



# Risk factors of obstetrics third and fourth degree perineal tears: a systematic review

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UNIVERSITE JOSEPH FOURIER  
UFR DE MEDECINE DE GRENOBLE

**DÉPARTEMENT DE MAÏEUTIQUE**

**RISK FACTORS OF OBSTETRICS THIRD AND FOURTH DEGREE PERINEAL TEARS:  
A SYSTEMATIC REVIEW**

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Par Elie GOUDON  
Né le 30 mars 1991

En vue de l'obtention du Diplôme d'État de Sage-femme

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**Risk factors of obstetrics third and fourth degree perineal tears: a systematic review**

***Facteurs de risque de traumatisme périnéal de troisième et quatrième degré lors d'un accouchement par voie vaginale : revue systématique de la littérature***

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## **ABSTRACT**

**Background** Third and fourth degree tears occur in 0.5 to 8 % of vaginal birth, reaching 25 % for some authors. Perineal traumas are often associated to chronic pain, dyspareunia, sexual dissatisfaction and urinary and faecal incontinence. The objective of this review is to identify the risk factors of 3rd and 4th degree perineal traumas during vaginal birth. **Method** We searched MEDLINE, Sciencedirect, EBSCO Pascal, OvidSP, BDSP, Opengrey and Google Scholar. All trial exploring risk factors of 3rd and 4th degree (RCOG) or 2nd and 3rd (CNGOF) perineal trauma were explored. We used methods described in the Cochrane Handbook for Systematic Reviews of Interventions for carrying out data collection, assessing study quality and analysing results. One review author evaluated methodological quality, using a quality assessment scale. **Results** The most important risk factors of third and fourth perineal tears are instrumental deliveries, both forceps and vacuum, nulliparity, Asian ethnicity, shoulder dystocia, increase of birth weight and occipito-posterior presentations. Results are discordant concerning episiotomy, epidural analgesia and duration of second stage of labour. Gestational age, maternal age, labour induction and augmentation are not risk-factors for perineal lacerations. **Conclusion** A careful management of birth, including reducing instrumental deliveries, a restrictive use of medio-lateral episiotomy and a reduction of occipito-posterior presentations to occipito-anterior should be performed in at risk population. A prevention of foetal weight increase should also be done. Several tools - such as scores, perineal massages and warm compresses have shown efficiency to predict and reduce perineal tears and should be generalized.

**Keywords:** perineum [MeSH], perineum\injuries [MeSH], review literature [MeSH], obstetrics [MeSH]

## RÉSUMÉ

**Introduction** La fréquence des déchirures de troisième et quatrième degré se situe entre 0,5 et 8 %, atteignant 25 % pour certains auteurs. Ces déchirures sont associées à des douleurs constantes, des dyspareunies, une insatisfaction sexuelle et des incontinences aux gaz et aux selles. L'objectif de cette revue de la littérature est d'identifier les facteurs de risque obstétricaux de traumatisme de troisième et quatrième degré. **Méthode** Nous avons questionné MEDLINE, Sciencedirect, EBSCO Pascal, OvidSP, BDSP, Opengrey et Google Scholar. Toutes les études concernant les facteurs de risque de traumatisme périnéal de 3<sup>ème</sup> et 4<sup>ème</sup> (RCOG) ou 2<sup>ème</sup> et 3<sup>ème</sup> (CNGOF) degré ont été explorées. La méthode décrite dans le Cochrane Handbook for Systematic Reviews of Intervention a été utilisée pour la collecte des données, l'évaluation de la qualité méthodologique des études et l'analyse des résultats. **Résultats** Les principaux facteurs de risque sont les extractions instrumentales, forceps ou ventouse, la nulliparité, l'origine asiatique, la dystocie des épaules, l'augmentation du poids de naissance ainsi que les variétés de présentations postérieures. Les données sont discordantes pour l'épisiotomie, l'analgésie péridurale et la durée de la seconde phase du travail. L'âge gestationnel, l'âge maternel, l'induction et la direction du travail ne sont pas des facteurs de risque de traumatisme périnéal. **Conclusion** Une gestion prudente du travail, passant par un moindre recours aux extractions instrumentales, l'usage restrictif de l'épisiotomie et la réduction des variétés postérieures en variétés antérieurs, doit être préconisée pour les populations à risque. La prévention des poids de naissance élevés est aussi un élément important. Plusieurs outils, comme certains scores, le massage périnéal ou l'utilisation de compresses chaudes, ont montré leur efficacité à prédire et limiter les traumatismes périnéaux, et devraient être utilisés plus largement.

**Mots clefs** : périnée [MeSH], périnée/traumatismes [MeSH], revue de la littérature [MeSH], obstétrique [MeSH]



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## BACKGROUND

In a recent report (1), the United Nations estimated that 369,633 women gave birth per day worldwide. During vaginal birth, between 20 and 60 % of women undergo a perineal trauma according to studies (2). Perineal traumas are defined by RCOG (3) for English publications and CNGOF (4) for French publications.

These classifications are described in table 1.

In France, third and fourth degree tears occur in 0.8 % of vaginal birth in 2010 (5), which is a low rate compared to international literature: it occurs in 0.5 to 8 % of birth according to some authors, reaching 25 % for some of them (6–10).

Maternal morbidity due to perineal traumas during birth is often associated to chronic pain, dyspareunia, sexual dissatisfaction and/or urinary and faecal incontinence. These long-term complications have a significant impact on quality of life.

Several published studies examined the risk factors for severe perineal trauma. If some risk factors, such as parity or instrumental deliveries, are recognized by most of the studies, the results obtained for other potential risk factors are divergent or show no statistically significant association.

The main objective of this systematic review is to identify the risk factors for 3rd and 4th degree perineal traumas during vaginal delivery.

The second objective is to define which actions are possible and could be developed by health professionals to avoid perineal injuries when they identify these risk factors.

## 25 **METHOD**

26 This systematic review of literature follows Cochrane collaboration's recommendations  
27 (11) for review method and PRISMA statement for redaction.

