Neonatal and child male circumcision: a global review

World Health Organization

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UNAIDS/10.07E – JC1672E (English original, April 2010)

WHO Library Cataloguing-in-Publication Data

Neonatal and child male circumcision: a global review.

«UNAIDS/10.07E».

1.Circumcision, Male - utilization. 2.Infant, Newborn. 3.Children. 4.HIV infections - prevention and control. I.UNAIDS.

ISBN 978 92 9 173855 7 (NLM classification: WC 503.6)

UNAIDS
20 avenue Appia
CH-1211 Geneva 27
Switzerland

T (+41) 22 791 36 66
F (+41) 22 791 48 35

distribution@unaids.org
www.unaids.org

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Infant from Nigeria following male circumcision

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CONTENTS

Acknowledgements

Helen Weiss led a team composed of Natasha Larke, Daniel Halperin and Inon Schenker in researching, drafting and finalising this report.

This report was commissioned and funded by the Bill and Melinda Gates Foundation. HW was funded by the UK Medical Research Council. We thank Amy Adelberger, Chris Eley, Catherine Hankins, Renee Ridzon, David Tomlinson for their detailed comments on the manuscript and Tim Farley, Kim Dickson and Richard Hayes for advice. We also thank Precious Lunga and Lon Rahn for layout and production of the report.

Photos used in this document are courtesy of David Tomlinson MD, Brown University (front page, Figures 2, 3, 4, 7), Helen Weiss PhD, LSHTM (Figures 6, 8, 9, 10), and Inon Schenker PhD MPH, The Jerusalem AIDS Project (Figure 11).

Tables

Figures

SECTION 1. Summary

1.1. Background

Male circumcision, which is practised for social, cultural and medical reasons, is one of the oldest and most common surgical procedures performed globally. It is estimated that one in three males worldwide are circumcised, with almost universal coverage in some settings. There is currently increased interest in male circumcision services, since three randomized controlled trials have confirmed that circumcision reduces the risk of acquiring HIV infection in males.

Several countries with a high prevalence of HIV are now expanding access to safe male circumcision. The immediate focus of circumcision for HIV prevention is on adolescents and adult men, but a longer-term HIV prevention strategy is likely to include the provision of neonatal and child circumcision. Information on paediatric male circumcision practices is therefore needed, not only to guide further expansion of male circumcision services for long-term HIV prevention, but also to ensure that the procedure is conducted as safely as possible where it is routinely undertaken for religious or cultural reasons.

1.2. Scope of the review

The aim of this report is to review global practices of male circumcision among neonates and children, including prevalence, age at circumcision, type and training of provider, common circumcision methods, frequency of complications and cost. Data were collected through a systematic review of the published literature.

1.3. Findings

Male circumcision is almost universal in much of the Middle East, North and West Africa and Central Asia and is common in other countries, including Australia, Bangladesh, Canada, Indonesia, Pakistan, the Philippines, the Republic of Korea, Turkey and the United States of America (USA). It is also prevalent among certain ethnic groups in central, eastern and southern Africa.

In some settings, such as North Africa, Pakistan, Indonesia, Israel and rural Turkey, the majority of providers are not medically trained. In contrast, circumcision is provided almost exclusively by medically trained personnel in Saudi Arabia and other Gulf States, and in Egypt, the Republic of Korea and the USA.

Circumcision tends to be practised shortly after birth in parts of West Africa, Israel, the Gulf States and the USA. In contrast, in North Africa, the Middle East and parts of Asia males are circumcised as young boys, and in some regions of east and southern Africa as adolescents or young adults.

The most common complications of circumcision are bleeding and wound infection. We identified 16 prospective studies documenting complications following neonatal and infant circumcision, in which the median frequency of any complication was 1.5% (range 0–16%). Most studies reported no severe adverse events, but two studies reported a frequency of 2%. Among studies of boys circumcised aged over one year by medical providers, the median frequency of any adverse event was 6% (range 2–14%); serious adverse events were rare (median frequency 0%,

range 0–3%). This is a similar proportion as among adult males in the three randomized controlled trials of circumcision for HIV prevention. Traditional circumcision is associated with greater risks, more severe complications and slower healing than medical circumcision. However, definitions of complications vary, as do methods of ascertainment, and prospective studies with standardized definitions and reporting methods of adverse events are needed.

