Obstetric consequences of female genital mutilation/cutting (FGM/C)

Report from Kunnskapssenteret (Norwegian Knowledge Centre for the Health Services)
No 6–2013
Systematic review

kunnskapssenteret
Norwegian Knowledge Centre for the Health Services

Background: Female genital mutilation/cutting (FGM/C) is a traditional practice that involves the partial or total removal of the external female genitalia or other injury to the female genital organs for non-medical reasons. This systematic review aimed to fill a gap in synthesized evidence of the obstetric sequelae of FGM/C. We included 44 primary studies, 28 of which compared groups of women with FGM/C to women with no or different types of genital modifications.
Main findings: • Women who have undergone FGM/C seem to be more likely than non-cut women to experience prolonged labor, obstetric tears, instrumental delivery, obstetric hemorrhage, and difficult delivery. • Women with FGM/C type III (infibulation) seem to be more likely than women with FGM/C type I-II (clitoridectomy or excision) to experience problems during delivery. • There was not found a significant difference in risk of cesarean section or episiotomy between women with FGM/C and women without FGM/C. • There was not found a significant difference in risk of obstetric tears, cesarean section, or episiotomy between women with FGM/C type I and women with FGM/C type II.

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(continued from page one) • There were insufficient data for us to conclude whether the risk of other obstetric complications is higher among women with FGM/C compared to women with no FGM/C and whether various FGM/C types differentially affect the risk of other obstetric complications. • These findings are based on very low quality of evidence and preclude us from drawing conclusions regarding causality. However, while the exact size of the greater risk from FGM/C is unclear, the findings provide evidence of serious harmful consequences from FGM/C.

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We would like to thank Tove Ringerike, Ingeborg B. Lidal, Owolabi Bjälkander, Vanja Berggren, and Staffan Bergström for their expertise in this project. Norwegian Knowledge Centre for the Health Services assumes final responsibility for the content of this report.

Norwegian Knowledge Centre for the Health Services
Oslo, April 2013

Key messages

Female genital mutilation/cutting (FGM/C) is a traditional practice that involves the partial or total removal of the external female genitalia or other injury to the female genital organs for non-medical reasons. This systematic review aimed to fill a gap in synthesized evidence of the obstetric sequelae of FGM/C. We included 44 primary studies, 28 of which compared groups of women with FGM/C to women with no or different types of genital modifications. The main findings are:

- Women who have undergone FGM/C seem to be more likely than non-cut women to experience prolonged labor, obstetric tears, instrumental delivery, obstetric hemorrhage, and difficult delivery.
- Women with FGM/C type III (infibulation) seem to be more likely than women with FGM/C type I-II (clitoridectomy or excision) to experience problems during delivery.
- There was not found a significant difference in risk of cesarean section or episiotomy between women with FGM/C and women without FGM/C.
- There was not found a significant difference in risk of obstetric tears, cesarean section, or episiotomy between women with FGM/C type I and women with FGM/C type II.
- There were insufficient data for us to conclude whether the risk of other obstetric complications is higher among women with FGM/C compared to women with no FGM/C and whether various FGM/C types differentially affect the risk of other obstetric complications.

These findings are based on very low quality of evidence and preclude us from drawing conclusions regarding causality. However, while the exact size of the greater risk from FGM/C is unclear, the findings provide evidence of serious harmful consequences from FGM/C.

Title:
Obstetric consequences of female genital mutilation/cutting (FGM/C)

Type of publication:

Systematic review

A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyse and summarise the results of the included studies.

Doesn't answer everything:

- Excludes studies that fall outside of the inclusion criteria
- No health economic evaluation
- No recommendations

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Peer review:

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Executive summary

Background

Female genital mutilation/ cutting (FGM/C) is a traditional practice that involves the partial or total removal of the external female genitalia or other injury to the female genital organs for non-medical reasons. To clarify understanding of the prevalence as well as consequences of the practice, WHO has classified FGM/C into four categories: type I (clitoridectomy), type II (excision), type III (infibulation), and type IV (other). It is widely recognized that FGM/C violates a series of human rights principles – including the Universal Declaration of Human Rights – yet, the practice is found among diverse ethnic groups in about 28 countries in Africa as well as some countries in the Middle East and Asia, and among immigrant communities in Western countries. A range of reasons, which vary across countries, regions and cultural groups, exist for FGM/C, but the practice is generally carried out as a matter of social convention. FGM/C is typically performed on pre-pubescent girls, often without anaesthetics, thus, it is reasonable to assume that it is a traumatic event that may cause short-term as well as long-term harm. WHO writes that, on the physiological level, the procedure causes permanent, irreparable changes in the external female genitalia and that there are no known health benefits to FGM/C. It is estimated that across the world, between 100-140 million girls/women are presently living with FGM/C.

The question addressed in the present systematic review is whether women who have been subjected to FGM/C are more likely than women without FGM/C to experience obstetric complications. Obstetrics is the medical specialty area dealing with the care of women and their children during pregnancy, childbirth, and the first six weeks after delivery.

Objective

This systematic review aimed to fill a gap in synthesized evidence of the obstetric sequelae of FGM/C. The overall aim of the systematic review is to support well-informed decisions in health promotion and health care that inform work to reduce the prevalence of FGM/C and improve quality of services related to the consequences of FGM/C.

The main research question was: What are the obstetric consequences of FGM/C?

Method

The systematic review was conducted in accordance with the NOKC Handbook for Summarizing Evidence and the Cochrane Handbook for Systematic Reviews of Interventions. The main literature search strategy was searches in 15 international databases. Studies eligible for inclusion were systematic reviews, cohort studies, case-control studies, cross-sectional studies, case series, and case reports. The population of interest was girls and women who have been subjected to any type of FGM/C. It follows that the event or intervention was FGM/C, and the comparison was no- or an alternative type of FGM/C. In this report, we summarized the obstetric consequences of FGM/C. These outcomes included, but were not limited to, prolonged labor, tears/lacerations, caesarean section, episiotomy, instrumental delivery, and postpartum hemorrhage.

Two reviewers assessed studies for inclusion according to pre-specified criteria, considered the methodological quality of the studies using appropriate checklists, and extracted data from the included sources using a pre-designed data recording form. These steps were done independently and then jointly by the two reviewers. Because results from studies which compare groups of women are most valid for evaluating risk of experiencing complications, we prioritized presenting results from comparative studies. We summarized the study level results in texts and tables and calculated effect estimates (relative risk and mean difference). When studies were sufficiently similar, we used the statistical technique of meta-analysis to estimate risk. We applied the instrument Grading of Recommendations Assessment, Development and Evaluation (GRADE) to assess the extent to which we could have confidence in the effect estimates.

Results

We identified 5,109 publications and after having assessed titles, abstracts, and publications in full text we included 44 primary studies. All included studies were observational studies, of which 28 were comparative, i.e. they compared groups of women with FGM/C to women with no- or a different type of genital modification. The methodological study quality was generally low, with only seven of the 28 comparative studies (25%) judged as having high or moderate methodological study quality. In our assessment, using the GRADE instrument, the quality of the evidence was very low with regards to documenting a causal relationship between FGM/C and obstetric consequences.

Collectively, the studies involved almost 3 million participants. This was due to the inclusion of seven registry studies. Women with FGM/C made up 2.4% of the total sample (n= 70,495). There were eight main outcomes reported across the included studies: Prolonged labor, obstetric tears/lacerations, cesarean section, episiotomy, instrumental delivery, obstetric hemorrhage, dystocia/difficult delivery, other obstetric and antenatal complications.

The main findings are:

- Women who have undergone FGM/C seem to be more likely than non-cut women to experience prolonged labor, obstetric tears, instrumental delivery, obstetric hemorrhage, and difficult delivery.
- Women with FGM/C type III (infibulation) seem to be more likely than women with FGM/C type I-II (clitoridectomy or excision) to experience problems during delivery.
- There was not found a significant difference in risk of cesarean section and episiotomy between women with FGM/C and women without FGM/C.
- There was not found a significant difference in risk of obstetric tears, cesarean section, and episiotomy between women with FGM/C type I and women with FGM/C type II.
- There were insufficient data for us to conclude whether the risk of other obstetric complications is higher among women with FGM/C compared to women with no FGM/C and whether various FGM/C types differentially affect the risk of other obstetric complications.

Discussion

This systematic review identified a number of disparities in obstetric outcomes for women with FGM/C relative to women who have not undergone FGM/C. Meta-analysis results show that deliveries to women who have undergone FGM/C are more likely to be complicated by prolonged labor, perineal tears/lacerations, instrumental delivery, obstetric hemorrhage, and obstructed labor than deliveries by comparable women who have not undergone FGM/C. Given the studies included in the meta-analyses included women with various types of FGM/C, genital cutting of any type seems to be associated with obstetric complications. Although the available data do not allow for obstetric complications to be causally attributed to FGM/C and the exact size of the greater risk from FGM/C is unclear, the data clarify the obstetric improvements that may be anticipated with the halting of FGM/C. These results could be used as arguments for campaigning against the practice.

Conclusion

The low quality of the body of evidence means that it is unclear whether the documented association of FGM/C with obstetric complications reflects true causality. However, the evidence base suggests that women who have undergone FGM/C are more likely than women who have not been subjected to FGM/C to experience obstetric complications.

It is questionable whether intensified research efforts would meaningfully change the results described here. If further research on the association between FGM/C and obstetric outcomes are considered ethically and financially justified, such studies should be based on the best possible methodological study design, which is case-control studies.

Hovedfunn (norsk)

Kjønnslemlestelse er en tradisjonell praksis som innebærer at hele eller deler av de eksterne kvinnelige kjønnsorganene fjernes eller skades av ikke-terapeutiske grunner. Denne systematiske oversikten hadde som mål å besvare: hva er de obstetriske konsekvensene (fødselskomplikasjoner) av kjønnslemlestelse? Vi inkluderte 44 primærstudier, hvorav 28 studier sammenlignet kvinner utsatt for kjønnslemlestelse med kvinner uten kjønnslemlestelse, eller sammenlignet ulike typer kjønnslemlestelse. Hovedfunnene er:

- Det ser ut til at kvinner med kjønnslemlestelse har større risiko enn kvinner uten kjønnslemlestelse for å oppleve forlenget fødsel, obstetriske rifter, instrumentell forløsning, store blødninger og vanskelig fødsel.
- Det ser ut til at kvinner med kjønnslemlestelse type III (infibulasjon) har større risiko enn kvinner med kjønnslemlestelse type I-II (klitoridektomi eller eksisjon) for å oppleve problemer under fødselen.
- Resultatene viste ingen statistisk signifikant forskjell mellom kvinner med og uten kjønnslemlestelse i risiko for keisersnitt og episiotomi.
- Resultatene viste ingen statistisk signifikant forskjell mellom kvinner med kjønnslemlestelse type I og type II i risiko for obstetriske rifter, keisersnitt og episiotomi.
- Det er ikke grunnlag for å konkludere om risikoen for andre obstetriske komplikasjoner er høyere blant kvinner med kjønnslemlestelse enn uten, og om ulike typer kjønnslemlestelse i ulik grad påvirker risikoen for andre obstetriske komplikasjoner.

Disse resultatene er basert på et kunnskapsgrunnlag av svært lav kvalitet, slik at vi kan ikke dra kausale slutninger. Men selv om den nøyaktige størrelsen på økt risiko av kjønnslemlestelse er uklar, viser resultatene likevel evidens for at kvinner med kjønnslemlestelse i større grad opplever obstetriske problemer enn kvinner uten kjønnslemlestelse.

Tittel:
Obstetriske konsekvenser av kvinnelig kjønnslemlestelse

Publikasjonstype:

Systematisk oversikt

En systematisk oversikt er resultatet av å
- innhente
- kritisk vurdere og
- sammenfatte

relevante forskningsresultater ved hjelp av forhåndsdefinerte og eksplisitte metoder.

Svarer ikke på alt:

- Ingen studier utenfor de eksplisitte inklusjonskriteriene
- Ingen helseøkonomisk evaluering
- Ingen anbefalinger

Hvem står bak denne rapporten?

Kunnskapssenteret har skrevet rapporten på oppdrag fra Verden Helseorganisasjon og NORAD.

Når ble litteratursøket utført?

Søk etter studier ble avsluttet Januar, 2012.

Fagfeller:

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Sammendrag (norsk)

Obstetriske konsekvenser av kvinnelig kjønnslemlestelse

Bakgrunn

Kjønnslemlestelse er en tradisjonell praksis som innebærer at hele eller deler av de eksterne kvinnelige kjønnsorganene fjernes eller skades av ikke-terapeutiske grunner. For å klargjøre forståelsen av forekomst og konsekvenser av praksisen har verdens helseorganisasjon klassifisert kjønnslemlestelse i fire kategorier: type I (klitoridektomi), type II (eksisjon), type III (infibulasjon) og type IV (andre former). Kjønnslemlestelse er anerkjent som en skadelig praksis som krenker menneskelige rettigheter – inkludert verdenserklæringen om menneskerettigheter – likevel fins praksisen blant ulike etniske grupper i ca 28 land i Afrika, samt noen land i Midtøsten og Asia og blant innvandrere i vestlige land. Begrunnelsene for kjønnslemlestelse varierer på tvers av land, regioner og kulturelle grupper, men praksisen er vanligvis grunnet i at det er en sosial konvensjon. Kjønnslemlestelse utføres vanligvis før pubertetsalderen, ofte uten bedøvelse og det er derfor rimelig å anta at det er en traumatisk hendelse som kan føre til kortsiktige så vel som langsiktige skader. Ifølge verdens helseorganisasjon fører inngrepet til vedvarende, uopprettelige endringer i de ytre kvinnelige kjønnsorganene, og ingen helsemessige gevinster. Det anslås at det på verdensbasis i dag er ca 100-140 millioner jenter/kvinner som lever med kjønnslemlestelse.

Problemstilling

Denne systematiske oversikten hadde som mål å besvare: hva er de obstetriske konsekvensene av kjønnslemlestelse?

Metode

Den systematiske oversikten ble utført i henhold til Kunnskapssenteret metodehåndbok og Cochrane Handbook for Systematic Reviews of Interventions. Den viktigste strategien for identifisering av litteratur var litteratursøk i 15 internasjonale databaser. Vi kunne inkludere følgende studiedesign: systematiske oversikter, kohortestudier, kasuskontrollstudier, tverrsnittstudier, kasus-serier og kasustikker. Populasjonen av interesse var jenter/kvinner som var kjønnslemlestet. Hendelsen (’tiltaket’) var kjønnslemlestelse. Sammenligningen var med versus uten kjønnslem-

lestelse, eller én type versus en annen type kjønnslemlestelse. Obstetriske konsekvenser av kjønnslemlestelse kunne inkludere, men var ikke begrenset til: forlenget fødsel, obstetriske rifter, keisersnitt, episiotomi, instrumentell forløsning og post partum-blødning. To medarbeidere, først uavhengig og så sammen, vurderte studier for inklusjon i henhold til forhåndsbestemte kriterier, vurderte den metodiske kvaliteten på studiene ved bruk av egnede sjekklister og hentet ut data fra de inkluderte studiene ved hjelp av et datauttrekkingsskjema. Resultater fra studier som sammenligner grupper gir de mest gyldige svarene på risiko for å oppleve komplikasjoner, derfor prioriterte vi å presentere resultater fra komparative studier. Vi oppsummerte resultater på studienivå i tekst og tabeller og beregnet effektestimat (relativ risiko og gjennomsnittsforskjell). For resultat fra studier som var tilstrekkelig like benyttet vi meta-analyser for å beregne risiko. Vi vurderte den samlede dokumentasjonen for endepunktene ved hjelp av Grading of Recommendations, Assessment, Development and Evaluation (GRADE).

Resultat

Vi identifiserte 5109 publikasjoner og etter å ha vurdert titler, sammendrag og artikler i fulltekst fant vi 44 studier som oppfylte inklusjonskriteriene. Alle studiene var observasjonsstudier, hvorav 28 var komparative, dvs. de sammenlignet kvinner utsatt for kjønnslemlestelse med kvinner uten kjønnslemlestelse, eller de sammenlignet kvinner med ulike typer kjønnslemlestelse. Den metodiske studiekvaliteten var generelt sett lav; kun syv av de 28 komparative studiene (25 %) hadde høy eller moderat metodisk studiekvalitet. Vi vurderte kvaliteten på den samlede dokumentasjonen for endepunktene ved hjelp av GRADE til svært lav. Det betyr at effektestimatene er for usikre til å kunne dokumentere en kausal sammenheng mellom kjønnslemlestelse og obstetriske konsekvenser. Studiene involverte totalt nesten 3 millioner deltakere. Dette var på grunn av at vi inkluderte syv registerstudier. Kvinner med kjønnslemlestelse utgjorde 2,4 % av det totale utvalget (n= 70 495). Åtte hovedutfall ble rapportert: forlenget fødsel, obstetriske rifter, keisersnitt, episiotomi, instrumentell forløsning, obstetrisk blødning, dystoci/vanskelig fødsel, andre obstetriske komplikasjoner. Hovedfunnene er:

- Det ser ut til at kvinner med kjønnslemlestelse har større risiko enn kvinner uten kjønnslemlestelse for å oppleve forlenget fødsel, obstetriske rifter, instrumentell forløsning, store blødninger og vanskelig fødsel.
- Det ser ut til at kvinner med kjønnslemlestelse type III (infibulasjon) har større risiko enn kvinner med kjønnslemlestelse type I-II (klitoridektomi eller eksisjon) for å oppleve problemer under fødselen.
- Resultatene viste ingen statistisk signifikant forskjell mellom kvinner med og uten kjønnslemlestelse i risiko for keisersnitt og episiotomi.
- Resultatene viste ingen statistisk signifikant forskjell mellom kvinner med kjønnslemlestelse type I og type II i risiko for obstetriske rifter, keisersnitt og episiotomi.

- Det er ikke grunnlag for å konkludere om risikoen for andre obstetriske komplikasjoner er høyere blant kvinner med kjønnslemlestelse enn uten, og om ulike typer kjønnslemlestelse i ulik grad påvirker risikoen for andre obstetriske komplikasjoner.

Diskusjon

Denne systematiske oversikten identifiserte en rekke forskjeller i obstetriske utfall for kvinner med kjønnslemlestelse i forhold til kvinner som ikke har blitt utsatt for kjønnslemlestelse. Meta-analysene viser at kvinner med kjønnslemlestelse, sammenlignet med kvinner uten kjønnslemlestelse, har større risiko for å oppleve fødselskomplikasjoner som: forlenget fødsel, perinealrifter, instrumentell forløsning, store blødninger, og vanskelig fødsel. Studiene som meta-analysene var basert på inkluderte kvinner med ulike typer kjønnslemlestelse, derfor ser det ut til at enhver type kjønnslemlestelse er assosiert med obstetriske komplikasjoner. Kunnskapsgrunnlager er av såpass lav kvalitet at vi kan ikke dra kausale slutninger og den nøyaktige størrelsen på økt risiko av kjønnslemlestelse er uklar. Likevel avklarer resultatene obstetriske fordeler som kan forventes med at praksisen stopper. Resultatene kan brukes som argumenter i kampanjer mot praksisen.

Konklusjon

Disse resultatene er basert på et kunnskapsgrunnlag av svært lav kvalitet, slik at vi ikke kan dra kausale slutninger. Men resultatene gir sterkt uttrykk for at kvinner med kjønnslemlestelse har større risiko for å oppleve obstetriske komplikasjoner enn kvinner uten kjønnslemlestelse. Det er usikkert om ytterligere studier vil gi meningsfulle endringer i resultatene vi har sammenfattet her. Hvis videre forskning på sammenhengen mellom kjønnslemlestelse og obstetriske utfall anses som etisk og økonomisk forsvarlig bør slike studier være basert på best mulig design, som er kasuskontrollstudier.

Nasjonalt kunnskapssenter for helsetjenesten fremskaffer og formidler kunnskap om effekt av metoder, virkemidler og tiltak og om kvalitet innen alle deler av helsetjenesten. Målet er å bidra til gode beslutninger slik at brukerne får best mulig helsetjenester. Kunnskapssenteret er formelt et forvaltningsorgan under Helsedirektoratet, men har ikke myndighetsfunksjoner og kan ikke instrueres i faglige spørsmål.

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Preface

The World Health Organization (WHO) and the Norwegian Agency for Development Cooperation (NORAD) commissioned a summary of available research on the physical health consequences following female genital mutilation/cutting (FGM/C) from the Norwegian Knowledge Centre for the Health Services (NOKC). This evidence review will make up the background documentation for supporting organizations like the WHO and NORAD's work concerning FGM/C among girls/women subjected to and at risk for the practice in countries where FGM/C may occur.

Given the enormous scope of the documentation identified we prepared three reports. The present report concerns the obstetric consequences of FGM/C. The other two reports will examine the immediate (acute) consequences and the gynecological consequences following FGM/C. These are planned to be completed by the end of 2013.

The project group consisted of:

- Project coordinator: researcher, Rigmor C Berg, NOKC
- Researcher: Vigdis Underland, NOKC

The literature search was conducted by search specialist Sari Ormstad, Jan Odgaard-Jensen provided statistical support, and Eva Denison assisted with methodological quality assessment. All three are with the NOKC. We are also indebted to Elise R. Johansen (WHO) for her efforts to locate full text of studies and data. We are grateful for peer review by two internal and three external reviewers:

• Tove Ringerike, researcher, NOKC, Norway
• Ingeborg B. Lidal, researcher, NOKC, Norway
• Owolabi Bjälkander, Ph.D candidate, Karolinska Institute, Sweden
• Vanja Berggren, researcher, Karolinska Institute, Sweden
• Staffan Bergström, professor, Karolinska Institute, Sweden

The aim of this report is to support well-informed decisions in health care that lead to improved quality of services. The evidence should be considered together with other relevant issues, such as clinical experience and patient preference.

Gro Jamtvedt	Gunn E. Vist	Rigmor C Berg
Department director	*Unit director*	*Project coordinator*

Objective

This systematic review summarizes empirical quantitative research describing the obstetric consequences of FGM/C on girls and women. The overall aim of the systematic review is to support well-informed decisions in health promotion and health care that inform work to reduce the prevalence of FGM/C and improve quality of services related to the consequences of FGM/C.

The main research question for this systematic review was:
• What are the obstetric consequences of FGM/C?

Background

A variety of terms is used to refer to the cutting of external female genital tissues, such as female circumcision, female genital mutilation, female genital cutting, and female genital mutilation/cutting (1). Throughout this report we adopt the official terminology used by the United Nations Children's Fund (UNICEF) and the United Nations Population Fund (UNFPA) "female genital mutilation/cutting" (FGM/C) (1). A glossary of terms is available in appendix 1.

FGM/C

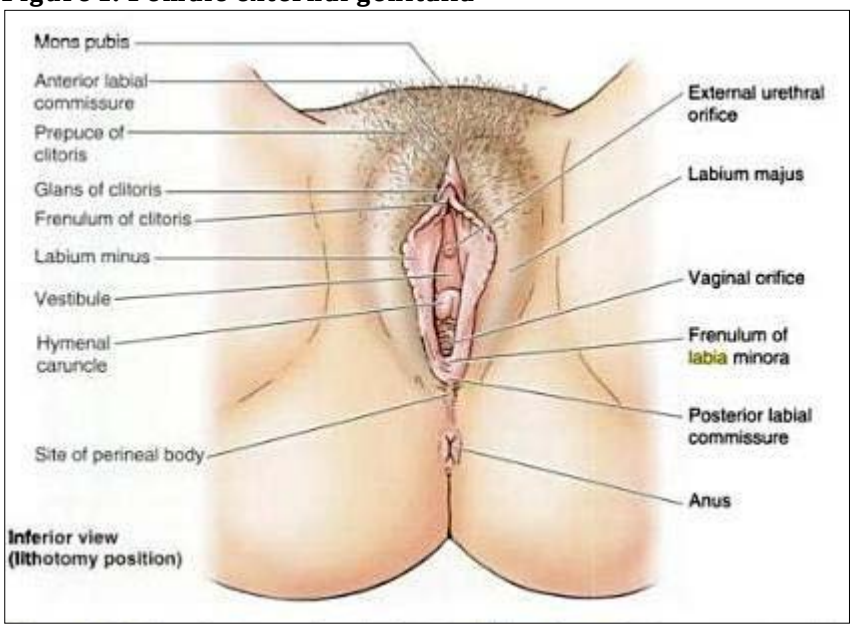
Classification

Female genital mutilation/ cutting (FGM/C) is a traditional practice that involves "all procedures involving partial or total removal of the external female genitalia or other injury to the female genital organs for non-medical reasons" ((1) p1). To clarify understanding of the prevalence as well as consequences of the practice, WHO has classified FGM/C into four categories:

- Type I (clitoridectomy)= partial or total removal of the clitoris and/or the prepuce (the external female genital anatomy is depicted in figure 1).
- Type II (excision)= partial or total removal of the clitoris and the labia minora, with or without excision of the labia majora.
- Type III (infibulation)= narrowing of the vaginal orifice with creation of a covering seal by cutting and appositioning the labia minora and/or the labia majora, with or without excision of the clitoris. This is considered the most invasive type of FGM/C.
- Type IV (other)= all other harmful procedures to the female genitalia for non-medical purposes, for example pricking, piercing, incising, scraping, and cauterizing. No genital tissue is excised (1).

Defibulation, opening of the covering seal, is often necessary prior to childbirth. Reinfibulation refers to the recreation of an infibulation after defibulation. While WHO guidelines recommend permanent defibulation, reinfibulation is considered a type of FGM/C (1).

Figure 1: Female external genitalia



Prevalence and reasons

It is widely recognized that FGM/C violates a series of human rights principles – including the Universal Declaration of Human Rights, the Convention on the Elimination of all Forms of Discrimination against Women, the Convention on the Rights of the Child (1). Nevertheless, the practice is found among diverse ethnic groups in about 28 countries in Africa as well as some countries in the Middle East and Asia (2;3). It is estimated that three million girls are at risk of undergoing the practice every year (4). No national prevalence data exist for countries outside of the African continent, but survey data suggest that in Africa, there are 91.5 million girls and women aged 10 years and above who have been subjected to FGM/C (3). National figures show a prevalence of FGM/C of more than 70% in Burkina Faso, Djibouti, Eritrea, Ethiopia, Mauritania, Northern Sudan, and Sierra Leone, and more than 90% in Egypt, Guinea, and Mali. In Somalia, available sources put FGM/C prevalence at 95-98% (3;4). However, because of the magnitude of FGM/C among certain ethnic groups there is great variation in prevalence between and within countries (3). On a country level, in Africa the prevalence of FGM/C is estimated to range from 0.6% to 98% of the female population (1).

Due to increased migration, FGM/C transcends geography and is also found among immigrant communities in a number of Western countries, such as Australia, Canada, France, Norway, Sweden, Switzerland, and the United States (2). Research indicates that the majority of girls living in Western countries who are subjected to FGM/C do not undergo the procedure in these countries. Rather, they are sent to their country of origin, usually in Africa, in order to undergo the practice (5-7).

A range of reasons, which vary across countries, regions and cultural groups, exist for FGM/C, but the practice is generally carried out as a matter of social convention. It is closely linked with ethnic identity, with FGM/C serving as an ethnic marker throughout the lifespan (8). The practice is also rooted in tradition as well as religio-social beliefs such as the conviction that FGM/C is a religious requirement, that it is necessary to control women's sexuality and preserve family honour (9), and that it is a prerequisite for marriage or an economic necessity in cases where women are largely dependent on men (10).

In a previous systematic review, we summarized factors perpetuating and hindering the continuance of FGM/C, as expressed by members from FGM/C practicing communities residing in a Western country (11;12). Understanding the motivations underpinning FGM/C is necessary such that messages and activities can be tailored to their audiences accordingly, thus enhancing the chances of abandonment of the practice. The systematic review, which included 21 studies, revealed six key factors that underpin FGM/C: cultural tradition, sexual morals, marriageability, religion, health benefits, and male sexual enjoyment. There were four key factors perceived to hinder FGM/C: health consequences, it is not a religious requirement, it is illegal in Western countries, and the host society discourse rejects FGM/C. The results showed that, among members of communities practicing FGM/C who reside in a Western country, FGM/C appears to be a tradition in transition and its continuation motivated by a complex mix of interlinked factors.

As social conventions go, the practice of FGM/C is not static but is changing in a number of ways. The practice is declining in several countries. For example, representative survey data from Egypt show that while 95% of 45-49 year olds have been subjected to FGM/C, only 79% of women aged 15-19 have been genitally cut (13). Another general trend is a lowering of the average age at which girls are subjected to the procedure. There is some speculation that this is to elude scrutiny, the reasoning being that the younger the girl, the easier it is to avoid detection (2). Lastly, there is a trend towards medicalization of FGM/C. Parents are increasingly utilizing healthcare providers to perform FGM/C for their daughters, rather than traditional circumcisers (13). Although FGM/C performed by medical personnel in health clinics may minimize short term complications, it tends to obscure its human rights aspect and there are no data to suggest that medicalization reduces long term complications (1). Rather, some research has shown that medicalization in some countries has led to institutionalization and increased severity of the procedure (14). The medical profession, led by WHO and the World Medical Association, has condemned medicalization of FGM/C (15).

Consequences

The practice is typically performed on pre-pubescent girls, often without anaesthetics (2), thus, it is reasonable to assume that it is a traumatic event that may cause

short-term as well as long-term harm. WHO writes that, on the physiological level, FGM/C causes permanent, irreparable changes in the external female genitalia and that there are no known health benefits to FGM/C (1). According to WHO estimates from 2008 (1), across the world, between 100-140 million girls/women are presently living with FGM/C.

In a previous systematic review, we summarized empirical quantitative data describing the social, psychological, and sexual consequences of FGM/C (16;17). Only studies that compared women with FGM/C to women without FGM/C were included. Unfortunately, we were unable to draw any conclusions concerning social consequences because only two studies, both of low study quality, included some measure of social consequences following FGM/C. With respect to psychological consequences, results from the four included studies suggested that women with FGM/C may be more likely than women without FGM/C to experience psychological disturbances (i.e. have a psychiatric diagnosis, suffer from anxiety, somatisation, phobia, and low self-esteem). The effect estimates for sexual consequences, derived from 15 comparative studies, showed that women with FGM/C were more likely than women without FGM/C to experience pain during intercourse, reduced sexual satisfaction, and reduced sexual desire.