28

29 All trials exploring risk factors of 3rd and 4th degree (RCOG) or 2nd and 3rd (CNGOF)  
30 perineal trauma as main objective were explored.

31 Studies exploring one particular risk factor have been excluded from the review.

32

33 The following online bibliographical databases were used: MEDLINE (1950-2014),  
34 Science Direct (1997-2014), EBSCO Pascal (1984-2014), OvidSP (1998-2014),  
35 BDSP (1978-2014), Opengrey (1980-2014), Google Scholar (2004-2014).

36

37 No restrictions were made on the type of dissemination (type of scientific journal,  
38 published or unpublished study or abstract), and the main languages of scientific  
39 publications, such as English and French, have been used.

40

41 A two-step strategy was used for online database search. First, following MeSH these  
42 terms were used:

43 Perineum\injuries"[Mesh];

44 (("Perineum"[Mesh]) AND "Obstetrics"[Mesh]) OR (("Perineum"[Mesh]) AND  
45 "Obstetrics\pathology"[Mesh]);

46 ("Anal Canal\injuries"[Mesh]) AND "Obstetrics"[Mesh];

47 périnée\traumatismes.mc[TER\MSH] ;

48 (périnée.mc [TER\MSH]) AND obstétrique.mc[TER\MSH] ;

49 (canal anal\{}traumatismes.mc [TER\MSH]) AND obstétrique.mc[TER\MSH].

50 These terms were defined using PubMed for English terms and CISMeF for French  
51 terms.

52

53 Secondly, free-text query was done, using the following terms:

54 Perine\* AND injury;

55 Perine\* AND tear;

56 Anal canal AND injuries;

57 Obstetrics AND laceration;

58 Périn\* AND déchirure;

59 Obstetrics AND high vaginal laceration.

60

61 Related citations were explored and filters used when existing.

62

63 Reports were first excluded on titles and keywords (off-topic, not related to a study),  
64 then on abstract. All studies meeting the inclusion criteria were reviewed in full.

65

66 One review author (EG) assessed for inclusion all the potential studies that were  
67 identified as a result of the research strategy.

68 A form was designed to extract data and was used for each study report.

69

70 The methodological quality of studies and reports was assessed using a quality  
71 assessment scale derived from the Newcastle - Ottawa quality assessment scale for  
72 case-control studies (12) and from Downs and Black instrument (13) as recommended  
73 by Cochrane collaboration.

74 Using this scale, each study was judged on five broad perspectives: the selection of

the study groups; the comparability of the groups; the ascertainment of the exposure; the internal validity of the study and the quality of the report.

Quality was summarized for every perspective using allocation of “stars”, as described in the Newcastle - Ottawa scale. A minimum threshold of 10 stars was set to include a study in the final analysis.

## **RESULTS**

### **Description of studies**

The research identified 36 studies from April to December 2014, including 4,552,623 women. Twelve studies were included (2,514,806 women) and 24 excluded (2,037,817 women). The 12 included studies covered a 13 years period, from 2001 to 2014.

All the included studies were case-control studies, 5 were prospective and 7 retrospective.

The results of literature research were summarised in figure 1. The characteristics of included and excluded studies are available in the appendices.

### **Risk of bias in included studies**

The quality of selection of the study groups and the ascertainment of the exposure were high for all the included studies, as well as the internal validity.

One study report was of poor quality (Dahlen et al.) with no p-value and three study reports were of average quality (Smith et al., Baumann et al. and Handa et al.).

Two studies (Baumann et al. and Schmitz et al.) have a poor comparability between cases and controls and two studies have an average comparability between cases and controls: the study from Handa et al. in which only one control was made to assess



this comparability, and from Di Piazza et al. in which a great part of the population was excluded, causing a loss of power.

## **Main findings**

The results of studies for all explored risk factors are summarized in tables 2 to 5.

## **DISCUSSION**

### **Summary of the main results**

#### **Modifiable risk factors**

The most important modifiable risk factors are instrumental deliveries. Both forceps and vacuum, analysed separately or together, are associated with an important increase of third and fourth degree perineal tears.

The results are heterogeneous concerning episiotomy, probably because most of the studies analysed midline and medio-lateral episiotomy with no distinction between the two techniques.

In addition, the use of episiotomy was variable from a country to another and has undergone many changes over the 13 year period covered by our review.

A Cochrane meta-analysis by Carroli and Mignini (14) explored the effects of restrictive use of episiotomy compared to routine episiotomy during vaginal birth. They conclude that restrictive episiotomy policies appear to have a number of benefits compared to policies based on routine episiotomy. For them, there is less posterior perineal trauma, less suturing and fewer complications and no difference for most pain measures, but there was an increased risk of anterior perineal trauma. It appears that restrictive episiotomy policies should be preferred to routine policies.

125 In their meta-analysis, the number of studies about the technic of incision, median or  
126 medio-lateral, is small and most of these studies are of poor quality. For them, no  
127 recommendations can be given on a better angle to perform episiotomy.

128  
129 In our review, there were significant discrepancies between the results of different  
130 studies analysed about epidural analgesia, and no conclusion can be drawn on these  
131 results.

132 In a Cochrane meta-analysis, Anim-Somuah et al (15) compared epidural analgesia  
133 with non-epidural or no pain relief during labour and found an increased risk of having  
134 an instrumental delivery with epidural analgesia. Considering this result, we can  
135 assume that instrumental deliveries could be a confounding factor in the studies  
136 selected in our review.

137  
138 Labour induction was not associated to any increase of perineal laceration, and labour  
139 augmentation (using oxytocin) was associated to no or a slight increase of perineal  
140 laceration.

#### 141 142 **Non-modifiable risk factors**

143 Nulliparity was the most important non-modifiable risk factor. This is confirmed by the  
144 association of multiparity with a significant decrease of perineal laceration.

145 It is of interest to note that vaginal nulliparity is not a risk factor of third and fourth  
146 degree perineal tears.

