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Prevalence of Neonatal Birth Trauma in Iran: a Systematic Review and Meta-Analysis

Mehdi Shokri[1,2], Somayyeh Nayyeri[3], Neda Salimi[3], Abdollah Nourmohammadi[4], Asma Tarjoman[5], Milad Borji[4,6], *Gholamreza Kalvandi[7], Somayeh mahdikhani[8]

[1] Clinical Research Development, Imam Khomeini Hospital, Ilam University of Medical Sciences, Ilam, Iran.
[2] Assistant Professor of Pediatrics, Department of Pediatrics, Ilam University of Medical sciences, Ilam, Iran.
[3] Department of Nursing, School of Nursing and Midwifery, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
[4] School of Allied Medical Sciences, Ilam University of Medical sciences, Ilam, Iran.
[5] Student Research Committee, Ilam University of Medical Sciences, Ilam, Iran.
[6] Zoonotic Disease Research Center, Ilam University of Medical Sciences, Ilam, Iran.
[7] School of Allied Medical Sciences, Ilam University of Medical sciences, Ilam, Iran.
[7] Associate Professor of Pediatrics Gastroenterology, School of Medicine, Ilam University of Medical Sciences, Ilam, Iran.
[8] University & agrave; degli Studi & quot; La Sapienza & quot; di Roma, Public Health and Infectious Diseases, Undergraduate, Italy.

Abstract

Background: Due to the importance of neonatal health, this study was performed by systematic review and meta-analysis with the aim of determining the prevalence of birth trauma in neonates in Iran.

Methods: This systematic review and meta-analysis study was conducted according to the PRISMA's checklist items. This study reviewed the articles published in Iran between 2000 and the beginning of July 2020. In this article, PICO indicators were used. Search in national databases in Iran(Scientific Information Database (SID), Iran Medex, Mag Iran, Iran Doc) and international databases(Scopus, PubMed/Medline, Embase, Web of Science (ISI), Cinahl, ScienceDirect) with keywords: Infant, Newborn, Birth Injuries, trauma, was done. The search was performed by two researchers. Data were analyzed using CMA software

Results: In this systematic review and meta-analysis study the total sample size of neonates in 9 studied articles was 42327 neonates. Also 9 articles had the necessary criteria to enter this systematic review and meta-analysis. Also, the overall prevalence of Neonatal birth trauma is 2.7% (95% CI [1.3, 5.3]), the prevalence of asphyxia in infants is 0.03 % (95% CI [0.02- 0.04]), the prevalence of brachial plexus paralysis is congenital. In infants equal to 0.02% (95% CI [0.01- 0.06]), the prevalence of congenital fracture in infants equal to 0.03% (95% CI [0.01- 0.08]), the prevalence of congenital injury in infants was 0.02% (95% CI [0.00-0.75]) and the prevalence of soft tissue injury at birth in infants was 0.02 % (95% CI [0.02- 0.03]).

Conclusion: Due to the high prevalence of birth trauma in infants in Iran, therefore, interventions are recommended to reduce it. Further studies on the factors affecting it need to be done to appropriate interventions to reduce it.

Key Words: Birth Trauma, Meta-Analysis, Neonatal, Systematic Review, Trauma.

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**** Corresponding Author:***

Gholamreza Kalvandi, Associate Professor of Pediatrics Gastroenterology, School of Medicine, Ilam University of Medical Sciences, Ilam, Iran. Email: pezeshk1351@yahoo.com

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1- INTRODUCTION

There are different types of trauma and it can affect all age groups (1-3). Trauma can cause many problems for patients by causing harmful effects (4, 5). Birth trauma is an injury during delivery, during labor, or both of them that occurs to functional deterioration or structural damage (6). These injuries can be avoidable or unavoidable (7).

Types of trauma that affect newborns include fractures, soft tissue injuries, cephalohematoma, brachial plexus injury, suffocation, spontaneous intracranial hemorrhage, and nerve damage (8, 9). Factors causing infant trauma can be divided into 3 categories: factors related to infant, mother and medical team. Factors related to the baby include birth weight, baby's head circumference. mother related factors include the presence of mother's diseases such as diabetes, short or long term delivery, type of delivery (vaginal or cesarean section). Also, the experience and expertise of the treatment team and their fatigue can be mentioned as factors related to the medical staff (8, 10 and 11).