As today, the literature "A systematic review of the health complications of female genital mutilation, including sequelae in childbirth" (18) provides the most comprehensive summary of physical complications from FGM/C. This review identified and summarized primary data on health complications after FGM/C with particular emphasis on sequelae in childbirth and psychosexual outcomes. It included a range of study designs and identified various complications, the most common being severe pain, bleeding, difficulty in passing urine and faeces and infections. Around the same time, Obermeyer completed a related review of women's health complications and sexual consequences following FGM/C, which concluded that "the powerful discourse that depicts these practices as inevitably causing death and serious ill health, and as unequivocally destroying sexual pleasure, is not sufficiently supported by the evidence" ((19) p79). The review was updated in 2005 (20), with largely similar conclusions but also the acknowledgement that there were statistically higher risks documented for some but not all types of health conditions. Drawbacks of both sets of reviews are that the literature searches are out-dated, they are not systematic, some outcomes are missing, and risks of various health consequences are not quantified.

Obstetrics

The term obstetrics comes from the Latin word obstare, which means "to stand by". It is the medical specialty area dealing with the care of women's reproductive tracts and their children during pregnancy, childbirth, and the first six weeks after delivery

(21). Pregnancy is a life-affirming state which many women aspire to at some point in their lives. Yet the process carries with it risks of complications and even death. Obstetric complications include disruptions and disorders of pregnancy, labor and delivery, and complications during the early neonatal period. Complications can have short- and long-term effects on the mother and child (21). Each year, approximately eight million women around the world suffer from pregnancy-related complications (22) and over 300,000 die in childbirth (23). In 2008, more than half of all maternal deaths were in six developing countries: India, Nigeria, Pakistan, Afghanistan, Ethiopia, and the Democratic Republic of Congo (23). For example, in West Africa, estimates indicate that the ratio of maternal death is 38 times higher than in more developed regions (24). Rates of maternal morbidity and mortality are hampered by obstacles to measurement, however, especially in developing countries, and they are likely to be underestimated given the high percentage of women in some areas who give birth at home (24;25). UNICEF writes that a large percentage of obstetric complications could be avoided if skilled health personnel and essential supplies, equipment and facilities were available (26). In fact, research has identified a close relationship between levels of maternal mortality and the percentage of births with a skilled birth attendant (25). Unfortunately, malfunctioning public health services in developing countries nonetheless mean that a considerable number of women who deliver within health services are in fact not attended by qualified health personnel (24). In eastern and southern Africa, half of all births occur without the support of a skilled birth attendant (26).

The relevant question for the present systematic review is whether women who have been subjected to FGM/C are more likely than women without FGM/C to experience obstetric complications. A reasonable follow-up question is by which mechanisms FGM/C may lead to adverse obstetric outcomes. In the WHO literature review, it is concluded that “the serious obstetric consequences of FGM, when it is performed prior to the index pregnancy, are mainly due to the scarring resulting from FGM” ((18) p12). In fact, across a number of studies, the most plausible pathway of effect suggested is inelastic scar tissue (27-33). As explained by WHO (18), FGM/C is generally performed on girls under the age of ten, and healing from any type of cutting inevitably involves varying amounts of scar formation. Further, scar tissue consists of mature collagen. The highest concentration of collagen is found in tissue subjected to recurrent incision and healing (33). Such scar tissue is less elastic and has decreased tensile strength, compared to undamaged tissue. It follows that a likely mechanism through which FGM/C may increase the risk of obstetric complications is the increase in scarring of perineal and vulval tissues found in women with FGM/C. Such scarring increases the possibility of tearing and hemorrhage during labor, even when appropriate episiotomy is performed, note Orji and Babalola (30). Obstetrician Hakim (27) writes that female genital tissue that has been cut is subjected to greater tears/lacerations during parturition and may interfere with the progress of labor. Additionally, researchers have suggested that damage to the vagi-

na, internally and externally through obstructions such as stenosis and retention cysts following FGM/C, may compromise a normal vaginal delivery, including prolongation of labor (28;31). According to a study (63), women with FGM/C are also more likely to suffer genital- and urinary-tract infections, which could have repercussions for obstetric outcomes. Similarly, women with FGM/C may be more susceptible to reproductive tract infections, which could affect labor (28). The degree to which women with FGM/C are more likely than non-cut women to suffer cysts, stenosis, infections, and similar will be examined in one of our subsequent systematic reviews.

Method

This systematic review of the obstetric consequences of FGM/C was conducted in accordance with the NOKC Handbook for Summarizing Evidence (34) and the Cochrane Handbook for Systematic Reviews of Interventions (35).

Literature search

The main literature search strategy was searches in databases. We systematically searched for relevant literature in the following 15 international databases:

- African Index Medicus
- British Nursing Index and Archive
- CINAHL
- The Cochrane Library:
  - Cochrane Central Register of Controlled Trials
  - Cochrane Database of Systematic Reviews
  - Database of Abstracts of Reviews of Effects
  - Health Technology Assessment Database
- EMBASE
- MEDLINE
- PILOTS
- POPLINE
- PsycINFO
- Social Services Abstracts
- Sociological Abstracts
- WHOLIS

The database search strategy was designed by Sari Ormstad, information retrieval specialist at the NOKC, in cooperation with the project group and commissioners. Sari Ormstad executed the search in January 2012. We planned to search also Anthropology Plus, but starting 2012, NOKC no longer had access to this database. The search strategy incorporated both text words (in title and abstract) and subject headings (e.g. MeSH terms in MEDLINE) relating to FGM/C and the four classifications of FGM/C, including mutilation, circumcision, excision. We applied no methodology search filters in order to maximize the sensitivity of searches. We did not restrict the

searches to any specific languages or publication dates. The complete search strategy is found in appendix 2.

We supplemented the electronic database searches with searches in sources for grey literature (OpenGrey, OpenSigle, OAIster), and browsed websites of six international organizations that are engaged in projects regarding FGM/C:

- Population Council: http://www.popcouncil.org/
- Population Reference Bureau (PRB): http://www.prb.org/
- The Centre for Development and Population Activities (CEDPA): http://www.cedpa.org/
- The United Nations Children's Fund (UNICEF): http://www.unicef.org/
- The United Nations Population Fund (UNFPA): http://www.unfpa.org/public/
- The World Health Organization (WHO): http://www.who.int/en/

We also searched reference lists of relevant reviews and all included studies. Finally, we communicated with experts engaged in FGM/C related work and asked for studies about the health consequences of FGM/C.

Inclusion criteria

Study design (in order of priority):

1. systematic reviews
2. cohort studies
3. case-control studies
4. cross-sectional studies
5. case series
6. case reports

We used study design features (as defined in the Cochrane glossary, http://www.cochrane.org/glossary) not study design labels to designate the studies. Methodological study quality was not a basis for inclusion/exclusion.

Population:	Girls and women who have been subjected to any type of FGM/C, as classified by WHO (1). We enforced no limitations on age, race/ethnicity, nationality or other participant characteristics.
Event/Intervention:	FGM/C classified as type I to type IV according to the WHO modified typology (1).
Comparison:	No FGM/C or a different type of FGM/C. We note that both studies with and without a comparison group were eligible for inclusion. When the study reported a comparison group, the study had to compare either 1) a type of

	FGM/C vs no FGM/C, or 2) one type of FGM/C vs another type, e.g., type I vs type III, as defined by WHO (1).
Outcome:	We included all types of physical consequences / complications following FGM/C, both short- and long term consequences experienced by girls/women. In this report, we summarize the obstetric consequences of FGM/C. These included but were not limited to: prolonged labor, tears, caesarean section, episiotomy, instrumental delivery, postpartum hemorrhage. All physical outcomes were included, but outcomes not considered obstetric are presented in separate reports.
Language:	We included all publication languages. When considered likely to meet the inclusion criteria, studies in languages not mastered by the review team were translated to English using Google translator. Professional translation was not necessary for any of the studies included in this report.

Unpublished reports, abstracts, brief and preliminary reports were considered for inclusion on the same basis as published reports. We also note that the outcomes had to be self-reported by the girls/women having experienced these or documented by health personnel and study investigators. When physical outcomes pertained to children, we accepted reports by the girl's parents.

Exclusion criteria

Study design:	Qualitative studies and all studies without a quantitative measure of a physical consequence of FGM/C.
Population:	We excluded consequences of a woman's FGM/C on other individuals, such as her sexual partners or babies during birth. We also excluded studies about FGM/C on populations where modifications of genital tissue were performed for medically indicated or purely cosmetic reasons.
Intervention:	All genital modifications not captured by the WHO stated FGM/C definition (1).
Outcome:	Psychological and social outcomes and any other outcomes that cannot be considered a physical outcome.

Selection of studies

Two reviewers (Berg and Underland) independently read all titles/and or abstracts resulting from the literature searches. We compared our judgments and obtained

full text copies of the studies that we deemed relevant. The same pairs of reviewers, working independently, classified the studies read in full text as relevant (met all inclusion criteria) and therefore to be included, or not relevant and therefore to be excluded. Next, we compared our judgments and included studies that we agreed met all inclusion criteria. We used pre-designed inclusion forms for each of the two screening levels. These forms contained questions regarding type of study, types of participants, type of FGM/C, and outcomes measured. Differences in opinion in the screening process were few and were resolved through a re-examination of the record and subsequent discussion. It was not necessary to contact the author(s) of any studies to aid the selection process. A list of studies formally considered in full text but excluded is found in appendix 3, and reasons for exclusion are provided.

Data extraction and analysis

Assessment of methodological study quality

With respect to assessment of methodological quality of included studies, two reviewers first independently assessed the quality of studies, using appropriate checklists for each included study design (see below). The two reviewers then discussed and agreed upon a final decision of high, moderate or low methodological quality for each study. There were few differences in judgments, and these were resolved by a re-examination of the publication and subsequent discussion. If consensus had not been reached, we would have consulted a third person.

We did not assess the methodological quality of case reports. Case reports are descriptive studies that report observations on a single or a few individuals and are considered among the study designs with lowest validity for effect questions. Thus, a methodological quality assessment would not have added valuable information. For case series, cross-sectional descriptive studies, case-control, and cohort studies, we used the respective NOKC checklists. Given our focus on consequences of exposure to FGM/C, the NOKC assessment tool for cross-sectional studies was used for analytic cross-sectional comparative studies (where two or more groups of women were compared with respect to consequences of FGM/C) but modified by the addition of five questions from the NOKC quality assessment tool for cohort studies in order to capture whether 1) the compared groups (women with FGM/C and women without FGM/C or women with different types of FGM/C) were selected from the same population; 2) the groups were comparable with respect to important backgrounds factors; 3) exposure and outcome were measured in the same way in the two groups; 4) the person who assessed the outcome was blind to whether participants were exposed or not; and 5) known, potentially important confounders had been considered in the study design and/or analyses, resulting in an adapted checklist with 12 questions (this modified checklist was successfully used by us previously, in (16)). The

paired reviewers' assessment of each checklist question of each study is listed in appendix 4.

Data extraction

Extraction of data from the included sources was completed first independently by two authors (Berg and Underland) using a pre-designed data recording form. The two authors next compared their results and when differences in data extracted occurred this was resolved by re-examination of the publication and subsequent discussion. The following core data were extracted from all included studies:

- Title, authors, and other publication details
- Study design
- Location/mode of recruitment
- Sample characteristics (current age, country of residency)
- FGM/C characteristics (type of cutting, age of cutting, type of practitioner, method of 'measurement' of FGM/C)
- Methods of outcome measurement (clinical or self-report)
- Health consequences

Data analysis

We extracted dichotomous and continuous data for all outcomes (health consequence/complication) meeting the inclusion criteria. When outcome data were missing in the publication, we contacted the corresponding author(s) via e-mail and requested that they send us the data. We grouped the data according to outcomes across the studies, and present the results of these in text and tables. We prioritized presenting results from those studies with highest internal validity (studies which compared groups of women). In line with the prioritization to present results from studies which compared the prevalence of complications at delivery for women with and without FGM/C (alternatively, for women with one type of FGM/C and women with another type), results from studies with the lowest internal validity are presented in appendix 5.

With respect to data analysis, when possible, we estimated effect on dichotomous variables by the relative risk (RR) and 95% confidence interval (95%CI). We estimated effect on continuous variables by mean difference (MD, or standardized mean difference when possible) and 95%CI. No case-control studies were included. If they had been, for studies where dichotomous variables were presented, we would estimate effect by the odds ratio (OR) and 95%CI, because a case-control design involves the selection of research subjects on the basis of the outcome measurement rather than on the basis of the exposure. With respect to descriptive cross-sectional

studies, case series and case reports — which express the number of women with FGM/C who experience an obstetric outcome — reported proportion of women experiencing an eligible outcome is presented in tables.

When studies were sufficiently similar, we pooled those that could be grouped together and used the statistical technique of meta-analysis to estimate risk, with RevMan v5.1. (Cochrane Collaboration meta-analysis software). To be pooled, the same outcome/consequence had to be assessed in similar populations across similar studies. Standard analysis procedures were used; i.e. Mantel-Haenszel random effects meta-analysis was conducted for dichotomous outcomes and inverse-variance random effects meta-analysis for continuous outcomes. We also examined between-study heterogeneity, with the Chi-square (Chi^2) and I-square (I^2) tests. A high value shows that most of the variability across studies is due to heterogeneity rather than to chance.

When possible (i.e. there was a sufficient number of similar studies), we planned to perform sensitivity analyses for:

- performer (health care provider and traditional circumciser)
- age (at which FGM/C was done, at onset of complications, or time between procedure and onset)
- type of FGM/C (according to WHO modified typology (1))
- other pertinent factors, such as type of study.

We were able to perform sensitivity analyses for type of FGM/C and type of study.

We applied the instrument Grading of Recommendations Assessment, Development and Evaluation (GRADE) with GRADE-Profiler version 3.6 to assess the extent to which we could have confidence in the effect estimates (36). It is a transparent and systematic approach to grading the strength of evidence that can minimize bias and aid interpretation. Examples of organizations that have endorsed or that are using GRADE include WHO, National Institute for Clinical Excellence (UK), Agency for Healthcare Research and Quality (USA), Cochrane Collaboration, and British Medical Journal. We applied the eight GRADE criteria:

- methodological quality of study
- consistency (were results consistent across studies?)
- directness (did the evidence directly answer the health care question?)
- precision (were the results precise enough?)
- publication bias
- strength of evidence of association
- evidence of a dose-response gradient

- all plausibe confounders would have reduced the effect.

For more details about the GRADE system we refer to publications by the GRADE Working Group (gradeworkinggroup.org). We used the standard definitions in grading the quality of the evidence (37):

- High= We are very confident that the true effect lies close to that of the estimate of effect.
- Moderate= We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
- Low= Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
- Very low= We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

When it comes to establishing a causal relationship between exposure to an intervention (or procedure such as FGM/C) and an outcome, evidence based on observational studies will usually be appreciably weaker than evidence from experimental studies. In this systematic review, because all included studies were necessarily observational (non-randomized), the evaluation of evidence started from a position of low quality, as per GRADE instructions. For resource reasons we assessed the quality of the evidence through GRADE only for outcomes which were eligible for meta-analysis.

Results

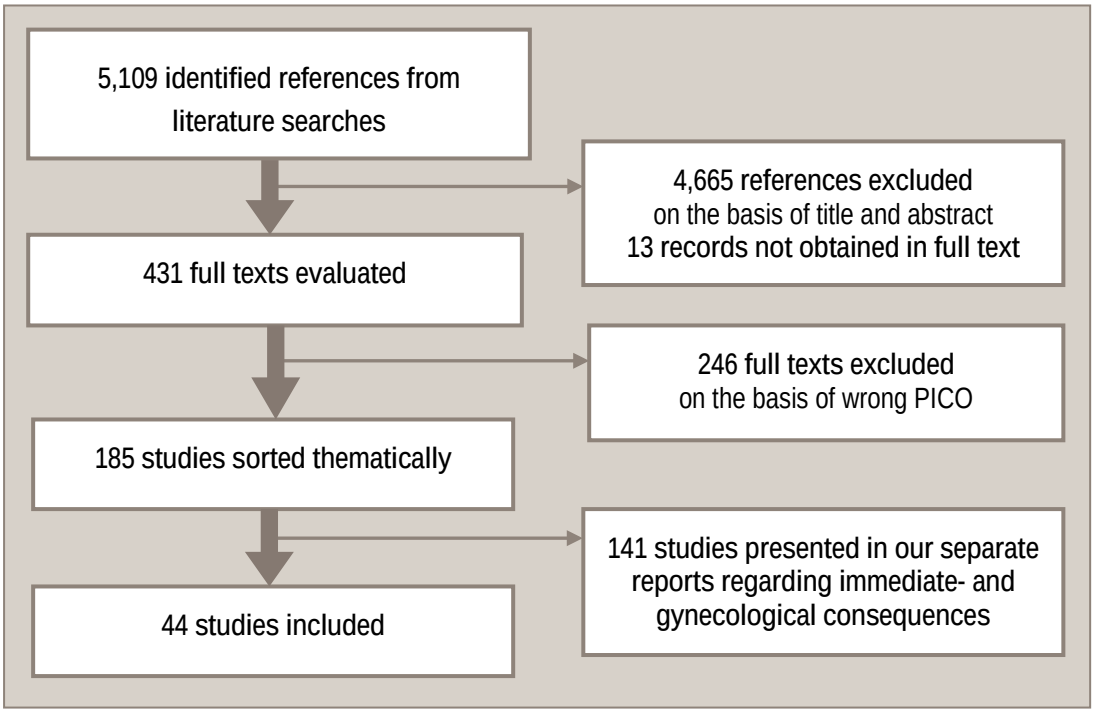
Description of included literature

Results of the search

The electronic search resulted in 4,989 individual records and the manual search in 120 potentially relevant records (figure 2). After removal of duplicates, Berg and Underland screened the records by reviewing all titles and abstracts. We eliminated non-relevant records based on titles and where available, abstracts.

After excluding 4,665 records, we were left with 444 potentially relevant records. Unfortunately, 13 records could not be obtained in full text, despite extensive retrieval efforts through national and international libraries, research contacts, and attempts at contacting the authors (38-49). Thus, we read the full text for 431 publications. We excluded 246 publications, these are listed with reasons for exclusion in appendix 3, and included 44 primary studies for the present report.

Figure 2: Flow diagram for selection of literature



Description of included studies

The majority of the 44 included studies were published in peer-reviewed journals (89%), four included studies were reports (50-53), and there was one conference abstract (54) included. Thirty of the studies (68%) were published after 2000, and with the exception of three case reports from 1927 (55), 1937 (56), and 1969 (57), the remaining third of the studies were published in the 1980s and 1990s (table 1 and 2).

There were 28 cross-sectional studies in which two or more groups were compared (comparative studies). These studies are presented in table 1. Additionally, we identified and included 16 non-comparative studies (table 2). Briefly, across all 44 studies, the great majority of the studies (75%) were judged to be of low methodological quality. Collectively, the studies involved a total of almost 3 million participants (2,978 458, range= 1 – 2.18 million). The median sample size was 492 (average= 67,692). Women with FGM/C made up 2.4% of the sample (n= 70,495). Most of the studies were conducted in Africa (29 studies, 66%). The most frequently reported outcomes were cesarean section, episiotomy, and obstetric tears. The majority of the studies (61%) had clinically measured obstetric outcomes, but 15 studies (34%) relied on women's self-report and two studies did not explain how the outcomes were ascertained (54;58).

Table 1: Included comparative studies (n=28)

Author, year	Study quality	Population, Country	Outcomes (self report or clinical verification)
Adinma 1997 (59)	Low	N=256, Nigeria	Episiotomy (self-report)
Berardi 1985 (60)	Low	N=852, France	Tears; Cesarean section; Episiotomy (clinical)
Bohoussou 1986 (58)	Low	N=4935, Ivory Coast	Prolonged labor; Tears; Cesarean section; Episiotomy; Instrumental delivery (not stated)
Browning 2010 (61)	High	N=492, Ethiopia	Prolonged labor (clinical)
Chibber 2011 (62)	Low	N=4800, not stated	Prolonged labor; Cesarean section; Hemorrhage; Infection: Other (clinical)
De Silva 1989 (63)	Low	N=2157, Saudi Arabia	Prolonged labor; Tears; Cesarean section; Episiotomy; Instrumental delivery; Hemorrhage; Other (clinical)
Diop 1998 (51)	Low	N=5390, Mali	Tears; Episiotomy; Hemorrhage; Other (clinical)
Elnashar 2007 (64)	Low	N=264, Egypt	Tears; Cesarean section; Episiotomy (self-report)
Eritrea DHS 2002 (52)	Low	N=7765, Eritrea	Problems during delivery (self-report)
Eritrea DHS 1995 (53)	Low	N=4775, Eritrea	Problems during delivery (self-report)
Essén 2005 (65)	Moderate	N=2554, Sweden	Prolonged labor (clinical)
Hakim 2001 (27)	Low	N=1481, Ethiopia	Prolonged labor; Tears; Episiotomy; Hemorrhage; Fever; Other (clinical)
Johnson 2005 (66)	Low	N=5416, USA	Tears; Cesarean section; Instrumental delivery; Hemorrhage; Other (clinical)

Jones 1999 a (28)	Low	N=1920, Burkina Faso	Other (self-report)
Jones 1999 b (28)	Moderate	N=5337, Mali	Other (clinical)
Larsen 2002 (29)	Low	N=1836, Nigeria	Prolonged labor; Tears; Cesarean section; Episiotomy (self-report)
Lupo 1999 (54)	Low	N=114, USA	Tears; Infection (not stated)
Millogo-Traore 2007 (67)	Low	N=454, Burkina Faso	Prolonged labor; Tears; Episiotomy; Instrumental delivery (clinical)
Ndiaye 2010 (68)	Low	N=354, Burkina Faso	Tears; Cesarean section; Episiotomy; Hemorrhage; Other (clinical)
Oduro 2006 (69)	High	N=5071, Ghana	Cesarean section (clinical)
Orji 2006 (30)	Low	N=500, Nigeria	Cesarean section; Episiotomy (self-report)
Slanger 2002 (70)	Moderate	N=1107, Nigeria	Tears; Cesarean section; Episiotomy; Instrumental delivery; Hemorrhage; Fever; Other (self-report)
Small 2008 (71)	Low	N=2 179322, multiple	Cesarean section; Instrumental delivery; Other (clinical)
Vangen 2002 (31)	Low	N=703925, Norway	Prolonged labor; Tears; Cesarean section; Hemorrhage (clinical)
WHO study group 2006 (32)	High	N=28393, multiple	Tears; Cesarean section; Episiotomy; Hemorrhage (clinical)
Wuest 2009 (33)	Low	N=232, Switzerland	Prolonged labor; Tears; Cesarean section; Episiotomy; Instrumental delivery; Hemorrhage (clinical)
Yount 2007 (72)	Moderate	N=3167, Kenya	Cesarean section (self-report)
Yount 2006 (73)	Low	N=1700, Egypt	Miscarriage (self-report)

Legend: Jones 1999 a=study in Burkina Faso, Jones 1999 b= study in Mali (i.e., two studies reported in same publication).

We included seven cross-sectional studies in which the prevalence of obstetric complications on women with FGM/C was presented, five case series, and four case reports (table 2).

Table 2: Included cross-sectional, case series and case report studies (n=16)

Author, year	Study design	Study quality	Population, Country	Outcomes (self report or clinical verification)
Abor 2006 (74)	Cross-sectional	Low	N=34, Ghana	Cesarean section; Episiotomy; Instrumental delivery (self-report)
Akotionga 2001 (75)	Case series	High	N=49, Burkina Faso	Difficult delivery (clinical)
Al-Hussaini 2003 (76)	Cross-sectional	Moderate	N=254, Egypt	Tears; Cesarean section; Episiotomy (clinical)
Awuah 2008 (77)	Case series	Low	N=70, Ghana	Prolonged labor; Tears; Episiotomy; Hemorrhage; Fistula (self-report)
Bayoudh 1995 (78)	Cross-sectional	Low	N=300, Somalia	Episiotomy (self-report)
Bonessio 2001 (79)	Case series	Low	N=9, Italy	Prolonged labor; Cesarean section; Other (clinical)
CAR DHS 1995 (50)	Cross-sectional	High	N=2555, CAR	Obstetric complications (self-report)

Chalmers 2000 (80)	Cross-sectional	Low	N=432, Canada	Cesarean section; Instrumental delivery (self-report)
Dörflinger 2000 (81)	Case series	Low	N=39, Sudan	Prolonged labor; Tears; Hemorrhage (clinical)
Litorp 2008 (82)	Cross-sectional	Low	N=40, Sweden	Obstetric difficulties (self-report)
McCaffrey 1995 (83)	Cross-sectional	Low	N=50, England	Tears; Cesarean section; Instrumental delivery; Other (clinical)
McSwiney 1992 (84)	Case report	NA	N=1, England	Tears (clinical)
Osifo 2009 (85)	Case series	High	N=51, Nigeria	Tears (clinical)
Philp 1927 (55)	Case report	NA	N=1, Kenya	Death in childbirth (clinical)
Preston 1937 (56)	Case report	NA	N=1, Kenya	Birth per rectum (clinical)
Pritchard 1969 (57)	Case report	NA	N=3, England	Dystocia (clinical)

Legend: CAR= Central African Republic; DHS= Demographic and Health Survey; NA= Not applicable (we did not assess the methodological quality of the four case reports).

Study design and sample recruitment

We identified no systematic reviews, cohort studies or case-control studies for inclusion in this report on obstetric complications. According to the study descriptions, 28 (64%) of the 44 included studies employed a cross-sectional comparative study design in which two or more groups of women were compared. For some obstetric outcomes, a few of these comparative studies reported results only for the FGM/C group – in these cases we place the results in appendix 5. Seven of the studies classified as cross-sectional comparative were registry studies (54;61;65;66;69;71;86). The researchers selected a sample frame and extracted data from hospital records, ranging in sample size from 50 to over 2 million women. For most of the registry studies (54;65;66;71;86), the 'exposed' group was not selected from the same population as the 'non-exposed' group, thus offering less confidence in the effect estimates. There were seven single-group cross-sectional studies (50;74;76;78;80;82;83), five case series (75;77;79;81;85), and four case reports (55-57;84).

All studies were based on a non-random sample, with the exception of five studies. Four of these were Demographic and Health Surveys (DHS) (50;52;53;72), which are nationally-representative household surveys that provide results for a range of population and health data. The study by Yount and Carrera (73) was based on a representative survey of 3,125 households in Minya, Egypt.

The five representative studies mentioned above were all based on household sampling. The great majority (37 studies, 84%) of the remaining non-random studies were clinical-/hospital-based. These studies recruited women attending a general- or a specialist hospital, family planning center, antenatal clinic, gynecological and obstetric clinic, or (maternity) welfare center. One study was community-based (80). One study did not state how and where the sample was recruited (74).

Population in the comparative studies

Overall, the 28 included comparative studies involved almost 3 million women (2, 974 569; range 114 - 2,18 million) (table 3). Twenty-three of the studies compared cut- and non-cut women, three studies compared women with various types of FGM/C (52;53;73), and two studies allowed a mix of comparisons (29;32). Most of the 28 included comparative studies took place in a country in Africa: Burkina Faso, Egypt, Ethiopia, Eritrea, Ghana, Ivory Coast, Kenya, Mali, Nigeria (note that Jones (28) included one study sample from Burkina Faso and one from Mali). Eight studies were carried out outside the African continent. Six of these eight studies included immigrant women residing in Europe or North America (31;33;54;60;65;66), one study included women residing in Saudi Arabia (63), and one combined registry data from six different western countries (71). In two of the eight non-African based studies, the entire sample of women originated from a country in Africa where FGM/C is commonly practiced (33;63). However, two studies compared cut women who originated from Africa with non-cut women who had diverse origins (60;65). Three studies compared Somali-born, immigrant women with women who were born in the country in which the study took place (31;66;71), and in Lupo (54) it was simply stated that Somali-born women were compared to non-Somali women. In these latter four studies (31;54;66;71), it was assumed that the absolute majority of the Somali-born women had FGM/C, presumably type III, since about 95-98% of the women in Somalia are subjected to FGM/C type III. The location of residence and origin of the women included in Chibber, El-Saleh and Harmi's study (62) was not specified. Across the studies, the women's ages ranged from early childhood to around 60, with a mean age of 26. Six studies did not state the age of the women.

With respect to FGM/C characteristics of the cut women included in the comparative studies, seven studies did not describe the extent of genital alteration, but most of the studies provided some information about type of FGM/C (table 3). Five registry studies (31;54;65;66;71) appeared to include only women with FGM/C type III. In each of the remaining 16 studies that explained which type of FGM/C the women had been subjected to, the female study participants had a mix of genital alterations. Across the studies, however, the most common type of cutting was type III, which was the type of FGM/C for about 41% of the women across the comparative studies. About 31% of the women were described as having FGM/C type II and 22% as type I. Across the five studies that reported FGM/C type IV (29;33;52;70;73), a total of about 2,880 women were classified as having this type of FGM/C. In two studies it was not explained how women's FGM/C status was ascertained (27;54), in three studies FGM/C type III was assumed (31;66;71), but in the majority of the studies (18 studies, 64%) the women were examined gynaecologically, generally both to confirm whether or not they had been genitally cut and to which type of FGM/C the women had been subjected. Physical examinations were not undertaken to verify the cutting statements in the remaining five studies but relied on women's self-report (52;53;64;72;73). In the majority of cases, the women self-reported that they had

been subjected to FGM/C in early childhood, typically before the age of 10 (mean age ca 7.0). In general, similar to data regarding age of cutting, information regarding who performed the FGM/C procedure was scarce. In the studies that did provide this information, the cutting was typically done by a traditional circumciser.

