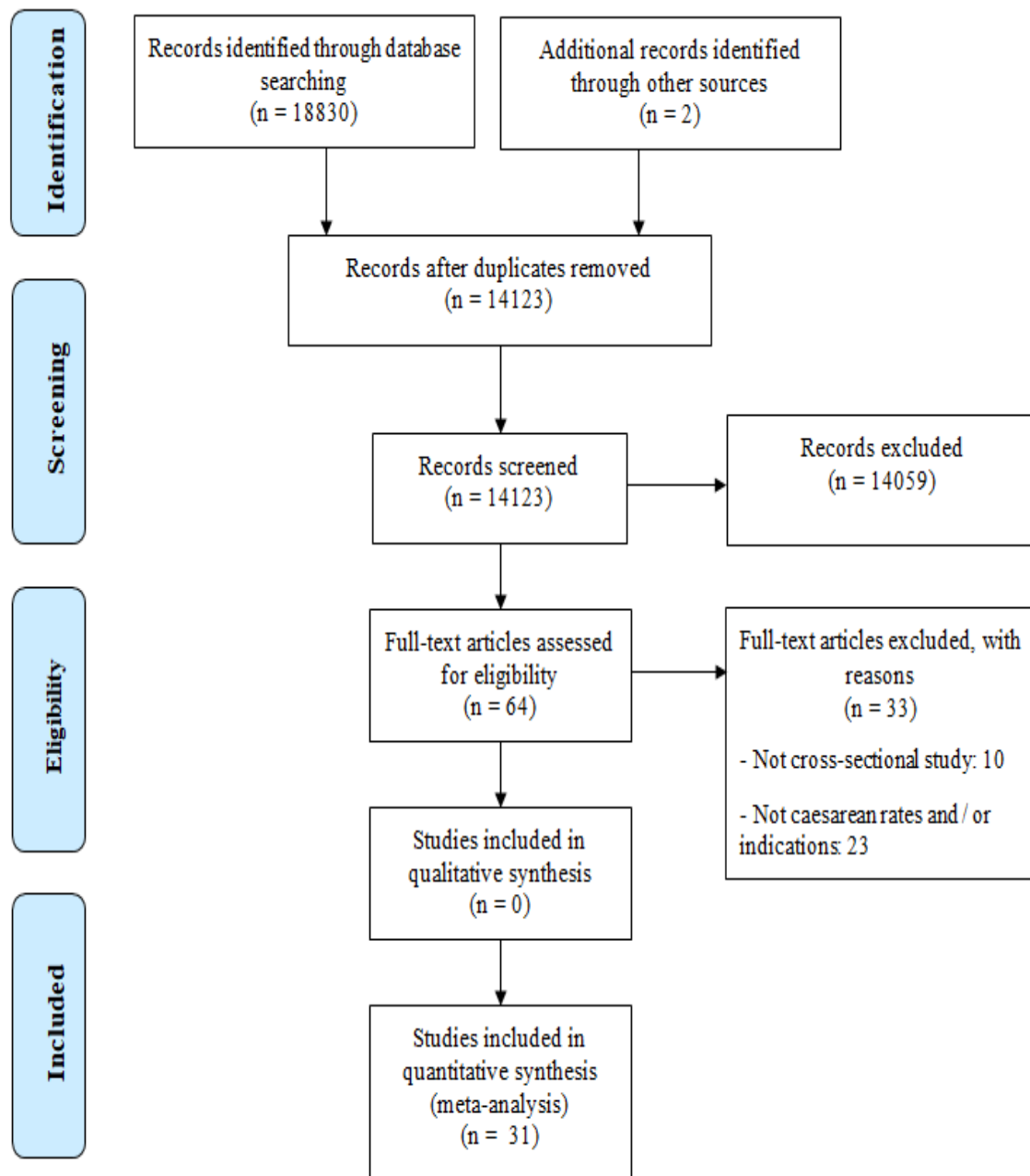

Fig. 1. PRISMA flow diagram of the search process

2. 2 Searching Strategy

The searching in this systematic review and meta-analysis was performed in January 2020 in the Turkish and English databases. The scans were carried out in the Google Academic (http://scholar.google.com.tr), PubMed, EBSCO, National Thesis Center

(https://tez.yok.gov.tr/Ulusal TezMerkezi/tarama.jsp), Dergipark, Ulakbim, Turkish Medline Perinatology Association, Turkish Clinics, Maternal Fetal Perinatology Association databases. The keywords used in the scans of the databases were "cesarean section" or "cesarean and Turkey" and the word "sezaryen" (cesarean) in the national databases. An example of the scan performed in the Pubmed databases was as follows: cesarean [All Fields] AND ("turkey"[MeSH Terms] OR "turkey"[All Fields])) AND ("2008/01/01"[PDAT]: "2019/12/31"[PDAT]). To identify studies that would be suitable to add, the reference lists of the selected articles were checked and selected studies were included.

2.3 Selection of Studies

After the first and second authors independently removed the repeating studies and selected the ones that matched the inclusion criteria for the meta-analysis, the studies were arranged according to headings, abstracts and complete text. Then both authors combined the studies through a comparison. The interrater differences were settled through discussions and when found to be necessary, the experienced third author was asked for an opinion. After this selection process, a total of 31 studies that were conducted and published in Turkey over the period 2008-2019 and reported on cesarean rates and/or indications were included. The detail of the article selection process is shown in Fig. 1.

2.4 Data Extraction

A data extraction instrument devised by the researchers was used to obtain the research data. This data extraction tool was used to identify the authors, year of publication, city where published and year of data collection, design, field of study, sample size of the studies included in the systematic review as well as the reported ages, numbers and rates of cesarean births, cesarean indications and case numbers.

2.5 Methodological Quality Evaluation of the Studies

The Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-sectional Studies was used in the evaluation of the methodological quality of the articles included in this systematic review and meta-analysis [24]. This checklist comprises eight items that are evaluated with responses of "yes," "no," "unclear" or "not applicable." The studies were checked to see whether they met the checklist criteria; the numerical results of these results can be seen as "Quality Assessment Scores" in Table 1.