By improving medical science, the prevalence of birth trauma has decreased but this rate has not yet reached zero (12, 13), and the different prevalence of trauma at birth has also been reported (14, 15). Neonatal health is one of the most important tasks of the healthcare team (16, 17) for this reason, it is necessary to conduct extensive studies to determine the prevalence of factors affecting the health of this group (20-20).

2- OBJECTIVES

Due to the importance of neonatal health, this systematic review and meta-analysis study was performed with the aim of determining the prevalence of birth trauma in neonates in Iran.

3- METHODS

3-1. Study protocol

This systematic review and meta-analysis study was conducted according to the PRISMA's checklist items (43). This study reviewed the articles published in Iran between 2000 and the beginning of July 2020.

3-2. Eligibility Criteria

In this article, PICO indicators were used, each of which included the following (21):

p: Epidemiological studies in infant article

I: Birth Trauma

C: Asphyxia, brachial plexus paralysis, fracture, Brain hemorrhage, Face Injury, Soft tissue injury, cephalo hematoma, total BT

O: Report on the overall prevalence of birth trauma in Iranian infants

3-3. Included Studies

1-Original articles (Cross-sectional, cross-sectional and retrospective) that examined birth trauma in Iranian infants were inclusion, 2- Articles of the last 20 years

3-4. excluded Studies

1-Systematic review and meta-analysis articles, case reports, qualitative studies, 2-Articles with NON-Iranian sample, 3- Low quality studies and insufficient sample size, 4- Unrelated and repetitive studies were excluded.

3-5. Search strategy

Search in national databases in Iran(Scientific Information Database(SID), Iran Medex, Mag Iran, Iran Doc) and international databases (Scopus, PubMed / Medline, Embase, Web of Science (ISI), Cinahl, Science Direct) with keywords: Infant [Mesh], Newborn [Mesh], Birth trauma [Mesh], neonatal [Mesh], Birth Injuries [Mesh], trauma [Mesh], was done. An example of a search strategy is attached.

Search strategy:

(((((((Infant[Title/Abstract]) OR (Newborn[Title/Abstract])) OR (neonatal[Title/Abstract])) AND (Birth Injuries[Title/Abstract])) OR (trauma[Title/Abstract])) OR (Birth trauma[Title/Abstract])) OR (Injuries[Title/Abstract])) AND (iran[Title/Abstract])

3-6. Selection Process

In the first stage, all articles published with the affiliation of Iranian autores were searched, and then the study population was examined in them, and if it was done in the Iranian population, it was included in the study. Data extraction of articles was done independently by two researchers. If there was any difference between the opinions of the two authors, who had a degree in pediatrics and a nursing expert (they were a pediatrician and a nurse), the process of reviewing the article would be continued by a pediatric gastroenterologist. After studying the title and abstract of the searched articles, if the extracted article was related to the purpose of the research, the researchers would include it in the study and otherwise it would be excluded from the study. The search was conducted in Persian and English.

3-7. Data Extraction

in this study prepared a Checklist was with author name, year of publication, purpose, sampling method, rate of asphyxia, brachial plexus paralysis, fracture, Brain hemorrhage, Face Injury, Soft tissue injury, cephalo hematoma, total amount BT (**Table 1**).

3-8. Quality evaluation

In this study, the quality of the article was reported in 3 categories: low(less than 5 stars), medium (5–7 stars) and high (8–10 stars). A checklist was used to evaluate the quality of the articles on the Modified Newcastle-Ottawa scale. Low quality studies were deleted (44).

3-9. Statistical analysis

The normal distribution model was used to analyze the data. The weight of each study was inversely proportional to its variance. The heterogeneity among the studies was checked using the Q test and I2 index. Due to the significant heterogeneity among the studies, we used a random-effects model for meta-analysis. Meta-regression was used to explore the reasons for heterogeneity. The statistical analyses were performed inSTATA software, version. 11 (College Station, TX, USA)

4. RESULTS

In this systematic review and meta-analysis study the total sample size of neonates in 9 studied articles was 42327 neonates (**Table 1**).

4-1. Search results

In the initial search, 343 articles were extracted from international and national databases. After a primary review, the researchers found that the number of 189 articles in the searched databases was duplicate, which is why 154 articles entered the next stage. Then, the titles of the articles were studied and in this stage, 116 articles were excluded from the study. Then, in the next stage, after reviewing the implementation method and inclusion and exit criteria, 9 articles had the necessary criteria to enter this systematic review and meta-analysis.