Table 3: Description of the population in included comparative studies (n=28)

Author, year	N	Country/ Origin	Age	FGM/C characteristics
Adinma 1997	N=256 (124 cut, 132 non-cut)	Nigeria	16-40	Type: 22% TI, 78% TII (gyn exam) Age cut/by: 97% in childhood / not stated
Berardi 1985	N=852 (71 cut, 781 non-cut)	France / 69% Senegal	Not stated	Type: 100% TII (gyn exam) Age cut/by: not stated
Bohoussou 1986	N=4935 (1099 cut, 3836 non-cut)	Ivory Coast	Not stated	Type: 29% TI, 73% TII (gyn exam) Age cut/by: not stated
Browning 2010	N=492 (255 cut, 237 non-cut)	Ethiopia	Mean 28.5	Type: 100% TI and TII (gyn exam) Age cut/by by: not stated
Chibber 2011	N=4800 (1842 cut, 2958 non-cut)	not stated	15-46	Type: "type I to III most common" (gyn exam) Age cut/by: not stated
De Silva 1989	N=2157 (167 cut, 1990 non-cut)	Saudi Arabia/ Sudan	≥15	Type: 9% TI, 34% TII, 32%TIII (gyn exam) Age cut/by: not stated
Diop 1998	N=5390 (4359 cut, 431 non-cut)	Mali	Mean 27.0	Type: 21% TI, 73% TII, 6%TIII (gyn exam) Age cut/by: not stated
Elnashar 2007	N=264 (200 cut, 64 non-cut)	Egypt	Not stated	Type: "circumcised" (self-report) Age cut/by: not stated
Eritrea DHS 2002	N=7765 (310 TI-II, 3028 TIII, 3572 TIV)	Eritrea	15-49	Type: 4% TI-II, 39%TIII, 46% TIV (self-report) Age cut/by: 62% ≤1 yr / 84% tc
Eritrea DHS 1995	N=4775 (2937 TI, 210 TII, 1624 TIII)	Eritrea	15-49	Type: 62% TI, 4% TII, 34%TIII (self-report) Age cut/by: 60% ≤5 yrs / 91% tc
Essén 2005	N=2554 (68 cut, 2486 non-cut)	Sweden/ Ethiopia, Somalia	Not stated	Type: most TIII (gyn exam) Age cut/by: not stated
Hakim 2001	N=1481 (1225 cut, 256 non-cut)	Ethiopia	Mean 25.9	Type: 12% TI, 85% TII, 3%TIII (not stated) Age cut/by: not stated
Johnson 2005	N=5416 (579 cut, 4837 non-cut)	USA/ Somalia	Most 20-34	Type: most likely type III (assumed, unverified). Age cut/by: not stated
Jones 1999 a	N=1920 (1787 cut, 133 non-cut)	Burkina Faso	Mean 26.6	Type: 56% TI, 39% TII, 5%TIII (gyn exam) Age cut/by: median 9.5 yrs / not stated
Jones 1999 b	N=5337 (5017 cut, 320 non-cut)	Mali	Mean 25.0	Type: 21% TI, 74% TII, 5%TIII (gyn exam) Age cut/by: not stated
Larsen 2002	N=1836 (1009 cut, 590 non-cut)	Nigeria	15-49	Type: 71% TI, 25% TII, 3%TIII, 1% TIV (gyn exam). Age cut/by: not stated
Lupo 1999	N=114 (38 cut, 76 non-cut)	USA/ Somalia	Not stated	Type: "female circumcision" (not stated) Age cut/by: not stated
Millogo-Traore 2007	N=454 (227 cut, 227 non-cut)	Burkina Faso	Median 25	Type: 28% TI, 69% TII, 3% TIII (gyn exam) Age cut/by: not stated

Ndiaye 2010	N=354 (210 cut, 144 non-cut)	Burkina Faso	Mean 24.0	Type: 47% TI, 47% TII, 6% TIII (gyn exam) Age cut/by: not stated
Oduro 2006	N=5071 (1466 cut, 3605 non-cut)	Ghana	Mean 25.8	Type: "type II is the commonest form" (gyn exam). Age cut/by: not stated
Orji 2006	N=500 (423 cut, 77 non-cut)	Nigeria	Mean 27.5	Type: 87% TI, 13% TII (gyn exam) Age cut/by: 95% cut in childhood / 80% tc, 14% hcp
Slanger 2002	N=1107 (621 cut, 486 non-cut)	Nigeria	Mean 33.7	Type: 72% TI, 24% TII, 4% TIII+IV (gyn exam). Age cut/by: 95% cut in childhood / 80% tc, 14% hcp
Small 2008	N=2179322 (10431 cut, 2168891 non-cut)	6 western countries/ Somalia [a]	Most 20-34	Type: most likely type III (assumed, unverified). Age cut/by: not stated
Vangen 2002	N=703 925 (1733 cut, 702192 non-cut)	Norway/ Somalia	Not stated	Type: most likely type III (assumed, unverified). Age cut/by: not stated
WHO study group 2006	N=28 393 (21222 cut, 7171 non-cut)	6 countries in Africa [b]	Mean 26.3	Type: 32% TI, 37% TII, 31% TIII (gyn exam) Age cut/by: not stated
Wuest 2009	N=232 (122 cut, 110 non-cut)	Switzerland/ 34% Somalia	Mean 28.0	Type: 17% TI, 24% TII, 48% TIII, 11% TIV (gyn exam). Age cut/by: not stated
Yount 2007	N=3167 (1071 cut, 2096 non-cut)	Kenya	15-49	Type: "had undergone FGC" (self-report) Age cut/by: not stated
Yount 2006	N=1700 (72 TI, 1232 TII, 396 TIV)	Egypt	17-55	Type: 4% TI, 73% TII, 23% TIV (self-report) Age cut/by: mode 9-10 yrs / 93% tc, 4% hcp

Legend: TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; TIV= FGM/C type IV; gyn exam= cutting status verified through gynecological examination; self-report= cutting status based on self-report; hcp= health care provider; tc: traditional circumciser. a= Australia, Belgium, Canada, Finland, Norway, Sweden; b= Burkina Faso, Ghana, Kenya, Nigeria, Sudan, Senegal.

Population in the non-comparative studies

Regarding the 16 non-comparative studies, there were seven cross-sectional studies, five case series, and four case reports (table 4). In total, 3,889 women were included in these studies and the study samples ranged from 1 to 2,555. Ten of the non-comparative studies took place in a country in Africa, five in a country in Europe, and one in Canada. Across the 16 studies, there was a range of ages and a mix of genital alterations, ascertained by gynecological examination in ten of them and self-reported in six studies. Generally, the women self-reported that they had been subjected to FGM/C in early childhood. In the seven non-comparative studies that reported on who performed the FGM/C procedure, this was almost exclusively done by a traditional circumciser.

Table 4: Description of the population in included non-comparative studies (n=16)

Author, year	N	Country/ Origin	Age	FGM/C characteristics
Abor 2006	N=34	Ghana	21-50	Type: "have undergone FGM" (self-report) Age cut/by: 47% 0-10 yrs, 29% 11-15 yrs / 100% tc

Akotionga 2001	N=49	Burkina Faso	5-32	Type: not stated (gyn exam) Age cut/by: 67% 3-7 yrs, up to age 19 / 100% tc
Al-Hussaini 2003	N=254	Egypt	16-37	Type: 51% TI, 49% TII (gyn exam) Age cut/by: 47% 0-10 yrs, 29% 11-15 yrs / 100% tc
Awuah 2008	N=70	Ghana	Not stated	Type: "circumcised" (self-report) Age cut/by: not stated
Bayoudh 1995	N=300	Somalia	20-60	Type: 12% TI, 8% TII, 80%TIII (self-report) Age cut/by: most ≤10 yrs (0-13) / 83% tc
Bonessio 2001	N=9	Italy/ 89% Somalia	21-45	Type: 100%TIII (gyn exam) Age cut/by: not stated
CAR DHS 1995	N=2555	CAR	15-49	Type: "circumcision" (self-report) Age cut/by: 55% 0-10 yrs / not stated
Chalmers 2000	N=432	Canada/ 100% Somalia	Mean 34.0	Type: 0.2% TI, 0.5% TII, 96%TIII (self-report) Age cut/by: mean 5.7 yrs / 58% tc, 10% hcp
Dörflinger 2000	N=39	Sudan	8-41	Type: 3% TII, 97%TIII (gyn exam) Age cut/by: median 8 yrs (0-12) / not stated
Litorp 2008	N=40	Sweden/ 65% Somalia, 20% Eritrea	Mean 31.8	Type: most type I or II (self-report) Age cut/by: mean 6.1 yrs (0-12) / 38% tc
McCaffrey 1995	N=50	England/ mostly Somalia	17-34	Type: 100%TIII (gyn exam) Age cut/by: mean 6.7 yrs / not stated
McSwiney 1992	N=1	England/ Somalia	22	Type: TIII (gyn exam) Age cut/by: not stated
Osifo 2009	N=51	Nigeria	Mean 5.0	Type: 41% TI, 59% TII (gyn exam) Age cut/by: not stated / 94% tc, 6% hcp
Philp 1927	N=1	Kenya	25	Type: "slicing off of the external parts and removal of vaginal mucous membrane" (gyn exam) Age cut/by: not stated
Preston 1937	N=1	Kenya	18	Type: "circumcised" (gyn exam) Age cut/by: 4 yrs / not stated
Pritchard 1969	N=3	England/ Sudan	Not stated	Type: 100%TIII (gyn exam) Age cut/by: not stated

Legend: TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; TIV= FGM/C type IV; gyn exam= cutting status verified through gynecological examination; self-report= cutting status based on self-report; hcp= health care provider.

Methodological quality assessment

We arrived upon a final decision of high study quality for three (11%) of the 28 cross-sectional studies in which two or more groups were compared (comparative studies), using the NOKC modified checklist for cross-sectional studies (appendix 4). Four of the comparative studies were of moderate quality (14%), and the remaining 21 studies were judged to be of low methodological study quality (75%). It was a strength that in all studies, except five (31;54;65;66;71), the authors explained that the non-exposed group (non-FGM/C) was selected from the same population as the exposed group (FGM/C), and that most had used standardized data collection methods and appropriate statistical methods. Conversely, most of the studies failed to explain

whether and how the participants who agreed to participate were different from those who declined to participate. All of the studies, except two (61;70), failed to show that the groups were comparable with respect to important background factors, and all of the studies, except one (68), failed to describe whether the person who assessed the outcome was blind to whether participants were exposed (genitally cut) or not.

With respect to the single-group cross-sectional studies, we found that one of the seven studies had high study quality (appendix 4). One of the cross-sectional studies was of moderate quality, and the remaining five studies were judged to be of low study quality. Two of the case series had high methodological study quality, and the remaining three had low study quality (appendix 4).

We reiterate that when it comes to establishing a causal relationship between exposure to an intervention (or procedure such as FGM/C) and an outcome, evidence based on observational studies will usually be appreciably weaker than evidence from experimental studies. In this systematic review, all included studies were necessarily observational (non-randomized) and, as this section describes, the majority of the studies had methodological shortcomings.

Obstetric consequences of FGM/C

There were eight main outcomes reported across the included studies. We present the data for each outcome in the following order:

- Prolonged labor
- Obstetric tears/lacerations
- Cesarean section
- Episiotomy
- Instrumental delivery
- Obstetric hemorrhage
- Dystocia/ difficult delivery
- Other obstetric and antenatal complications

Table 5 points out the number and types of studies located for each obstetric outcome.

Table 5: Outcomes reported in comparative and non-comparative studies

Outcome	Nº of studies	Comparative studies	Non-comparative studies
Prolonged labor	13	10 studies: Bohoussou 1986, Browning 2010, Chibber 2011, De Silva 1989, Essén 2005, Hakim 2001, Larsen 2002, Millogo-Traore 2007, Vangen 2002, Wuest 2009	3 studies: Awuah 2008, Bonessio 2001, Dörflinger 2000
Obstetric tears	21	15 studies: Berardi 1985, Bohoussou 1986, De Silva 1989, Diop 1998, Elnashar 2007, Hakim 2001, Johnson 2005, Larsen 2002, Lupo 1999, Millogo-Traore 2007, Ndiaye 2010, Slanger 2002, Vangen 2002, WHO study group 2006, Wuest 2009	6 studies: Al-Hussaini 2003, Awuah 2008, Dörflinger 2000, McCaffrey 1998, McSwiney 1992, Osifo 2009
Cesarean section	21	16 studies: Berardi 1985, Bohoussou 1986, Chibber 2011, De Silva 1989, Elnashar 2007, Johnson 2005, Larsen 2002, Ndiaye 2010, Oduro 2006, Orji 2006, Slanger 2002, Small 2008, Vangen 2002, WHO study group 2006, Wuest 2009, Yount 2007	5 studies: Abor 2006, Al-Hussaini 2003, Bonessio 2001, Chalmers 2000, McCaffrey 1995
Episiotomy	18	14 studies: Adinma 1997, Berardi 1985, Bohoussou 1986, De Silva 1989, Diop 1998, Elnashar 2007, Hakim 2001, Larsen 2002, Millogo-Traore 2007, Ndiaye 2010, Orji 2006, Slanger 2002, WHO study group 2006, Wuest 2009	4 studies: Abor 2006, Al-Hussaini 2003, Awuah 2008, Bayoudh 1995
Instrumental delivery	11	8 studies: Bohoussou 1986, De Silva 1989, Johnson 2005, Millogo-Traore 2007, Slanger 2002, Small 2008, Vangen 2002, Wuest 2009	3 studies: Abor 2006, Chalmers 2000, McCaffrey 1995
Obstetric hemorrhage	13	10 studies: Chibber 2011, De Silva 1989, Diop 1998, Hakim 2001, Johnson 2005, Ndiaye 2010, Slanger 2002, Vangen 2002, WHO study group 2006, Wuest 2009	3 studies: Abor 2006, Chalmers 2000, McCaffrey 1995
Difficult labor	11	9 studies: Chibber 2011, Diop 1998, Eritrea DHS 2002, Eritrea DHS 1995, Johnson 2005, Jones 1999 a, Jones 1999 b, Ndiaye 2010, Slanger 2002	2 studies: Akotionga 2001, Pritchard 1969
Other complications			
- Fever	4	3 studies: Hakim 2001, Johnson 2005, Slanger 2002	1 study: Bonessio 2001
- Labor induction	3	3 studies: Johnson 2005, Small 2008, Vangen 2002	0 studies
- Death	2	1 study: WHO study group 2006	1 study: Philp 1927
- Other	11	5 studies: Chibber 2011, Hakim 2001, Lupo 1999, Slanger 2002, Vangen 2002	6 studies: Awuah 2008, Bonessio 2001, CAR DHS 1995, Litorp 2008, McCaffrey 1995, Preston 1937

As described in the methods, results from studies which compare groups of women are most valid for evaluating the risk of cut women relative to non-cut women (or alternatively cut women) experiencing obstetric complications. Therefore, in this chapter we present results from the 28 comparative studies. Results presented in the 16 cross-sectional, case series and case report studies can be found in appendix 5.

Prolonged labor

Labor is a series of strong, repeated muscle contractions which push the baby out of the uterus and into the birth canal. The duration of labor varies from woman to woman, but is usually shorter in women who have given birth before than women who are giving birth for the first time. Typically, labor is considered prolonged when the baby is not born after approximately 20 hours of regular contractions, but some

health experts define prolonged labor as occurring after 18 to 24 hours of regular contractions (21).

Ten comparative studies (27;29;31;33;58;61-63;65;67) reported on prolonged labor. One comparative study (58), only provided prolonged labor data for the FGM/C group (see appendix 5). One study (29) stated whether the women were primiparous/nulliparous or multiparous, but we present the results for all women, since first- and later pregnancies are not specified in any of the other studies reporting on prolonged labor. Six of the studies presented prolonged labor as a dichotomous outcome and four as a continuous outcome. The dichotomous results for prolonged labor are presented in table 6.

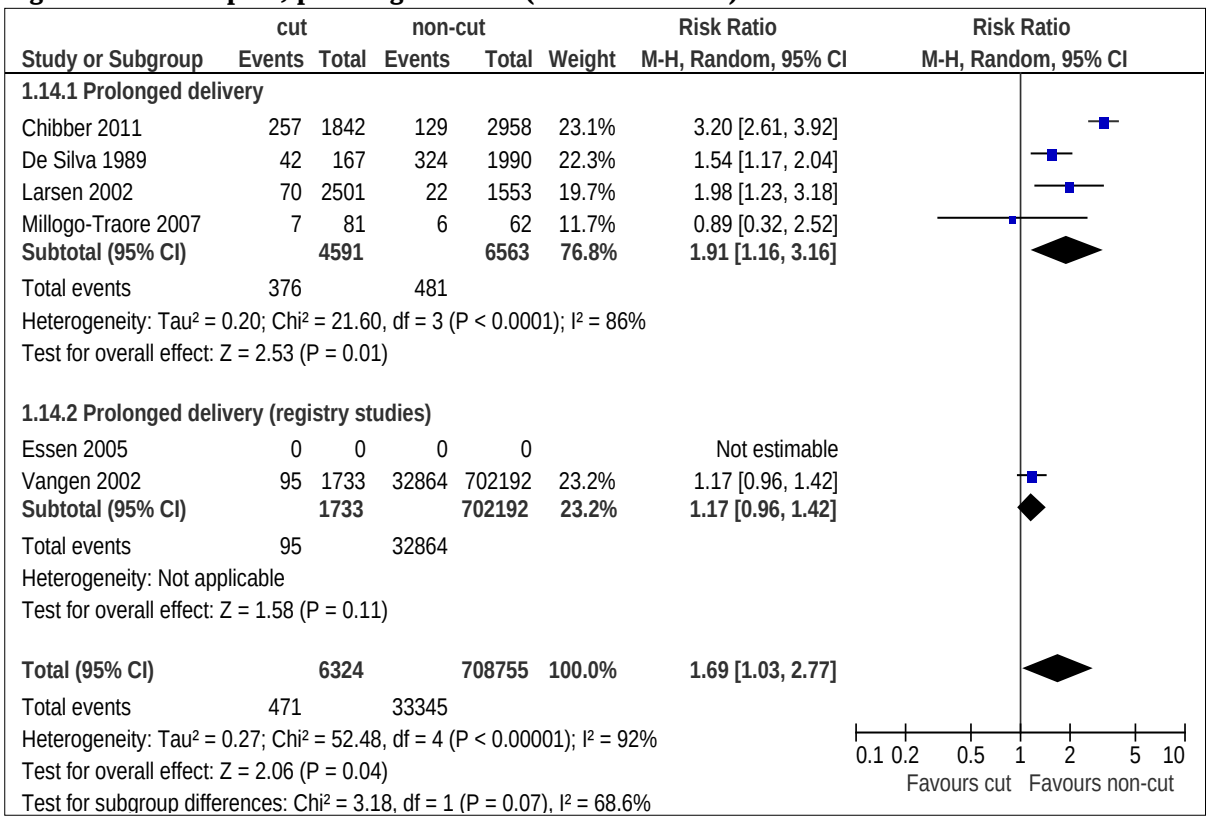
Table 6: Study outcomes (dichotomous) and effect estimates for prolonged labor

Author, year	Study quality	Outcome [a]	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Chibber 2011	Low	Prolonged labor	257/1842 (14.0%)	129/2958 (4.4%)	3.20 (2.61, 3.92)*
De Silva 1989	Low	Prolonged stage 1 Prolonged stage 2	19/167 (11.4%) 23/167 (13.8%)	238/1990 (12.0%) 86/1990 (4.3%)	0.70 (0.45, 1.08) 3.19 (2.07, 4.91)*
Essén 2005	Moderate	Prolonged stage 2	Data not received		OR=0.3 (0.2, 0.5) [b]
Larsen 2002	Low	Prolonged labor [c]	62/1929 (3.2%) TI 8/572 (1.4%) TII	22/1553 (1.4%)	2.27 (1.40, 3.67)* 0.99 (0.44, 2.20)
Millogo-Traore 2007	Low	Prolonged labor	7/81 (8.6%)	6/62 (9.7%)	0.89 (0.32, 2.52)
Vangen 2002	Low	Prolonged stage 2	95/1733 (5.5%)	32864/702192 (4.7%)	1.17 (0.96, 1.42)

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I; TII= FGM/C type II; a= The definition of prolonged labor for the included studies is found in appendix 5, table 6.1; b= Bivariate odds ratio stated in publication; c= Larsen reported results also separately for first and second pregnancy, but we present only results for all pregnancies; *= statistically significant.

We carried out meta-analyses, pooling available data from six studies for the obstetric complication prolonged labor. Sensitivity analyses were conducted for study type. Figure 3 presents the meta-analyses results for prolonged labor, comparing cut and non-cut women.

Figure 3: Forest plot, prolonged labor (cut vs non-cut)



The pooled results showed that there was a statistically significant difference between the two groups of women regarding prolonged labor (RR= 1.69, CI= 1.03, 2.77). Women with FGM/C were 1.7 times at greater risk of prolonged labor compared to women without FGM/C. In these studies, among women with FGM/C there were 8 per 100 woman (8%) who experienced prolonged labor, while 5 per 100 (5%) non-cut women experienced prolonged labor. The absolute risk difference was 3 more cases of prolonged labor among women with FGM/C per 100 woman (CI= 0 more to 8 more). Considerable heterogeneity indicated by I^2 and Chi^2 (I^2= 92%, Chi^2= 52.5, p< 0.00001) showed inconsistency across studies. The results of the sensitivity analyses indicated that the heterogeneity was not due to the registry study, which compared Somali-born women to ethnic Norwegian women. But we note that the pooled effect size for Africa-based studies (figure 3, 1.14.1) was greater than the effect size for the registry study (figure 3, 1.14.2), which offers less confidence in the effect estimate. Using GRADE, we judged the quality of the evidence for this outcome as very low (table 24). The Summary of Findings (GRADE) tables are presented at the end of the results chapter and the GRADE Evidence profile tables are in appendix 6.

Four studies presented prolonged labor as a continuous outcome (table 7). Essential data were missing to calculate mean difference and/or the outcomes were not sufficiently similar to warrant meta-analysis. As is evident in the table, the duration of labor for cut vs non-cut women varied across the studies with no observable pattern.

Table 7: Study outcomes (continuous) and effect estimates for prolonged labor

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results Mean diff (95%CI)
Browning 2010	High	Days in labor	3.1 (1.7) days	2.8 (1.5) days	0.30 (0.02, 0.58)*
Essén 2005	Moderate	Duration of labor stage 2	35 min [a]	53 min	-
Hakim 2001	Low	Duration of labor stage 1	11.8 (4.7) hrs (708 min)	11.6 (2.2) hrs (696 min)	0.20 (-0.54, 0.94)
		Duration of labor stage 2	41.5 (13.3) min	40.1 (3.2) min	1.40 (-0.08, 2.88)
		Duration of labor stage 3	11.0 (4.0) min	11.1 (4.5) min	-0.10 (-1.40, 1.20)
Wuest 2009	Low	Duration of labor stage 1	220 min [a]	300min	-
		Duration of labor stage 2	39 min	45 min	-

Legend: Mean diff=mean difference; a= Essén 2005 and Wuest 2009 reported duration of labor as median minutes (not mean); *= statistically significant.

FGM/C type I vs type II

Larsen (29) presented results for women with FGM/C type I and women with FGM/C type II separately (see above, table 6). The relative risk with 95% CI for this comparison was RR= 2.30 (CI= 1.11, 4.77). That is, in this study, women with FGM/C type I had a significantly higher risk of prolonged labor than women with FGM/C type II.

What we know about prolonged labor

- Women who have been genitally cut seem to be more likely than non-cut women to experience prolonged labor; this is based on very low quality of evidence.
- We do not know if various FGM/C types differentially affect the risk of prolonged labor.

Obstetric tears/lacerations

Childbirth may lead to overstretching of the vagina which in turn may cause tearing of tissue in the vagina, perineum and/or anus. Perineal lacerations during vaginal childbirth are usually classified into four categories according to the severity of trauma (21):

- 1st degree tear: laceration only of the fourchette and superficial perineal skin or vaginal mucosa
- 2nd degree tear: laceration extends beyond fourchette, perineal skin and vaginal mucosa to perineal muscles and fascia (but not to the anal sphincter)
- 3rd degree tear: laceration of fourchette, perineal skin, vaginal mucosa, muscles, and anal sphincter
- 4th degree tear: laceration of fourchette, perineal skin, vaginal mucosa, muscles, anal sphincter, and rectal mucosa.

Fifteen comparative studies reported on some type of obstetric tear/laceration (27;29;31-33;51;54;58;60;63;64;66-68;70). Results from the comparative studies which reported on the occurrence of obstetric tears in cut women vs non-cut women are shown in table 8.

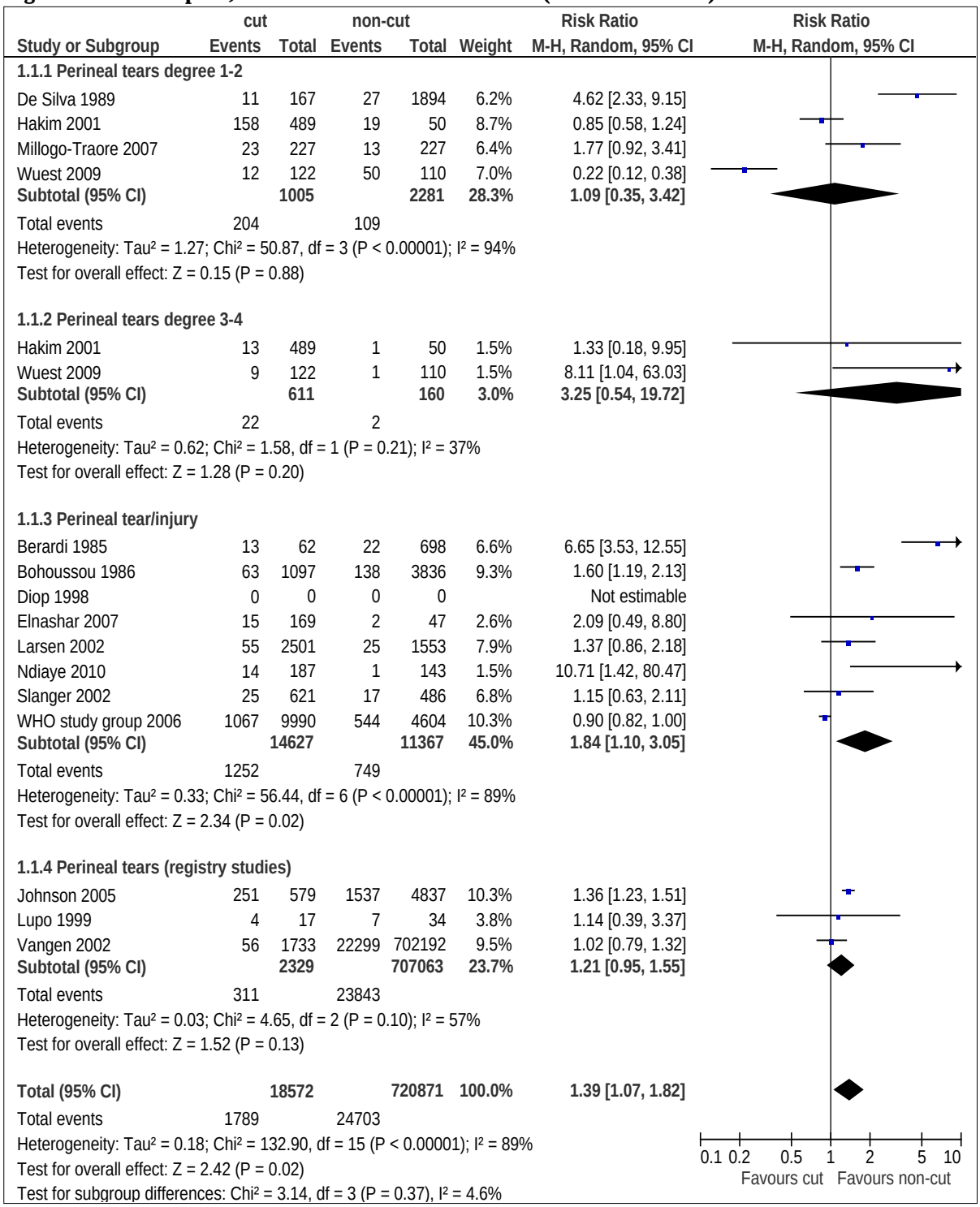
Table 8: Study outcomes (dichotomous) and effect estimates for obstetric tears/lacerations

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Berardi 1985	Low	Perineal injury	13/62 (20.7%)	22/698 (3.2%)	6.65 (3.53, 12.55)*
Bohoussou 1986	Low	Perineal tears	63/1097 (5.7%)	138/3836 (3.6%)	1.60 (1.19, 2.13)*
De Silva 1989	Low	Second degree tear Urethral tear	11/167(6.6%) 6/167 (3.6%)	27/1894 (1.4%) 1/1894 (0.1%)	4.62 (2.33, 9.15)* 68.05 (8.24, 561.88)*
Diop 1998	Low	Tears	Data not received		
Elnashar 2007	Low	Perineal tear	15/169 (8.9%)	2/47 (4.2%)	2.09 (0.49, 8.80)
Hakim 2001	Low	Perineal tears degree 1 Perineal tears degree 2 Perineal tears degree 3	102/489 (20.9%) 56/489 (11.5%) 13/489 (2.7%)	15/50 (30.0%) 4/50 (8.0%) 1/50 (2.0%)	0.70 (0.44, 1.10) 1.43 (0.54, 3.78) 1.33 (0.18, 9.95)
Johnson 2005 [a]	Low	1st/2nd degree tear 3rd/4th degree tear	194/579 (33.5%) 57/579 (9.8%)	1336/4837 (27.6%) 201/4837 (4.2%)	1.21 (1.07, 1.37)* 2.37 (1.79, 3.14)*
Larsen 2002 [b]	Low	Tear	35/1929 (1.8%) TI 20/572 (3.5%) TII	25/1553 (1.6%)	1.33 (0.68, 1.87) 2.17 (1.22, 3.88)*
Lupo 1999	Low	Perineal laceration	4/17(23.5%)	7/34 (11.8%)	1.14 (0.39, 3.37)
Millogo-Traore 2007	Low	Perineal tears d1-2	23/227 (10.1%)	13/227 (5.7%)	1.77 (0.92, 3.41)
Ndiaye 2010	Low	Perineal tear	14/187 (7.4%)	1/143 (0.7%)	10.71 (1.42, 80.47)*
Slanger 2002	Moderate	Perineal tear	25/621 (4.0%)	17/486 (3.5%)	1.15 (0.63, 2.11)
Vangen 2002	Low	Perineal injury d2-4	56/1733 (3.2%)	22299/702192 (3.2%)	1.02 (0.79, 1.32)
WHO study group 2006	High	Tear (any) [c]	422/4386 (9.6%) TI 596/4962 (12.0%) TII 49/642 (7.6%) TIII	544/4604 (11.8%)	0.81 (0.72, 0.92)* 1.02 (0.91, 1.13) 0.65 (0.49, 0.86)*
Wuest 2009	Low	1st degree tear 2nd degree tear 3rd degre tear	6/122 (4.9%) 6/122 (4.9%) 9/122 (7.4%)	28/110 (25.5%) 22/110 (20.0%) 1/110 (0.9%)	0.19 (0.08, 0.45)* 1.25 (0.10, 0.58)* 8.11 (1.04, 63.03)*

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; TI-III= FGM/C type I to III; a= Johnson 2005 reported results also separately for nulliparous and multiparous women and white and black US-born women, but we present only results for all pregnancies and all US-born women; b= Larsen 2002 reported results also separately for first and second pregnancy, but we present only results for all pregnancies; c= Data provided by study authors; *= statistically significant.