2.6 Synthesis of the Data

The results of the studies included in this systematic review were combined through meta-analysis. First, the results of the studies included in the study were grouped according to the outcomes required to appear in the results of the systematic review and meta-analysis (number of cesarean births, indications for each cesarean and the Robson 10-Group Classification System). Then, for the sub-group analysis, the results of the studies were grouped according to data collection years (2008-2010, 2011-2013, 2014-2016, 2017-2019) and the regions of our country. Since the cesarean rates by year were calculated according to the years specified in the studies, the study numbers in this analysis group multiplied. The Comprehensive Meta-Analysis Version 3-Free Trial was used for the meta-analysis. The heterogeneity between the studies was assessed with the Cochran Q and Higgins I^2 tests and it was agreed that the I^2 rate exceeding 50% was an important indication of heterogeneity. When I^2 was greater than 50%, the Random effect results, if the value was less, the Fixed Effect results were considered. For each result variable a calculation was made at a 95% confidence interval (CI) and Estimated Values were computed. All of the tests were calculated on a two-tailed basis and a p value of less than 0.05 was accepted to be statistically significant.

Table 1. Characteristics and main findings of the cross-sectional studies included in the systematic review and meta-analyses

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
Aksoy et al. 2014 [30]	Kayseri	2013 Hospital records	State hospital	N= 6765 [a]CS: 2736 Primary CS: 462 Age Mean (SD): 27.3 ± 5.5	Previous CS: 1252 Fetal distress: 448 [b]CPD: 294 Presentation and position abnormalities: 213 Fetal macrosomia: 118 Non-progressive/prolonged labor: 176 Placenta anomalies: 55 Multiple pregnancy: 70 Maternal systemic diseases : 14 Other: 90	Yes: 6/8 Not applicable: 2/8
Aksoy et al. 2015 [31]	İzmir	2012 Hospital records	State hospital	N= 1724 CS: 864	Previous CS: 355 Fetal distress: 60 CPD: 29 Presentation and position abnormalities: 68 Fetal macrosomia: 26 Non-progressive/prolonged labor: 119 Placenta anomalies: 65 Multiple pregnancy: 30 Maternal systemic diseases :23 Other: 63	Yes: 6/8 Not applicable 2/8
Arıkan et al. 2009 [32]	Zonguldak	2004-2008 Hospital records	University hospital	N= 778 CS: 566 Age Mean (SD): 28.5 ± 5.4	Previous CS: 427 Fetal distress: 372 CPD: 174 Presentation and position abnormalities: 168 Multiple pregnancy: 88 Other: 403	Yes: 6/8 Not applicable 2/8
Balcı et al. 2009 [33]	Konya	2004-2008 Hospital records	University hospital	N= 2338 CS: 1363 Age Mean (SD): 29.4 ± 5.4	Previous CS: 715 Fetal distress: 880 CPD: 622 Presentation and position abnormalities: 355 Placenta anomalies: 164	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
					Multiple pregnancy: 296 Maternal systemic diseases : 293 Other: 860 Elective CS (Mother's request):715	
Budak and Temur 2018 [34]	Diyarbakır	2010-2016 Hospital records	State hospital	N= 125816 CS: 32708 Primary CS: 1635	**Robson 10-Group Classification** 1. Nulliparous, single, cephalic presentation, ≥37 weeks, spontaneous labor:1595/20804 2. Nulliparous, single, cephalic presentation, ≥37 weeks, induced labor: 1373/ 2830 3. Multiparous (excl. previous cesareans), single, head presentation, ≥37 weeks, spontaneous labor: 1516/54786 4. Multiparous (excluding previous cesareans), single, cephalic presentation, ≥37 weeks, induced or cesarean before labor: 2589/14565 5.Previous cesarean, single, cephalic presentation, ≥37 weeks:15392/15415 6. All nulliparous breech presentations:1836/1886 7. All multiparous breech presentations (including previous cesareans): 2054/ 2264 8. All multiple pregnancies (including previous cesareans): 2097/2390 9. All transverse oblique lies (including previous cesareans): 628/628 10. All single cephalic presentations, ≤36 weeks (including previous cesareans): 2247/7368	Yes: 6/8 Not applicable 2/8
Budak 2019 [28]	İzmir	2013-2017 Hospital records	Training and research hospital	Primary CS:10990	Fetal distress: 3554 CPD:1908 Presentation and position abnormalities: 904 Fetal macrosomia: 965 Non-progressive/prolonged labor: 2450 Placenta anomalies: 329 Other: 880	Yes: 6/8 Not applicable: 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
Cantürk and Dağlı 2018 [35]	Kırşehir	2014-2015 Hospital records	Training and research hospital	N= 4269 CS: 2165 Primary CS: 871 Age Mean (SD): 31.6 ± 6.2	Fetal distress: 200 CPD:176 Presentation and position abnormalities: 87 Fetal macrozomia:46 Non-progressive/prolonged labor: 257 Placenta anomalies: 24 Multiple pregnancy:21 Maternal systemic diseases : 13 Other: 48	Yes: 6/8 Not applicable: 2/8
Çağan 2017 [25]	Ankara	1976 1986 1996 2006 2016 Hospital records	University hospital	N= 1895 CS: 1477	Previous CS:487 Fetal distress:199 CPD: 158 Presentation and position abnormalities: 83 Fetal macrosomia: 96 Non-progressive/prolonged labor: 134 Placenta anomalies: 18 Multiple pregnancy:53 Maternal systemic diseases : 168 Other: 38 Elective CS (Mother's request): 43 **Robson 10-Group Classification** 1. Nulliparous, single, cephalic presentation, ≥37 weeks, spontaneous labor: 20/147 2. Nulliparous, single, cephalic presentation, ≥37 weeks, induced labor: 565/962 3. Multiparous (excl. previous cesareans), single, head presentation, ≥37 weeks, spontaneous labor: 14/241 4. Multiparous (excluding previous cesareans), single, cephalic presentation, ≥37 weeks, induced or cesarean before labor: 147/163 5. Previous cesarean, single, cephalic presentation, ≥37 weeks: 394/394	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
					6. All nulliparous breech presentations: 41/44 7. All multiparous breech presentations (including previous cesareans): 38/38 8. All multiple pregnancies (including previous cesareans): 54/66 9. All transverse oblique lies (including previous cesareans): 8/10 10. All single cephalic presentations, ≤36 weeks (including previous cesareans:199/227	
Çağlayan et al. 2010 [36]	Yozgat	2007-2009 Hospital records	State hospital	N= 2546 CS: 604 Age Mean (SD): 25.2 ± 5.8	Previous CS: 239 Fetal distress: 121 CPD: 20 Presentation and position abnormalities:74 Fetal macrosomia: 5 Non-progressive/prolonged labor: 191 Placenta anomalies: 11 Multiple pregnancy: 8 Maternal systemic diseases : 6 Other: 12	Yes: 6/8 Not applicable 2/8
Çalık et al. 2018 [37]	Trabzon	2013-2016 Hospital records	Training and research hospital	N= 12315 CS: 5558 Primary CS: 2321	Previous CS: 3237 Fetal distress: 715 CPD:899 Presentation and position abnormalities: 277 Fetal macrosomia: 114 Non-progressive/prolonged labor:47 Placenta anomalies: 60 Multiple pregnancy: 95 Maternal systemic diseases : 61 Other:11	Yes: 6/8 Not applicable 2/8
Çelik et al. 2016 [27]	İstanbul	Hospital records	Training and research hospital	N= 238 CS: 110 Age Mean (SD): 30.4 ± 5.3	Fetal distress: 42 Presentation and position abnormalities: 16 Fetal macrosomia: 12 Non-progressive/prolonged labor: 10	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
					Placenta anomalies: 3 Multiple pregnancy: 12 Maternal systemic diseases : 10 Other: 5	