4-2. Meta-analysis

According to the findings, the overall prevalence of Neonatal birth trauma is 2.7%, asphyxia in infants is 0.03% and brachial plexus paralysis is congenital. In infants prevalence congenital fracture 0.02%, congenital fracture in infants equal to 0.03%, Brain hemorrhage in infants equal to 0.01%, congenital injury in infants was 0.02 %, soft tissue injury at birth in infants was 0.02%, congenital cephalohematoma in infants was it was 0.07%.

Table-1: Characters of articles submitted to the systematic review and meta-analysis stage

-	Author(years)	City	Aim	Study population	asphyxia	brachial plexus paralysis	fracture	Brain hemorr hage	Face Injury	Soft tissue injury	cephalon hematoma	Result
1	Mosavat (2008) (22)	Rafsanjan	3340	cross-sectional	-	-	3(11.2)	-	-	10 (37.03)	10 (37.03)	27(0.8)
2	Borna (2010) (23)	Tehran	3596	cohort study	7(1.95)	13(3.62)	56(15.57)	1(0.28)	1 (0.28)	2(0.56)	77(21.41)	157(43.66)
3	Kalahroudi (2015) (13)	Kashan	7154	cross-sectional	27(0.38)	5(0.07)	7(0.09)	3(0.04)	4(0.05)	22(0.30)	92(1.28)	161(2.2)
4	Rezaie (2009) (24)	Yasuj	2005	cross-sectional	7(0.35)	7(0.35)	3(0.15)	-	89(43.41)	2(0.1)	21(1.05)	175(8.7)
5	Ghorashi (2005) (25)	Tabriz	7260		19 (17.6)	-	-	-	-	-	19 (17.6)	108(1.48)
6	Esmailpour (2005) (26)	Rasht	13117	Retrospective study	-	5(0.03)	51(0.38)	-	-	26(0.19)	27(0.2)	141(1.07)
7	Keshtkaran (2004) (27)	Fars	417	descriptive study	-	-	-	-	-	-	-	100(1.68)
8	Maharlouei (2018) (28)	Fars	2438	cohort study	-	-	-	7(0.28)	-	-	-	18(0.73)
9	Tehrani (2007) (11)	Tehran	3000	case-control	-	22(0.73)	28(0.93)	-	-	-	29(0.96)	79(2.63)
-	-	-	-	-	4	5	6	3	3	5	7	8