147 Thus, gravidity is probably an important factor, and multiparas with previous  
148 caesarean section might be managed as multiparas without previous caesarean  
149 section if this hypothesis is confirmed.

150 Asian ethnicity (including Indian ethnicity) provide an important increase of risk of  
151 perineal laceration. It is likely that particular characteristics in this population, such as  
152 babies' weight or tissue elasticity, account for this result. However, practitioners should  
153 be more careful managing birth in this population.

154

155 Shoulder dystocia is associated with an important increase of third and fourth degree  
156 perineal tears. It must be anticipated during pregnancy or at least during birth by  
157 analysing the second stage of labour.

158

159 The increase of birth weight is associated with a slight increased risk of perineal  
160 laceration. Results concerning birth weight over 4000 g are discordant but are in favour  
161 of a consistent rise of perineal laceration.

162

163 As already well established previously, in our review occipito-posterior position is  
164 associated with an important increase of third and fourth degree perineal tears.

165 Obstetrical operations to reduce this foetal head position should be undertaken, since  
166 results about persistent occipito-position are discordant and do not confirm this event  
167 to be clearly associated with an increase of perineal laceration.

168

169 Results about the second stage of labour differ, but are in favour of a moderate  
170 augmentation of perineal laceration.

171

172 Gestational age and maternal age are not risk factors of third and fourth degree  
173 perineal tears, despite the increase of foetal weight during pregnancy.

## 174 **Applicability of evidence**

175 Studies selected in this review are distributed over a 13 years period (2001 to 2014).

176 The practices have quickly evolved during the last decade in obstetrics.

177

178 Gurol-Urganci et al (16) have described the trends of severe perineal tears in England  
179 and investigated to what extent the changes in related risk factors could account for  
180 the observed trends.

181 In this paper, third and fourth degree perineal tears have increased threefold between  
182 2000 and 2012. They explain a part of this rise because of an important increase of  
183 third and fourth degree tears report, due to the introduction of a standard classification  
184 and a better practitioners training.

185 Another important cause of this increase is the change in practices: a modification in  
186 the use of instrument during deliveries was observed with more forceps deliveries and  
187 less use of vacuum, and a radical change in the practice of episiotomy occurred. First  
188 performed routinely and midline, it became selective and in majority medio-lateral,  
189 because of an international consensus between 2004 and 2006.

190 Lastly, the use of perineal support techniques has expanded in England, trying to  
191 reduce perineal tears.

192

193 In France, Blondel et al (5) have explored major changes of a wide range of factors  
194 between 2003 and 2010.

195 They found an increase in the use of oxytocin and analgesia: the prevalence of  
196 epidural analgesia and rachianesthesia was 74.9 % in 2003 and rose to 81.4 % in  
197 2010. Episiotomy has decreased in both primiparas (71.3 % in 2003 to 44.4 % in 2010)  
198 and multiparas (36.2 % in 2003 to 14.3 % in 2010).

199 These changes have impacted the results of studies, and must be taken into account  
200 when reading this review.

201

## 202 **Potential biases in the review process**

203 This review followed the Cochrane collaboration's recommendations displayed in the  
204 Cochrane Handbook for systematic review, but some potential biases in the review  
205 process can remain.

206

207 First, only one author performs the review process, including database querying,  
208 studies selection and assessment of quality. The Cochrane recommend two authors  
209 for this part of a review, working simultaneously and comparing their results.

210

211 Secondly, this review included only case-control studies instead of randomised  
212 controlled trials. This type of studies is of poorer quality and lower level of evidence.

213 This is supported by the poor quality of a wide range of studies included for quality  
214 assessment in this review. Of 36 studies, 24 were excluded and some are of very poor  
215 quality. However, it should be noted that the subject do not really lend itself to  
216 randomization.

217

218 Finally, only online databases have been reviewed, and no results of grey literature  
219 were found, causing a potential selection bias.

## **Links with others studies or reviews**

In April 2014, Pergialiotis et al published a meta-analysis (17) of risk factors for severe perineal laceration during childbirth.

The methodological quality of this paper is debatable: the selected studies have various objectives. For instance, only six studies of the 21 included meet the inclusion criteria of our review, which are clearly established.

Moreover, the authors have not mentioned any quality assessment of the selected studies. For instance, three of the six studies meeting our inclusion criteria were of poor quality.

However, their results are comparable with ours. They found birth weight, midline episiotomy, instrumental deliveries, vacuum deliveries, forceps deliveries, nulliparity, asian ethnicity, labour induction and augmentation, epidural analgesia and persistent occipito-posterior presentation significantly associated with an increased risk of third and fourth degree perineal tears.

Maternal age, pregnancy duration, vaginal birth after caesarean section and prolonged second stage of labour were not significant risk factors in this paper.

Regarding the morbidity of perineal lacerations and the importance of non-modifiable risk factors, tools to predict these laceration and techniques to reduce their number seem to be essential.

Several studies explored the predictors of third and fourth degree perineal tears.

In 2009, Minaglia et al (18) tried to define a population at-risk for obstetric anal sphincter laceration. They found that women having cephalopelvic disproportion (CPD), arrest of descent, maternal exhaustion, and foetal distress have significantly

245 more third and fourth degree perineal tears, reaching 23.9 %.

246 In addition, they found that five caesarean deliveries are needed to prevent one anal  
247 sphincter laceration associated with operative vaginal delivery in their cohort.

248

249 Halperin et al (19) explored the relation between a striae gravidarum based score (total  
250 striae score or TSS, described by Atwal, Manku, Griffiths, and Polson in 2006,  
251 obtained by counting the striae on the abdomen, hips, buttocks, and breast) and  
252 perineal trauma.

253 They found significantly higher TSS in women experiencing perineal trauma compared  
254 with women without perineal trauma.

255 A significant increase in the degree of tearing was observed with increased TSS.

256 This score can be a simple and non-invasive tool to better define women at risk for  
257 perineal trauma.

258

259 Two Cochrane meta-analysis by Aasheim et al (20) in 2011 and Beckmann et al (21)  
260 in 2013 studied different techniques to reduce third and fourth degree perineal tears.