We conducted meta-analysis of the outcome obstetric tear; it is presented by degree of tear and study type (figure 4).

Figure 4: Forest plot, obstetric tears/lacerations (cut vs non-cut)



As shown in the forest plot, there was a statistically significant difference between cut and non-cut women (RR= 1.39, CI= 1.07, 1.82). Women with FGM/C were 1.4 times at greater risk of tears/lacerations compared to women without FGM/C. In these studies, among women with FGM/C there were 5 per 100 woman (5%) who experienced lacerations, while 3 per 100 (3%) non-cut women experienced lacerations. The absolute risk difference was 1 more case of lacerations among women with FGM/C per 100 woman (CI= 0 more to 3 more). The results show that there was

large, unexplained heterogeneity across studies (I^2= 89%, Chi^2= 132.9, p< 0.00001). The pooled effect size for Africa-based studies (figure 4, 1.1.3) was greater than the effect size for the registry studies (figure 4, 1.1.4), which compared Somali-born women to women born in the USA or Norway. The difference between these two sets of studies was not statistically significant, but there is greater confidence in the estimate for the Africa-based studies since the exposed groups were selected from the same population as the non-exposed groups. The quality of the evidence for this outcome is very low (table 24). The GRADE Evidence profile tables are in appendix 6.

FGM/C type I vs type II

Two studies (29;32) presented results regarding obstetric tears/lacerations for women with FGM/C type I and women with FGM/C type II separately (table 9).

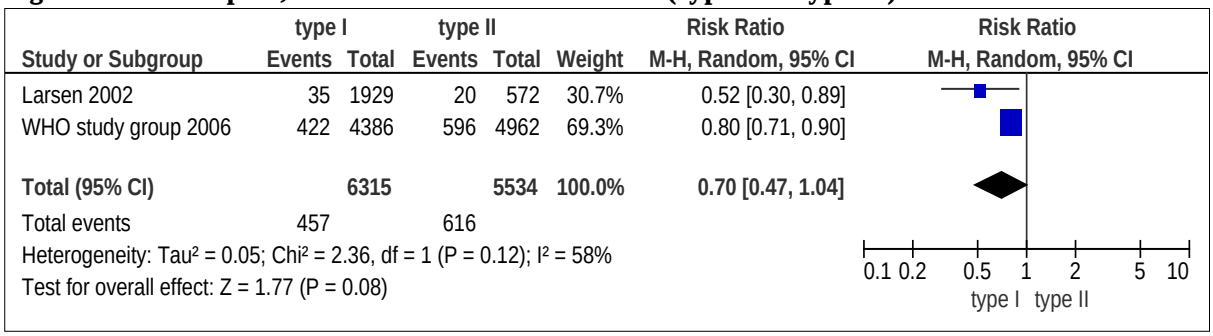
Table 9: Study outcomes (dichotomous) and effect estimates for obstetric tears, FGM/C type I vs type II

Author, year	Study quality	Outcome	FGM/C type I	FGM/C type II	Results RR (95%CI)
Larsen 2002	Low	Tear [a]	35/1929 (1.8%)	20/572 (3.5%)	0.52 (0.30, 0.89)*
WHO study group 2006	High	Tear (any) [b]	422/4386 (9.6%)	596/4962 (6.3%)	0.80 (0.71, 0.90)*

Legend: RR= relative risk with 95% confidence interval (CI). a= Larsen 2002 reported results also separately for first and second pregnancy, but we present only results for all pregnancies; b= Data provided by study authors; *= statistically significant.

We conducted meta-analysis of obstetric tears/lacerations, comparing women with FGM/C type I to women with FGM/C type II (figure 5).

Figure 5: Forest plot, obstetric tears/lacerations (type I vs type II)



The pooled relative risk with 95% CI for the comparison of obstetric tears/lacerations between women with FGM/C type I and II was RR= 0.70 (CI= 0.47, 1.04), showing that there was no statistically significant difference between the two groups of women. There was moderate heterogeneity across the two studies (I^2= 58%, Chi^2= 2.7, p= 0.12). The quality of the evidence for this outcome is very low (table 25). The GRADE Evidence profile tables are in appendix 6.

What we know about obstetric tears/lacerations

- Women who have been genitally cut seem to be more likely than non-cut women to experience obstetric tears; this is based on very low quality of evidence.
- The risk of obstetric tears does not seem to be significantly different between women with FGM/C type I and women with FGM/C type II; this is based on very low quality of evidence. However, the direction of effect across studies seems to favor FGM/C type I over type II.

Cesarean section

Usually, women deliver their baby through the birth canal, i.e. they have a vaginal birth. But there are cases when a cesarean section is necessary for the safety of the mother and/or the baby. In the general case, cesarean sections are performed because of problems that arise during labor (emergency/ unplanned cesarean), but a cesarean section can also be elective (planned). Whether unplanned or planned, a cesarean section is the delivery of a baby through a cut (incision) in the mother's belly and uterus, rather than through the birth canal (21).

Among the included studies in this systematic review, a total of 16 studies reported the prevalence of cesarean section for women with FGM/C compared to women who were not genitally cut (29-33;58;60;62-64;66;68-72). Results regarding cesarean section from these comparative studies are shown in table 10. We note that Small and colleagues' study (71) included registry data from six countries, and the researchers compared labor events between Somali-born women and receiving country-born women. Because of considerable variation between countries in these outcomes, we treated each country as one dataset/study, denoted by country in tables and figures where this study is included.

Table 10: Study outcomes (dichotomous) and effect estimates for cesarean section

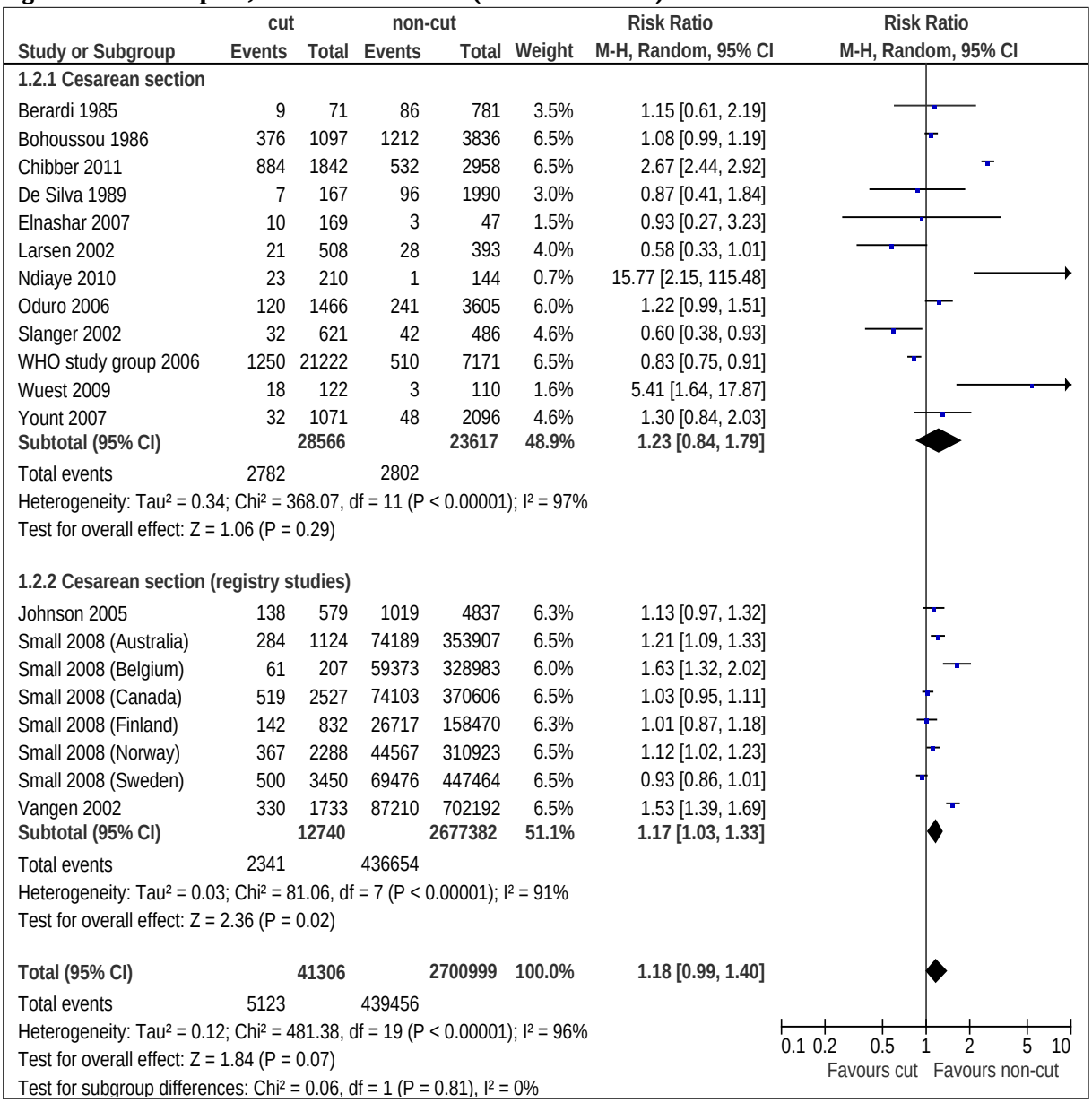
Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Berardi 1985	Low	Cesarean section	9/71 (12.7%)	86/781 (11.0%)	1.15 (0.61, 2.19)
Bohoussou 1986	Low	Cesarean section	376/1097 (34.3%)	1212/3836 (31.6%)	1.08 (0.99, 1.19)
Chibber 2011	Low	Cesarean section	884/1842 (48.0%)	532/2958 (18.0%)	2.67 (2.44, 2.92)*
De Silva 1989	Low	Cesarean section	7/167 (4.2%)	96/1990 (4.8%)	0.87 (0.41, 1.84)
Elnashar 2007	Low	Cesarean section	10/169 (5.9%)	3/47 (6.4%)	0.93 (0.27, 3.23)
Johnson 2005 [a]	Low	Cesarean delivery	138/579 (23.8%)	1019/4837 (21.1%)	1.13 (0.97, 1.32)
Larsen 2002 [b]	Low	Cesarean section	16/385 (4.2%) TI 5/123 (4.1%) TII	28/393 (7.1%)	0.58 (0.32, 1.06) 0.57 (0.23, 1.45)
Ndiaye 2010	Low	Cesarean section	23/210 (11.0%)	1/144 (0.7%)	15.77 (2.15, 115.48)*

Oduro 2006	High	Cesarean section	120/1466 (8.2%)	241/3605 (6.7%)	1.22 (0.99, 1.51)
Small 2008 [b]	Low	Cesarean section			
-Australia			284/1124 (25.3%)	74189/353907 (21.0%)	1.21 (1.09, 1.33)*
-Belgium			61/207 (29.5 %)	59373/328983 (18.0%)	1.63 (1.32, 2.02)*
-Canada			519/2527 (20.5%)	74103/370606 (20.0%)	1.03 (0.95, 1.11)
-Finland			142/832 (17.1%)	26717/158470 (16.8%)	1.01 (0.87, 1.18)
-Norway			367/2288 (16.1%)	44567/310923 (14.3%)	1.12 (1.02, 1.23)*
-Sweden			500/3450 (14.5%)	69476/447464 (15.5%)	0.93 (0.86, 1.01)
Slanger 2002	Moderate	Cesarean section	32/621 (5.2%)	42/486 (8.6%)	0.60 (0.38, 0.93)*
Vangen 2002	Low	Cesarean section	330/1733 (19.0%)	87210/702192 (12.4%)	1.53 (1.39, 1.69)*
WHO study group 2006	High	Cesarean section	463/6856 (6.8%) TI	510/7171 (7.1%)	0.95 (0.84, 1.07)
			493/7771 (6.3%) TII		0.89 (0.79, 1.01)
			294/6595 (4.5%) TIII		0.63 (0.55, 0.72)*
Wuest 2009	Low	Emergency c-section	18/122 (14.8%)	3/110 (2.7%)	5.41 (1.64, 17.87)*
		Elective c-section	9/122 (7.4%)	8/110 (7.3%)	1.01 (0.41, 2.54)
Yount 2007	Moderate	Cesarean section	32/1071 (3.0%)	48/2096 (2.3%)	1.30 (0.84, 2.03)

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; a= Johnson 2005 reported results also separately for nulliparous and multiparous women and white and black US-born women, but we present only results for all pregnancies and all US-born women; b= Larsen 2002 and Small 2008 reported results also separately for first and second pregnancy, but we present only results for all pregnancies; *= statistically significant.

We carried out meta-analyses, pooling available data from 15 studies for cesarean section. Sensitivity analyses were conducted for type of study. Figure 6 presents the meta-analyses results for cesarean section, comparing cut and non-cut women.

Figure 6: Forest plot, cesarean section (cut vs non-cut)



As evident from the forest plot, we did not find a statistically significant difference between cut and non-cut women with respect to cesarean section (RR= 1.18, CI= 0.99, 1.40). Considerable, unexplained heterogeneity indicated by I^2 and Chi^2 (I^2= 96%, Chi^2= 481.4, p< 0.00001) showed inconsistency across studies. Similar to the pooled result for the outcome obstetric tears, we note that the Africa-based studies provide greater confidence in the estimate than the registry studies since the groups were selected from the same population. We judged the quality of the evidence for this outcome as very low (table 24).

FGM/C type I vs II

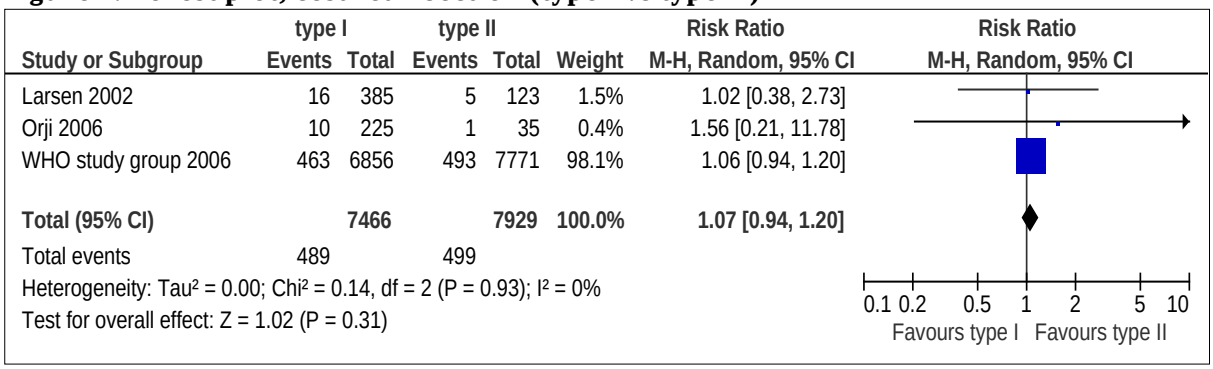
As shown in table 11, three studies presented results concerning cesarean section for women with FGM/C type I and women with FGM/C type II separately (29;30;32).

Table 11: Study outcomes (dichotomous) and effect estimates for cesarean section, FGM/C type I vs type II

Author, year	Study quality	Outcome	FGM/C type I	FGM/C type II	Results RR (95%CI)
Larsen 2002	Low	Cesarean section	16/385 (4.2%)	5/123 (4.1%)	1.02 (0.38, 2.73)
Orji 2006	Low	Cesarean section	10/225 (4.4%)	1/35 (2.9%)	1.56 (0.21, 11.78)
WHO study group 2006	High	Cesarean section	463/6856 (6.8%)	493/7771 (6.3%)	1.06 (0.94, 1.20)

We conducted meta-analysis of cesarean section, comparing women with FGM/C type I to women with FGM/C type II (figure 7).

Figure 7: Forest plot, cesarean section (type I vs type II)



The pooled estimate showed that there was not a statistically significant difference between the two groups of women (RR= 1.07, CI= 0.94, 1.20). The quality of the evidence for this outcome is very low (table 25).

What we know about cesarean section

- The risk of cesarean section does not seem to be significantly different between women with FGM/C and women without FGM/C; this is based on very low quality of evidence.
- The risk of cesarean section does not seem to be significantly different between women with FGM/C type I and women with FGM/C type II; this is based on very low quality of evidence.

Episiotomy

Vaginal childbirth stretches the vagina. In some cases, during delivery, the birth attendant will make a surgical incision of the vulva in order to avoid tearing of the vaginal opening and rectum. This surgical cut is referred to as episiotomy. It can be midline or at an angle from the posterior end of the vulva, and is sutured closed after delivery (21).

In total, 14 comparative studies reported on episiotomy (27;29;30;32;33;51;58-60;63;64;67;68;70). One study (58) only provided episiotomy data for the FGM/C group (see appendix 5). Table 12 shows the results for episiotomy at study level between cut and non-cut women.

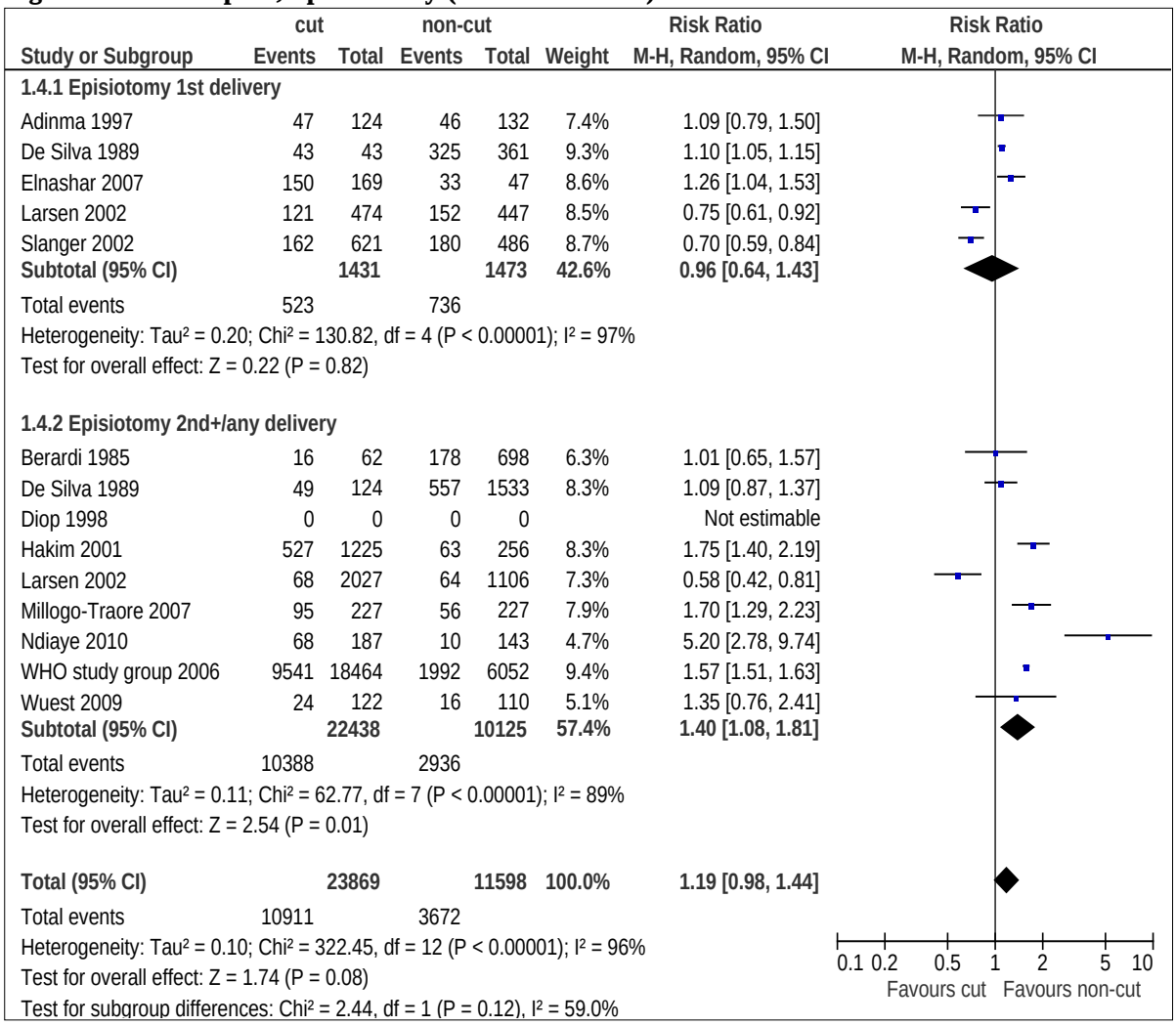
Table 12: Study outcomes (dichotomous) and effect estimates for episiotomy

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Adinma 1997	Low	Episiotomy 1st delivery Episiotomy all deliveries	47/124 (37.9%) 25/124 (20.2%)	46/132 (34.9%) 13/132 (9.8%)	1.09 (0.79,1.50) 2.05 (1.10, 3.82)*
Berardi 1985	Low	Episiotomy	16/62 (25.8%)	178/698 (25.5%)	1.01 (0.65, 1.57)
De Silva 1989	Low	Episiotomy 1st delivery Episiotomy 2+ delivery	43/43 (100%) 49/124 (39.5%)	325/361 (90.0%) 557/1533 (36.3%)	1.10 (1.05, 1.15)* 1.09 (0.87, 1.37)
Diop 1998	Low	Episiotomy	Data not received		
Elnashar 2007	Low	Episiotomy 1st delivery	150/169 (88.8%)	33/47 (70.2%)	1.26 (1.04, 1.53)*
Hakim 2001	Low	Episiotomy	527/1225 (43.0%)	63/256 (24.6%)	1.75 (1.40, 2.19)*
Larsen 2002	Low	Episiotomy 1st delivery Episiotomy 2nd delivery Episiotomy any delivery 	90/368 (24.5%) TI 31/106 (29.2%) TII 20/385 (5.2%) TI 11/123 (8.9%) TII 133/1929 (6.9%) TI 56/572 (9.8%) TII	152/447 (34.0%) 36/393 (9.2%) 216/1553 (13.9%) 	0.72 (0.58, 0.90)* 0.86 (0.62, 1.19) 0.57 (0.33, 0.96)* 0.98 (0.51, 1.86) 0.50 (0.40, 0.61)* 0.70 (0.53, 0.93)*
Millogo-Traore 2007	Low	Episiotomy	95/227 (41.9%)	56/227 (24.7%)	1.70 (1.29, 2.23)*
Ndiaye 2010	Low	Episiotomy	68/187 (36.4%)	10/143 (7.0%)	5.20 (2.78, 9.74)*
Slanger 2002	Moderate	Episiotomy 1st delivery	162/621 (26.1%)	180/486 (37.0%)	0.70 (0.59, 0.84)*
WHO study group 2006	High	Episiotomy any delivery [a]	1810/5774 (31.3%) TI 2152/6518 (33.0%) TII 5579/6172 (90.4%) TIII	1992/6052 (32.9)	0.95 (0.90, 1.00) 1.00 (0.95, 1.05) 2.75 (2.65, 2.85)*
Wuest 2009	Low	Episiotomy	24/122 (19.7%)	16/110 (14.5%)	1.35 (0.76, 2.41)

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; a= Data provided by study authors, *= statistically significant.

Eleven studies were sufficiently similar to warrant pooling of effect sizes of episiotomy in meta-analysis (figure 8). It is presented by first delivery and second or later /any delivery.

Figure 8: Forest plot, episiotomy (cut vs non-cut)



As shown in the forest plot, there was not a statistically significant difference between the two groups concerning episiotomy (RR= 1.19, CI= 0.98, 1.44). The results show that there was large, unexplained heterogeneity across studies (I^2= 96%, Chi^2= 322.4, p< 0.00001). Using GRADE, we judged the quality of the evidence for this outcome as very low (table 24).

FGM/C type I vs II

Table 13 shows the results of the three studies that presented results concerning episiotomy for women with FGM/C type I and women with FGM/C type II separately (29;30;32).

Table 13: Study outcomes (dichotomous) and effect estimates for episiotomy, FGM/C type I vs FGM/C type II

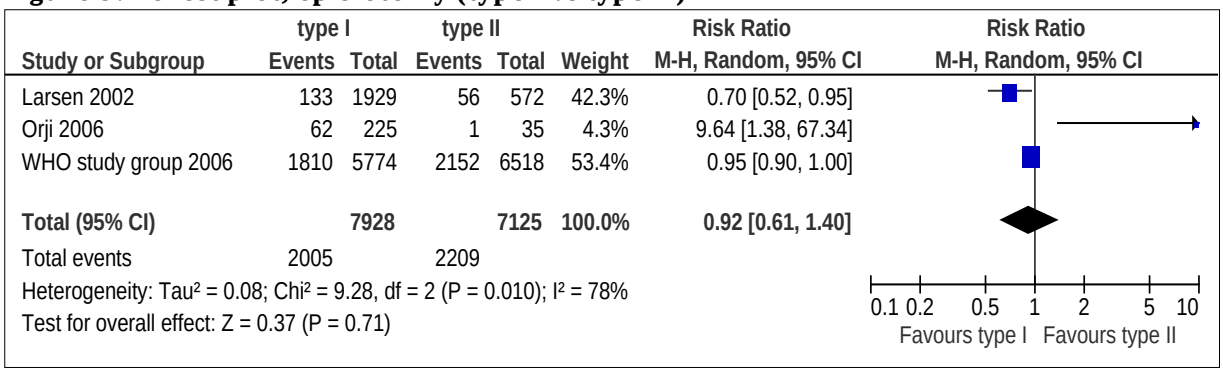
Author, year	Study quality	Outcome	FGM/C type I	FGM/C type II	Results RR (95%CI)
Larsen 2002	Low	Episiotomy 1st delivery	90/368 (24.5%)	31/106 (29.2%)	0.84 (0.59, 1.18)
		Episiotomy 2nd delivery	20/385 (5.2%)	11/123 (8.9%)	0.58 (0.29, 1.18)

		Episiotomy any delivery	133/1929 (6.9%) [a]	56/572 (9.8%)	0.70 (0.52, 0.95)*
Orji 2006	Low	Episiotomy	62/225 (27.6%)	1/35 (2.9%)	9.64 (1.38, 67.34)*
WHO study group 2006	High	Episiotomy any delivery [b]	1810/5774 (31.3%)	2152/6518 (33.0%)	0.95 (0.90, 1.00)

Legend: RR= relative risk with 95% confidence interval (CI); a= Created from two categories by collapsing across categories; b= Data provided by study authors; *= statistically significant.

The meta-analysis of episiotomy comparing women with FGM/C type I to women with FGM/C type II is shown in figure 9.

Figure 9: Forest plot, episiotomy (type I vs type II)



The pooled estimate shows that there was not a statistically significant difference between the two groups of women (RR= 0.923, CI= 0.61, 1.40) and there was considerable heterogeneity (I^2= 78%, Chi^2= 9.3, p= 0.01). Using GRADE, we judged the quality of the evidence for this outcome as very low (table 25).

What we know about episiotomy

- The risk of episiotomy does not seem to be significantly different between women with FGM/C and women without FGM/C; this is based on very low quality of evidence.
- The risk of episiotomy does not seem to be significantly different between women with FGM/C type I and women with FGM/C type II; this is based on very low quality of evidence.

Instrumental delivery

In order to assist with delivery of the baby during vaginal birth, typically in cases of fetal or maternal distress during the second stage of labor, it is sometimes necessary to use special devices. Broadly speaking, these devices are either forceps or vacuum. Both devices are introduced into the vagina of a laboring woman, applied onto the head of the baby, and used to assist the delivery (21).

We identified and included eight comparative studies which reported on instrumental delivery (31;33;58;63;66;67;70;71). These studies and their results are presented in table 14.