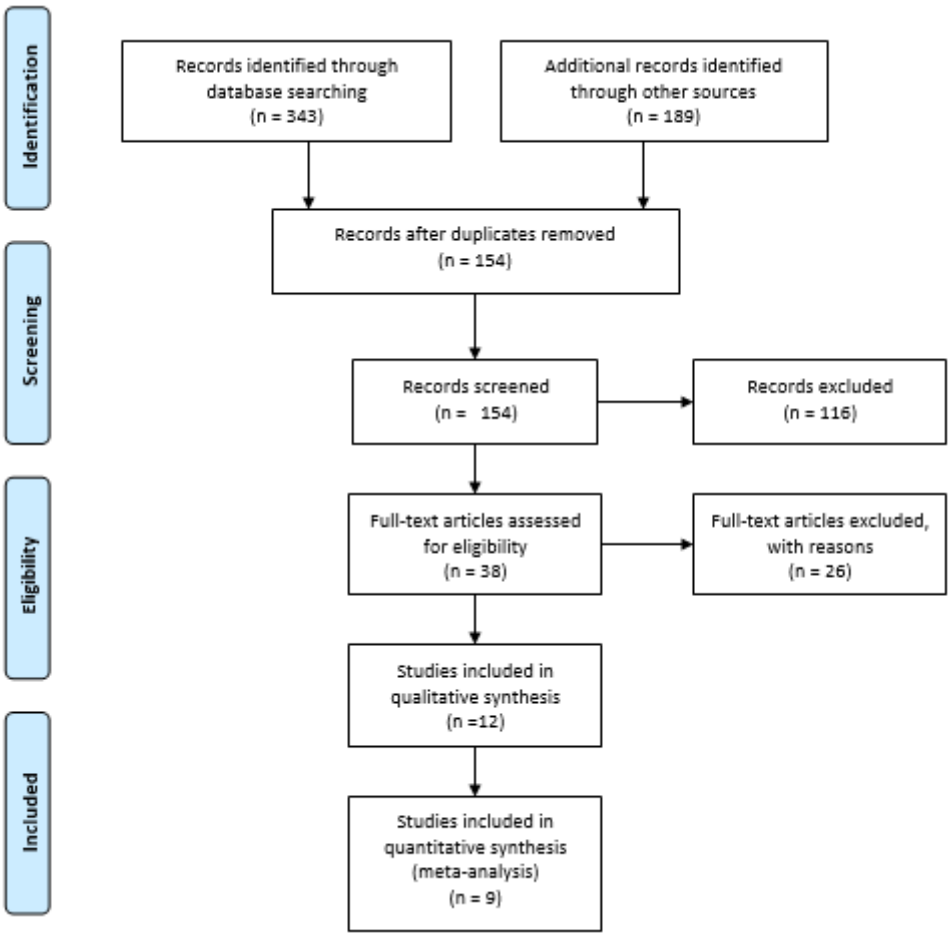

Fig. 1: Flowcharts for Systematic Review and Meta-Analysis

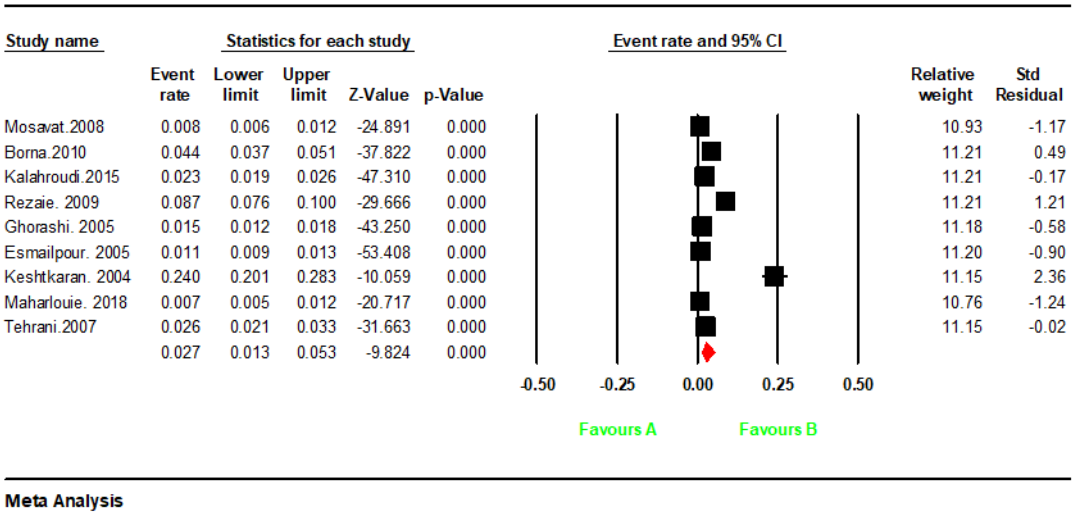

Fig. 2: Prevalence of overall Neonatal birth trauma in Iran between 2019 and 2020

According to the findings, the overall prevalence of birth trauma in infants was 2.7 (95% CI [1.3, 5.3]) (**Fig. 2**).