261 They found a significant effect of warm compresses and perineal massages on the  
262 reduction of third- and fourth-degree tears.

263 Aasheim et al found a risk ratio (RR) = 0.48 (0.28-0.84) for warm compresses and RR  
264 = 0.52 (0.29-0.94) for perineal massages.

265 In their study, the hands off versus hand on technique showed no effect on third- and  
266 fourth-degree tears, but a significant effect on reduced rate of episiotomy with RR =  
267 0.69 (0.50-0.96).

268 Beckmann et al found a significant decrease of third and fourth perineal lacerations  
269 associated with perineal massages with a RR = 0.91 (0.86-0.96), and a significant

270 reduction of episiotomy with a RR = 0.84 (0.74-0.95), but only in nulliparas.  
271 They also found out that only women who have previously given birth vaginally  
272 reported a statistically significant reduction in the incidence of pain at three months  
273 postpartum with this technique, RR = 0.45 (0.24-0.87). Perineal massages and warm  
274 compresses have shown to be acceptable to women and midwives and may therefore  
275 be offered to women.

276

## 277 **MAIN CONCLUSIONS**

278 Nulliparous and asian women appear to be a high-risk population of third and fourth  
279 degree perineal tears. A careful management of birth, including reducing instrumental  
280 deliveries, a restrictive use of medio-lateral episiotomy and a reduction of occipito-  
281 posterior presentations to occipito-anterior should be performed.

282 A prevention of foetal weight increase should also be done to reduce increased birth  
283 weight.

284 Few tools - such as scores, perineal massages and warm compresses - have shown  
285 efficiency to predict and reduce perineal tears. The use of such tools might be  
286 generalized if this efficiency is confirmed.

287

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357 Table 1: RCOG and CNGOF classifications

Type of tear	RCOG classification	CNGOF classification
First degree opened tears	Tears involving perineal skin and vaginal mucous membrane, but not the underlying fascia and muscle	Incomplete tear, the anal sphincter is intact
Second degree opened tears	Tears involving the perineal muscles and skin	Complete tear, the anal sphincter is injured
Third degree opened tears	Tears affecting the anal sphincter	Deep complete tear, creating a recto-vaginal fistula
Fourth degree opened tears	Deep complete tear creating a recto-vaginal fistula	-
Closed tears	-	The musculo-aponevrotic structures can be injured with no breach in the skin.

359 **Table 2: Instrumental deliveries (\*: adjusted OR)**

Studies	Instrumental deliveries  OR (95 CI)	Forceps deliveries  OR (95 CI)	Vacuum deliveries  OR (95 CI)
Baumann et al.		2.68* (2.17-3.32)	1.21* (1.03-1.42)
Dahlen et al	1.92* (1.20-3.07)		
DiPiazza et al.		4.70* (2.00-11.20)	2.10 (0.80-5.40)
Groutz et al. (1)			2.68* (1.57-4.55)
Groutz et al. (2)			10.10* (3.54-28.82)
Handa et al.		1.45* (1.37-1.52)	2.30* (2.21-2.40)
Hehir et al.		7.10 (6.40-7.90)	2.90 (2.00-2.60)
Melamed et al.	4.30 (3.40-5.40)	5.50* (3.90-7.80)	1.90* (1.40-2.60)
Nakai et al.		7.11* (1.95-20.59)	5.93* (3.98-10.36)
Riskin-Mashia et al.		4.48* (3.85-5.20)	1.81* (1.41-2.34)
Schmitz et al.	4.17* (5.51-6.90)		
Smith et al.		4.43* (2.02-9.71)	2.03* (0.96-4.40)

360

361 **Table 3: Birth management (\*: adjusted OR)**

Studies	Epidural analgesia  OR (95 CI)	Episiotomy  OR (95 CI)	Labour induction  OR (95 CI)	Oxytocin augmentation  OR (95 CI)
Baumann et al.				1.02* (0.92- 1.13)
Dahlen et al	0.73* (0.47- 1.14)	1.14* (0.71- 1.83)	1.04* (0.64- 1.70)	1.61* (1.00- 2.68)
DiPiazza et al.	1.00 (0.49- 2.00)	16.30* (7.70- 34.40)	1.20 (0.70- 2.20)	1.04 (0.80- 2.40)
Handa et al.	1.79 (1.74- 1.84)	0.89* (0.86- 0.92)	1.01* (0.96- 1.06)	
Melamed et al.	1.00 (0.80- 1.30)	1.10 (0.90- 1.40)	1.00 (0.70- 1.50)	
Nakai et al.				2.19* (1.27- 3.73)
Riskin-Mashia et al.	1.27* (1.10- 1.45)		1.05 (1.27- 1.76)	1.17* (1.04- 1.32)
Schmitz et al.		0.38* (0.23- 0.63)		
Smith et al.	0.56* (0.33- 0.93)	0.64* (0.36- 1.15)		

362

363 **Table 4: Non-modifiable risk factors (\*: adjusted OR – NS: non-significant, no OR available – α: 1 previous vaginal birth**  
 364 **versus ≥ 2 as reference category – OP: occipito-posterior – POP: persistent occipito-posterior)**

Studies	Nulliparity OR (95 CI)	Vaginal nulliparity OR (95 CI)	Multiparity OR (95 CI)	Birth weight OR (95 CI)	Birth weight > 4kg OR (95 CI)	OP position OR (95 CI)	POP position OR (95 CI)
Baumann et al.						1.71* (1.43-2.04)	
Dahlen et al.	3.98* (2.51-6.32)				2.64* (1.69-4.13)		
DiPiazza et al.					11.2 (4.50-27.80)		
Groutz et al. (1)	2.38* (1.51-3.75)			1.001* (1.000-1.001)	NS		2.11* (1.00-4.46)