Demir et al. 2012 [38]	Bursa	2000-2010 Hospital records	University hospital	N= 2462 CS: 1433	Previous CS: 463 Fetal distress:250 CPD:140 Presentation and position abnormalities: 212 Placenta anomalies :53 Other: 433 Elective CS (Mother's request)**: 7**	Yes: 6/8 Not applicable 2/8
Doğanay 2009 [26]	Ankara	2008 Hospital records	Training and research hospital	N= 1347 CS: 556 Age Mean (SD): 29.1 ± 5.5	Previous CS :265 Fetal distress: 113 CPD: 69 Presentation and position abnormalities: 50 Fetal macrosomia: 2 Non-progressive/prolonged labor: 12 Placenta anomalies: 1 Maternal systemic diseases : 5 Other: 18	Yes: 6/8 Not applicable 2/8
Ercan et al. 2013 [39]	İstanbul	2006-2010 Hospital records	Training and research hospital	N= 49981 CS: 17467	Previous CS: 6306 Fetal distress: 3782 CPD: 1830 Presentation and position abnormalities: 1331 Fetal macrosomia: 989	Yes: 6/8 Not applicable 2/8
Eskicioğlu et al. 2014 [40]	Manisa	2007-2012 Hospital records	State hospital	N= 19781 CS: 8463		Yes: 6/8 Not applicable 2/8
Hacısalihoğlu et al. 2009[41]	İstanbul	2008 Hospital records	Training and research hospital	N= 1579 CS: 593 Primary CS: 123 Age Mean (SD): 28.3 ± 5.5	Previous CS: 264 Fetal distress: 110 CPD: 67 Presentation and position abnormalities: 53 Maternal systemic diseases : 14	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
İnal et al. 2017 [42]	Konya	2010-2015 Hospital records	Training and research hospital	N= 24283 CS: 10437 Primary CS: 5157 Age Mean (SD): 28.6 ± 4.8	Other: 77 Previous CS: 5168 Fetal distress: 1307 Presentation and position abnormalities: 787 Fetal macrosomia: 380 Non-progressive/prolonged labor: 889 Placenta anomalies: 246 Multiple pregnancy: 420 Maternal systemic diseases : 411 Other: 741 Elective CS (Mother's request): 88	Yes: 6/8 Not applicable 2/8
İşgüder et al. 2017 [43]	Tokat	2014-2016 Hospital records	University hospital	N= 2802 CS: 2056 Age Mean (SD): 28.3 ± 5.8	Previous CS: 1225 Fetal distress: 159 CPD: 118 Presentation and position abnormalities: 238 Fetal macrosomia: 30 Non-progressive/prolonged labor: 72 Placenta anomalies: 59 Multiple pregnancy: 75 Maternal systemic diseases : 62 Other: 18	Yes: 6/8 Not applicable 2/8
Kara et al. 2009 [44]	Ağrı	2008 Hospital records	State hospital	N= 3092 CS: 420 Age Mean (SD): 27.6 ± 6.1	Previous CS: 104 Fetal distress: 143 CPD: 88 Non-progressive/prolonged labor: 56 Other: 29	Yes: 6/8 Not applicable 2/8
Karaalp et al. 2013 [45]	İstanbul	2011 Hospital records	Training and research hospital	N= 2681 CS: 1370	Previous CS: 616 Fetal distress: 183 CPD: 270 Presentation and position abnormalities: 96 Non-progressive/prolonged labor: 48 Placenta anomalies: 23 Multiple pregnancy: 31	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
					Maternal systemic diseases : 36 Other: 46	
Kıyak et al. 2019 [46]	İstanbul	2015-2019-June Hospital records	Training and research hospital	N= 57404 CS: 24240	**Robson 10-Group Classification** 1. Nulliparous, single, cephalic presentation, ≥37 weeks, spontaneous labor: 2979/12400 2. Nulliparous, single, cephalic presentation, ≥37 weeks, induced labor: 433/849 3. Multiparous (excl. previous cesareans), single, head presentation, ≥37 weeks, spontaneous labor: 2717/21979 4. Multiparous (excluding previous cesareans), single, cephalic presentation, ≥37 weeks, induced or cesarean before labor: 218/494 5. Previous cesarean, single, cephalic presentation, ≥37 weeks:11273/11270 6. All nulliparous breech presentations: 536/554 7. All multiparous breech presentations (including previous cesareans): 406/458 8. All multiple pregnancies (including previous cesareans): 1333/1540 9. All transverse oblique lies (including previous cesareans) : 44/45 10. All single cephalic presentations, ≤36 weeks (including previous cesareans: 4321/7313	Yes: 6/8 Not applicable 2/8
Koçer et al. 2014 [47]	İstanbul	2011 Hospital records	Training and research hospital	N= 3996 CS: 1499	Previous CS: 955 Fetal distress: 152 Presentation and position abnormalities: 85 Fetal macrosomia: 103 Non-progressive/prolonged labor: 126 Placenta anomalies: 11 Maternal systemic diseases : 30 Other: 36	Yes: 6/8 Not applicable 2/8
Köse et al.	İzmir	2007-2017	University	Primary CS:2848	Fetal distress: 648	Yes: 6/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
2018 [29]		Hospital records	hospital	Age Mean (SD): 29.2 ± 5.3	CPD: 795 Presentation and position abnormalities: 588 Fetal macrosomia: 239 Non-progressive/prolonged labor: 387 Placenta anomalies: 104 Multiple pregnancy: 273 Maternal systemic diseases : 179 Other: 164	Not applicable 2/8
Küçükbaş et al. 2016 [48]	Ankara	2010-2014 Hospital records	Training and research hospital	N= 64154 CS: 23200	Previous CS: 11815 Fetal distress: 3199 CPD: 3831 Presentation and position abnormalities: 2146 Fetal macrosomia: 468 Non-progressive/prolonged labor: 737 Other: 171	Yes: 6/8 Not applicable 2/8
Mutlu et al. 2013 [49]	Elazığ	2009-2012 Hospital records	Training and research hospital	N= 13874 CS: 6154 Age Mean (SD): 27.9 ± 5.9	Previous CS: 2391 Fetal distress: 1125 CPD: 1067 Presentation and position abnormalities: 387 Fetal macrosomia: 123 Other: 276	Yes: 6/8 Not applicable 2/8
Özer et al. 2016 [50]	Kahraman maraş	2009-2015 Hospital records	State hospital	N= 6535 CS: 1339 Primary CS: 462 Age Mean (SD): 26.7 ± 6.0		Yes: 6/8 Not applicable 2/8
Şimşek et al. 2012 [51]	Ankara	2006-2008 Hospital records	Training and research hospital	N= 20302 CS: 8235 Age Mean (SD): 29.1 ± 5.4	Previous CS: 3018 Fetal distress: 1825 Presentation and position abnormalities: 763 Non-progressive/prolonged labor: 1414 Placenta anomalies: 138 Maternal systemic diseases : 134 Other: 943	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
Toklucu et al. 2019 [52]	İstanbul	2017-2018 Hospital records	Training and research hospital	N= 3276 CS: 1047	**Robson 10-Group Classification** 1. Nulliparous, single, cephalic presentation, ≥37 weeks, spontaneous labor:191/885 2. Nulliparous, single, cephalic presentation, ≥37 weeks, induced labor: 15/31 3. Multiparous (excl. previous cesareans), single, head presentation, ≥37 weeks, spontaneous labor: 108/1525 4. Multiparous (excluding previous cesareans), single, cephalic presentation, ≥37 weeks, induced or cesarean before labor: 6/36 5. Previous cesarean, single, cephalic presentation, ≥37 weeks: 478/482 6. All nulliparous breech presentations :15/15 7. All multiparous breech presentations (including previous cesareans): 13/14 8. All multiple pregnancies (including previous cesareans): 16/20 9. All transverse oblique lies (including previous cesareans): 3/3 10. All single cephalic presentations, ≤36 weeks (including previous cesareans): 30/73	Yes: 6/8 Not applicable 2/8
Töz et al. 2011 [53]	İzmir	2006-2011-July Hospital records	Training and research hospital	N= 33183 CS: 17115	Previous CS: 7384 Fetal distress: 1678 CPD: 1487 Presentation and position abnormalities: 1377 Non-progressive/prolonged labor: 2051 Other: 2693	Yes: 6/8 Not applicable 2/8
Uzunçakmak et al. 2013 [54]	İstanbul	2005-2012 Hospital records	Training and research hospital	N= 6840 CS: 2858 Age Mean (SD): 28.8 ± 5.7	Previous CS: 1352 Fetal distress: 447 CPD: 334 Presentation and position abnormalities: 120 Fetal macrosomia: 103	Yes: 6/8 Not applicable 2/8