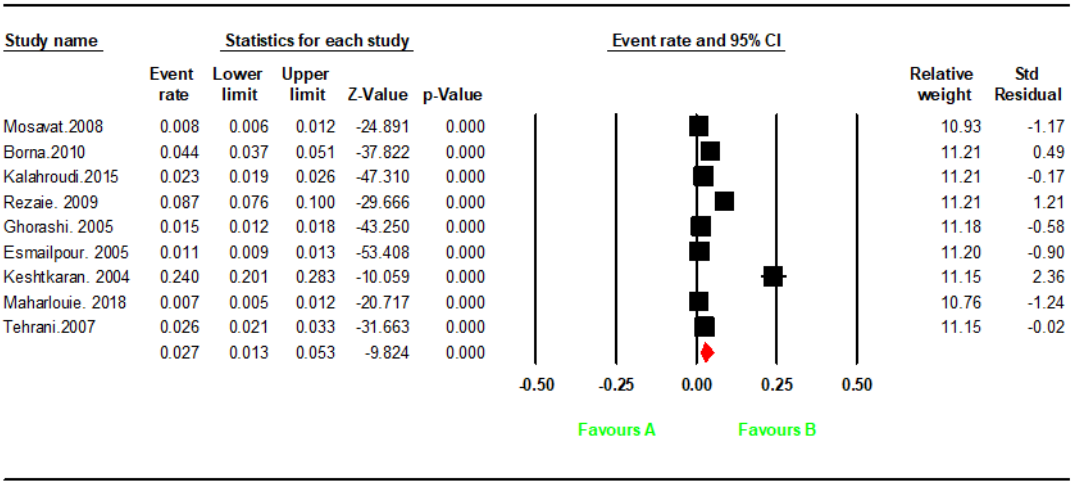

Fig. 3: funnel plot of studies for publication bias, Z=0.31 P=0.75

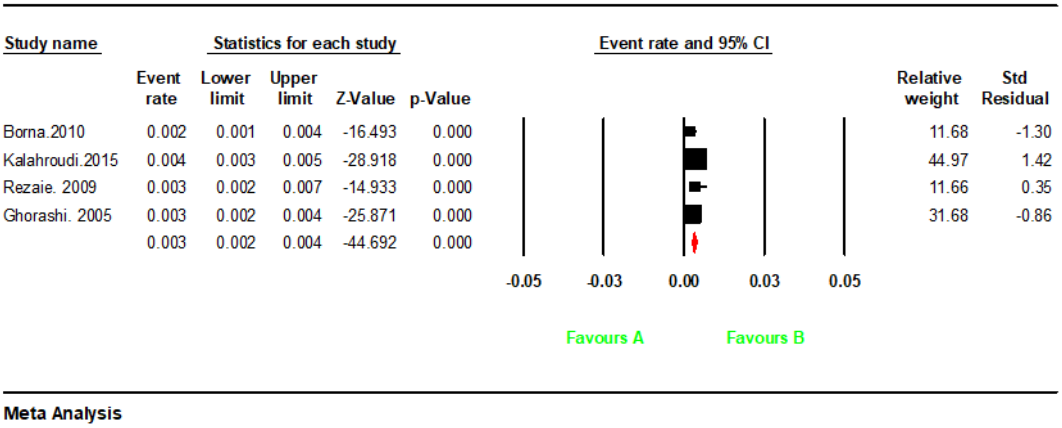

Fig. 4: prevalence of asphyxia in Neonatal trauma in Iran between 2019 and 2020

According to the findings, the prevalence of asphyxia at birth in infants was 0.03 (95% CI [0.02-0.04)) (**Fig. 4**).

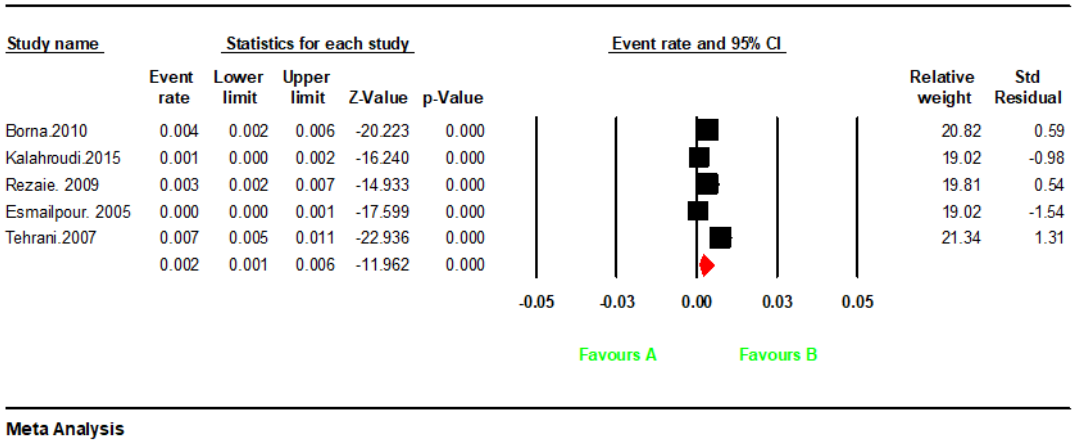

Fig. 5: brachial plexus paralysis trauma in Iran between 2019 and 2020

According to the findings, the prevalence of brachial plexus paralysis in infants at birth was 0.02 (95% CI [0.01- 0.06]) (**Fig. 5**).