Studies	Nulliparity OR (95 CI)	Vaginal nulliparity OR (95 CI)	Multiparity OR (95 CI)	Birth weight OR (95 CI)	Birth weight > 4kg OR (95 CI)	OP position OR (95 CI)	POP position OR (95 CI)
Groutz et al. (2)	2.80* (1.33- 5.90)	NS		1.002* 1.001-1.003)	NS		NS
Handa et al.		1.12* (0.71- 1.77)	0.15* (0.14- 0.15)		2.17* (2.07- 2.27)		
Melamed et al.	1.60* (1.30- 2.00)	1.40 (0.90- 2.20)			1.00 (0.60-1.70)		2.60* (1.60- 4.30)
Nakai et al.	4.36* (2.17- 9.57)						
Riskin-Mashia et al.	6.40* (5.11- 8.01)		2.34* (1.83- 3.00) (α)		2.35* (1.91- 2.89)		



Studies	Nulliparity OR (95 CI)	Vaginal nulliparity OR (95 CI)	Multiparity OR (95 CI)	Birth weight OR (95 CI)	Birth weight > 4kg OR (95 CI)	OP position OR (95 CI)	POP position OR (95 CI)
Schmitz et al.	2.58* (1.55- 4.29)	NS		1.28* (1.03- 1.60)		2.24* (1.02- 4.94)	
Smith et al.			0.52* (0.30- 0.90)	1.001* (1.001- 1.001)			

366 **Table 5: Modifiable risk factors (\*: adjusted OR – NS: non-significant, no OR available – β: Indian ethnicity, other asian**

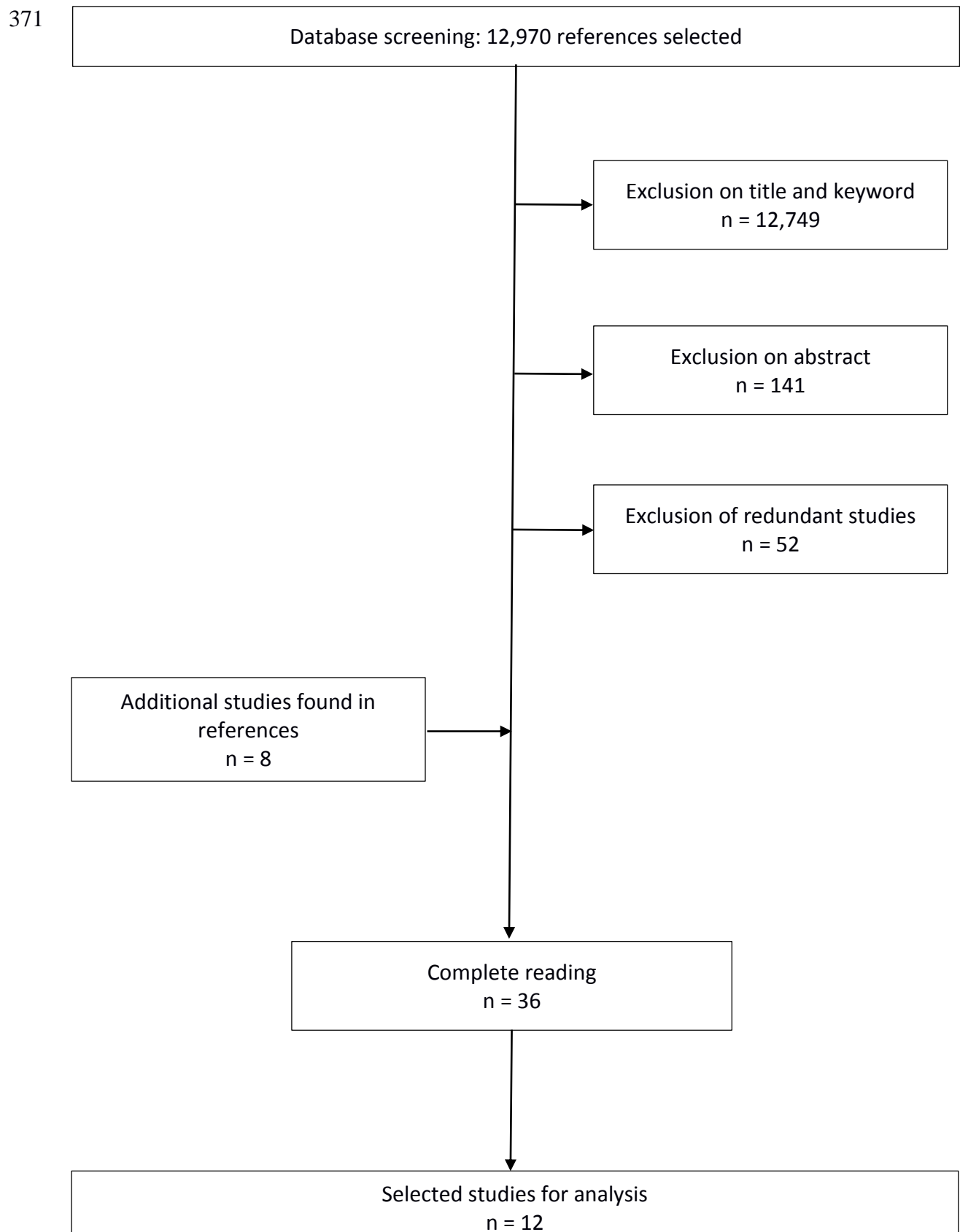
367 **OR = 1.37 (1.29-1.45))**

Studies	Gestational age OR (95 CI)	Maternal age OR (95 CI)	asian ethnicity OR (95 CI)	Shoulder dystocia OR (95 CI)	Second stage length OR (95 CI)	Second stage length ≥ 2 hours OR (95 CI)
Baumann et al.						1.17* (1.01-1.36)
Dahlen et al			1.83* (1.22-2.75)	2.10* (0.76-5.74)		
DiPiazza et al.				7.90* (1.60-38.00)		NS*
Groutz et al. (1)	NS*	NS	8.94* (4.23-18.86)		NS*	NS