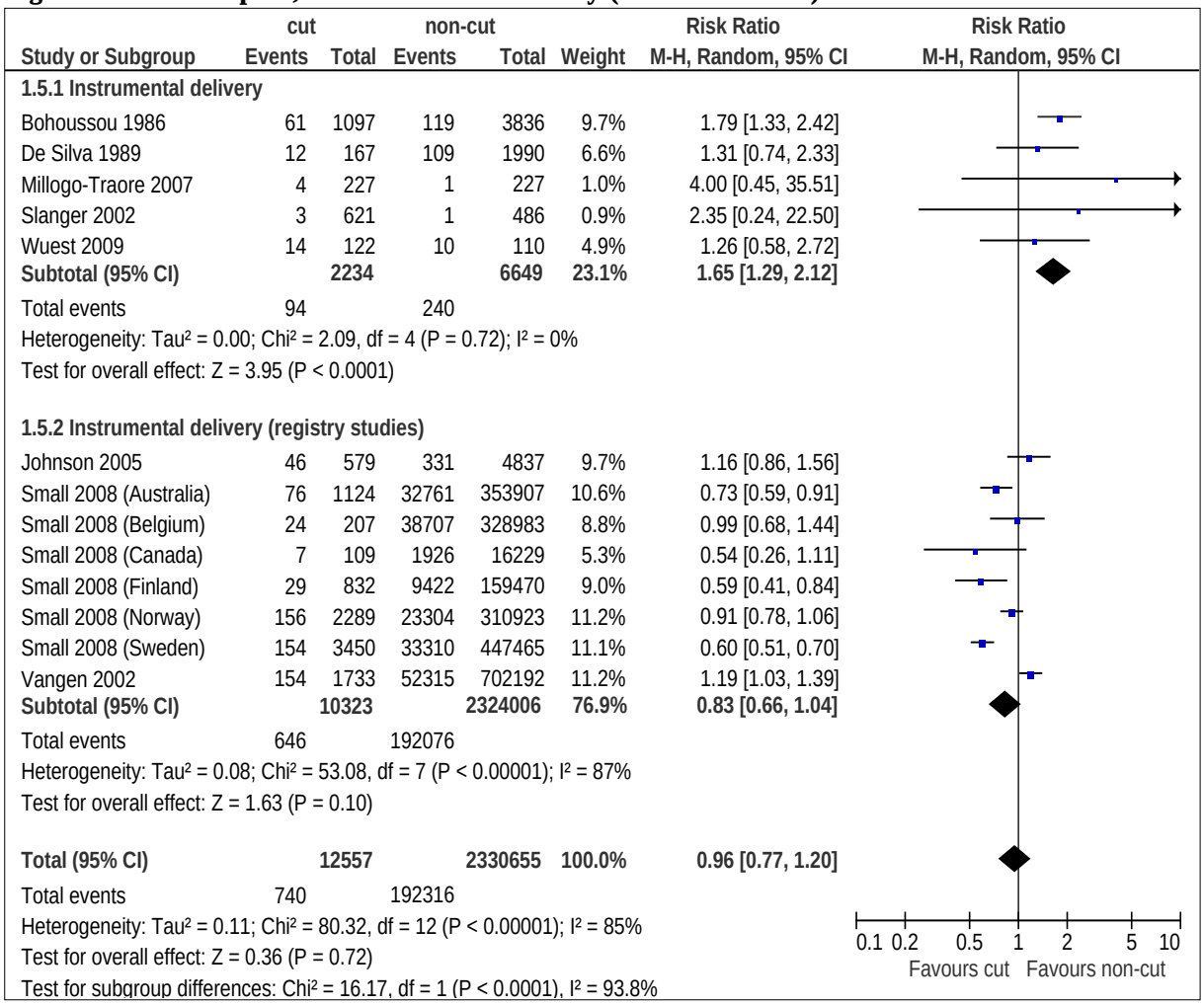
Table 14: Study outcomes (dichotomous) and effect estimates for instrumental delivery

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Bohoussou 1986	Low	Instrumental extraction	61/1097 (5.6%)	119/3836 (3.1%)	1.79 (1.33, 2.42)*
De Silva 1989	Low	Forceps/ventouse	12/167 (7.2%)	109/1990 (5.5%)	1.31 (0.74, 2.33)
Johnson 2005 [a]	Low	Operative vaginal delivery	46/579 (7.9%)	331/4837 (6.8%)	1.16 (0.86, 1.56)
Millogo-Traore 2007	Low	Instrumental delivery	4/227 (1.8%)	1/227 (0.4%)	4.00 (0.45, 35.51)
Slanger 2002	Moderate	Instrumental delivery	3/621 (0.5%)	1/486 (0.2%)	2.35 (0.24, 22.50)
Small 2008	Low	Operative vaginal birth			
-Australia			76/1124 (6.8%)	32761/353907 (9.3%)	0.73 (0.59, 0.91)*
-Belgium			24/207 (11.6%)	38707/328983 (11.8%)	0.99 (0.68, 1.44)
-Canada			7/109 (6.4%)	1926/16229 (11.9%)	0.54 (0.26, 1.11)
-Finland			29/832 (3.5%)	9422/159470 (6.0%)	0.59 (0.41, 0.84)*
-Norway			156/2289 (6.8%)	23304/310923 (7.5%)	0.91 (0.78, 1.06)
-Sweden			154/3450 (6.7%)	33310/447465 (7.4%)	0.60 (0.51, 0.70)*
Vangen 2002	Low	Operative delivery	154/1733 (8.9%)	52315/702192 (7.5%)	1.19 (1.03, 1.39)*
Wuest 2009	Low	Forceps	3/122 (2.5%)	0/110 (0%)	6.32 (0.33, 120, 94)
		Ventouse	11/122 (9.0%)	10/110 (9.1%)	0.99 (0.44, 2.24)

Legend: RR= relative risk with 95% confidence interval (CI). a= Johnson 2005 reported results also separately for nulliparous and multiparous women and white and black US-born women, but we present only results for all pregnancies and all US-born women; *= statistically significant.

We carried out meta-analysis, pooling available data from eight studies for the obstetric outcome instrumental delivery. Sensitivity analyses were conducted for study type. Figure 10 presents the results.

Figure 10: Forest plot, instrumental delivery (cut vs non-cut)



As shown in the forest plot, there was a significant difference between the Africa-based studies and the registry studies (test for subgroup differences, Chi^2= 16.2, p= 0.0001). Pooled results from studies where the cut and non-cut women were selected from the same population suggested that women with FGM/C are more likely than women with no FGM/C to require instrumental delivery (figure 10, 1.5.1, RR= 1.65, CI= 1.29, 2.12). Women with FGM/C were 1.6 times at greater risk of instrumental delivery compared to women without FGM/C. In these studies, among women with FGM/C there were 6 per 100 woman (6%) who needed instrumental delivery, while 4 per 100 (4%) non-cut women required instrumental delivery. The absolute risk difference was 2 more cases of instrumental delivery among women with FGM/C per 100 woman (CI= 1 more to 4 more). The quality of the evidence for this outcome is very low (table 24). The GRADE Evidence profile tables are in appendix 6. The registry studies, comparing Somali-born women (likely FGM/C type III) and western-born women without FGM/C showed no statistically significant difference between the two groups of women with respect to instrumental delivery (figure 10, 1.5.2, RR= 0.83, CI= 0.66, 1.04). There was large heterogeneity across the registry studies (I^2= 87%, Chi^2= 53.1, p< 0.00001).

What we know about instrumental delivery

- Women with FGM/C seem to be more likely than non-cut women to experience instrumental delivery; this is based on very low quality of evidence.
- The risk of instrumental delivery does not seem to be significantly different between Somali-born women and western-born women; this is based on low quality of evidence.
- There were no studies that compared women with different types of FGM/C with respect to instrumental delivery, thus, we do not know if various FGM/C types differentially affect the risk of instrumental delivery.

Obstetric hemorrhage

While obstetrical hemorrhage refers to heavy bleeding during pregnancy, labor, or immediately after birth, here we focus on such bleeding occurring only during labor and the post-partum period (reported in included studies). Main causes of bleeding during labor include uterine rupture and separation of the placenta from the wall of the uterus before birth. Postpartum hemorrhage is usually defined as the loss of greater than 500 ml of blood in relation to vaginal delivery (21).

We identified and included ten comparative studies that reported on obstetric hemorrhage (27;31-33;51;62;63;66;68;70). Nine of the studies measured obstetric hemorrhage as a dichotomous outcome and one as a continuous outcome. The dichotomous results for obstetric hemorrhage are presented in table 15.

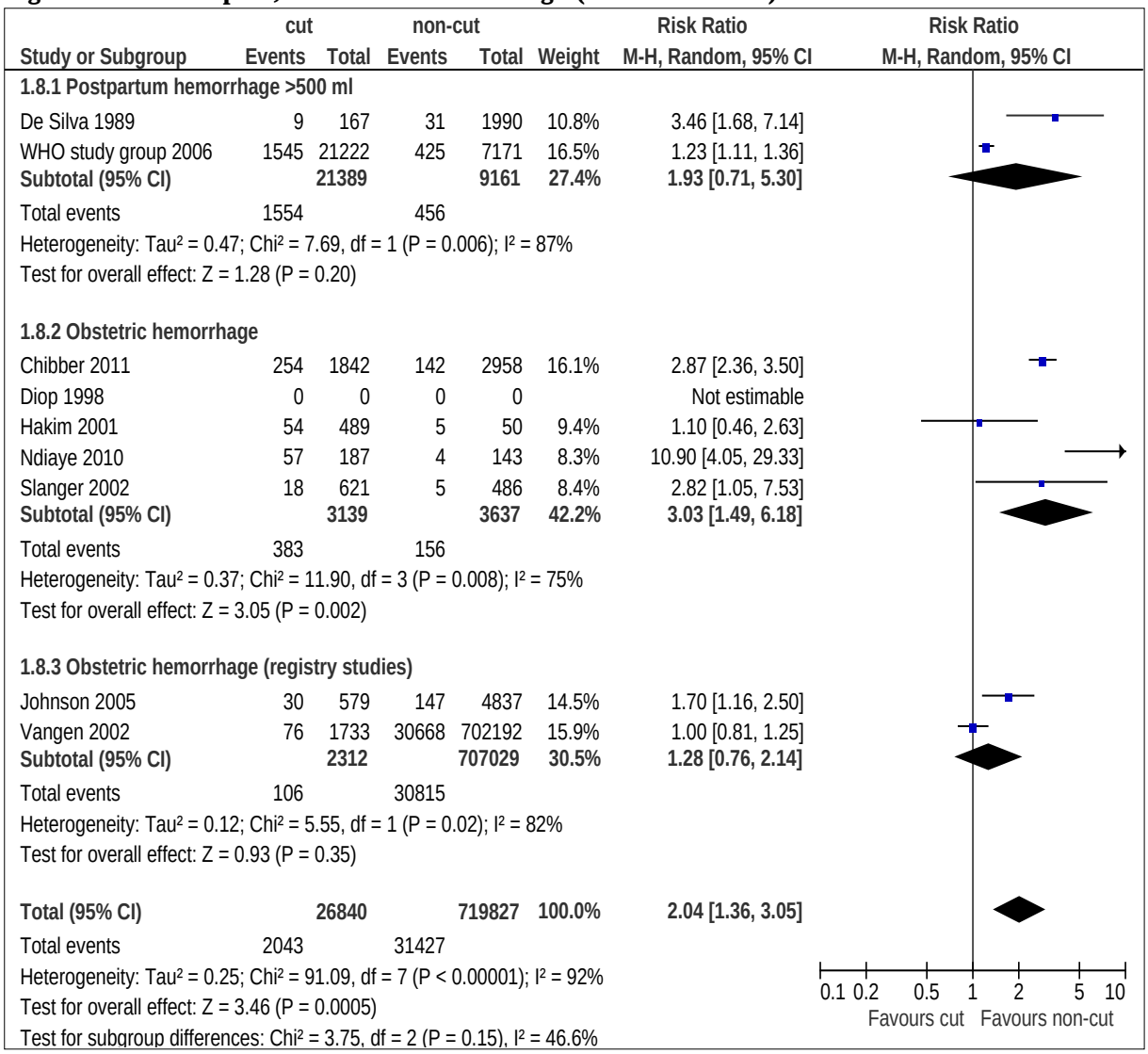
Table 15: Study outcomes (dichotomous) and effect estimates for obstetric hemorrhage

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Chibber 2011	Low	Postpartum hemorrhage	254/1842 (13.8%)	142/2958 (4.8%)	2.87 (2.36, 3.50)*
De Silva 1989	Low	Postpartum hemorrhage ≥500ml	9/167 (5.4%)	31/1990 (1.6%)	3.46 (1.68, 7.14)*
Diop 1998	Low	Hemorrhage	Data not received		
Hakim 2001	Low	Bleeding	54/489 (11.0%)	5/50 (10.0%)	1.10 (0.46, 2.63)
Johnson 2005[a]	Low	Postpartum hemorrhage	30/579 (5.2%)	147/4837 (3.0%)	1.70 (1.16, 2.50)*
Ndiaye 2010	Low	Obstetric hemorrhage	57/187 (30.5%)	4/143 (2.8%)	10.90 (4.05, 29.33)*
Slanger 2002	Moderate	Obstetric hemorrhage	18/621 (2.9%)	5/486 (1.0%)	2.82 (1.05, 7.53)*
Vangen 2002	Low	Postpartum hemorrhage ≥500ml	76/1733 (4.4%)	30668/702192 (4.4%)	1.00 (0.81, 1.25)
WHO study group 2006	High	Postpartum blood loss ≥500 ml	583/6856 (8.5%)TI 530/7771 (6.8%)TII 432/6595 (6.6%) TIII	425/7171 (5.9%)	1.43 (1.27, 1.62)* 1.15 (1.02, 1.30)* 1.11 (0.97, 1.26)

Legend: RR= relative risk with 95% confidence interval (CI); TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; a= Johnson 2005 reported results also separately for nulliparous and multiparous women and white and black US-born women, but we present only results for all pregnancies and all US-born women; *= statistically significant.

We conducted meta-analysis of the outcome obstetric hemorrhage; it is presented by hemorrhage classification stated in the studies and type of study (figure 11).

Figure 11: Forest plot, obstetric hemorrhage (cut vs non-cut)



As shown in the forest plot, there was a significantly higher risk of obstetric hemorrhage among women with FGM/C compared to women without FGM/C (RR= 2.04, CI= 1.36, 3.05). Women with FGM/C were 2 times at greater risk of obstetric hemorrhage compared to women without FGM/C. In these studies, among women with FGM/C there were 9 per 100 woman who experienced hemorrhage, while 4 per 100 non-cut women experienced hemorrhage. The absolute risk difference was 5 more cases of obstetric hemorrhage among women with FGM/C per 100 woman (CI= 2 more to 9 more). The I^2 and Chi^2 results showed that there was large, unexplained heterogeneity across studies (I^2= 92%, Chi^2= 91.1, p<0.00001). The quality of the evidence for this outcome is very low (table 24). The GRADE Evidence profile tables are in appendix 6.

Wuest and colleagues (33) used a continuous measure for maternal blood loss during labor, measured as ml blood loss, which ranged from 100 to 3500 ml among the patients (table 16). Cut women experienced a median of 50 ml blood loss more than non-cut women during labor.

Table 16: Study outcomes (continuous) and effect estimate for maternal blood loss

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Result Median diff (p-value)
Wuest 2009	Low	Maternal blood loss	400ml (range 200-1000)	350ml (range 100-3500)	-50 (p= 0.81)

Comparison of different types of FGM/C

The WHO study (32) presented results for various FGM/C groups separately with regards to postpartum blood loss ≥ 500 ml (see table 15 above), allowing an evaluation of the relative risk of this outcome for various types of FGM/C:

- Type I vs Type II (583/6856 vs 530/7771): RR= 1.25 (CI= 1.11, 1.40)
- Type I vs Type III (583/6856 vs 432/6595): RR= 1.30 (CI= 1.15, 1.46)
- Type II vs Type III (530/7771 vs 432/6595): RR= 1.04 (CI= 0.92, 1.18)

The results show that there was a significant difference between women with FGM/C type I and women with FGM/C type II, and between women with FGM/C type I and women with FGM/C type III with regards to postpartum hemorrhage. In both cases, women with FGM/C type I had a greater risk of experiencing postpartum hemorrhage.

What we know about obstetric hemorrhage

- Women with FGM/C seem to be more likely than non-cut women to experience obstetric hemorrhage; this is based on very low quality of evidence.
- We do not know if various FGM/C types differentially affect the risk of obstetric hemorrhage.

Difficult delivery

Nine comparative studies reported outcomes categorized as difficult delivery (28;51-53;62;66;68;70). While the terminology used in the studies varied (difficult delivery, obstructed labor, difficulties/problems during delivery, dystocia) all seemed to refer to obstructed labor, which means difficult childbirth. Dystocia usually means failure to progress in labor. A difficult delivery may arise due to several reasons, such as incoordinate uterine activity and abnormal fetal presentation (21).

The seven comparative studies that examined difficult delivery among women with FGM/C and women without FGM/C are shown in table 17.

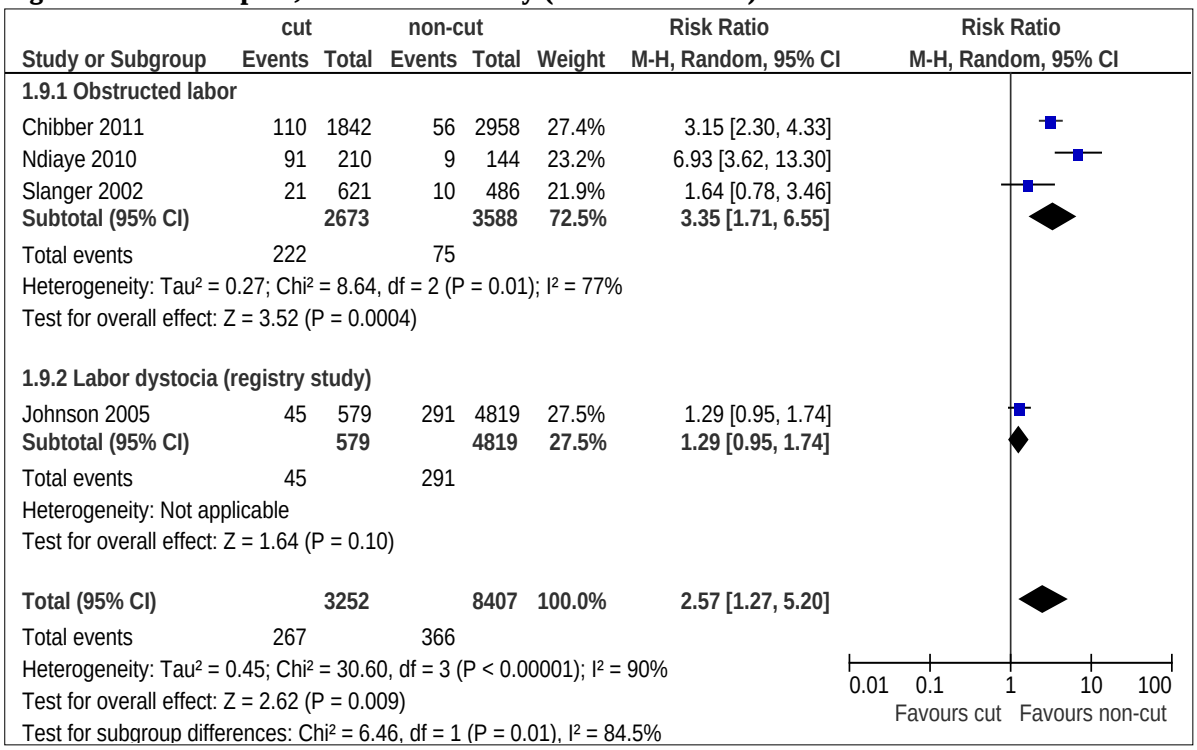
Table 17: Study outcomes (dichotomous) and effect estimates for difficult delivery

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Chibber 2011	Low	Obstructed labor	110/1842 (6.0%)	56/2958 (1.9%)	3.15 (2.30, 4.33)*
Diop 1998	Low	Difficult delivery	Data not received		
Johnson 2005	Low	Labor dystocia	45/579 (7.8%)	291/4819 (6.0%)	1.29 (0.95, 1.74)
Jones 1999 a	Low	Difficulties with delivery	Data not located		OR=1.00 TI (ref) [a] OR=1.30 (1.04, 1.62) TII OR=2.28 (1.33, 3.94) TIII OR=0.32 (0.19, 0.54) nonFGM/C
Jones 1999 b	Moderate	Observable difficulties with delivery	Data not located		OR=1.00 TI (ref) [a] OR=1.79 (1.10, 2.89) TII OR=1.77 (0.87, 3.61) TIII OR=0.17 (0.06, 0.52) nonFGM/C
Ndiaye 2010	Low	Obstructed labor/dystocia	91/210 (43.3%)	9/144 (6.3%)	6.93 (3.62, 13.30)*
Slanger 2002	Moderate	Obstructed labor	21/621 (3.4%)	10/486 (2.1%)	1.64 (0.78, 3.46)

Legend: RR= relative risk with 95% confidence interval (CI); TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; a= Odds ratio reported in publication; *= statistically significant.

We conducted meta-analyses of the outcome difficult delivery, with sensitivity analyses for study type (figure 12).

Figure 12: Forest plot, difficult delivery (cut vs non-cut)



As shown in the forest plot, there was a significant difference between the Africa-based studies and the registry study (test for subgroup differences, Chi^2= 6.5, p=

0.01). Pooled results from studies where the cut and non-cut women were selected from the same population suggested that women with FGM/C are more likely than women with no FGM/C to experience difficult labor (figure 12, 1.9.1, RR= 3.35, CI= 1.71, 6.55). Women with FGM/C were 3.3 times at greater risk of difficult delivery compared to women without FGM/C. In these studies, among women with FGM/C there were 7 per 100 woman who experienced difficult delivery, while 2 per 100 non-cut women experienced difficult delivery. The absolute risk difference was 5 more cases of difficult delivery among women with FGM/C per 100 woman (CI= 1 more to 12 more). Using GRADE, we judged the quality of the evidence for this outcome as very low (table 24). The GRADE Evidence profile tables are in appendix 6. The registry studies, comparing Somali-born women (likely FGM/C type III) and US-born women showed no statistically significant difference between the two groups of women regarding labor dystocia (figure 12, 1.9.2, RR= 1.29, CI= 0.95, 1.74).

Comparison of different types of FGM/C

Two studies compared difficult delivery among women with various types of FGM/C (52;53). The results of these two studies are found in table 18.

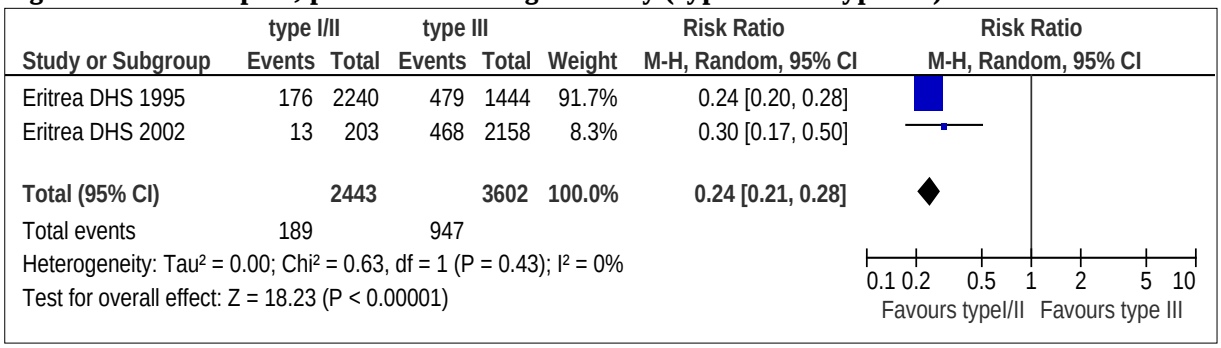
Table 18: Study outcomes (dichotomous) and effect estimates for difficult delivery, comparing various types of FGM/C

Author, year	Study quality	Outcome	FGM/C type	FGM/C type	Results RR (95%CI)
Eritrea DHS 2002	Low	Problems during delivery	13/203 (6.4%) TI-II	468/2158 (21.7%) TIII	0.30 (0.17, 0.50)*
			13/203 (6.4%) TI-II	61/2434 (2.5%) TIV	2.56 (1.43, 4.57)*
			468/2158 (21.7%) TIII	61/2434 (2.5%) TIV	8.65 (6.67, 11.23)*
Eritrea DHS 1995	Low	Problems during delivery	101/2240 (4.5%) TI	75/190 (39.5%) TII	0.11 (0.09, 0.15)*
			101/2240 (4.5%) TI	479/1444 (33.2%) TIII	0.14 (0.11, 0.17)*
			75/190 (39.5%) TII	479/1444 (33.2%) TIII	1.19 (0.98, 1.44)

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I; TII= FGM/C type II; TIII= FGM/C type III; TIV= FGM/C type IV; TI-II= FGM/C type I and II; *= statistically significant.

The two studies were sufficiently similar for us to conduct meta-analyses of problems during delivery comparing women with FGM/C type I-II to women with FGM/C type III. The results are shown in figure 13.

Figure 13: Forest plot, problems during delivery (type I/II vs type III)



The pooled estimate demonstrates that there was a statistically significant difference between the two groups of women, favoring FGM/C type I-II over FGM/C type III (RR= 0.24, CI= 0.21, 0.28). Women with FGM/C type I-II had a smaller risk of problems during delivery compared to women with FGM/C type III. In these studies, among women with FGM/C type III there were 26 per 100 woman who experienced problems during delivery, while 6 per 100 woman with FGM/C type I-II experienced problems. The absolute risk difference was 20 fewer cases of problems during delivery among women with FGM/C type I-II per 100 woman (CI= 19 fewer to 21 fewer). Using GRADE, we judged the quality of the evidence for this outcome as very low (table 26). The GRADE Evidence profile tables are in appendix 6.

What we know about difficult delivery

- Women who have been genitally cut seem to be more likely than non-cut women to experience a difficult delivery; this is based on very low quality of evidence.
- Women with FGM/C type I-II seem to be less likely to experience problems during delivery compared to women with FGM/C type III; this is based on very low quality of evidence.

Other obstetrical and antenatal complications

In addition to the seven main complications described above, a few studies reported on other obstetrical and antenatal complications.

Fever

Fever during labor can have infectious or non-infectious etiology, such as receiving epidural anesthesia, and can lead to a variety of maternal and neonatal sequelae (21). Three of our included comparative studies reported on fever in the laboring woman (27;66;70). The results from these three studies are shown in table 19.

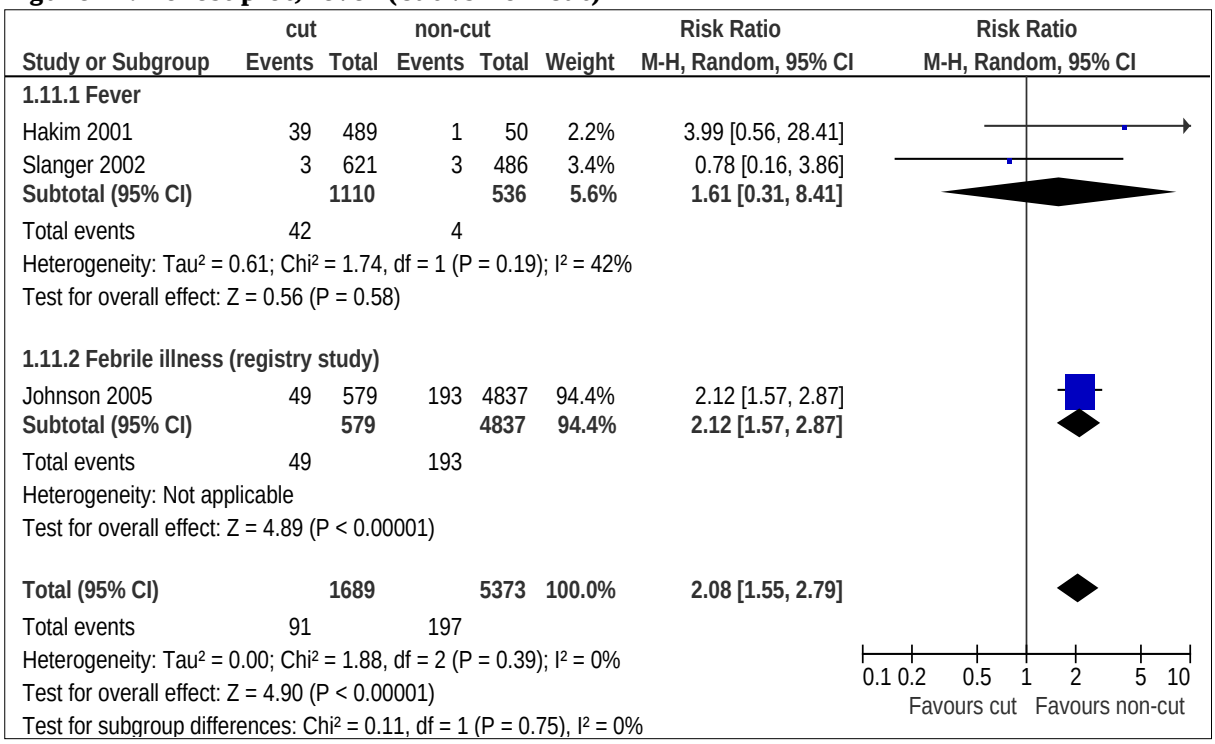
Table 19: Study outcomes (dichotomous) and effect estimates for fever related to childbirth

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Hakim 2001	Low	Febrile illness	39/489 (8.0%)	1/50 (2.0%)	3.99 (0.56, 28.41)
Johnson 2005 [a]	Low	Febrile illness	49/579 (8.4%)	193/4837 (4.0%)	2.12 (1.57, 2.87)*
Slanger 2002	Moderate	Fever	3/621 (0.5%)	3/486 (0.6%)	0.78 (0.16, 3.86)

Legend: RR= relative risk with 95% confidence interval (CI). a= Johnson 2005 reported results also separately for nulliparous and multiparous women and white and black US-born women, but we present only results for all pregnancies and all US-born women, *= statistically significant.

We conducted meta-analyses for maternal fever, pooling available data from three studies comparing women with FGM/C to women without FGM/C (figure 14).

Figure 14: Forest plot, fever (cut vs non-cut)



As shown in the forest plot, there was a statistically significant difference between cut and non-cut women (RR= 2.08, CI= 1.55, 2.79). The registry study that compared Somali-born women to US-born women contributed disproportionate weight to the pooled result (figure 14, 1.11.2), and there is less confidence in its estimate since the groups were not selected from the same population. The quality of the evidence for this outcome is very low (table 24).

What we know about maternal fever

We conclude that the data from three comparative studies are insufficient to establish whether there is a significant difference in the risk of maternal fever between women with FGM/C and women with no FGM/C.

Induction of labor

Occasionally, artificially or prematurely stimulating childbirth in a woman is necessary for the health of the woman and/or the baby. Labor induction is necessary in cases such as when labor does not start within a specific amount of time after the membranes have ruptured (21). We included three comparative studies that reported on labor induction. All were registry studies of Somali-born women compared to western-born women (31;66;71). The three studies and their results are presented in table 20.