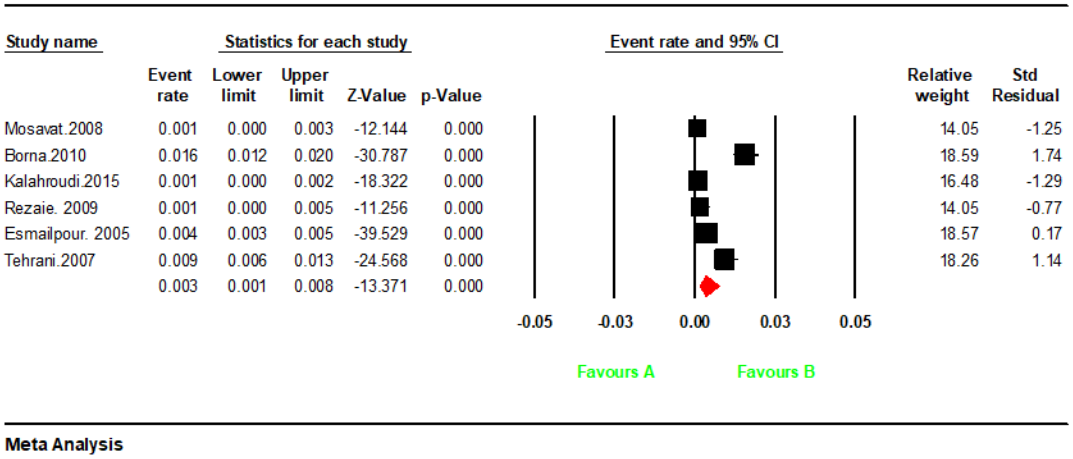

Fig. 6: prevalence of fracture trauma in Iran between 2019 and 2020

According to the findings, the prevalence of fracture at birth in infants was 0.03 (95% CI [0.01- 0.08]) (**Fig. 6**).

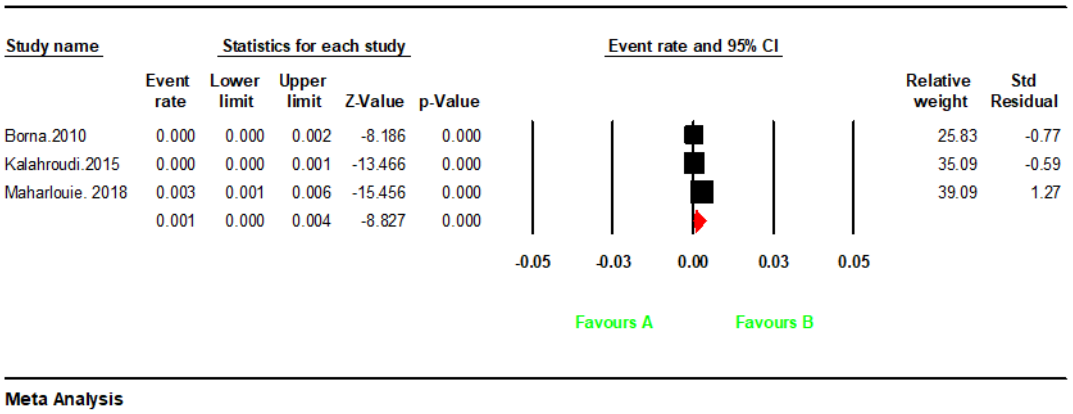

Fig. 7: prevalence of Brain hemorrhage trauma in Iran between 2019 and 2020

According to the findings, the prevalence of Brain hemorrhage at birth in infants was 0.01 (95% CI [0.01- 0.04]) (**Fig. 7**).