Studies	Gestational age OR (95 CI)	Maternal age OR (95 CI)	asian ethnicity OR (95 CI)	Shoulder dystocia OR (95 CI)	Second stage length OR (95 CI)	Second stage length ≥ 2 hours OR (95 CI)
Groutz et al. (2)	NS	NS*	NS		NS*	NS*
Handa et al.			2.50* (2.23-2.79) (β)	2.67* (2.47-2.89)		1.49* (1.35-1.66)
Melamed et al.		0.98 (0.96-1.02)				
Nakai et al.		NS*				
Riskin-Mashia et al.		NS*	1.75* (1.27-2.42)	2.04* (1.52-2.73)		
Schmitz et al.	NS	NS*				
Smith et al.		NS		7.35 (3.40-16.00)	1.49* (1.13-1.98)	

369 **FIGURES**

370 **Figure 1: Flow chart**



372 **APPENDICES**

373 **Appendix 1: Summary of selected studies**

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
1999	Buchhave P, Flatow L, Rydhstroem H, Thorbert G	Risk factors for rupture of the anal sphincter	2 years	Retrospective case-control	584	7 stars	Sweden
2000	Angioli R, Gómez- Marín O, Cantuaria G, O'Sullivan MJ	Severe perineal lacerations during vaginal delivery: The University of Miami experience	7 years	Case-control	50,210	7 stars	USA

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2000	Samuelsson E, Ladfors L, Wennerholm UB, Gåreberg B, Nyberg K, Hagberg H	Anal sphincter tears: prospective study of obstetric risk factors	3 years	Prospective case-control	2,883	7 stars	Sweden
2001	Jandér C, Lyrenäs S	Third and fourth degree perineal tears	2 years	Retrospective case-control	5,822	5 stars	Sweden
2001	Victoria L. Handa, Beate H. Danielsen, William M. Gilbert	Obstetric Anal Sphincter Lacerations	6 years	Prospective case-control	2,101,843	10 stars	USA
2002	Riskin-Mashiah S, O'Brian Smith E, Wilkins IA	Risk Factors for Severe Perineal Tear: Can We Do Better?	6 years	Retrospective case-control	23,244	10 stars	USA

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2003	Christianson LM, Bovbjerg VE, McDavitt EC, Hullfish KL	Risk factors for perineal injury during delivery	2 years	Retrospective case-control	226	7 stars	USA
2003	McLeod NL, Gilmour DT, Joseph KS, Farrell SA, Luther ER	Trends in major risk factors for anal sphincter lacerations: a 10-year study	10 years	Retrospective case-control	91,206	8 stars	Canada
2005	Vani Dandolu, Ashwin Chatwani, Ozgur Harmanli, Clara Floro, John P. Gaughan, Enrique Hernandez	Risk factors for obstetrical anal sphincter lacerations	2 years	Prospective case-control	258,507	7 stars	USA

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2006	Nakai A, Yoshida A, Yamaguchi S, Kawabata I, Hayashi M, Yokota A, et al	Incidence and risk factors for severe perineal laceration after vaginal delivery in Japanese patients	8 years	Retrospective case-control	7,946	10 stars	Japan
2006	DeAnn DiPiazza, Holly E. Richter, Victoria Chapman, Suzanne P. Cliver, Cherry Neely, Chi Chiung Chen and Kathryn L. Burgio	Risk Factors for Anal Sphincter Tear in Multiparas	13 years	Retrospective case-control	284	10 stars	UK



Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2007	A. Barbier, O. Poujade, R. Fay, O. Thiébauges, M. Levardon, B. Deval	La primiparité est-elle le seul facteur de risque des lésions du sphincter anal en cours d'accouchement ?	5 years	Cross-sectional case-control	130	6 stars	France
2007	Gottvall K, Allebeck P, Ekéus C	Risk factors for anal sphincter tears: the importance of maternal position at birth	4 years	Retrospective case-control	12,782	6 stars	Sweden

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2007	Hannah G. Dahlen, Maureen Ryan, Caroline S.E. Homer, Margaret Cooke	An Australian prospective cohort study of risk factors for severe perineal trauma during childbirth	2 years	Prospective case-control	6,595	10 stars	Australia
2007	Baumann P, Hammoud AO, McNeeley SG, DeRose E, Kudish B, Hendrix S	Factors associated with anal sphincter laceration in 40,923 primiparous women	7 years	Retrospective case-control	40,953	10 stars	USA Germany

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2008	Kudish B, Sokol RJ, Kruger M	Trends in major modifiable risk factors for severe perineal trauma, 1996-2006	11 years	Retrospective case-control	46,245	9 stars	USA
2009	Nadav Schwartz, David E. Seubert, Julian Mierlak and Alan A. Arslan	Predictors of severe perineal lacerations in Chinese women	5 years	Retrospective case-control	3,085	7 stars	USA
2009	O. Eskandar and D. Shet	Risk factors for 3rd and 4th degree perineal tear	2 years	Retrospective case-control	2,278	8 stars	UK

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2011	Alouini S, Rossard L, Lemaire B, Megier P, Mesnard L	LÉSIONS SPHINCTÉRIENNES ANALES APRÈS ACCOUCHEMENT PAR VOIE VAGINALE: facteurs de risque et moyens de prévention	5 years	Retrospective case-control	15,387	4 stars	France

2011	<p>Helain J. Landy, S.  Katherine Laughon,  Jennifer Bailit,,  Michelle A.  Kominiarek, Victor  Hugo Gonzalez-  Quintero, Mildred  Ramirez, Shoshana  Haberman, Judith  Hibbard, Isabelle  Wilkins, D. Ware  Branch, Ronald T.  Burkman, Kimberly  Gregory, Matthew K.  Hoffman, Lee A.  Learman, Christos</p>	<p>Characteristics  Associated With  Severe Perineal and  Cervical Lacerations  During Vaginal  Delivery</p>	1 year	Retrospective case-control	87,267	6 stars	USA
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Year	Authors	Title	Length	Type	Number of patient	Quality	Country
	Hatjis , Paul C. VanVeldhuisen, Uma M. Reddy, James Troendle, Liping Sun, MS, and Jun Zhang						
2011	C. Salameh, F. Canoui-Poitrine, M. Cortet, A. Lafon, R.-C. Rudigoz, C. Huissoud	Les présentations posterieures augmentent-elles le risque de déchirures perinéales severes ?	4 years	Retrospective case-control	9,075	7 stars	France