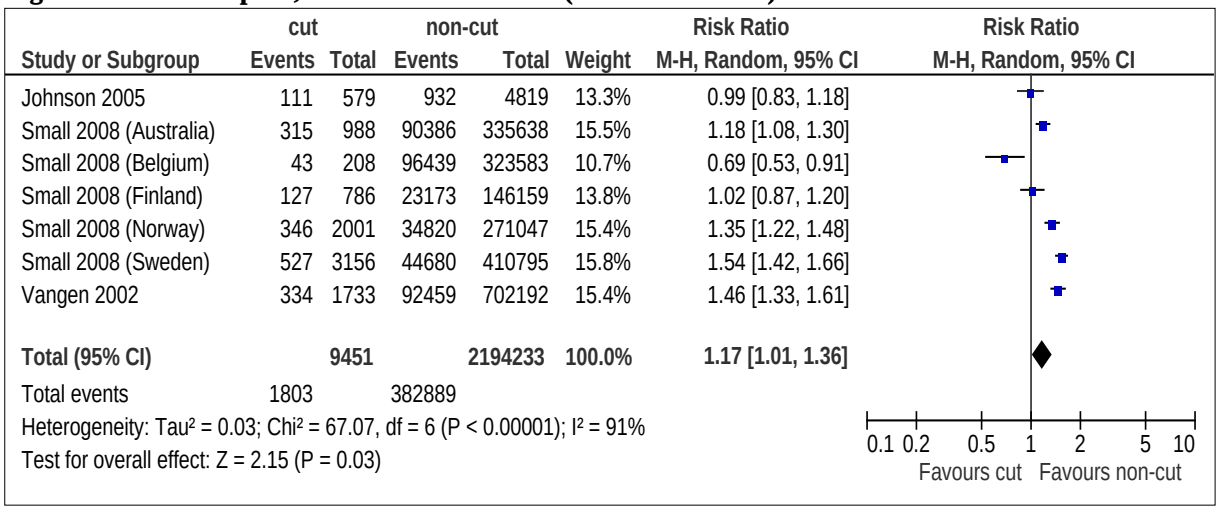
Table 20: Study outcomes (dichotomous) and effect estimates for labor induction

Author, year	Study quality	Outcome	FGM/C type III group	Non-FGM/C group	Results RR (95%CI)
Johnson 2005 [a]	Low	Labor induction	111/579 (19.2%)	932/4819 (19.3%)	0.99 (0.83, 1.18)
Small 2008	Low	Induction of labor			
-Australia			315/988 (31.9%)	90386/335638 (26.9%)	1.18 (1.08, 1.30)*
-Belgium			43/208 (20.7%)	96439/323583 (29.8%)	0.69 (0.53, 0.91)*
-Finland			127/786 (16.2%)	23173/146159 (15.8%)	1.02 (0.87, 1.20)
-Norway			346/2001 (17.3%)	34820/271047 (12.8%)	1.35 (1.22, 1.48)*
-Sweden			527/3156 (16.7%)	44680/410795 (10.9%)	1.54 (1.42, 1.66)*
Vangen 2002	Low	Induction of labor	334/1733 (19.3%)	92459 /702192 (13.2%)	4.59 (4.17, 5.06)*

Legend: RR= relative risk with 95% confidence interval (CI). a= Johnson 2005 reported results also separately for white and black US-born women, but we present only results for all US-born women, *= statistically significant.

The three registry studies were sufficiently similar to warrant pooling of effect sizes in meta-analyses. Figure 15 presents the meta-analyses results for induction of labor, comparing Somali-born women (likely FGM/C type III) to western-born women (non-cut).

Figure 15: Forest plot, induction of labor (cut vs non-cut)



The pooled result shows there was a statistically significant difference between Somali-born women, who likely had FGM/C type III, and western-born, non-cut women with regards to labor induction. The difference favored western-born, non-cut women (RR= 1.17, CI= 1.01, 1.36). Using GRADE, we judged the quality of the evidence of this outcome as very low (table 23). Considerable heterogeneity indicated by I^2 and Chi^2 (I^2= 91%, Chi^2 =67.1, p= 0.00001) showed that there was large heterogeneity across the registry data.

What we know about induction of labor

We can conclude that a) the results from registry studies suggest that Somali-born women have a greater risk of labor induction than receiving country-born women, and b) we do not know whether women with FGM/C are more likely than non-cut women to experience labor induction, due to the lack of data from studies where the cut and non-cut women were selected from the same population. This is based on very low quality of evidence (table 24).

Death

One comparative study reported on maternal death. The WHO multi-centre study (32) reported that 54 (0.19%) of the women in their study died before being discharged from the hospital (table 21). Despite being a large study, there was a small number of events and the results are therefore uncertain. Table 21 shows the relative risks of maternal death for various comparisons.

Table 21: Study outcome (dichotomous) and effect estimates for maternal death

Author, year	Study quality	FGM/C type I	FGM/C type II	FGM/C type III	No FGM/C	Results RR (95%CI)
WHO study group 2006	High	15/6856 (0.22%)	23/7771 (0.30%)	7/6595 (0.11%)	9/7171 (0.13%)	0.74 (0.39, 1.42) TI vs TII 2.06 (0.84, 5.05) TI vs TIII 2.79 (1.20, 6.49) TII vs TIII* 1.69 (0.83, 3.45) cut vs not

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I. TII= FGM/C type II. TIII= FGM/C type III; *= statistically significant.

In the article (32), the authors state the following relative risks, adjusted for potential confounding factors such as illness at admission: FGM/C type I RR= 1.29 (CI= 0.36, 4.60), FGM/C type II RR= 4.18 (CI= 1.24, 14.08), FGM/C type III RR= 1.56 (CI= 0.25, 9.92) (versus non-cut).

Additionally, a case report from 1927 (55) reported on the death of a woman and her child in childbirth. We mention it here along with the WHO study (32) because it is one of the few studies we identified which described death as a likely complication of FGM/C. The author, Dr Philp, concluded "The result of circumcision narrowed the patient's vagina and drew the patient's bladder down on the left side. This led to the urethra not being retracted at labour, and when the pressure of the child's head came against a cicatrized opening, the thinned walls of the bladder and rectum gave way. If my conclusions are correct, this woman died as another victim of the abominable practice of female circumcision among the Akikuyu" ((55) p128). In sum, with respect to maternal death, there were insufficient data to conclude regarding differences between cut and non-cut women.

Other obstetrical and antenatal complications

A total of six comparative studies reported various obstetric complications not described earlier (27;31;54;62;70;73). Each of these outcomes was only reported in one study. The outcomes were: antenatal kidney infection, antenatal hepatitis-C infection, urinary incontinence, faecal/flatus incontinence, urinary tract infection (UTI) in pregnancy, convulsion/seizure, secondary arrest of labor. These outcomes comparing cut vs non-cut women are listed in table 22. They show that there was a statistically higher risk among cut women, compared to non-cut women, to experience the following: antenatal kidney infection, antenatal hepatitis-C infection, secondary arrest of labor. Conversely, there was no significant difference between the cut and non-cut women with respect to: urinary incontinence, faecal/flatus incontinence, UTI in pregnancy, convulsion/seizure.

Table 22: Study outcomes (dichotomous) and effect estimates for other obstetrical and antenatal complications

Author, year	Study quality	Outcome	FGM/C group	Non-FGM/C group	Results RR (95%CI)
Chibber 2011	Low	Antenatal kidney infection	405/1842 (22.0%)	243/2958 (8.2%)	2.68 (2.31, 3.10)*
Chibber 2011	Low	Antenatal hepatitis-C	722/1842 (39.2%)	26/2958 (1.4%)	44.59 (30.29, 65.66)*
Hakim 2001	Low	Urinary incontinence	4/489 (1.0%)	0/50(0%) [a]	0.51 (0.06, 4.29)
Hakim 2001	Low	Faecal/flatus incontinence	2/489 (0.4%)	0/50 (0%) [a]	0.31 (0.03, 2.89)
Lupo 1999	Low	UTI in pregnancy	2/38 (5.3%)	19/76 (25.0%)	0.21 (0.05, 0.86)
Slanger 2002	Moderate	Convulsion/seizure	4/621 (0.6%)	0/486 (0%)[1]	3.91 (0.46, 33.38)
Vangen 2002	Low	Secondary arrest of labor	204/1733 (11.8%)	60358/702192 (8.6%)	1.37 (1.20, 1.56)*

Legend: RR= relative risk with 95% confidence interval (CI); UTI= Urinary tract infection; a= in the calculation of RR, 1 event was added to both groups to avoid 0 events; *= statistically significant.

We also identified one comparative study which reported on miscarriage. It compared the prevalence of pregnancy loss for women with various types of FGM/C. Yount and Carrera (73) asked women to self-report whether they had experienced pregnancy loss, defined as "ever lost a pregnancy because of miscarriage, stillbirth, abortion" ((73) p190). As shown in table 23, there were no significant differences in pregnancy loss between the groups of women.

Table 23: Study outcome (dichotomous) and effect estimates for pregnancy loss

Author, year	Study quality	Outcome	FGM/C type I	FGM/C type II	FGM/C type IV	Results RR (95%CI)
Yount 2006	Low	Pregnancy loss	28/72 (38.9%)	522/1232 (42.4%)	170/396 (42.9%)	0.92 (0.68, 1.23) TI vs TII 0.91 (0.66, 1.24) TI vs TIV 0.99 (0.87, 1.13) TII vs TIV

Legend: RR= relative risk with 95% confidence interval (CI). TI= FGM/C type I. TII= FGM/C type II. TIV= FGM/C type IV.

In summary, for all of the outcomes reported in only one comparative study, there were insufficient data for us to conclude regarding differences between groups of women.

Other obstetrical complications reported in non-comparative studies

In this chapter we have presented results from the 28 comparative studies included. Non-comparative studies can give a sense of possible complications following FGM/C and the range of frequency of complications but provide no answers on the strength of association between FGM/C and the proposed complications. Obstetric outcomes reported in the 16 non-comparative studies were the same as those reported in the comparative studies, except that five additional outcomes were presented. Additional obstetric outcomes reported in the cross-sectional, case series and case report studies were labeled: obstetric fistula, infection, obstetric complica-

tions, obstetric difficulties, and not normal vaginal delivery. These outcomes are detailed in appendix 5.

Summary of Findings tables

The following three tables (tables 24-26) present our assessment of the quality of the evidence, organized according to comparison.

Table 24: Summary of Findings table for the comparison cut vs non-cut

FGM/C compared to non-FGM/C for girls/women – Obstetric outcomes

Patient or population: Girls/women

Settings: Clinics/maternity welfare centers

Intervention: FGM/C

Comparison: non-FGM/C

Outcomes (dichotomous)	Illustrative comparative risks* (95% CI) Assumed risk Non-FGM/C	Corresponding risk FGM/C	Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
Prolonged labor	**5 per 100**	**8 per 100** (5 to 13)	**RR 1.69** (1.03 to 2.77)	715079 (5 studies[1])	⊕⊖⊖⊖ **very low**[2,3]	
Obstetric tears/ lacerations	**3 per 100**	**5 per 100** (4 to 6)	**RR 1.39** (1.07 to 1.82)	739443 (14 studies[4])	⊕⊖⊖⊖ **very low**[5,6]	
Cesarean section	**44 per 100**	**52 per 100** (44 to 62)	**RR 1.18** (0.99 to 1.4)	1041305 (15 studies)	⊕⊖⊖⊖ **very low**[7,8,9]	
Episiotomy	**32 per 100**	**38 per 100** (31 to 46)	**RR 1.19** (0.98 to 1.44)	35467 (11 studies[10])	⊕⊖⊖⊖ **very low**[11,12,13]	
Instrumental delivery (cross-sectional studies)	**4 per 100**	**6 per 100** (5 to 8)	**RR 1.65** (1.29 to 2.12)	8883 (5 studies)	⊕⊖⊖⊖ **very low**[14]	
Obstetric hemorrhage	**4 per 100**	**9 per 100** (6 to 13)	**RR 2.04** (1.36 to 3.05)	746667 (8 studies[15])	⊕⊖⊖⊖ **very low**[16,17]	
Difficult delivery (cross-sectional studies)	**2 per 100**	**7 per 100** (4 to 14)	**RR 3.35** (1.71 to 6.55)	6261 (3 studies)	⊕⊖⊖⊖ **very low**[18,19,20]	
Maternal fever	**1 per 100**	**1 per 100**	**RR 1.61**	1646	⊕⊖⊖⊖	

		(0 to 6)	(0.31 to 8.41)	(3 studies)	**very low**[21,22]
Induction of labor	**38 per 100**	**45 per 100** (39 to 52)	**RR 1.17** (1.01 to 1.36)	1009450 (3 studies)	⊕⊖⊖⊖ **very low**[23]

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI). **CI:** Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence= **High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. **Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. **Very low quality:** We are very uncertain about the estimate.

[1] One additional study includes this outcome, but we have not received the data.

[2] 5 of 5 studies had low methodological study quality.

[3] Considerable heterogeneity indicated by I2 (I2=92%) showed inconsistency across studies.

[4] One additional study include this outcome, but we have not received the data.

[5] 12 of 14 studies had low methodological study quality.

[6] Considerable heterogeneity indicated by I2 (I2=89%) showed inconsistency across studies.

[7] 11 of 15 studies had low methodological study quality.

[8] Considerable heterogeneity indicated by I2 (I2=97%) showed inconsistency across studies.

[9] CI is wide, crosses limitations of precision (CI=0.94, 1.51).

[10] One additional study includes this outcome, but we have not received the data.

[11] 8 of 11 studies had low methodological study quality.

[12] Considerable heterogeneity indicated by I2 (I2=96%) showed inconsistency across studies.

[13] CI is wide, crosses limitations of precision (CI=0.98, 1.44).

[14] 4 of 5 studies had low methodological study quality.

[15] One additional study includes this outcome, but we have not received the data.

[16] 6 of 8 studies had low methodological study quality.

[17] Considerable heterogeneity indicated by I2 (I2=92%) showed inconsistency across studies.

[18] 2 of 3 studies had low methodological study quality.

[19] Considerable heterogeneity indicated by I2 (I2=77%) showed inconsistency across studies.

[20] CI is wide (CI=1.71, 6.55) and number of events is less than 300.

[21] 2 of 3 studies had low methodological study quality.

[22] Total number of events is less than 300.

[23] Considerable heterogeneity indicated by I2 (I2=91%) showed inconsistency across studies.

Table 25: Summary of Findings table for the comparison FGM/C type I vs II

FGM/C type I compared to FGM/C type II for girls/women – Obstetric outcomes

Patient or population: Girls/women

Settings: Clinics/maternity welfare centers

Intervention: FGM/C type I

Comparison: FGM/C type II

Outcomes (dichotomous)	Illustrative comparative risks* (95% CI) Assumed risk FGM/C type II	Corresponding risk FGM/C type I	Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
Obstetric tears/ lacerations	**11 per 100**	**8 per 100** (5 to 12)	**RR 0.70** (0.47 to 1.04)	11849 (2 studies)	⊕⊖⊖⊖ **very low**[1,2]	
Cesarean section	**6 per 100**	**7 per 100** (6 to 8)	**RR 1.07** (0.94 to 1.2)	15395 (3 studies)	⊕⊖⊖⊖ **very low**[3]	
Episiotomy	**31 per 100**	**29 per 100** (19 to 43)	**RR 0.92** (0.61 to 1.4)	15053 (3 studies)	⊕⊖⊖⊖ **very low**[4,5,6]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI). **CI:** Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence= **High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. **Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. **Very low quality:** We are very uncertain about the estimate.

[1] 1 of 2 studies had low methodological study quality.

[2] CI is wide, crosses limitations of precision (CI=0.47, 1.04).

[3] 2 of 3 studies had low methodological study quality.

[4] 2 of 3 studies had low methodological study quality.

[5] Considerable heterogeneity indicated by I2 (I2=78%) showed inconsistency across studies.

[6] CI is wide, crosses limitations of precision (CI=0.61, 1.40).

Table 26: Summary of Findings table for the comparison FGM/C type I-II vs type III

FGM/C type I-II compared to FGM/C type III in girls/women – Obstetric outcomes

Patient or population: Girls/women

Settings: Community

Intervention: FGM/C

Comparison: non-FGM/C

Outcome (dichotomous)	Illustrative comparative risks* (95% CI) Assumed risk FGM/C type III	Corresponding risk FGM/C type I-II	Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
Problems during	**26 per 100**	**6 per 100**	**RR 0.24**	6045	⊕⊖⊖⊖	

delivery	(6 to 7)	(0.21 to 0.28)	(2 studies)	**very low**[1]

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI). **CI:** Confidence interval; **RR:** Risk ratio;

GRADE Working Group grades of evidence= **High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. **Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. **Very low quality:** We are very uncertain about the estimate.

[1] Number of events is less than 300.

Discussion

This systematic review aimed to summarize empirical data assessing the obstetric sequelae of FGM/C. The estimates for prolonged labor, obstetric tears/lacerations, instrumental delivery, obstetric hemorrhage, and difficult delivery offer evidence in support of a negative association between such obstetric complications and FGM/C. There seems to be a greater risk of problems during delivery for women with FGM/C type III compared to type I-II. However, the low quality of the body of evidence precludes us from drawing conclusions regarding causality. The meta-analysis results further suggest that the risk of cesarean section and episiotomy is not significantly different between women with FGM/C and women without FGM/C. Lastly, the meta-analysis results suggest that the risk of obstetric tears/lacerations, cesarean section, and episiotomy is not significantly different between women with FGM/C type I and those with type II, although the direction of effect across studies favored FGM/C type I over type II with regards to tears/lacerations. There were insufficient data for us to conclude with respect to whether the risk of other obstetric complications is higher among cut women compared to women with no FGM/C and whether various FGM/C types differentially affect the risk of other obstetric complications.

Discussion of main results

Observed associations with FGM/C

The meta-analyses results show that deliveries to women who have undergone FGM/C are more likely to be complicated by prolonged labor, perineal tears/lacerations, instrumental delivery, obstetric hemorrhage, and obstructed labor than deliveries by comparable women who have not had FGM/C. Given the studies included in the meta-analyses included women with various types of FGM/C, genital cutting of any type seems to be associated with obstetric complications (when studied in African countries).

While it is not clear whether the documented association of FGM/C with obstetric complications reflects true causality, aspects of the delivery process for women with FGM/C show cause for concern, particularly the increased risk of obstructed labor and obstetric hemorrhage. Women with FGM/C were 3.3 times more likely to experience obstructed labor and twice as likely to experience obstetric hemorrhage as

non-FGM/C women. The mechanism by which FGM/C may cause problems during delivery is unclear, but, as mentioned above, FGM/C is a physiologically plausible explanation especially for the increased risk of obstetric lacerations and hemorrhage because of the increased inelasticity of scar tissue. Additionally, the presence of inelastic scar tissue may contribute to more obstructions, which may prolong labor. In turn, a longer second stage of labor could underlie the increased risk of perineal lacerations and hemorrhage. Furthermore, lack of episiotomy (results of the meta-analysis indicated there was no statistically significant difference between cut and non-cut women in episiotomy) could contribute to the occurrence of obstetric lacerations (21).

As explained by researchers such as Browning, Allsworth, and Wall (61), it is commonly assumed that increased scarring around the introitus from more invasive FGM/C can cause a delay in the second stage of labor, which, in turn, may lead to additional complications. The second stage of labor may impact not just maternal distress but is also considered a determinant phase in the well-being of the fetus in the intrapartum period. If prolonged, there is a risk of anoxic or hypoxic injury to the brain as well as cardiopulmonary functions (27). Given women with FGM/C had statistically significant higher rates of prolonged labor than comparable non-cut women, the health of the fetus may be affected. We did not assess outcomes related to the child, but note that several studies have documented an increased risk of fetal distress in women with FGM/C (27;32;62). Contextually, it must be remembered that while we cannot causally attribute FGM/C to obstetric complications, FGM/C seems implicated in their occurrence, which is in areas with existing high rates of adverse maternal and infant outcomes (23). FGM/C may therefore lead to additional cases of adverse obstetric outcomes. The now sounder understanding of anticipated obstetric improvements with the halting of FGM/C may be used as a strategy for campaigning against the practice.

In addition to being distressful, there are medical costs associated with obstetric complications of FGM/C. In a multistage modeling analysis, the medical costs associated with obstetric complications related to FGM/C were estimated. The researchers calculated that compared to a 15-year-old who does not undergo FGM/C, the average 15-year-old who undergoes FGM/C type III loses nearly one-fourth of a year of life and generates $5.82 (in international dollars) of associated medical costs over her lifetime; the averages for women who undergo any type of FGM/C were 0.07 years lost and $1.71 in costs. Overall, the estimated annual cost of treating obstetric complications from FGM/C totaled $3.7 million for the 53 million women living in the six countries. National costs ranged from 0.1% to 1% of government health spending on women with FGM/C (87). Presumably, there are not only likely obstetric impacts from FGM/C but economic burdens imposed on the health system from providing care for these women.

No significant associations with FGM/C

The results of the present systematic review show no indication of there being obstetrical benefits to FGM/C. Today's best available evidence documents either a significantly greater risk (prolonged labor, instrumental delivery, obstetric hemorrhage, difficult delivery) or no significant difference in risk (cesarean section, episiotomy) among women with FGM/C relative to women with no FGM/C. We found no statistically significant excess of experiencing cesarean section and episiotomy among women with FGM/C. However, we point out that the direction of effect across studies, particularly for episiotomy, certainly seems to favor women being non-cut.

Unknown association with FGM/C for some outcomes

Despite including 28 comparative studies, the data were insufficient to show whether or not FGM/C contributes to maternal fever during labor (reported in three studies), labor induction (reported in three studies), and eight other obstetric complications (each reported in one study). The study results for maternal fever and labor induction were heterogeneous. For example, a study from Ethiopia and a study from Nigeria showed opposing results for maternal fever. Regarding maternal mortality, the two studies we identified that reported this outcome are insufficient to give a true sense of the magnitude of the problem. One was a case report from 1927 (55) and one was the WHO study (32) from obstetric centers in six African countries. In the latter study, the difference in maternal inpatient death between cut and non-cut women was only significant for women with FGM/C type II, and there were wide confidence intervals around all of the estimates for maternal death. In this study, which had high methodological study quality and included over 28,000 participants, there were 54 maternal inpatient deaths (0.19%). It is unlikely that the estimate of this outcome would change with additional cross-sectional studies.

Different degrees of exposure to FGM/C

The opportunity to examine whether various types of FGM/C differentially affect the risk of obstetric consequences was limited. This was because only five comparative studies specifically evaluated risk relative to different degrees of FGM/C exposure, and they largely reported on different outcomes (29;32;52;53;73). However, we could pool results from two or more studies for the outcomes obstetric tears/lacerations, cesarean section, episiotomy, and problems during delivery. The results of these suggested that, similar to the risk between cut and non-cut women, the risks of cesarean section and episiotomy do not seem to be significantly different between women with FGM/C type I and women with FGM/C type II. Nonetheless, the direction of effect across studies favored FGM/C type I over type II with regards to tears/lacerations. Also, women with FGM/C type III seem to be more likely to experience problems during delivery compared to women with FGM/C type I-II, supporting there may be a dose-response relationship between exposure to FGM/C and

experiencing problems during delivery. We recognize that the severity of obstetric complications is likely not just a function of the extent of cutting of genital tissue, but also factors such as complications at the time of the cutting, scar tissue formation, and long-term complications such as cysts, stenosis, infections.

Registry studies

In most of the registry studies, the groups were selected from different sociocultural and ethnic populations, and the rate of- and FGM/C type were not known. This limits the conclusions that can be drawn from these studies regarding the association between FGM/C and adverse obstetric outcomes. Interestingly, the results showed that for all outcomes, except instrumental delivery, the direction of effect was the same for registry studies and Africa-based comparative cross-sectional studies. This strengthens the argument for a true association between FGM/C and obstetric complications. When it comes to instrumental delivery, the meta-analyses results for registry studies comparing Somali-born women and western-born women showed a lower (non-significant) risk among Somali-born women, who likely had FGM/C type III. The difference may be related to Somali women favoring natural childbirth. According to qualitative studies, Somali women living in diaspora express anxiety about childbirth interventions and a general dislike of interference in the birth process. Such studies have also identified language problems and difficulties in communication with caregivers (80;88-90). There are also data suggesting that western practitioners' unfamiliarity with FGM/C, especially infibulations, may contribute to delivery differences between cut and non-cut women giving birth in a western country (89;91;92). Such factors may help explain our finding, from registry studies, that Somali women were at greater risk of labor induction than receiving country-born women.

Quality of the evidence

Of the 28 included comparative studies, we rated the methodological study quality of three studies as high, four as moderate, and the remaining 21 studies as having low study quality. Using GRADE, the quality of the total body of evidence was assessed as very low, meaning that any estimate of effect is very uncertain. As mentioned in the methods chapter, a cultural practice like FGM/C does not lend itself to a randomized controlled trial, the gold standard for drawing causal inferences between an exposure and an outcome (effect). For obstetric outcomes, also prospective cohort studies will be practically unfeasible, leaving case-control studies as the best study design for evaluating a possible association between FGM/C and obstetric outcomes. In this design, women with obstetric complications (cases) are compared to women from the same population without that complication (controls), and it seeks to find associations between the outcome (e.g. lacerations) and prior exposure to FGM/C (risk factor). To date, however, no case-control studies have been conducted

concerning FGM/C and obstetric complications. Rather, the best evidence on this issue comes from 28 cross-sectional studies that compare FGM/C 'exposed' women and 'unexposed' women (or differently exposed) and that calculate the risk among those exposed compared to those who are not. The issue of study design illustrates the practical barriers to health outcomes research related to FGM/C but at this point it is important to stress the importance of future studies applying the best design possible for examining the consequences of the practice.

Cross-sectional studies are problematic when it comes to sampling bias because the recruitment of sufficiently equivalent and large exposed and unexposed groups of women may be challenging. For practical reasons, studies evaluating obstetric complications are typically done in health clinics and it is possible that women with antepartum complications and those able to afford hospital care are overrepresented in these studies. Researchers also believe that, on a general basis, obstetric complications are likely to be underestimated in low-income countries in Africa, that variations between study sites are related to problems with classification, and that pregnant women's care is poor due to malfunctioning of public health services (24). It is, however, unlikely that such factors are systematically different between cut and non-cut women in all included studies, such as to affect the relative risk of obstetric complications between these groups of women. Larsen and colleagues (29) state that clinic based studies on the association between FGM/C and obstetric outcomes in Nigeria may in fact be representative of the general population given more than 90% of the women receive antenatal health care services. With regards to the issue of equivalency, it was a strength that in most studies (85%) the non-exposed group was selected from the same population as the exposed group. However, in four of the included comparative studies (31;54;66;71), the non-exposed group was selected from a different (western) population than the exposed group and in 17 of the studies the researchers did not show whether the groups were comparable with respect to important background factors. It is possible that the obstetric outcome differences between Somali-born women and western-born women are partially attributable to sociocultural and medical factors, including suboptimal perinatal care and intercurrent diseases. However, it is unlikely that the differences documented in risk between cut and non-cut women in the other studies are attributable to sociocultural factors, since these results are based on women selected from the same population. Lastly, cross-sectional studies have to take account of confounding and moderators.

As highlighted by authors of previous reviews on health complications following FGM/C (17;20) another methodological challenge is measurement of 'exposure' to FGM/C. Measuring exposure to FGM/C means determining the extent of genital tissue excised or altered. Here, we applied the WHO classification system for FGM/C (type I through IV) (1) and found that a similar classification system was applied in most of the included studies. Encouragingly, in 18 of the comparative studies (69%), classification and exposure were based on gynaecological examination. Briefly, re-

search shows that both validity and reliability of self-reporting of FGM/C are variable. In general, several studies suggest that most women can correctly say whether or not they have been genitally cut, but are less able to correctly determine the extent of their cutting (59;93-96). Although also gynaecological examination is subject to variation (interindividual and intraindividual), it is currently the best classification method available for measurement of exposure to FGM/C. Thus, we encourage future studies to base classification of FGM/C on gynaecological examination by trained personnel and to compare degrees of exposure, because there may be a dose-response relationship whereby women with more severe forms of cutting are at greater risk of experiencing complications.

It was also a strength that measurement of the majority of the obstetric outcomes were clinically based. However, there was a lack of a unified approach and standardized definitions to measure common outcomes such as prolonged labor. Although we scrutinized the publications for definitions, these were not always provided. This meant that we heavily relied on the terminology and categories used in the publications, and we could not always be sure that similarly labeled outcomes were identically defined and measured in each study. In a broader perspective, this may not be a serious limitation as the crucial question is whether the risk of obstetric complications in the general case, not only specific to certain outcomes, is greater among cut women than non-cut women. Nonetheless, we stress the importance of researchers using precise definitions and clinical measurement of outcomes such as obstetric lacerations since they are amenable to direct physical measurement and more valid than self-report.

Strengths and limitations

The results of the systematic review rest on a comprehensive and systematic literature search and a systematic process for identifying relevant studies. Two independent reviewers at NOKC carried out the inclusion selection of studies based on pre-set inclusion criteria, detailed in our published protocol (see http://www.crd.york.ac.uk/PROSPERO/). A further strength is that we included all empirical research, but prioritized the reporting of comparative studies, i.e., study designs which can say something about the likelihood of health consequences from the exposure (FGM/C) on an outcome (e.g. hemorrhage). The 28 comparative studies with data about the differences in outcomes between groups made it possible to estimate the risk of obstetric complications in women with FGM/C versus women without FGM/C, or an alternative type of FGM/C, and in many cases meta-analyses could be performed.

From this and previous systematic reviews we have carried out on the issue of FGM/C, our impression is that the literature on FGM/C includes numerous un-

published and other hard-to-obtain works. Our search is more than one year old. Despite a comprehensive search strategy, it is possible that we have missed some studies and our systematic review may be subject to publication bias. Missed studies may differ systematically from the ones we identified, the likeliest scenario being that the results of the present systematic review are biased to the positive. We failed to obtain 13 relevant records in full text as well as primary data from three studies which potentially could have been included in meta-analyses (28;51;65). We are exceedingly grateful for the data received from the WHO study group.