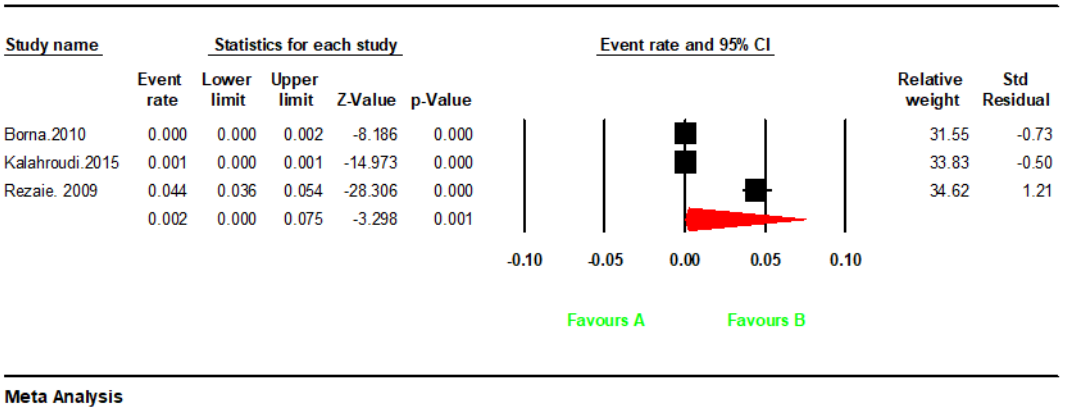

Fig. 8: prevalence of face injury trauma in Iran between 2019 and 2020

According to the findings, the prevalence of birth injuries in infants was 0.02 (95% CI [0.00- 0.75]) (**Fig. 8**).

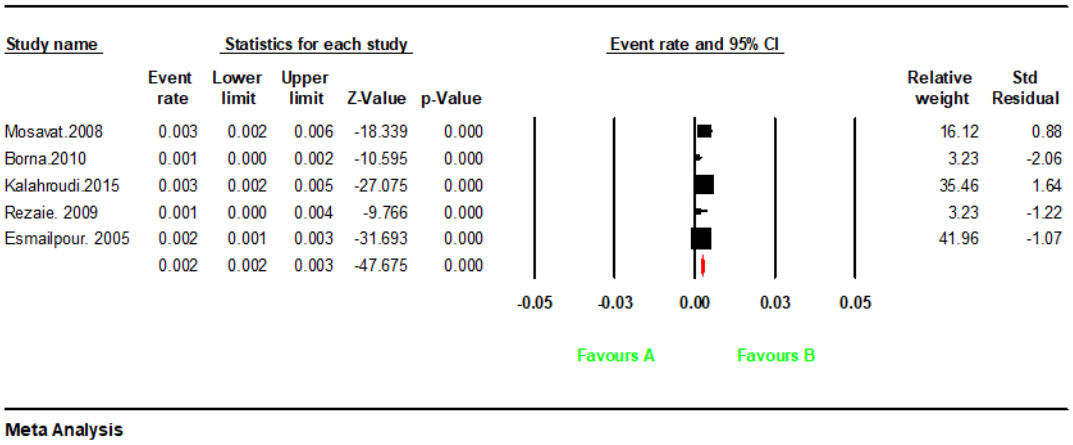

Fig. 9: prevalence of soft tissue injury trauma in Iran between 2019 and 2020

According to the findings, the prevalence of soft tissue injury at birth in infants was 0.02 (95% CI [0.02-0.03)) (**Fig. 9**).

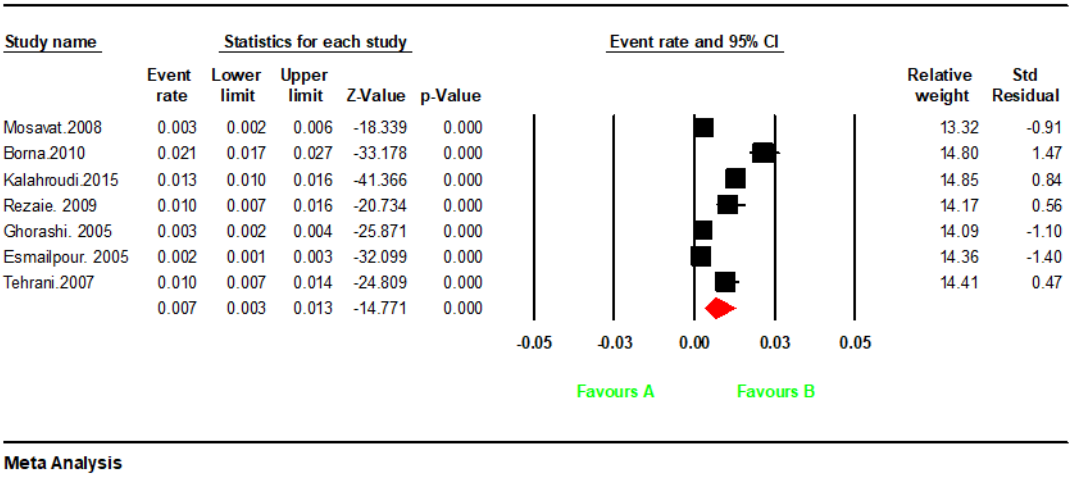

Fig. 10: prevalence of cephalohematoma trauma in Iran between 2019 and 2020

According to the findings, the prevalence of cephalohematoma at birth in infants was 0.07 (95% CI [0.03-0.13]) (**Fig. 10**).