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2011	Hamilton EF, Smith S, Yang L, Warrick P, Ciampi A	Third- and fourth-degree perineal lacerations: defining high-risk clinical clusters	5 years	Retrospective case-control	10,692	7 stars	USA Canada
2011	Lewis T, DaCosta V, Harriott J, Wynter S, Christie L, Cawich S	Factors related to obstetric third and fourth degree perineal lacerations in a Jamaican cohort	4 years	Retrospective case-control	57	9 stars	Jamaica

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2011	A. Groutz, A. Cohen, R. Gold, J. Hasson, A. Wengier, J. B. Lessing and D. Gordon [Groutz and al (2)]	Risk factors for severe perineal injury during childbirth: a case–control study of 60 consecutive cases	3 years	Prospective case-control	300	12 stars	Israel
2011	Asnat Groutz, Joseph Hasson, Anat Wengier, Ronen Gold, Avital Skornick-Rapaport, Joseph B. Lessing, David Gordon [Groutz and al (1)]	Third- and fourth-degree perineal tears: prevalence and risk factors in the third millennium	5 years	Prospective case-control	38,252	13 stars	Israel



Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2012	F Hirayama, A Koyanagi, R Mori, J Zhang, JP Souza, AM Gulmezoglu	Prevalence and risk factors for third- and fourth-degree perineal lacerations during vaginal delivery: a multi-country study	1 year	Prospective case-control	214,599	6 stars	Japan China Switzerland
2012	Melamed N, Gavish O, Eisner M, Wiznitzer A, Wasserberg N, Yogev Y	Third- and fourth-degree perineal tears – incidence and risk factors	13 years	Retrospective case-control	58,937	10 stars	Israel

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2013	Porat S, Baud D, Farine D	Obstetric anal sphincter injuries in vaginal delivery of twins: associated risk factors and comparison with singletons	25 years	Retrospective case-control	91,222	9 stars	Canada

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2013	Gurol-Urganci I, Cromwell D, Edozien L, Mahmood T, Adams E, Richmond D, et al	Third- and fourth-degree perineal tears among primiparous women in England between 2000 and 2012: time trends and risk factors	12 years	Retrospective case-control	1,035,253	9 stars	UK
2013	Smith LA, Price N, Simonite V, Burns EE	Incidence of and risk factors for perineal trauma: a prospective observational study	5 month	Prospective case-control	2,757	10 stars	UK

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2013	Hehir MP, O'Connor HD, Higgins S, Robson MS, McAuliffe FM, Boylan PC, et al.	Obstetric anal sphincter injury, risk factors and method of delivery – an 8-year analysis across two tertiary referral centers	8 years	Retrospective case-control	214,256	12 stars	Denmark
2014	Jangö H, Langhoff-Roos J, Rosthøj S, Sakse A	Modifiable risk factors of obstetric anal sphincter injury in primiparous women: a population-based cohort study	10 years	Retrospective case-control	100,307	7 stars	Ireland

Year	Authors	Title	Length	Type	Number of patient	Quality	Country
2014	Schmitz T, Alberti C, Andriss B, Moutafoff C, Oury J-F, Sibony O	Identification of women at high risk for severe perineal lacerations	10 years	Retrospective case-control	19,442	10 stars	France

374

375 **Appendix 2: Quality assessment scale (form)**

376 Reporting

377 1) Have the actual probability values been reported?

378 a) yes (allocation of one star)

379 b) no

380 2) Description of elements reported

381 a) clear, for each element (allocation of one star)

382 b) clear, some elements are not described

383 c) unclear / more than 3 elements are missing

384

385 Selection

386 1) Is the case definition adequate?

387 a) yes, with independent validation (allocation of one star)

388 b) yes, eg record linkage or based on self-reports

389 c) no description

390 2) Representativeness of the cases

391 a) consecutive or obviously representative series of cases (allocation of one star)

392 b) potential for selection biases or not stated

393 3) Selection of Controls

394 a) community controls (allocation of one star)

395 b) hospital controls

396 c) no description

397 4) Definition of Controls

398 a) no history of disease (endpoint) (allocation of one star)

399 b) no description of source

400

401 Comparability

402 1) Comparability of cases and controls on the basis of the design or analysis

403 a) study controls for \_\_\_\_\_ (Select the most important factor.) (allocation of one  
404 star)

405 b) study controls for any additional factor (allocation of one star) (This criteria could  
406 be modified to indicate specific control for a second important factor.)

407

408 Exposure

409 1) Ascertainment of exposure

410 a) secure record (eg surgical records) (allocation of one star)

411 b) structured interview where blind to case/control status (allocation of one star)

412 c) interview not blinded to case/control status

413 d) written self report or medical record only

414 e) no description

415 2) Same method of ascertainment for cases and controls

416 a) yes (allocation of one star)

417 b) no

418 3) Non-Response rate

419 a) same rate for both groups (allocation of one star)

420 b) non respondents described

421 c) rate different and no designation

422 Internal validity

423 1) Statistical test

424 a) appropriate (allocation of one star)

425 b) not appropriate

426 2) Adjustment for confounding

427 a) yes, adequate adjustment (allocation of one star)

428 b) yes, adjustment can be discussed

429 c) no

430

431 **Appendix 3: Quality assessment scale (manual)**

432 Reporting

433 1) Have the actual probability values been reported?

434 a) the probability values are reported in extenso (e.g. 0.035 rather than  $< 0.05$ ),  
435 except where the probability value is less than 0.001 (allocation of one star)

436 b) the probability values are rounded

437 2) Description of elements reported

438 a) clear description of hypothesis/aim/objective of the study, of the main outcomes  
439 to be measured, of the characteristics of the patients included in the study, of  
440 principal confounders in each groups of subjects, of the main findings of the  
441 study (allocation of one star)

442 b) clear description, but some of the previous elements are not described

443 c) unclear / more than 3 of the previous elements are missing



444 Selection

445 1) Is the case definition adequate?