Caution is warranted in interpreting the results of this systematic review. Using GRADE, we assessed the quality of the evidence for all outcomes as being too low to warrant conclusions about a causal relationship between FGM/C and obstetric complications. This was largely due to the weaknesses of the observational design of all included studies, but also inconsistencies in results and estimate imprecision. Despite the large sample sizes for several of the pooled analyses, the confidence intervals for many of the effect estimates remained wide. Additional outcome research could narrow the confidence intervals, but for several outcomes only very large studies would alter the direction of effect. Lastly, we acknowledge the limitation of only including outcomes for the woman and not her baby(ies).

Conclusion

The need for synthesized scientific research to specify the health sequelae of FGM/C motivated this systematic review. While the low quality of the body of evidence means that it is unclear whether the documented association of FGM/C with obstetric complications reflects true causality, the evidence base suggests that women who have undergone FGM/C are more likely than women who have not been subjected to FGM/C to experience obstetric complications. Four important findings emerge from this systematic review. First, the strongest associations between FGM/C and obstetric complications were found for obstructed labor and obstetric hemorrhage, but associations were also found for prolonged labor, perineal tears/lacerations, and instrumental delivery. Second, genital cutting of any type seems to be associated with these obstetric complications (when studied in African countries). Third, there seems to exist no significant difference in risk for cesarean section and episiotomy among women with FGM/C relative to women with no FGM/C. Fourth, the data were insufficient to show whether or not FGM/C contributes to maternal fever during labor and labor induction.

The meta-analyses results require cautious interpretation due to the considerable statistical heterogeneity in most of the results. Interpretation of the findings is thus speculative. Yet, while the exact size of the greater risk from FGM/C is unclear, the data clarify the obstetric improvements that may be anticipated with the halting of FGM/C and may be used as arguments for campaigning against the practice.

Need for further research

The results of the present systematic review show no indication of there being obstetrical benefits to FGM/C. Rather, today's best available evidence generally documents a significantly greater risk, but also no significant difference in risk for a few outcomes, among women with FGM/C relative to women with no FGM/C. It is questionable whether intensified research efforts would change these results. From a women's health standpoint, irrespective of the exact size of the greater risk from FGM/C, the increase in obstetric suffering and morbidity is too high to justify continuing the practice, and even the lowest increase in risk of complications to be avoided.

If further research on the association between FGM/C and obstetric outcomes are considered ethically and financially justified, such studies should be based on the best possible methodological study design, which for this question is case-control studies. Additional cross-sectional studies would possibly narrow the confidence intervals, but it is unlikely that the direction of the estimate of obstetric outcomes would change. Further, any future research should be based on a methodology that ensures representativeness and equivalency between exposed and unexposed groups of women, and that applies standardized definitions and clinical measures for exposure as well as outcomes.

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Appendix

Appendix 1: Glossary

The explanation for obstetric terms is taken from Danforth's Obstetrics and Gynecology (21). The explanation of methodological and statistical terms is copied from the glossary of the Cochrane handbook.

TERM	EXPLANATION
Anoxic	Absence of oxygen.
Case-control study	A study that compares people with a specific disease or outcome of interest (cases) to people from the same population without that disease or outcome (controls), and which seeks to find associations between the outcome and prior exposure to particular risk factors. This design is particularly useful where the outcome is rare and past exposure can be reliably measured. Case-control studies are usually retrospective, but not always.
Case report	A study reporting observations on a single individual. (Also called anecdote, case history, or case study).
Case series	A study reporting observations on a series of individuals, usually all receiving the same intervention, with no control group.
Cervix	The lower, narrow portion of the uterus where it joins with the top end of the vagina.
Cesarean section	A surgical procedure, during which the fetus is delivered through an incision in the lower abdomen and the uterine wall.
Chi^2	A statistic used to express heterogeneity. A small p-value is often used to indicate evidence of heterogeneity. As it applies to Cochrane reviews, the test is of somewhat limited value. This is because most meta-analyses in Cochrane reviews have

	very few studies in them. When there are few studies, the test is not very good at detecting heterogeneity if it is present (it has 'low power'). For this reason, a p-value of less than 0.10 is often used to indicate heterogeneity rather than the conventional cutpoint of p= 0.05.
CI	Confidence interval. A measure of the uncertainty around the main finding of a statistical analysis. Estimates of unknown quantities, such as the odds ratio comparing an experimental intervention with a control, are usually presented as a point estimate and a 95% confidence interval. This means that if someone were to keep repeating a study in other samples from the same population, 95% of the confidence intervals from those studies would contain the true value of the unknown quantity. Alternatives to 95%, such as 90% and 99% confidence intervals, are sometimes used. Wider intervals indicate lower precision; narrow intervals, greater precision.
Cohort study	An observational study in which a defined group of people (the cohort) is followed over time. The outcomes of people in subsets of this cohort are compared, to examine people who were exposed or not exposed (or exposed at different levels) to a particular intervention or other factor of interest. A prospective cohort study assembles participants and follows them into the future. A retrospective (or historical) cohort study identifies subjects from past records and follows them from the time of those records to the present. Because subjects are not allocated by the investigator to different interventions or other exposures, adjusted analysis is usually required to minimize the influence of other factors (confounders).
Cross-sectional study	A study measuring the distribution of some characteristic(s) in a population at a particular point in time.
Diaspora	Far from ancestral homelands.
Episiotomy	Surgical incision of the vulva (area behind the vagina, above the rectum). Used during delivery to avoid tearing or laceration of the vaginal opening and rectum.
Fascia	A layer of fibrous tissue.
Forceps	Vacuum device used to assist the delivery of a baby when the second stage of labor has not progressed adequately.
FGM/C	Female genital mutilation/cutting.
Forceps	Instrument used to help remove baby from the birth canal

	during delivery.
Fourchette	The band of membranes at the posterior angle of the vagina that connects the posterior ends of the labia minora.
Hypoxic	Inadequate oxygen supply.
I^2	A measure used to quantify heterogeneity. It describes the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance). A value greater than 50% may be considered to represent substantial heterogeneity.
Instrumental delivery	The use of special devices, forceps or vacuum, to facilitate vaginal delivery.
Intrapartum	During childbirth.
Introitus	Entrance to a cavity or space or canal, for example vaginal introitus.
Mature collagen	Hard or tough collagen (tissue).
Meta-analysis	The use of statistical techniques in a systematic review to integrate (pool) the results of included studies.
Mucosa	Moist tissue that lines certain parts of the inside of the body, for example the mouth and vagina.
Multiparous	Having experienced one or more parturitions (births).
Nulliparous/ primiparous	Having experienced zero parturitions (births).
Observational study	A study in which the investigators do not seek to intervene, and simply observe the course of events. Changes or differences in one characteristic (e.g. whether or not people received the intervention of interest) are studied in relation to changes or differences in other characteristic(s) (e.g. whether or not they died), without action by the investigator. There is a greater risk of selection bias than in experimental studies (Also called nonexperimental study).
Obstetrics	Branch of medicine that involves care of a woman during pregnancy, labor, childbirth and after the baby is born.
Obstetric/ perineal tear/laceration	A superficial tearing of the tissue in the vagina, perineum and/or anus that occurs during a vaginal delivery. Lacerations are classified as one of four types (degree 1-4), based on the severity.

OR	Odds ratio. The ratio of the odds of an event in one group to the odds of an event in another group. In studies of treatment effect, the odds in the treatment group are usually divided by the odds in the control group. An odds ratio of one indicates no difference between comparison groups. For undesirable outcomes an OR that is less than one indicates that the intervention was effective in reducing the risk of that outcome. When the risk is small, odds ratios are very similar to risk ratios.
Postpartum	The period immediately following childbirth.
Postpartum hemorrhage	Bleeding greater than 500ml at time of delivery.
Random effects model	In meta-analysis: A statistical model in which both within-study sampling error (variance) and between studies variation are included in the assessment of the uncertainty (confidence interval) of the results of a meta-analysis. When there is heterogeneity among the results of the included studies beyond chance, random-effects models will give wider confidence intervals than fixed-effect models.
RR	Relative risk or Risk ratio. The ratio of risks in two groups. In intervention studies, it is the ratio of the risk in the intervention group to the risk in the control group. A risk ratio of one indicates no difference between comparison groups. For undesirable outcomes, a risk ratio that is less than one indicates that the intervention was effective in reducing the risk of that outcome.
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
Vacuum extractor	Device used to provide traction on fetal head during delivery.
Ventouse	Vacuum device used to assist the delivery of a baby when the second stage of labor has not progressed adequately.

Appendix 2: Search for literature

African Index Medicus

Database: African Index Medicus
Date: 22.12.2011
Number of records: 14
Search:

"CIRCUMCISION" [Descriptor] or "CIRCUMCISION, FEMALE" [Descriptor] or "INFIBULATION" [Descriptor]

British Nursing Index and Archive

Database: Ovid British Nursing Index and Archive 1985 to January 2012
Date: 20.01.2012
Number of records: 177
Search:
1. Circumcision/
2. ((female$ or wom#n or girl$1) adj3 (mutilation$ or circumcis$ or cutting$)).tw.
3. "fgm/c".tw.
4. ((removal$ or alteration$ or excision$) adj6 female genital$).tw.
5. pharaonic circumcision$.tw.
6. sunna.tw.
7. (clitoridectom$ or clitorectom$).tw.
8. (infibulat$ or reinfibulat$ or deinfibulat$).tw.
9. or/1-8

CINAHL

Database: EBSCO Host CINAHL 1981-Present
Date: 16.01.2012
Number of records: 443
Search:

#	Query	Limiters/Expanders	Last Run Via	Results	
S7	S1 or S2 or S3 or S4 or S5 or S6	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	534	Edit S7
S6	TI (sunna or clitoridectom* or clitorectom* or infibulat* reinfibulat* or deinfibulat*) OR AB (sunna or clitoridectom* or clitorectom* or infibulat* reinfibulat* or deinfibulat*)	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	4	Edit S6
S5	TI pharaonic W0 circumcision* OR AB pharaonic W0 circumcision*	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	2	Edit S5
S4	TI ((removal* or alteration* or excision*) N6 (female W0 genital*)) OR AB ((removal* or alteration* or excision*)	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	4	Edit S4

	N6 (female W0 genital*))				
S3	TI "fgm/c" OR AB "fgm/c"	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	1	Edit S3
S2	TI ((female* or wom#n or girl*) N3 (mutilation* or circumcis* or cutting*)) OR AB ((female* or wom#n or girl*) N3 (mutilation* or circumcis* or cutting*))	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	345	Edit S2
S1	(MH "Circumcision, Female")	Search modes - Boolean/Phrase	Interface - EBSCOhost Search Screen - Advanced Search Database - CINAHL	443	Edit S1

The Cochrane Library

Databases in The Cochrane Library:

- Cochrane Database of Systematic Reviews (CDSR): Issue 12 of 12, Dec 2011
- Cochrane Central Register of Controlled Trials (CENTRAL),
- Database of Abstracts of Reviews of Effects (DARE)
- Health Technology Assessment Database (HTA): Issue 4 of 4 Oct 2011

Date: 09.01.2012

Number of records: CDSR: 1; CENTRAL: 12; DARE: 0; HTA: 3

Search:

#1 MeSH descriptor Circumcision, Female, this term only

#2 ((female* or woman or women or girl or girls) near/3 (mutilation* or circumcis* or cutting*)) or "fgm/c" or ((removal* or alteration* or excision*) near/6 (female next genital*)) or (pharaonic next circumcision*) or sunna or clitoridectom* or clitorectom* or infibulat* or reinfibulat* or deinfibulat*:ti or ((female* or woman or women or girl or girls) near/3 (mutilation* or circumcis* or cutting*)) or "fgm/c" or ((removal* or alteration* or excision*) near/6 (female next genital*)) or (pharaonic next circumcision*) or sunna or clitoridectom* or clitorectom* or infibulat* or reinfibulat* or deinfibulat*:ab

#3 (#1 OR #2)

EMBASE

Database: Ovid Embase 1980 to 2012 Week 02

Date: 20.01.2012

Number of records: 1442

Search:
1. female circumcision/ or female genital mutilation/ or female genital cutting/ or infibulation/
2. ((female$ or wom#n or girl$1) adj3 (mutilation$ or circumcis$ or cutting$)).tw.
3. "fgm/c".tw.
4. ((removal$ or alteration$ or excision$) adj6 female genital$).tw.
5. pharaonic circumcision$.tw.
6. sunna.tw.
7. (clitoridectom$ or clitorectom$).tw.
8. (infibulat$ or reinfibulat$ or deinfibulat$).tw.
9. or/1-8

MEDLINE(R) In-Process & Other Non-Indexed Citations
Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present (1946 to January Week 2 2012; January 19, 2012)
Date: 20.01.2012
Number of records: 1299
Search:
1. Circumcision, Female/
2. ((female$ or wom#n or girl$1) adj3 (mutilation$ or circumcis$ or cutting$)).tw.
3. "fgm/c".tw.
4. ((removal$ or alteration$ or excision$) adj6 female genital$).tw.
5. pharaonic circumcision$.tw.
6. sunna.tw.
7. (clitoridectom$ or clitorectom$).tw.
8. (infibulat$ or reinfibulat$ or deinfibulat$).tw.
9. or/1-8

PILOTS
Database: CSA Illumina: PILOTS database (1871-Current)
Date: 02.03.2011
Number of records: 17
Search:
((DE=("genital mutilation")) or (TI=(((female* or woman or women or girl or girls) within 3 (mutilation* or circumcis* or cutting*)) or fgm or ((removal* or alteration* or excision*) within 6 female genital*) or pharaonic circumcision* or sunna or clitoridectom* or clitorectom* or infibulat* or reinfibulat* or deinfibulat*)) or (AB=(((female* or woman or women or girl or girls) within 3 (mutilation* or circumcis* or cutting*)) or fgm or ((removal* or alteration* or excision*) within 6 female genital*) or pharaonic circumcision* or sunna or clitoridectom* or clitorectom* or infibulat* or reinfibulat* or deinfibulat*)))

POPLINE

Database: POPLINE® (POPulation information onLINE)
Date: 03.03.2011
Number of records: 1331
Search:
KEYWORDS:
FEMALE GENITAL CUTTING

PsycINFO
Database: Ovid PsycINFO 1806 to January Week 3 2012
Date: 20.01.2012
Number of records: 574
Search:
1. Circumcision/
2. ((female$ or wom#n or girl$1) adj3 (mutilation$ or circumcis$ or cutting$)).tw.
3. "fgm/c".tw.
4. ((removal$ or alteration$ or excision$) adj6 female genital$).tw.
5. pharaonic circumcision$.tw.
6. sunna.tw.
7. (clitoridectom$ or clitorectom$).tw.
8. (infibulat$ or reinfibulat$ or deinfibulat$).tw.
9. or/1-8

Social Services Abstracts
Database: ProQuest: Social Services Abstracts (1979-Current)
Date: 25.01.2012
Number of records: 94
Search:
su.EXACT("Genital Mutilation" OR "Circumcision") OR ti((female* NEAR/3 (mutilation* OR circumcis* OR cutting*))) OR ab((female* NEAR/3 (mutilation* OR circumcis* OR cutting*)))

Sociological Abstracts
Database: ProQuest: Sociological Abstracts (1952-Current)
Date: 25.01.2012
Number of records: 436
Search:
su.EXACT("Genital Mutilation" OR "Circumcision") OR ti((female* NEAR/3 (mutilation* OR circumcis* OR cutting*))) OR ab((female* NEAR/3 (mutilation* OR circumcis* OR cutting*)))

WHOLIS

Database: WHO Library & Information Networks for Knowledge Database (WHOLIS)
Date: 03.03.2011
Number of records: 72
Search:
words or phrase "((female$ or wom?n or girl or girls) near3 (mutilation$ or circumcis$ or cutting$))"
OR
words or phrase ""fgm/c""
OR
words or phrase "((removal$ or alteration$ or excision$) near6 (female adj genital$))"
OR
words or phrase "(pharaonic adj circumcision$)"
OR
words or phrase "sunna"
OR
words or phrase "(clitoridectom$ or clitorectom$)"
OR
words or phrase "(infibulat$ or reinfibulat$ or deinfibulat$)"

Appendix 3: Excluded studies

Table 1.1: Excluded studies read in full text and reason for exclusion

Study first author (ref no.)	Cause for exclusion of study
NN 1994 (97)	Not empirical study
NN 2007 (98)	Not empirical study
NN 1996 (99)	Not empirical study
NN 1997 (100)	Not empirical study
Abariga 2009 (101)	No physical consequences/complications following FGM/C reported
Abubakar 2004 (102)	No physical consequences/complications following FGM/C reported
Abu-Shamma 1949 (103)	Not empirical study
Adanu 2005 (104)	Population not girls/women subjected to FGM/C
Adelusi 1975 (105)	No physical consequences/complications following FGM/C reported
Adeneye 2006 (106)	No physical consequences/complications following FGM/C reported
Adeokun 2006 (107)	No physical consequences/complications following FGM/C reported
Adeyinka 2009 (108)	No physical consequences/complications following FGM/C reported
Adinma 1999 (109)	No physical consequences/complications following FGM/C reported
Afifi 2007 (110)	No physical consequences/complications following FGM/C reported

Study first author (ref no.)	Cause for exclusion of study
Ahmed 2000 (111)	Not empirical study
Ahmed 2005 (112)	Not empirical study
Ahnaimugan 1978 (113)	No physical consequences/complications following FGM/C reported
Al-Krenawi 1999 (114)	No physical consequences/complications following FGM/C reported
Al-Krenawi 1999 (115)	No physical consequences/complications following FGM/C reported
Allag 2001 (116)	No physical consequences/complications following FGM/C reported
Ahmed Allam 1999 (117)	Population not girls/women subjected to FGM/C
Allam 2001 (118)	Population not girls/women subjected to FGM/C
Almroth-Berggren 2001 (119)	No physical consequences/complications following FGM/C reported
Amusan 2006 (120)	No physical consequences/complications following FGM/C reported
Anderson 1929 (121)	No extractable physical consequences following FGM/C reported
Applebaum 2008 (122)	No physical consequences/complications following FGM/C reported
Archibong 1987 (123)	No physical consequences/complications following FGM/C reported
Arthur 1942 (124)	Not empirical study
Asali 1995 (125)	No physical consequences/complications following FGM/C reported (qual)
Azadeh 1997 (126)	Not empirical study
Baasher 1982 (127)	Not empirical study
Badri 1992 (128)	Not empirical study
Badri 1984 (129)	Not empirical study (review)
Baido 2004 (130)	No physical consequences/complications following FGM/C reported
Baido 2007 (131)	No physical consequences/complications following FGM/C reported
Baker 1993 (132)	No physical consequences/complications following FGM/C reported
Bakr 1985 (133)	Not empirical study
Balogun 2001 (134)	Not empirical study
Barber 2010 (135)	Not empirical study
Beck 2008 (136)	Not empirical study
Behrendt 2005 (137)	No physical consequences/complications following FGM/C reported
Belmaker 2011 (138)	No physical consequences/complications following FGM/C reported
Bender 1999 (139)	Not empirical study
Bikoo 2008 (140)	Not empirical study
Boddy 1982 (141)	No physical consequences/complications following FGM/C reported (qual)
Bonilla 1997 (142)	Not empirical study
Brady 1999 (143)	Not empirical study
Briggs 2002 (144)	No physical consequences/complications following FGM/C reported
Brotmacher 1955 (145)	Not empirical study
Burkina Faso DHS 1999 (146)	No physical consequences/complications following FGM/C reported

Study first author (ref no.)	Cause for exclusion of study
Caldwell 1983 (147)	No physical consequences/complications following FGM/C reported
Campbell 1995 (148)	No physical consequences/complications following FGM/C reported (qual)
Cameron DHS 2004 (149)	No physical consequences/complications following FGM/C reported
Cannon 1964 (150)	No physical consequences/complications following FGM/C reported
Capraro 1972 (151)	No physical consequences/complications following FGM/C reported
Carton 2008 (152)	Not empirical study
Certinkurşun 2009 (153)	No physical consequences/complications following FGM/C reported
Cohen 1992 (154)	Population not girls/women subjected to FGM/C
Coker 1998 (155)	No physical consequences/complications following FGM/C reported
Cook 1979 (156)	Not empirical study
Damas 1972 (157)	No physical consequences/complications following FGM/C reported
Dattijo 2010 (158)	No physical consequences/complications following FGM/C reported
Davis 1999 (159)	No physical consequences/complications following FGM/C reported
Daw 1970 (160)	No physical consequences/complications following FGM/C reported
Dekou 2002 (161)	Population not girls/women subjected to FGM/C
De Villeneuve 1937 (162)	Not empirical study
Dirie 1991 (163)	No physical consequences/complications following FGM/C reported
Ebomoyi 1987 (164)	No physical consequences/complications following FGM/C reported
Ebong 1997 (165)	No physical consequences/complications following FGM/C reported
Egypt DHS 2008 (166)	No physical consequences/complications following FGM/C reported
Egypt DHS 2005 (167)	No physical consequences/complications following FGM/C reported
Egypt DHS 2003 (168)	No physical consequences/complications following FGM/C reported
Egypt DHS 2000 (169)	No physical consequences/complications following FGM/C reported
Ehigiegba 1998 (170)	No physical consequences/complications following FGM/C reported
Eke 2006 (171)	Not empirical study
Ekwueme 2010 (172)	No physical consequences/complications following FGM/C reported
Elmusharaf 2009 (173)	No physical consequences/complications following FGM/C reported
Elmusharaf 2006 (94)	No physical consequences/complications following FGM/C reported
Elnashar 2007 (174)	No physical consequences/complications following FGM/C reported
Epelboin 1979 (175)	No physical consequences/complications following FGM/C reported (qual)
Ericksen 1995 (176)	No physical consequences/complications following FGM/C reported
Essen 2002 (177)	Consequences/complications following FGM/C not reported for women
Ethiopia DHS 2005 (178)	No physical consequences/complications following FGM/C reported
Ethiopia DHS 2000 (179)	No physical consequences/complications following FGM/C reported
Fahmy 2010 (180)	No physical consequences/complications following FGM/C reported
Feyi-Waboso 2006 (181)	No physical consequences/complications following FGM/C reported

Study first author (ref no.)	Cause for exclusion of study
Fleischer 1975 (182)	No physical consequences/complications following FGM/C reported
Gage 2006 (183)	No physical consequences/complications following FGM/C reported
Gallo 1985 (184)	No physical consequences/complications following FGM/C reported
Gallo 1985 (185)	No physical consequences/complications following FGM/C reported
Ghana DHS 2003 (186)	No physical consequences/complications following FGM/C reported
Gillian 1929 (187)	Not empirical study
Gilson 1995 (188)	Not empirical study
Githiora 2011 (189)	No physical consequences/complications following FGM/C reported
Gordon 2007 (190)	Not empirical study
Grisaru 1997 (191)	No physical consequences/complications following FGM/C reported
Gruenbaum 2006 (192)	No physical consequences/complications following FGM/C reported
Gurunluoglu 1999 (193)	Population not girls/women subjected to FGM/C
Hanselmann 2011 (194)	No physical consequences/complications following FGM/C reported
Harris 1951 (195)	No physical consequences/complications following FGM/C reported
Harrison 1983 (196)	Not empirical study
Hassan 1995 (197)	Not empirical study
Hassanin 2008 (198)	No physical consequences/complications following FGM/C reported
Henrion 2007 (199)	Not empirical study
Herieka 2003 (200)	No physical consequences/complications following FGM/C reported
Hezekiah 1989 (201)	Not empirical study
Hosken 1978 (202)	Not empirical study
Hosken 1993 (203)	Not empirical study (review)
Hrdy 1987 (204)	Not empirical study
Huber 1966 (205)	Not empirical study
Hulverscheidt 2009 (206)	Not empirical study
Igwegbe 2000 (207)	No physical consequences/complications following FGM/C reported
Isa 1999 (208)	No physical consequences/complications following FGM/C reported
Ismail 2009 (209)	No physical consequences/complications following FGM/C reported
Ivory Coast DHS 1999 (210)	No physical consequences/complications following FGM/C reported
Jackson 2003 (211)	No physical consequences/complications following FGM/C reported
Jaffer 2006 (212)	No physical consequences/complications following FGM/C reported
Jirovsky 2010 (213)	No physical consequences/complications following FGM/C reported
Johansen 2002 (214)	No physical consequences/complications following FGM/C reported (qual)
Junaid 1981 (215)	Population not girls/women subjected to FGM/C
Kangoum 2004 (216)	No physical consequences/complications following FGM/C reported
Karmaker 2011 (217)	No physical consequences/complications following FGM/C reported

Study first author (ref no.)	Cause for exclusion of study
Kassegne 2010 (218)	No physical consequences/complications following FGM/C reported
Kästner 2005 (219)	Not empirical study
Keita 2001 (220)	No physical consequences/complications following FGM/C reported
Kenya DHS 2009 (221)	No physical consequences/complications following FGM/C reported
Kenya DHS 2003 (222)	No physical consequences/complications following FGM/C reported
Kenya DHS 1998 (223)	No physical consequences/complications following FGM/C reported
Khadivzadeh 2009 (224)	No physical consequences/complications following FGM/C reported
Khan 1997 (225)	No physical consequences/complications following FGM/C reported
Khanam 1977 (226)	Population not girls/women subjected to FGM/C
Khisa 2011 (227)	No physical consequences/complications following FGM/C reported
Kingston 1957 (228)	Not empirical study
Kiragu 1995 (229)	Not empirical study
Kun 1997 (230)	Not empirical study
Lagarde 2003 (231)	No physical consequences/complications following FGM/C reported
Lax 2000 (232)	Not empirical study
Levin 1980 (233)	Not empirical study
Liberia DHS 2007 (234)	No physical consequences/complications following FGM/C reported
Lightfoot-Klein 1983 (235)	No physical consequences/complications following FGM/C reported
Lightfoot-Klein 1989 (236)	No physical consequences/complications following FGM/C reported
Lightfoot-Klein 1989 (237)	No physical consequences/complications following FGM/C reported
Lightfoot-Klein 1993 (238)	Not empirical study
Lister 1960 (239)	No physical consequences/complications following FGM/C reported
Longo 1964 (240)	Not empirical study
Lowenstein 1978 (241)	No physical consequences/complications following FGM/C reported
Lundberg 2008 (242)	No physical consequences/complications following FGM/C reported
Mahran 1981 (243)	Not empirical study
Mali DHS 1996 (244)	No physical consequences/complications following FGM/C reported
Marin 1980 (245)	Not empirical study
Marinho 2009 (246)	Population not girls/women subjected to FGM/C
Masho 2009 (247)	No physical consequences/complications following FGM/C reported
Mboto 2010 (248)	No physical consequences/complications following FGM/C reported
McLintock 1985 (249)	Population not girls/women subjected to FGM/C
Melhado 2006 (250)	Not empirical study
Menage 2006 (251)	Not empirical study
Meniru 1994 (252)	Not empirical study
Missailidis 2000 (253)	No physical consequences/complications following FGM/C reported (qual)

Study first author (ref no.)	Cause for exclusion of study
Mitike 2009 (254)	No physical consequences/complications following FGM/C reported
Mohamud 1991 (255)	Consequences/complications following FGM/C not reported for women
Momoh 2004 (256)	No physical consequences/complications following FGM/C reported
Momoh 2010 (257)	Not empirical study
Momoh 2011 (258)	Not empirical study
Monjok 2007 (259)	Not empirical study
Morgan 2006 (260)	Not empirical study
Morison 2003 (261)	Not empirical study
Morris 1996 (262)	No physical consequences/complications following FGM/C reported
Morris 1999 (263)	Not empirical study
Mseddi 2007 (264)	No physical consequences/complications following FGM/C reported
Mustafa 1972 (265)	No physical consequences/complications following FGM/C reported
Ncayiyana 2003 (266)	Not empirical study
Ng 2000 (267)	Not empirical study
Niger DHS 2006 (268)	No physical consequences/complications following FGM/C reported
Niger DHS 1998 (269)	No physical consequences/complications following FGM/C reported
Nigeria DHS 2008 (270)	No physical consequences/complications following FGM/C reported
Nigeria DHS 2003 (271)	No physical consequences/complications following FGM/C reported
Nigeria DHS 1999 (272)	No physical consequences/complications following FGM/C reported
Nkrumah 1999 (273)	Not empirical study
Nnodum 2002 (274)	Only sexual and psychological consequences following FGM/C reported
No 2004 (275)	Not empirical study
Nour 2004 (276)	Not empirical study
Nour 2006 (277)	Reports on effect of defibulation
Nour 2008 (278)	Not empirical study
Ntiri 1993 (279)	No physical consequences/complications following FGM/C reported
Obermeyer 1999 (280)	Not empirical study (review paper)
Obermeyer 1999 (281)	Not empirical study (review paper)
Obermeyer 2005 (282)	Not empirical study (review paper)
Odimegwu 2001 (283)	No physical consequences/complications following FGM/C reported
Odimegwu 2000 (284)	No physical consequences/complications following FGM/C reported
Odu 2008 (285)	No physical consequences/complications following FGM/C reported
Odujinrin 1989 (286)	No physical consequences/complications following FGM/C reported
Ogunlola 2003 (287)	No physical consequences/complications following FGM/C reported
Olamijulo 1983 (288)	No physical consequences/complications following FGM/C reported
Onuigbo 1976 (289)	No physical consequences/complications following FGM/C reported

Study first author (ref no.)	Cause for exclusion of study
Osinowo 2003 (290)	No physical consequences/complications following FGM/C reported
Oyeledun 1997 (291)	No data for physical consequences following FGM/C reported
Paul 1993 (292)	No physical consequences/complications following FGM/C reported
Penna 2002 (293)	Reports on effect of defibulation with laser surgery
Peterman 2009 (294)	No data for physical consequences following FGM/C reported
Philp 1925 (295)	Not empirical study
Preston 1942 (296)	Population not girls/women subjected to FGM/C
Preston 1951 (297)	No physical consequences/complications following FGM/C reported
Preston 1954 (298)	Not empirical study
Rasheed 2011 (299)	No physical consequences/complications following FGM/C reported
Renaud 1968 (300)	Not empirical study
Reyners 2004 (301)	Not empirical study
Roberts 1944 (302)	Population seems not to be girls/women subjected to FGM/C
Roles 1966 (303)	Not empirical study
Ronge 2006 (304)	Not empirical study
Rouzi 2001 (305)	Reports on effect of defibulation
Satti 2006 (306)	No physical consequences/complications following FGM/C reported
Senegal DHS 2011 (307)	No physical consequences/complications following FGM/C reported
Sequeira 1931(308)	Not empirical study
Shah 2009 (309)	Not empirical study
Shay 2010 (310)	No physical consequences/complications following FGM/C reported
Sierra Leone DHS 2008 (311)	No physical consequences/complications following FGM/C reported
Silberstein 1977 (312)	Not empirical study (review)
Snow 2002 (96)	No physical consequences/complications following FGM/C reported
Stewart 2002 (313)	No physical consequences/complications following FGM/C reported
Suardi 2010 (314)	No physical consequences/complications following FGM/C reported
Sudan DHS 1990 (315)	No physical consequences/complications following FGM/C reported
Tanganelli 1989 (316)	Not empirical study
Tanzania DHS 2010 (317)	No physical consequences/complications following FGM/C reported
Tanzania DHS 2004 (318)	No physical consequences/complications following FGM/C reported
Tanzania DHS 1996 (319)	No physical consequences/complications following FGM/C reported
Tegman 1990 (320)	Not empirical study
Thabet 2003 (321)	Only sexual consequences/complications following FGM/C reported
Thabet 2009 (322)	No physical consequences/complications following FGM/C reported
Thomas 2010 (323)	No physical consequences/complications following FGM/C reported
Ugboma 2004 (324)	No physical consequences/complications following FGM/C reported

Study first author (ref no.)	Cause for exclusion of study
Utz-Billing 2008 (325)	Not empirical study
Vaizey 1955 (326)	Not empirical study
Van Roosmalen 2000 (327)	Not empirical study
Van Rossem 2009 (328)	No physical consequences/complications following FGM/C reported
Vangen 2006 (329)	Not empirical study
Verzin 1975 (330)	Not empirical study
Wagner 2000 (331)	Not empirical study
WHO 2000 (18)	Not empirical study (review)
Williams 1999 (332)	Not empirical study
Wilson 1955 (333)	No physical consequences/complications following FGM/C reported
Worsley 1938 (334)	Not empirical study
Yemen DHS 1992 (335)	No physical consequences/complications following FGM/C reported
Yoder 2004 (336)	Not empirical study
Yoong 2005 (337)	Population mix of girls/women subjected to FGM/C and not
Young 1949 (338)	Not empirical study
Yount 2004 (339)	Not empirical study

Appendix 4: Quality assessment

Description of assessment of study quality for all studies:

High quality (few limitations): All or almost all of the criteria from the checklist are met. If some of the criteria are not met, it must be unlikely that the study conclusions will change.