5- DISCUSSION

The present study is the first study in the field of birth trauma in the neonatal group of Iran, which was conducted with the aim of determining the prevalence of Neonatal birth trauma in Iran by systematic review and meta-analysis. According to the findings, the overall prevalence of birth trauma in infants was 2.7% (95% CI [1.3, 5.3]). In the study by Hughes et al. (29), the overall prevalence of Neonatal birth trauma was 0.82% (9.5 per 1000 births).

In the study of Moczygemba et al. (30), the total Birth trauma rate was 25.85 per 1000 births and in the study of Ray et al. (31) it was shown that out of 4741 newborns, the rate of birth trauma was 15.4 per 1000 births. In a study by Leinweber et al., Which interviewed midwives, it was shown that 67.2% of the midwives in the study had observed at least one traumatic

event in the newborn (32), which can be attributed to differences in the type of sample method. Because in this article, the systematic review reported articles on birth trauma observed in infants, while in the article by Leinweber et al. (32), observations of midwifery staff were reported.

According to the findings, the prevalence of brachial plexus paralysis at birth in infants was 0.02% (95% CI [0.01- 0.06]). The study by Hughes et al. (30) was 5.1% and in the study by Okby et al. It was 1.62 per thousand infants (33). Causes of brachial plexus paralysis include fetal macrosomia, obesity and diabetes in mothers, as well as shoulder dystocia (33-35). In relation to other research objectives, it was shown that the prevalence of cephalohematoma at birth was 0.07% (95% CI [0.03-0.13]). In Hughes et al. (29) this rate was equal to 56.6% and in the study of Ray et al. (31) 13 cases in 4741 total cases of neonates and also in the study of Osinaike et al. It was equal to 14 (15.6) (36).

According to the findings, the prevalence of fracture at birth in infants was 0.03% (95% CI [0.01-0.08]), which in the study of Osinaike et al. Was 8 (8.9) (36). In relation to similar studies, we can refer to the study of Hughes et al. (29) where the prevalence of skull fracture was 2.9% and in the study of Ray et al. (31) the prevalence of skull injury was 0.51%. Also, in the study of Lam et al., It was shown that the prevalence of Clavicular fracture is 1.6% (37). Fracture can lead to stress and anxiety in parents and treatment staff, which factors such as infant weight, gestational diabetes, vacuum delivery and the experience and expertise of the treatment staff are effective in causing it (40-40).

According to the findings, the prevalence of asphyxia at birth in infants was 0.03% (95% CI [0.02-0.04)), which was 52 (38.8) in the study of Osinaike et al. (36). Also, in the study of Cavallin et al., Which examined 1019 neonates admitted to the Neonatal Intensive Care Unit (NICU) ward, it was shown that the prevalence of asphyxia in neonates was 178 (17.5%) (41). Regarding the prevalence of soft tissue injury at birth in infants, it was 0.02 (95% CI [0.02- 0.03]), which was equal to 0.59% in the study of Ray et al. (31). Attention to asphyxia and soft tissue injury in infants is so important that among infants with asphyxia, 15-20% of them died in infancy and about 25% of them had organ dysfunction (42).

6- STUDY LIMITATIONS

One of the limitations of this study is that in this study, Neonatal birth trauma was studied only in infants of Iran by systematic review and meta-analysis. For this reason, it is recommended that a global study be conducted on the prevalence of Neonatal birth trauma. These findings are also related to this study period and the last 20 years.

7- CONCLUSION

Due to the high prevalence of birth trauma in infants in Iran, therefore, interventions are recommended to reduce it. Due to the high prevalence of birth trauma in infants in Iran, therefore, interventions are recommended to reduce it. Further studies on the factors affecting it need to be done to appropriate interventions to reduce it.

8- ACKNOWLEDGMENTS

Student Research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran.

9- CONFLICT OF INTEREST

The authors declare no conflict of interest.

10. FINANCIAL DISCLOSURE

Student Research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran.

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