Serious complications among neonates or young boys are rare when the procedure is carried out by experienced providers. Several studies stressed the need for comprehensive training of circumcision providers, as complications were more common when the procedure was undertaken by inexperienced or poorly trained providers, or by those with inadequate equipment or supplies.

Cost is often a factor influencing the choice of provider, and the costs of neonatal and young boy circumcision vary widely depending on the setting. There is relatively little data in the published literature on the cost of male circumcision. In general, circumcision provided by non-medically trained providers is cheaper than that provided by medical providers. Recent cost-effectiveness studies indicate that both neonatal and adult circumcision are relatively low cost and have multiple health benefits, including lower risks of urinary tract infections and of invasive penile cancer.

1.4. Conclusions

Circumcision occurs at a wide range of ages, and neonatal and child male circumcision is routinely practised in many countries for religious and cultural reasons. There are several advantages of circumcising males at a younger versus older age, including a lower risk of complications, faster healing and a lower cost. However, some parents may wish to wait for an older age for religious or cultural reasons, or have a preference to wait until the child can give consent for the procedure.

The procedure is undertaken by a range of providers, with the choice of provider depending on family or religious tradition, cost, availability and the perception of service quality. As an engrained religious and cultural practice, paediatric circumcision is likely to continue to be highly prevalent around the world, and is now being considered as a long-term HIV prevention strategy.

This review shows that circumcision complications are rare when conducted by trained and experienced providers with adequate supplies and in hygienic conditions. However, there is a clear need for comprehensive, ongoing training programmes for both medically trained and non-medically trained providers, which should cover all aspects of the procedure and after-care in order to avoid the current unnecessary morbidity associated with the procedure in many settings.

There is currently relatively little data comparing risks by different methods, types of provider or age at circumcision, and further prospective studies are needed. A number of new disposable devices for circumcision are available, and further work is needed to evaluate the potential for these to be used in different settings.

SECTION 2. Background

2.1. Introduction

Approximately one in three males worldwide are circumcised, with almost universal coverage in some settings.[1] However, the practices and procedures of male circumcision (hereafter called circumcision), and risks of complications, are not well documented.

Randomized controlled trials have shown that adult circumcision reduces the risk of acquiring HIV infection in heterosexual males by 50–60%,[2–4] and several African countries with a high prevalence of HIV are now expanding access to safe circumcision. The immediate focus of circumcision for HIV prevention is on adolescents and adult men, but a longer-term HIV prevention strategy is likely to include the provision of neonatal and child circumcision.

In this report, we review the current global practices of circumcision among neonates (age less than one month), infants (1 to 11 months) and children (age 1 to 12 years), including age at circumcision, type and training of provider, circumcision methods used, frequency and management of complications, cost and legislation.

In this section we provide a background to the review by summarizing the global prevalence and determinants of circumcision, the physiology of the foreskin and the common surgical methods for paediatric circumcision.