Study (years)	City	Data collection year / Data source	Study field	Sample characteristics	Indications for CS / Cases	Quality assessment score
Yapça et al. 2015 [55]	Yozgat	2011-2013 Hospital records	State hospital	N= 3184 CS: 851 Primary CS: 335 Age Mean (SD): 27.3 ± 5.5	Non-progressive/prolonged labor: 160 Placenta anomalies: 34 Maternal systemic diseases : 89 Other: 51 Previous CS: 516 Fetal distress: 83 CPD: 41 Presentation and position abnormalities: 87 Fetal macrosomia: 59 Non-progressive/prolonged labor: 21 Multiple pregnancy: 16 Maternal systemic diseases : 16 Other: 12	Yes: 6/8 Not applicable 2/8

aCS Ceserean section
bCPD Cephalopelvic disproportion

3. RESULTS

3.1 Searching Results

In the first stage of the scan, 18,830 records were obtained. After repetitions were removed and a selection was made on the basis of headings and abstracts, the full texts of 48 studies were accessed as possible candidates for inclusion in our review. The full texts of the studies were examined and 31 cross-sectional articles published in Turkey in English (10) and Turkish (21) reporting on cesarean rates and/or indications were included in this systematic review and meta-analysis (Fig. 1).

3.2 Characteristics of the Studies

Two of the articles (2/31) included in the systematic review and meta-analysis were theses [25,26]. The studies had been conducted in 2008-2019 and published in 2008-2019. The interval between the time the data had been compiled for the studies and their publication date was an average of 1.83 years (range: 0-6 years). There was one study however that did not indicate the year in which the data had been collected [27]. The studies had been conducted in 16 different provinces and seven regions of Turkey. It was noted that the data in all of the studies had been collected from hospital records. The sample size of the studies varied between 238 – 125.816. The range of ages of the participating women was 13-51 years. Two of the studies reported only on primary cesarean rates [28,29] and 29 on total cesarean rates [25,26,27,30-55]. Twenty-seven of the studies reported on cesarean indications [26-29,30-33,35-45,47-51,53-55]; four used the Robson Ten-Group Classification system (on total cesarean rates [25,34,46,52] and 2 studies did not report any indications [40,50]. Of the total of 31 studies included in this systematic review, 17 were conducted in training/research hospitals [26-28,35,37,39,41,42,45-49,51-54], eight in public hospitals [30,31,34,36,40,44,50,55], and six at university hospitals [25,29,32,33,38,43] (Table 2).