Moderate quality (some limitations): Some of the criteria are not met and/or the study does not adequately address the criteria. It is unlikely that the study conclusions will change.

Low quality (serious limitations): Few or no criteria are met and/or the study does not adequately address the criteria. It is likely that the study conclusions will change.

Quality assessment of comparative studies

Quality assessment questions for comparative studies.
All questions are answered 'yes', 'unclear/somewhat', or 'no' (na= not applicable):

1. Was the population from which the sample was drawn clearly defined?
2. Was the sample representative of the population?
3. Is it explained whether (and how) the participants who agreed to participate are different from those who refused to participate?
4. Is the response rate adequate?
5. Were standardized data collection methods used?

6. Were measures shown to be reliable and valid?
7. Were the statistical methods appropriate?
8. Was the non-exposed group selected from the same population as the exposed group?
9. Were the groups comparable with respect to important background factors?
10. Were exposure and outcome measured in the same way and reliably in the two groups?
11. Was the person who assessed the outcome blind to whether participants were exposed or not.
12. Have known, potential confounders been considered in the study design and/or analyses?

Table 2.1: Results of quality assessment of comparative studies

Study	1	2	3	4	5	6	7	8	9	10	11	12	Assessment
Adinma 1997	yes	unclear	no	yes	unclear	no	unclear	yes	unclear	unclear	unclear	unclear	Low
Berardi 1985	unclear	unclear	no	unclear	yes	yes	yes	yes	unclear	yes	unclear	no	Low
Bohoussou 1986	unclear	unclear	no	unclear	yes	unclear	yes	yes	unclear	unclear	unclear	unclear	Low
Browning 2010	yes	unclear	na	na	yes	yes	yes	yes	yes	yes	unclear	yes	High
Chibber 2011	yes	yes	unclear	unclear	yes	unclear	yes	yes	unclear	unclear	unclear	unclear	Low
De Silva 1989	unclear	unclear	no	unclear	yes	unclear	yes	yes	unclear	unclear	unclear	unclear	Low
Diop 1998	unclear	unclear	no	unclear	yes	no	yes	yes	unclear	unclear	unclear	unclear	Low
Elnashar 2007	yes	yes	no	yes	unclear	no	unclear	yes	unclear	unclear	no	unclear	Low
Eritrea DHS 2002	yes	yes	no	yes	yes	no	yes	yes	unclear	unclear	no	unclear	Low
Eritrea DHS 1995	yes	yes	no	yes	yes	no	yes	yes	unclear	unclear	no	unclear	Low
Essén 2005	yes	unclear	na	na	yes	yes	yes	no	unclear	yes	unclear	yes	Moderate
Hakim 2001	yes	unclear	no	unclear	unclear	unclear	no	yes	unclear	unclear	unclear	no	Low
Johnson 2005	yes	yes	na	na	yes	yes	yes	no	no	no	unclear	yes	Low
Jones 1999 a	yes	unclear	no	unclear	yes	no	yes	yes	unclear	unclear	unclear	yes	Low
Jones1999 b	yes	unclear	na	yes	yes	no	yes	yes	unclear	unclear	unclear	yes	Moderate
Larsen 2002	yes	unclear	no	yes	yes	no	yes	yes	no	unclear	unclear	yes	Low
Lupo 1999	no	unclear	no	na	unclear	unclear	yes	no	no	unclear	unclear	unclear	Low
Mill.-Traore 2007	yes	unclear	no	unclear	yes	unclear	yes	yes	unclear	unclear	unclear	unclear	Low
Ndiaye 2010	yes	unclear	no	yes	yes	unclear	yes	yes	unclear	unclear	yes	no	Low
Oduro 2006	yes	yes	na	na	yes	yes	yes	yes	no	yes	unclear	unclear	High
Orji 2006	yes	unclear	no	unclear	yes	no	yes	yes	no	unclear	unclear	no	Low

Slanger 2002	yes	unclear	no	yes	yes	no	yes	yes	yes	unclear	unclear	yes	Moderate
Small 2008	unclear	unclear	na	na	unclear	no	yes	no	no	no	unclear	yes	Low
Vangen 2002	yes	yes	na	na	yes	yes	yes	no	no	no	unclear	yes	Low
WHO sg. 2006	yes	unclear	no	yes	yes	yes	yes	yes	unclear	yes	unclear	yes	High
Wuest 2009	yes	unclear	na	na	yes	yes	yes	unclear	no	yes	unclear	no	Low
Yount 2007	yes	yes	no	yes	yes	no	yes	yes	no	unclear	unclear	yes	Moderate
Yount 2006	yes	yes	no	unclear	unclear	no	yes	yes	unclear	unclear	no	yes	Low

Legend: Jones 1999 a = Study in Burkina Faso; Jones 1999b = Study in Mali; na= not applicable.

Quality assessment of cross-sectional descriptive studies (one group)

Quality assessment questions for cross-sectional studies.
All questions are answered 'yes', 'unclear/somewhat', or 'no' (na= not applicable):

1. Was the population from which the sample was drawn clearly defined?
2. Was the sample representative of the population?
3. Is it explained whether (and how) the participants who agreed to participate are different from those who refused to participate?
4. Is the response rate adequate?
5. Were standardized data collection methods used?
6. Were measures shown to be reliable and valid?
7. Were the statistical methods appropriate?

Table 3.1: Results of quality assessment of cross-sectional descriptive studies

Study	1	2	3	4	5	6	7	Assessment
Abor 2006	yes	no	no	yes	yes	no	yes	Low
Al-Hussaini 2003	yes	unclear	unclear	no	yes	yes	yes	Moderate
Bayoudh 1995	no	no	no	unclear	yes	no	yes	Low
CAR DHS 1995	yes	yes	no	yes	yes	unclear	yes	High
Chalmers 2000	yes	unclear	no	unclear	yes	no	yes	Low
Litorp 2008	yes	unclear	no	yes	yes	no	yes	Low
McCaffrey 1995	yes	unclear	na	na	unclear	unclear	unclear	Low

Quality assessment of case series

Quality assessment questions for case series.
All questions are answered 'yes', 'unclear/somewhat', or 'no' (na= not applicable):

1. Was the study based on a series of individuals from a suitable group of patients?
2. Were measures taken to ensure that the sample was not too selective?
3. Were the inclusion criteria for the sample clearly defined?
4. Is the response rate adequate?
5. Were all included patients at the same stage of disease progression?
6. Was the follow-up adequate (type/extent/time) to account for outcomes?
7. Were objective criteria used to assess the outcome?
8. If case series are compared, were the series adequately described and was the distribution of prognostic factors described?
9. Was registration of data prospective?

Table 4.1: Results of quality assessment of case series

Study	1	2	3	4	5	6	7	8	9	Assessment
Akotionga 2001	yes	yes	unclear	na	unclear	yes	yes	na	yes	High
Awuah 2008	yes	unclear	no	unclear	unclear	na	no	na	no	Low
Bonessio 2001	unclear	unclear	no	unclear	yes	na	yes	na	unclear	Low
Dörflinger 2000	yes	unclear	no	unclear	no	yes	yes	na	unclear	Low
Osifo 2009	yes	unclear	yes	unclear	no	yes	yes	na	yes	High

Appendix 5: Outcome tables

The following tables present results from the non-comparative studies. The tables are organized according to outcomes, in line with the results chapter.

Prolonged labor

Table 5.1: Study outcomes for non-comparative studies that reported on prolonged labor

Author	Study design	Outcome	Result
Awuah 2008	Case series	Prolonged 1st stage labour Prolonged 2nd stage labour	26/70 (37.0%) 6/70 (9.0%)
Bohoussou 1986	Cross-sectional+	Prolonged delivery	88/1097 (8.0%)
Bonessio 2001	Case series	Prolonged labor	1/4 (25.0%)
Dörflinger 2000	Case series	Prolonged stage 1 Prolonged stage 2	2/29 (6.9%) 7/29 (24.1%)

Legend: Cross-sectional+ = comparative cross-sectional study.

Table 6.1: Included studies that reported on prolonged labor and their description of prolonged labor

Author	Study design	Outcome	Description
Awuah 2008	Case series	Prolonged 1st stage labour Prolonged 2nd stage labour	24-72 hrs
Bohoussou 1986	Cross-sectional	Prolonged delivery	
Bonessio 2001	Case series	Prolonged labor	
Browning 2010	Cross-sectional+	Days in labor	Continous
Chibber 2011	Cross-sectional+	Prolonged labor	Not defined
De Silva 1989	Cross-sectional+	Prolonged stage 1 Prolonged stage 2	>12 hours >60 min for multiparous and >90 minutes for primiparous women
Dörflinger 2000	Case series	Prolonged stage 1 Prolonged stage 2	>7 hrs >1 hr
Essén 2005	Cross-sectional+	Prolonged stage 2 Prolonged labor	>60 min “second stage of labour was defined as the period from complete cervical dilatation to delivery. Prolongation of labour was defined as a second stage of labour exceeding 60 min.” (p) Continous
Hakim 2001	Cross-sectional+	Duration of labor stage 1 Duration of labor stage 2 Duration of labor stage 3	Continous Continous Continous
Larsen 2002a	Cross-sectional+	Prolonged labor	>24 hrs/2 days (self reported based on the interviewer question: did you have “strong and

			regular labor pains that lasted longer than 24 h/ 2 days") (p)
Millogo-Traore 2007	Cross-sectional+	Prolonged labor	>8 hours for multiparous and >12 hours for primiparous women
Vangen 2002	Cross-sectional+	Prolonged 2nd stage of labor	The time from the baby's head reaching the pelvic floor until the birth exceeded two hours (p318)
Wuest 2009	Cross-sectional+	Duration of 1st stage of labor Duration of 2nd stage of labor	Continous Continous

Legend: Cross-sectional+ = comparative cross-sectional study.

Obstetric tears

Table 7.1: Study outcomes for non-comparative studies that reported on obstetric tears/lacerations

Author	Study design	Outcome	Result
Al-Hussaini 2003	Cross-sectional	Vaginal/perineal tears	4/254 (1.6%)
Awuah 2008	Case series	Massive vaginal tears Damage to rectal wall	16/70 (23.0%) 9/70 (13.0%)
Dörflinger 2000	Case series	Tear degree IV	2/29 (6.9%)
McCaffrey 1995	Cross-sectional	Perineal laceration or episiotomy	13/13 (100%)
McSwiney 1992	Case report	Perineal and vaginal tears	Led to rapid hemorrhage (>6 l blood loss)
Osifo 2009	Case series	Perineal tear during delivery	2/51 (3.9%) led to uncontrolled bleeding

Table 8.1: Included studies that reported on obstetric tears and their description of obstetric tears

Author	Study design	Outcome	Description
Al-Hussaini 2003	Cross-sectional	Vaginal/perineal tears	
Awuah 2008	Case series	Massive vaginal tears Damage to rectal wall	
Berardi 1985	Cross-sectional+	Perineal injury	Not specified
Bohoussou 1986	Cross-sectional+	Perineal tears	Not specified
De Silva 1989	Cross-sectional+	2nd tear Urethral tear	Second degree tear of the perineum Tear of the urethra
Diop 1998	Cross-sectional+	Tears	Tearing of the perineum
Dörflinger 2000	Case series	Tear degree IV	
Elnashar 2007	Cross-sectional+	Tears (1st baby)	Perineal tear
Hakim 2001	Cross-sectional+	Lacerations/tear	Perineal laceration with 1st degree tear, 2nd degree tear, 3rd degree tear
Johnson 2005	Cross-sectional+	1st-4th degree tears	Perineal lacerations (none, 1º/2º, 3º/4º/cervical/vaginal

Larsen 2002a	Cross-sectional+	Tear (1st pregnancy, 2nd pregnancy, all pregnancies)	Self reported based on the interviewer question: did you have “a large tear that needed stitching” (p 258)
Lupo 1999	Cross-sectional+	Perineal laceration 3rd degree	”perineal laceration of 3rd degree of greater” (p19S)
McCaffrey 1995	Cross-sectional	Perineal laceration or episiotomy	
McSwiney 1992	Case report	Perineal and vaginal tears	Perineal and vaginal tears (led to rapid hemorrhage)
Millogo-Traore 2007	Cross-sectional+	Perineal tears	First degree tears (tearing of vulvar tissue), second degree tears (bulbocavernosus muscle tear and anterior part of the central fibrous tissue)
Ndiaye 2010	Cross-sectional+	Perineal tear	Not specified
Osifo 2009	Case series	Perineal tear during delivery	Perineal tear during delivery (led to uncontrolled bleeding)
Slanger 2002	Cross-sectional+	Perineal tear	A large tear (perineal tear)
Vangen 2002	Cross-sectional+	Perineal injury degree 2-4	“perineal injury was diagnosed by the obstetrician and comprised of perineum laceration, anal sphincter or vaginal wall degree 2-4” (p 318)
WHO study grop 2006	Cross-sectional+	Perineal tear	Not specified
Wuest 2009	Cross-sectional+	Any tear, 1st degree, 2nd degree, 3rd degree	”The severity of any perineal tear was classified at the time of delivery using the 9th International Classification of Disease. A first-degree vaginal tear was defined as damage to the superficial vaginal epithelium; a second-degree tear as involving the vaginal epithelium and deeper muscles, but excluding the anal sphincters. A third-degree perineal tear was defined as a partial or complete anal sphincter rupture without the involvement of the anal mucosa and a fourth-degree tear as a rupture of the anal sphincter and mucosa” (p 1205).

Legend: Cross-sectional+ = comparative cross-sectional study.

Cesarean section

Table 9.1: Study outcomes for non-comparative studies that reported on cesarean section

Author	Study design	Outcome	Result
Abor 2006	Cross-sectional	Cesarean section	4/24 (16.7%)
Al-Hussaini 2003	Cross-sectional	Cesarean section	52/306 (17.0%)
Bonessio 2001	Case series	Cesarean section	1/4 (25.0%)
Chalmers 2000	Cross-sectional	Cesarean section	218/432 (50.5%)
McCaffrey 1995	Cross-sectional	Cesarean section	6/23 (26.1%)

Episiotomy

Table 10.1: Study outcomes for non-comparative studies that reported on episiotomy

Author	Study design	Outcome	Result
Abor 2006	Cross-sectional	Episiotomy	7/24 (29.2%)
Al-Hussaini 2003	Cross-sectional	Mediolateral episiotomy	241/254 (94.9%)
Awuah 2008	Case series	Large episiotomies	10/70 (14.0%)
Bayoudh 1995	Cross-sectional	Double episiotomy	10/300 (3.3%)
Bohoussou 1986	Cross-sectional	Episiotomy	276/1097 (25.2%)

Table 11.1: Included studies that reported on episiotomy and their description of episiotomy

Author	Study design	Description
Abor 2006	Cross-sectional	Episiotomy
Adinma 1997	Cross-sectional+	Episiotomy 1st delivery Episiotomy all deliveries
Al-Hussaini 2003	Cross-sectional	Mediolateral episiotomy
Awuah 2008	Case series	Large episiotomies
Bayoudh 1995	Cross-sectional	Double episiotomy
Berardi 1985	Cross-sectional+	Episiotomy
Bohoussou 1986	Cross-sectional	Episiotomy
De Silva 1989	Cross-sectional+	Episiotomy
Diop 1998	Cross-sectional+	Episiotomy
Elnashar 2007	Cross-sectional+	Episiotomy (1st baby)
Hakim 2001	Cross-sectional+	Episiotomy
Larsen 2002a	Cross-sectional+	Episiotomy (1st pregnancy, 2nd pregnancy, all pregnancies)
Millogo-Traore 2007	Cross-sectional+	Episiotomy
Ndiaye 2010	Cross-sectional+	Episiotomy
Orji 2006	Cross-sectional+	Episiotomy
Slanger 2002	Cross-sectional+	Episiotomy
WHO study grop 2006	Cross-sectional+	Episiotomy
Wuest 2009	Cross-sectional+	Episiotomy

Legend: Cross-sectional+ = comparative cross-sectional study.

Instrumental delivery

Table 12.1: Study outcomes for non-comparative studies that reported on instrumental delivery

Author	Study design	Outcome	Result
Abor 2006	Cross-sectional	Vacuum extraction	2/24 (8.3%)
Chalmers 2000	Cross-sectional	Vacuum extraction Forceps	28/432 (6.5%) 13/432 (3.0%)
McCaffrey 1995	Cross-sectional	Instrumental delivery	3/23 (13.0%)

Obstetric hemorrhage

Table 13.1: Study outcomes for non-comparative studies that reported on obstetric hemorrhage

Author	Study design	Outcome	Result
Awuah 2008	Case series	Severe intrapartum haemorrhage	19/70 (27.1%)
Dörflinger 2000	Case series	Hemorrhage >500 ml	4/29 (13.8%)

Table 14.1: Included studies that reported on obstetric hemorrhage and their description of obstetric hemorrhage

Author	Study design	Outcome	Description
Awuah 2008	Case series	Severe intrapartum haemorrhage	
Chibber 2011	Cross-sectional+	Post-partum hemorrhage	Not specified
De Silva 1989	Cross-sectional+	Post-partum hemorrhage	≥500ml
Diop 1998	Cross-sectional+	Hemorrhage	Not specified
Dörflinger 2000	Case series	Hemorrhage	>500 ml
Hakim 2001	Cross-sectional+	Shock/bleeding	Not specified
Johnson 2005	Cross-sectional+	Post-partum hemorrhage	Postpartum hemorrhage (yes, no)
Ndiaye 2010	Cross-sectional+	Obstetric hemorrhage	Not specified
Slanger 2002	Cross-sectional+	Hemorrhage	Self-report question ”so much bleeding that they feared they would die” (p176)
Vangen 2002	Cross-sectional+	Post partum hemorrhage	≥500ml
WHO study group 2006	Cross-sectional+	Post-partum blood loss	≥500ml
Wuest 2009	Cross-sectional+	Maternal blood loss	Continous

Legend: Cross-sectional+ = comparative cross-sectional study.

Difficult delivery

Table 15.1: Study outcomes for non-comparative studies that reported on dystocia/difficult labor

Author	Study design	Outcome	Result
Akotionga 2001	Case series	Difficult delivery	5/40 (12.5%)
Pritchard 1969	Case report	Dystocia (difficult labor)	3 patients

Table 16.1: Studies that reported difficult delivery and their description of difficult delivery

Author	Study design	Outcome	Description
Akotionga 2001	Case series	Difficult delivery	
Chibber 2011	Cross-sectional+	Obstructed labor	Not specified
Diop 1998	Cross-sectional+	Difficult delivery	Not specified
Eritrea DHS 2002	Cross-sectional+	Problems during delivery (because of circumcision)	Self-report question "Women who had had at least one birth were also asked whether they had had any problem at the time of delivery." (p.214)
Eritrea DHS 1995	Cross-sectional+	Problems during delivery (because of circumcision)	Self-report question "all female respondents who had ever had sex were asked whether they had had any problems or complications due to circumcision during sexual intercourse or at the time of delivery" (p.168)
Jones 1999 a	Cross-sectional+	Difficulties with delivery	Not specified, except "all women included in the study who had ever given birth were asked whether they had experienced any difficulties during any of their deliveries, and if so, to describe the type of complication" (p 222)
Jones 1999 b	Cross-sectional+	Observable difficulties with delivery	Not specified, except "any difficulties in childbirth were noted on the data-collection form" (p 222)
Ndiaye 2010	Cross-sectional+	Obstructed labor/dystocia	Not specified
Pritchard 1969	Case report	Dystocia (difficult labor)	
Slanger 2002	Cross-sectional+	Obstructed labor	Not specified

Legend: Cross-sectional+ = comparative cross-sectional study.

Other obstetrical and antenatal complications

Table 17.1: Study outcomes for non-comparative studies that reported on other obstetrical and antenatal complications

Author	Study design	Outcome	Result
Awuah 2008	Case series	Fistulae	10/70 (14.0%)

Bonessio 2001	Case series	Infection	1/4 (25.0%)
CAR DHS 1995	Cross-sectional	Obstetric complications	7/677 (1.1%)
Litorp 2008	Cross-sectional	Obstetric difficulties	18/37 (48.6%)
McCaffrey 1995	Cross-sectional	Not normal vaginal delivery	1/17 (7.1%)
Philp 1927	Case report	Death (after childbirth after FGM/C)	1 patient
Preston 1937	Case report	Birth per rectum	1 patient

Appendix 6: GRADE Evidence profile tables

The following three GRADE Evidence profile tables (tables 18.1-20.1) present our assessment of the quality of the evidence, organized according to comparison.

Table 18.1: GRADE Evidence profile table for the comparison cut vs non-cut

Quality assessment							Summary of findings				
							No of patients		Effect		Quality
No of studies	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considera-tions	FGM/C	non-FGM/C	Relative (95% CI)	Absolute	
Prolonged labor											
5[1]	observational studies	serious[2]	serious[3]	no serious indi-rectness	no serious imprecision	none	471/6324 (7.5%)	33345/708755 (4.7%)	RR 1.69 (1.03 to 2.77)	3 more per 100 (from 0 more to 8 more)	⊕OOO VERY LOW
Obstetric tears											
14[4]	observational studies	serious[5]	serious[6]	no serious indi-rectness	no serious imprecision	none	1789/18572 (9.6%)	24703/720871 (3.4%)	RR 1.39 (1.07 to 1.82)	1 more per 100 (from 0 more to 3 more)	⊕OOO VERY LOW
Cesarean section											
15	observational studies	serious[7]	serious[8]	no serious indi-rectness	serious[9]	none	5123/41306 (12.4%)	439456/999999 (43.9%)	RR 1.18 (0.99 to 1.4)	8 more per 100 (from 0 fewer to 18 more)	⊕OOO VERY LOW
Episiotomy											
11[10]	observational studies	serious[11]	serious[12]	no serious indi-rectness	serious[13]	none	10911/23869 (45.7%)	3672/11598 (31.7%)	RR 1.19 (0.98 to 1.44)	6 more per 100 (from 1 fewer to 14 more)	⊕OOO VERY LOW
Instrumental delivery (cross-sectional studies)											
5	observational	serious[14]	no serious incon-	no serious indi-	no serious	none	94/2234 (4.2%)	240/6649 (3.6%)	RR 1.65 (1.29	2 more per 100 (from 1	⊕OOO

	studies		sistency	rectness	imprecision				to 2.12)	more to 4 more)	VERY LOW
Obstetric hemorrhage											
8[15]	observational studies	serious[16]	serious[17]	no serious indirectness	no serious imprecision	none	2043/26840 (7.6%)	31427/719827 (4.4%)	RR 2.04 (1.36 to 3.05)	5 more per 100 (from 2 more to 9 more)	⊕OOO VERY LOW
Difficult delivery (cross-sectional studies)											
3	observational studies	serious[18]	serious[19]	no serious indirectness	serious[20]	none	222/2673 (8.3%)	75/3588 (2.1%)	RR 3.35 (1.71 to 6.55)	5 more per 100 (from 1 more to 12 more)	⊕OOO VERY LOW
Fever											
3	observational studies	serious[21]	no serious inconsistency	no serious indirectness	serious[22]	none	42/1110 (3.8%)	4/536 (0.75%)	RR 1.61 (0.31 to 8.41)	0 more per 100 (from 1 fewer to 6 more)	⊕OOO VERY LOW
Induction of labor											
3	observational studies	serious	serious[23]	no serious indirectness	no serious imprecision	none	1803/9451 (19.1%)	382889/999999 (38.3%)	RR 1.17 (1.01 to 1.36)	7 more per 100 (from 0 more to 14 more)	⊕OOO VERY LOW
								0%		0 more per 100 (from 0 more to 0 more)	

[1] One additional study includes this outcome, but we have not received the data.

[2] 5 of 5 studies had low methodological study quality.

[3] Considerable heterogeneity indicated by I2 (I2=92%) showed inconsistency across studies.

[4] One additional study includes this outcome, but we have not received the data.

[5] 12 of 14 studies had low methodological study quality.

[6] Considerable heterogeneity indicated by I2 (I2=89%) showed inconsistency across studies.

[7] 11 of 15 studies had low methodological study quality.

[8] Considerable heterogeneity indicated by I2 (I2=97%) showed inconsistency across studies.

[9] CI is wide, crosses limitations of precision (CI=0.94, 1.51).

[10] One additional study includes this outcome, but we have not received the data.

[11] 8 of 11 studies had low methodological study quality.

[12] Considerable heterogeneity indicated by I2 (I2=96%) showed inconsistency across studies.

[13] CI is wide, crosses limitations of precision (CI=0.98, 1.44).

[14] 4 of 5 studies had low methodological study quality.

[15] One additional study includes this outcome, but we have not received the data.

[16] 6 of 8 studies had low methodological study quality.

[17] Considerable heterogeneity indicated by I2 (I2=92%) showed inconsistency across studies.

[18] 2 of 3 studies had low methodological study quality.

[19] Considerable heterogeneity indicated by I2 (I2=77%) showed inconsistency across studies.

[20] CI is wide (CI=1.71, 6.55) and number of events is less than 300.

[21] 2 of 3 studies had low methodological study quality.

[22] Total number of events is less than 300.

[23] Considerable heterogeneity indicated by I2 (I2=91%) showed inconsistency across studies.

Table 19.1: GRADE Evidence profile table for the comparison FGM/C type I vs II

Quality assessment							Summary of findings				
							No of patients		Effect		Quality
No of studies	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	FGM/C type I	FGM/C type II	Relative (95% CI)	Absolute	
Obstetric tears											
2	observational studies	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	457/6315 (7.2%)	616/5534 (11.1%) 0%	RR 0.70 (0.47 to 1.04)	3 fewer per 100 (from 6 fewer to 0 more) 0 fewer per 100 (from 0 fewer to 0 more)	⊕OOO VERY LOW
Cesarean section											
3	observational studies	serious[3]	no serious inconsistency	no serious indirectness	no serious imprecision	none	489/7466 (6.5%)	499/7929 (6.3%)	RR 1.07 (0.94 to 1.2)	0 more per 100 (from 0 fewer to 1 more)	⊕OOO VERY LOW
Episiotomy											
3	observational studies	serious[4]	serious[5]	no serious indirectness	very serious[6]	none	2005/7928 (25.3%)	2209/7125 (31%)	RR 0.92 (0.61 to 1.4)	2 fewer per 100 (from 12 fewer to 12 more)	⊕OOO VERY LOW

[1] 1 of 2 studies had low methodological study quality.

[2] CI is wide, crosses limitations of precision (CI=0.47, 1.04).

[3] 2 of 3 studies had low methodological study quality.

[4] 2 of 3 studies had low methodological study quality.

[5] Considerable heterogeneity indicated by I2 (I2=78%) showed inconsistency across studies.

[6] CI is wide, crosses limitations of precision (CI=0.61, 1.40).

Table 20.1: GRADE Evidence profile table for the comparison FGM/C type I-II vs III

Quality assessment							Summary of findings				
							No of patients		Effect		Quality
No of studies	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considera-tions	FGM/C type I-II	FGM/C type III	Relative (95% CI)	Absolute	
Problems during delivery											
2	observational studies	serious[1]	no serious incon-sistency	no serious indi-rectness	serious	none	189/2443 (7.7%)	947/3602 (26.3%)	RR 0.24 (0.21 to 0.28)	20 fewer per 100 (from 19 fewer to 21 fewer)	⊕OOO VERY LOW

[1] Number of events is less than 300.