2.2. Determinants of male circumcision

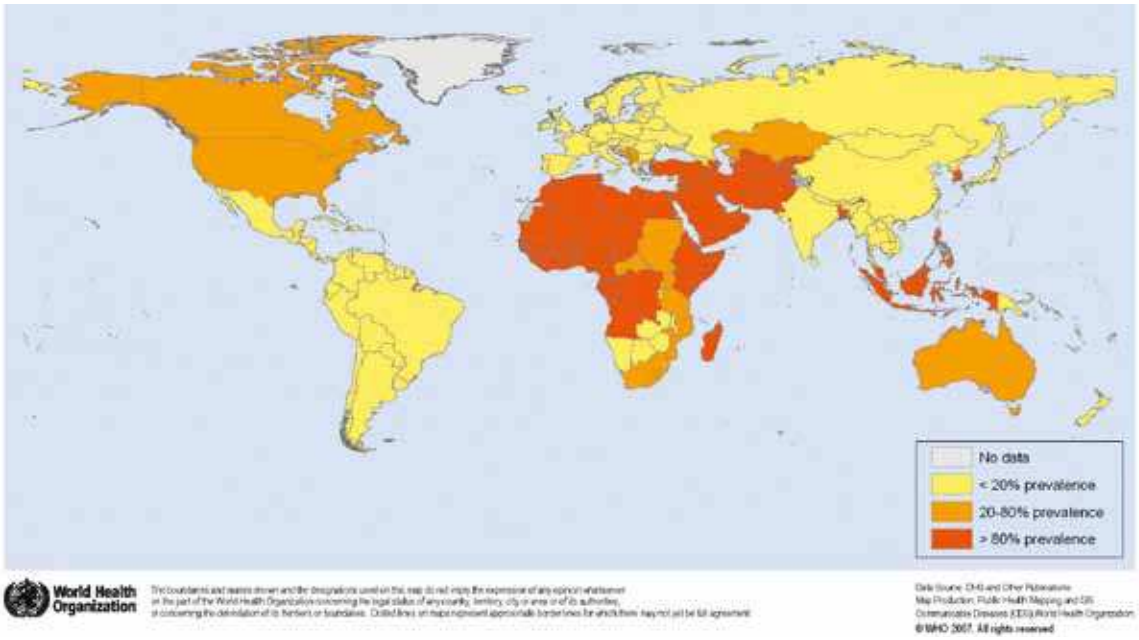
Male circumcision is one of the oldest surgical procedures known, traditionally undertaken as a mark of cultural identity or religious importance or for perceived health benefits such as improved penile hygiene or reduced risk of infection. Muslims are the largest religious group to practise circumcision, and an estimated 68% of circumcised men are Muslim.[1] Circumcision is known in Arabic as al-Tohour and is practised as a confirmation of the relationship with God; the practice is also known as 'tahera', meaning 'purification', but there is no specific mention of circumcision in the Koran. The Prophet Muhammad was ordered to follow the faith of Abraham (Koran 16:123), including the act of circumcision. In other writings circumcision is ordered as one of five behaviours that men should follow to attain a high degree of respectability and dignity. Circumcision is also almost universally practised among Jewish people. The religious justification for Jews comes from Genesis 17, which states that circumcision is a covenant with God and that all boys should be circumcised on the eighth day of life. Most other religions, including Christianity, Hinduism and Buddhism, tend to have a neutral stance towards circumcision.

Circumcision has been widely practised for non-religious reasons for many centuries in West Africa and in parts of central, east and southern Africa, as well as among aboriginal Australasians[5,6] and the Aztecs and Mayas in the Americas,[7–9] in the Philippines and eastern Indonesia[10] and on various Pacific islands, including Fiji[11] and the Polynesian islands.[12] More recently, circumcision has become common in other settings, including the USA and the Republic of Korea.[13,14] In some cultures, circumcision is an integral part of a rite of passage to manhood[15] and is associated with factors such as masculinity, self-identity and spirituality.[16] For example, circumcision in Turkey is seen as part of becoming a man and a member of society,[17] and it can be seen as unacceptable to remain uncircumcised.[18] In other settings, circumcision is most commonly carried out neonatally or in childhood, with the primary reason being perceived improved penile hygiene, or to fit with the social norm.[1]

2.3. Global prevalence of male circumcision

Estimated country-level prevalences of circumcision are shown in Figure 1. Due to the almost universal coverage of circumcision among Muslim and Jewish men, prevalence in the Middle East and North Africa is high, with published data from Egypt, the Islamic Republic of Iran, Morocco and Turkey suggesting that over 95% of males are circumcised in those countries.[18–26]

Figure 1. Global map of male circumcision prevalence at the country level, as of December 2006.