3.3 Quality Assessment Results of the Studies

The results of the quality assessment of the articles carried out with the IJB Critical Appraisal Checklist for Analytical Cross-sectional Studies indicated that all of the studies met six of the eight criteria. Two criteria were deemed to be inapplicable to any of the studies. These were: 1) were any confounding/contributing factors defined? and 2) Were any strategies specified to manage the confounding factors? Since this study related to the examination of cesarean rates and indications, the criteria by their nature did not apply to the expected outcomes.

3.4 Cesarean Rates

In twenty-nine of the studies included in this systematic review and meta-analysis, data were reported on total cesarean rates [25,26,30-55]. The estimate based on the meta-analysis results arising from the data collected in the studies indicated a total cesarean rate of 43% (95% CI: 0.39-0.47; *P*< .001). It was seen furthermore that eight studies revealed data on primary cesarean rates [29,35,37,41,42, 46, 50, 55]. According to the pooled results of the studies, the estimated primary cesarean rate was found to be 26% (95% CI: 0.12-0.47; *P*= .028).

When the cesarean rates were examined according to the change by year, it was seen that there were 15 studies conducted between 2008-2010 [26,32,33,36,38-42,44,48,49,51,53,54]. In the meta-analysis performed on the basis of the results of these studies, it was observed that the cesarean rate during the period 2008-2010 was 41% (95% CI: 0.39-0.43; *P*< .001). Moreover, there were 12 studies referring to data collected between 2011-2013 [30,31,37,40,42,45,47,48,49,53-55], 7 studies conducted over the period 2014-2016 [25,35,37,42,43,46,48] and one study reporting data from 2017-2019 [46]. The meta-analysis results revealed that the cesarean rates over the period 2011-2013 was 40% (95% CI: 0.38-0.43; *P*< .001), 43% (95% CI: 0.37-0.49; *P*= .032) over 2014-2016 and 43% (95% CI: 0.41-0.46; *P*< .001) over the period 2017-2019 (Table 2).

In the examination of cesarean rates by geographical region, it was found that nine studies had been conducted in the Marmara Region [27,38,39,41,45-47,52,54], three had been conducted in the Aegean Region [31,40,53], one in the Mediterranean Region [50], 11 in Central Anatolia [25,26,30,33,35,36,42,43,48,51,55], two in the Black Sea Region [32,37], two in the Eastern Anatolian Region [44, 49], and one in the Southeastern Anatolian Region of the country [34]. According to the pooled results of these studies, the cesarean rate in the Marmara

Region was 47% (95% CI: 0.41-0.53; *P*= .275), 48% in the Aegean Region (95% CI: 0.41-0.55; *P*= .587), 21% in the Mediterranean Region (95% CI: 0.19-0.22; *P*< .001), 47% in the Central Anatolian Region (95% CI: 0.41-0.52; *P*= .253), 60% in the Black Sea Region (95% CI: 0.32-0.82; *P*= .507), 26% in the Eastern Anatolian Region (95% CI: 0.06-0.64; *P*= .201) and 26% in the Southeastern Anatolian Region (95% CI: 0.26-0.26; *P*< .001) (Table 2).

When the structural features of the hospitals where the deliveries took place were considered, it was seen that 17 were conducted in training and research hospitals [26-28,35,37,39,41,42,45-49,51-54], eight in public hospitals [30,31,34,36,40,44,50,55], and six at university hospitals [25,29,32,33,38,43]. The meta-analysis results showed that the cesarean rate at training and research hospitals was 42% (95% CI: 0.39-0.45; *P*< .001), 29% at state hospitals (95% CI: 0.23-0.37; *P*< .001 and 69% at university hospitals (95% CI: 0.60-0.76; *P*< .001) (Table 2).

3.5 Cesarean Indications

The indications reported in the studies included in the meta-analysis were collected under 11 headings. The rate of frequency of the indications were, in order: having previously undergone a cesarean section (22 studies: [25,26,30-33,36-39,41-45,47-49,51,53-55], fetal distress (26 studies: [25-33,35-39,41-45,47-49,51,53-55], cephalopelvic disproportion (22 studies: [25,26,28-33,35-39,41,43-45,48,49,53-55], presentation ve position abnormalities (25 studies: [25-33,35-39,41-43,45,47-49,51,53-55], non-progressive/prolonged labor (20 studies: [25-31,35-37,42- 45,47,48,51,53-55], fetal macrosomia (18 studies: [25-31,35-37,39,42,43,47-49,54,55], multiple pregnancy (14 studies: [25,27,29-33,35-37,42,43,45,55], systemic diseases of the mother (18 studies: [25-27,29-31,33,35-37,41-43,45,47,51,54,55], placenta anomalies (18 studies: [25-31,33,35-38,42,43,45,47,51,54] and other (25 studies: [25-33,35-38,41-45,47-49,51,53-55]. In the meta-analysis of these studies, the estimated rates for the indications reported for the total of cesarean births were 46% (95% CI: 0.43-0.50; *P*= .051) for previous cesarean section surgery, 19% (95% CI: 0.15-0.23; *P*< .001) for fetal distress, 14% (95% CI: 0.11-0.19; *P*< .001) for cephalopelvic disproportion, 9% (95% CI: 0.08-0.11; *P*< .001) for presentation and position abnormalities, 8% (95% CI: 0.06-0.10; *P*< .001) for nonprogressive/prolonged labor, 4% (%95 CI:

0.03-0.05; *P*< .001) for fetal macrosomia, 4% (%95 CI: 0.02-0.07; *P*< .001) for multiple pregnancy, 3% (95% CI: 0.02-0.04; *P*< .001) for systemic diseases of the mother, 2% (95% CI: 0.02-0.03; *P*< .001) for placenta anomalies, and 5% (95% CI: 0.03-0.08; *P*< .001) for other indications. Another four studies reported elective cesareans (mother's choice) as an indication [25,33,38,42] and the estimated rate for this indication was 3% (95% CI: 0.01-0.41; *P*= .029). Out of these indications, only the overall effect value of previous cesarean surgery was not statistically significant (Table 3).