446 a) Requires some independent validation (e.g. >1 person/record/time/process to  
447 extract information, or reference to primary record source such as x-rays or  
448 medical/hospital records) (allocation of one star)

449 b) Record linkage (e.g. ICD codes in database) or self-report with no reference to  
450 primary record

451 c) No description

452 2) Representativeness of the Cases

453 a) All eligible cases with outcome of interest over a defined period of time, all cases  
454 in a defined catchment area, all cases in a defined hospital or clinic, group of  
455 hospitals, health maintenance organisation, or an appropriate sample of those  
456 cases (e.g. random sample) (allocation of one star)

457 b) Not satisfying requirements in part (a), or not stated.

458 3) Selection of Controls

459 This item assesses whether the control series used in the study is derived from the  
460 same population as the cases and essentially would have been cases had the  
461 outcome been present.

462 a) Community controls (i.e. same community as cases and would be cases if had  
463 outcome) (allocation of one star)

464 b) Hospital controls, within same community as cases (i.e. not another city) but  
465 derived from a hospitalised population

466 c) No description

#### 4) Definition of Controls

- a) If cases are first occurrence of outcome, then it must explicitly state that controls have no history of this outcome. If cases have new (not necessarily first) occurrence of outcome, then controls with previous occurrences of outcome of interest should not be excluded. (allocation of one star)
- b) No mention of history of outcome

#### Comparability

##### 1) Comparability of Cases and Controls on the Basis of the Design or Analysis

A maximum of 2 stars can be allotted in this category

Both cases and controls must be matched in the design and/or confounders must be adjusted for in the analysis. Statements of no differences between groups or that differences were not statistically significant are not sufficient for establishing comparability. Note: If the odds ratio for the exposure of interest is adjusted for the confounders listed, then the groups will be considered to be comparable on each variable used in the adjustment.

There may be multiple ratings for this item for different categories of exposure (e.g. ever vs. never, current vs. previous or never)

Age = allocation of one star, other controlled factors = allocation of one star

#### Exposure

##### 1) Ascertainment of Exposure

Allocation of stars as per rating sheet

##### 2) Non-Response Rate

Allocation of stars as per rating sheet

492 Internal validity

493 1) Statistical test

494 a) the statistical test used to assess the main outcome is appropriate (allocation of  
495 one star)

496 b) the statistical test used to assess the main outcome is not appropriate

497 2) Adjustment for confounding

498 a) adequate adjustment for confounding in the analyses from which the main  
499 findings were drawn (allocation of one star)

500 b) yes but the adjustment can be discussed

501 c) no

502 **Appendix 4: Risk of bias in included studies (expressed in “stars”)**

Study	Report	Selection	Comparability	Exposure	Internal validity	Other bias	Quality
Baumann et al.	1 star	3 stars	0 star	3 stars	3 stars	No p-values Exclusion of a great part of the population	10 stars
Dahlen and al	0 star	3 stars	2 stars	3 stars	2 stars		10 stars
DiPiazza et al.	2 stars	3 stars	1 star	2 stars	2 stars		10 stars
Groutz et al. (1)	2 stars	4 stars	2 stars	3 stars	2 stars		13 stars
Groutz et al. (2)	2 stars	3 stars	2 stars	3 stars	2 stars		12 stars
Handa et al.	1 star	4 stars	1 stars	2 stars	2 stars		10 stars
Hehir et al.	2 stars	4 stars	2 stars	2 stars	2 stars		12 stars
Melamed et al.	2 stars	2 stars	2 stars	2 stars	2 stars		10 stars
Nakai et al.	2 stars	2 stars	2 stars	2 stars	2 stars		10 stars
Riskin-Mashia et al.	2 stars	2 stars	2 stars	2 stars	2 stars		10 stars

Study	Report	Selection	Comparability	Exposure	Internal validity	Other bias	Quality
Schmitz et al.	2 stars	3 stars	0 star	3 stars	2 stars		10 stars
Smith et al.	1 star	3 stars	2 stars	2 stars	2 stars		10 stars

503

## **Abstract**

**Background** Third and fourth degree tears occur in 0.5 to 8 % of vaginal birth, reaching 25 % for some authors. Perineal traumas are often associated to chronic pain, dyspareunia, sexual dissatisfaction and urinary and faecal incontinence. The objective of this review is to identify the risk factors of 3rd and 4th degree perineal traumas during vaginal birth. **Method** We searched MEDLINE, Sciencedirect, EBSCO Pascal, OvidSP, BDSP, Opengrey and Google Scholar. All trial exploring risk factors of 3rd and 4th degree (RCOG) or 2nd and 3rd (CNGOF) perineal trauma were explored. We used methods described in the Cochrane Handbook for Systematic Reviews of Interventions for carrying out data collection, assessing study quality and analysing results. One review author evaluated methodological quality, using a quality assessment scale. **Results** The most important risk factors of third and fourth perineal tears are instrumental deliveries, both forceps and vacuum, nulliparity, Asian ethnicity, shoulder dystocia, increase of birth weight and occipito-posterior presentations. Results are discordant concerning episiotomy, epidural analgesia and duration of second stage of labour. Gestational age, maternal age, labour induction and augmentation are not risk-factors for perineal lacerations. **Conclusion** A careful management of birth, including reducing instrumental deliveries, a restrictive use of medio-lateral episiotomy and a reduction of occipito-posterior presentations to occipito-anterior should be performed in at risk population. A prevention of foetal weight increase should also be done. Several tools - such as scores, perineal massages and warm compresses have shown efficiency to predict and reduce perineal tears and should be generalized.

**Keywords:** perineum [MeSH], perineum\injuries [MeSH], review literature [MeSH], obstetrics [MeSH]