It was observed that four studies included in the systematic review reported cesarean indications according to the Robson 10-Group Classification System [25,34,46,52]. The estimated rates reported according to this classification system in the meta-analysis were found to be: for Group 1 (nullipara, single, head presentation, ≥37 weeks, spontaneous labor), 11% (95% 0.07-0.31; *P*< .001); Group 2 (nullipara, single, head presentation, ≥37 weeks, induced), 52% (95% CI: 0.47-0.58; *P*= .431); Group 3 (multipara, no previous cesarean, single, head presentation, ≥37 weeks, spontaneous labor), 6% (95% CI: 0.02-0.16; *P*< .001); Group 4 (multipara, no previous cesarean, single, head presentation, ≥37 weeks, induced), 43% (95% CI: 0.19-0.72; *P*= .648); Group 5 (previous cesarean, single, head presentation, ≥37 weeks), 99% (95% CI: 0.99-0.99; *P*< .001); Group 6 (all nulliparae, breech presentation), 97% (95% 0.96-0.98; *P*< .001); Group 7 (all multiparae, breech presentation, previous cesareans included), 90% (95% CI: 0.88-0.92; *P*< .001); Group 8 (all multiple pregnancies, including previous cesareans), 87% (95% CI: 0.86-0.88; *P*< .001); Group 9 (all transverse-obliques, previous cesareans included), 97% (95% CI: 0.75-0.98; *P*= 0.005) and Group 10 (all singles, head presentations, ≤36 weeks, previous cesareans included), 56% (95% CI: 0.37-0.73; *P*= .551). The overall effect calculated for Groups 1, 3 and 5-7 10 were statistically significant (Table 4).

4. DISCUSSION

Thirty-one studies that reported cesarean rates and indications in Turkey were analyzed in this systematic review. The studies contained data on a total of 479.440 births and 177.484 of these were cesarean section deliveries. Based on the data from these studies, the meta-analysis presents results pertaining to total and primary cesarean rates, cesarean indications, the

Table 2. Meta-analysis results of related to cesarean section delivery rates

Variables	Number of Studies	Cesarean section / Total sample size	Odds Ratio (%95 CI)	Heterogeneity			Test for overall effect
				Tau^2	Chi^2 / df / P	I^2	Z / P
Cesarean section rate	29 [25, 26, 30-55]	177484/479438	0.43 (0.39-0.47)	0.19	17608.72/28/<.001	99.84	-3.57/<.001
Primary cesarean section rate	8 [29, 35, 37, 41, 42, 46, 50, 55]	36357/11434	0.26 (0.12-0.47)	1.90	13846.07/7/<.001	99.95	-2.19/.028
[a]CS rate data grouped according to years							
2008-2010	15 [26, 32, 33, 36, 38-42, 44, 48, 49, 51, 53, 54]	63450/154204	0.41 (0.39-0.43)	0.005	119.96/26/<.001	98.33	-8.73/<.001
2011-2013	12 [30, 31, 37, 40, 42, 45, 47, 48, 49, 53-55]	37155/91955	0.40 (0.38-0.43)	0.007	105.72/20/<.001	98.18	-8.01/<.001
2014-2016	7 [25, 35, 37, 42, 43, 46, 48]	28976/67797	0.43 (0.37-0.49)	0.05	561.84/13/<.001	99.64	-2.21/.032
2017-2019	1 [46].	12444/29337	0.43 (0.41-0.46)	0.008	36.30/2/<.001	94.49	-5.42/<.001
[b]CS rates according to hospitals							
Training and research hospitals	17 [26- 28, 35, 37, 39, 41, 42, 45-49, 51-54]	122604/299720	0.42 (0.39-0.45)	0.06	3521.64/16/<.001	99.57	-5.28/<.001
State hospital	9 [30, 31, 34, 36, 40, 44, 50, 55]	47985/169443	0.29 (0.23-0.37)	0.24	3681.36/8/<.001	99.81	-5.12/<.001
University hospital	5 [25, 29, 32, 33, 38, 43]	6895/10275	0.69 (0.60-0.76)	0.19	325.96/4/<.001	98.77	3.98/<.001
CS rates according to geographical region							
Marmara Region	9 [27, 38, 39, 41, 45-47, 52, 54]	86008/93264	0.47 (0.41-0.53)	0.11	794.42/8/<.001	98.99	-1.08/.275
Aegean Region	3 [31, 40, 53]	26442/54688	0.48 (0.41-0.55)	0.06	384.78/2/<.001	99.48	-0.54/.587
Mediterranean Region	1 [50]	1339/6535	0.21 (0.19-0.22)	0.00	0.00/ 0/1.000	0.00	-44.24/<.001
Central Anatolia	11 [25, 26, 30, 33, 35, 36, 42, 43, 48, 51, 55],	53680/133885	0.47 (0.41-0.52)	0.16	3502.56/10/<.001	9.71	-1.15/.253
Black Sea Region	2 [32, 37]	6124/13093	0.60 (0.32-0.82)	0.69	203.50/1/<.001	99.51	0.66/.507
Eastern Anatolian Region	2 [44, 49]	6574/16966	0.26 (0.06-0.64)	1.40	889.11/1/<.001	99.89	-1.27/.201
Southeastern Anatolian Region	1 [34]	32708/125816	0.26 (0.26-0.26)	0.00	0.00/0/1.000	0.00	-62.76/<.001

[a] *CS Ceserean section*

[b] *There has been an increase in the number of studies, as the cesarean rate by years was calculated taking into account the dates announced in the studies*

Table 3. Meta-analysis results of related to cesarean section indications

Cesarean section indications	Number of Studies	Cesarean section/ Total sample size	Odds Ratio (%95 CI)	Heterogeneity			Test for overall effect
				Tau²	Chi² /df/*P*	I²	*Z/P*
Previous cesarean section	22 [25, 26, 30-33, 36-39, 41-45, 47-49, 51, 53-55]	48554/107392	0.46 (0.43-0.50)	0.12	2643.15/21/<.001	99.21	-1.95/.051
Fetal distress	26 [25-33, 35-39, 41-45, 47-49, 51, 53-55],	21795/21825	0.19 (0.15-0.23)	0.37	5624.04/25/<.001	99.56	-12.24/<.001
Cephalopelvic disproportion	22 [25, 26, 28-33, 35-39, 41, 43- 45, 48, 49, 53-55]	14417/94419	0.14 (0.11-0.19)	0.64	5846.26/21/<.001	99.64	-10.36/<.001
Presentation and position abnormalities	25 [25-33, 35-39, 41-43, 45, 47-49, 51, 53-55]	10992/123085	0.09 (0.08-0.11)	0.18	1579.87/24/<.001	98.48	-26.13/<.001
Non-progressive/prolonged labor	20 [25-31, 35-37, 42- 45, 47, 48, 51, 53-55]	9357/95949	0.08 (0.06-0.10)	0.57	3898.53/19/<.001	99.51	-14.58/<.001
Fetal macrosomia	18 [25-31, 35-37, 39, 42, 43, 47-49, 54, 55]	3878/92410	0.04 (0.03-0.05)	0.39	1217.93/17/<.001	98.61	-21.33/<.001
Multiple pregnancy	14 [25, 27, 29-33, 35-37, 42, 43, 45, 55]	1488/33005	0.04 (0.02-0.07)	0.98	1124.65/13/<.001	98.84	-1181/<.001
Maternal systemic diseases	18 [25-27, 29-31, 33, 35-37, 41-43, 45, 47, 51, 54, 55]	1564/46180	0.03 (0.02-0.04)	1.11	1385.27/17/<.001	98.77	-14.29/<.001
Placenta anomalies	18 [25-31, 33, 35-38, 42, 43, 45, 47, 51, 54]	2898/71430	0.02 (0.02-0.03)	0.52	627.98/17/<.001	97.29	-21.21/<.001
Elective cesarean section (Mother's request)	4 [25, 34, 46, 52].	853/14710	0.03 (0.01-0.41)	9.47	2023.67/3/<.001	99.85	-2.18/.029
[a]Other	25 [25-33, 35-38, 41-45, 47-49, 51, 53-55].	8118/106058	0.05 (0.03-0.08)	1.35	7176.51/24/<.001	99.67	-12.44/<.001

[a]*The studies did not specify what the others were*

Table 4. Meta-analysis results of related to cesarean section indications according to Robson 10-Group Classification System

Robson 10-Group Classification	Number of studies	Cesarean section / Total sample size	Odds Ratio (%95 CI)	Heterogeneity			Test for overall effect
				Tau^2	Chi^2 / df / *P*	I^2	Z / *P*
1. Nulliparous, single, cephalic presentation, ≥37 weeks, spontaneous labor	4 [25, 34, 46, 52]	4785/34236	0.11 (0.07-0.31)	0.79	1617.50/3/<.001	99.81	-3.76/<.001
2. Nulliparous, single, cephalic presentation, ≥37 weeks, induced labor	4 [25, 34, 46, 52]	2386/4672	0.52 (0.47-0.58)	0.04	29.89/3/<.001	89.96	0.80/.431
3. Multiparous (excl. previous cesareans), single, head presentation, ≥37 weeks, spontaneous labor	4 [25, 34, 46, 52]	4355/78531	0.06 (0.02-0.16)	1.17	2333.35/3/<.001	99.87	-4.98/<.001
4. Multiparous (excluding previous cesareans), single, cephalic presentation, ≥37 weeks, induced or cesarean before labor	4 [25, 34, 46, 52]	2960/15258	0.43 (0.19-0.72)	1.44	387.66/3/<.001	99.23	-0.45/.648
5. Previous cesarean, single, cephalic presentation, ≥37 weeks	4 [25, 34, 46, 52]	27537/27561	0.99 (0.99-0.99)	0.30	10.71/3/.011	71.98	17.24/<.001
6. All nulliparous breech presentations	4 [25, 34, 46, 52]	2428/2499	0.97 (0.96-0.98)	0.00	2.90/3/.405	0.00	29.23/<.001
7. All multiparous breech presentations (including previous cesareans)	4 [25, 34, 46, 52]	2511/2774	0.90 (0.88-0.92)	0.02	4.17/3/.243	28.04	34.59/<.001
8. All multiple pregnancies (including previous cesareans)	4 [25, 34, 46, 52]	3500/4016	0.87 (0.86-0.88)	0.00	3.77/3/.288	20.35	40.52/<.001
9. All transverse oblique lies (including previous cesareans)	4 [25, 34, 46, 52]	683/686	0.97 (0.75-0.98)	4.52	13.79/3/.003	78.25	2.84/.005
10. All single cephalic presentations, ≤36 weeks (including previous cesareans)	4 [25, 34, 46, 52]	6797/14981	0.56 (0.37-0.73)	0.58	1047.64/3/<.001	99.71	0.60/.551

grouping of cesarean indications according to the Robson Ten-Group Classification System, and the distribution of cesarean rates by years, types of hospital and regions of the country. The results are significant in terms of exhibiting a comprehensive summary of national data.

It was seen in the study that total (43%) and primary (26%) cesarean rates were much higher and on an increasing trend over the years compared to the rates recommended by WHO (10%-15%) [15]. It was further observed that while the data announced in the Annual Health Statistics published by the Turkish Ministry of Health displayed a rapidly increasing cesarean birth rate trend that stood at 21% in 2002, in 2018 this rate had risen to 54.9%, pushing Turkey up to the first ranks in this category among the countries of the OECD [5]. In a systematic review by Betran et al. in which the authors determined optimum cesarean rates by population, it was reported that the rate varied between 9%-16% and that developing and highly populated countries were showing an increasingly rising trend in this respect [56]. Again, some other studies have reported cesarean rates of 31% in Thailand, 41% in Ecuador, 31% in the U.S. and 35% in China [57-60]. These results clearly point to high cesarean rates and to the rapid increase of cesarean births in Turkey. Among the underlying reasons reported for the continuous increase of cesarean rates in Turkey have been the increase in malpractice suits, the convenience offered to mothers and obstetricians at private hospitals, the pressures placed on doctors by the performance system that has been adopted, resulting in the reduction in midwife-led births, the medicalization of childbirth, changes in women's perceptions and fears of normal childbirth, and the misconception that cesarean birth is safer for the baby [9,61].

The primary cesarean rate found in this systematic review (26%) is similar to the rate (26.3%) provided by the Annual Health Statistics of the Turkish Ministry of Health, but both rates are decidedly above the recommendation of the WHO [3,5]. Allen reported a 14.5% primary cesarean rate in the U.S. for 1996 and then a rise to 22% for 2014 [62]. Boyle et al. reported a primary cesarean rate of 31% for the U.S. High cesarean rates point to the increased possibility of more cesarean births [63]. This is significant because it further indicates that the increasing cesarean section trend in recent years is likely to continue. This information is also valuable

because it raises awareness about the steadily increasing rise in cesarean rates and calls attention to the fact that there is a need for evidence-based applications to generate a solution to the issue in line with the recommendations of WHO.

When the cesarean rates were examined by regions in this systematic review and meta-analysis, it was observed that the highest rate was in the Black Sea Region (60%) while the lowest rate was in the Mediterranean Region (21%). The data of the Turkish Ministry of Health however differs from these findings. The Ministry reports that the highest cesarean rate was in the Mediterranean Region (64%) and the lowest in the Eastern Anatolian Region (34%) [5]. The difference in the findings of the present study may perhaps be due to the unequal distribution of the articles included in the systematic review in terms of the data on the various regions. The number of studies conducted in some of the regions may have been relatively few.

The meta-analysis showed that cesarean birth rates at the university (69%) and training/research (42%) hospitals were noticeably higher than at the state hospitals (29%). This finding is consistent with the results of national data in Turkey [5]. The national rate is 39% in China and 29% in Pakistan [64,65]. The higher rates found in our study at the university and training/research hospitals may be due to the fact that these institutions have a higher admittance of high-risk pregnancies and that pregnant women of higher socio-economic status choose these hospitals for their elective cesarean deliveries.

The most frequently reported cesarean indications in this study were previous cesarean section surgeries, fetal distress, cephalopelvic disproportion, presentation and position abnormalities and nonprogressive/prolonged labor. Khatoun et al. found in their study where they examined the change in cesarean indications that the most commonly reported cesarean indications were non-progressive labor, fetal distress and previous cesareans [65]. There are other studies in the literature as well that report a different order of common cesarean indications [8,63-65]. It can be seen however that the studies included in the present review as well as other works in the literature do not reveal any data on systematic cesarean indication classification. It is because of this that a case may have been included in more than one

indication and could thus not be appropriately assessed. This presents a problem when it comes to deriving a definitive result from the actual indication rates. It is for this reason that a common approach needs to be devised in order to gather realistic results about cesarean indications over the years, by country and hospital. The correct and effective use of the Robson-10 Group Classification System, recommended by WHO and employed by more than 50 countries, including Turkey, may serve to produce a systematic cesarean indication resource.

We noted in our study that some women (3%) underwent elective cesarean section delivery. Studies conducted in other countries report an elective cesarean rate of 1%-9% [66]. In Norway, for example, where cesarean rates are low, the elective cesarean rate is reported as 5% [67]. Women's demand for cesarean-section delivery can result from a fear of childbirth, anxiety over the health of their baby, and a negative perception of childbirth [12,68]. On the other hand, in a systematic review by Oliman et al., it was asserted that maternal fears could not be associated with mode of delivery and that despite receiving counseling and education, women can still prefer to deliver by cesarean section [66].

In this systematic review and meta-analysis, the lowest cesarean indication rates according to the Robson 10-Group Classification System were in Group 1 (nullipara, single, head presentation, ≥37 weeks, spontaneous labor) and Group 3 (multipara, no previous cesarean, single, head presentation, ≥37 weeks, spontaneous labor). It is asserted in the literature that low rates in Groups 1 and 3 according to this classification system are significant in terms of reducing cesarean rates [31]. Our results are consistent with the literature. At the same time, the low cesarean rates in these groups may make a contribution to lowering primary cesarean rates.

4.1 Limitations of the Study

There were some limitations to our systematic review and meta-analysis. The first of these was that all of the data analyzed were obtained from the hospital records systems. The possible lack of a systematic approach to the records and the fact that record entries were made by different individuals may have affected the reliability of the data. The second limitation was that most of the cesarean indications in the studies reviewed had been recorded and reported according to

available diagnoses. Based on the results, it can be said that the meta-analysis results may differ from results that are based on the Robson 10-Group Classification System.

5. CONCLUSION

In this systematic review, the estimated total cesarean rates and primary cesarean rates in our country were found to be quite high compared to the acceptable cesarean rates of WHO. We saw that the cesarean rates varied according to geographical region, that they showed an increase in recent years, and that the rate was noticeably high in university and training/research hospitals. The study revealed that the most commonly reported cesarean indications were previous cesarean section surgeries, fetal distress, cephalopelvic disproportion, presentation and position abnormalities and nonprogressive/prolonged labor.

It might be recommended based on these findings that cesarean rates are reduced by focusing on evidence-based approaches to perinatal care and reorganizing and conducting healthcare services accordingly. In this context, it must be said that a multidisciplinary approach to childbirth should be developed in Turkey, whereby prenatal education, midwife-supported care, post-cesarean vaginal birth, late admittance to the delivery room, intrapartum mobilization and the use of vertical positions are adopted. Hospital administrations may improve their available services, meanwhile formulating policies and applications that can be used to monitor cesarean birth rates. Additionally, to obtain more qualitative and standardized data on cesarean indications, the use of current standardized recording systems can be made more widespread or a nationally standardized data recording system can be developed and employed. Another recommendation may be to suggest that programs be set up and tested to explore societal characteristics that may provide insight in the efforts to reduce cesarean rates. It is recommended to conduct research on the reasons for the increase in cesarean delivery in the future and the practices that should be done to reduce it.

CONSENT

Informed consent is not required for this type of study.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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