In West Africa, where circumcision is common among both non-Muslim and Muslim men, demographic and health surveys (DHS) show a very high prevalence overall (97% in Benin, 96% in Côte d'Ivoire, 95% in Ghana and 90% in Burkina Faso).[27] There are some variations within the region; for example, circumcision is less common in the Upper West region in Ghana (68%) and among the Lobi in south-west Burkina Faso (28%). Published sources indicate the prevalence of circumcision to be greater than 80% in most West African countries (Gambia, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, the Niger, Nigeria, Senegal, Sierra Leone and Togo[28–30]).

In other parts of sub-Saharan Africa, ethnicity is a major determinant of circumcision. Overall prevalence is low in Rwanda (9%), Burundi (<20%) and Uganda (25%), and higher in other countries (70% in the United Republic of Tanzania, 84% in Kenya, 92.5% in Ethiopia, 93% in Cameroon and greater than 80% in Chad, the Democratic Republic of the Congo, Djibouti, Eritrea and Somalia[27,28,31,32]). In contrast, circumcision is less common in southern African countries, with prevalence estimates of around 15% in Botswana and Swaziland, 10% in Zimbabwe, 17% in Zambia, 21% in Malawi and Namibia and 35% in South Africa; the prevalence estimates are higher in Mozambique (60%), Angola (>80%) and Madagascar (98%).[27,28,33,34]Circumcision is highly prevalent in Muslim Asian countries (Bangladesh, Malaysia, Indonesia, Pakistan) and also in the Republic of Korea and the Philippines.[10,28,35,36] It is uncommon in other parts of South-East Asia, including the Hong Kong Special Administrative Region,[37] Thailand,[38,39] Viet Nam, the Lao People's Democratic Republic, Cambodia, Myanmar, China, Japan and Taiwan, China.[10,40] Only 3% of Chinese boys attending a clinic in the Hong Kong Special Administrative Region

were circumcised.[37] These circumcisions were performed either for medical reasons, because the doctor recommended it as routine, for familial preference or for the perceived health benefits. The prevalence among a sample of 1145 Taiwanese boys aged 7 to 13 years was 8%.[41] A recent study of mothers of infant boys in Mysore, southern India, found that, as expected, prevalence was associated with religion, with 57% of Muslim boys circumcised compared with 2.5% of non-Muslim boys.[42] The relatively low prevalence of circumcision among the Muslim boys in this study is likely due to the young age of the boys at time of the interview (90% of the Muslim mothers reported that they would typically circumcise their sons at age greater than one year).

Neonatal circumcision became common in English-speaking industrialized countries in the mid-19th century, but is currently widely practised only in the USA, where currently between 60% and 90% of newborn males are circumcised, depending on the region.[43–51] Nationally representative studies have shown that the overall prevalence of circumcision among adult men is around 79% in the USA[50], 59% in Australia[52] and 16% in the United Kingdom.[53] There is little representative data from other European countries, except for Denmark (1.5%)[54] and Slovenia (4.5%),[55] with circumcised men in the latter survey being almost exclusively Muslim or of non-Slovenian origin.

2.4. Physiology of the foreskin in neonates and boys

Circumcision removes some, or all, of the foreskin from the penis (Figure 2). The foreskin is a continuation of skin from the shaft of the penis that covers the glans penis and the urethral meatus. There is debate about the role of the foreskin, with possible functions including keeping the glans moist[56] and protecting the developing penis in utero.[51]

The foreskin develops during the third month of intra-uterine development (about 65 mm stage), when a fold of skin develops at the base of the glans penis and beings to grow distally.[57] This free fold of skin will become the prepuce. The dorsal aspect grows more rapidly than the ventral, so that initially only the dorsum is covered. As the glanular urethra closes, so does the ventral prepuce, and the resultant fusion is marked by the frenulum. This process is completed by the fifth month,[57] and fusion then occurs between the inner epithelium of the prepuce and the epithelium of the glans penis, both of which are made of stratified squamous cells. The squamous cells arrange themselves in whorls as they keratinize and then degenerate so that clefts appear. These clefts increase in size and fuse with each other so that eventually the inner preputial epithelium and epithelium of the glans are separated from each other. This separation is usually incomplete at birth, and consequently, the foreskin is not usually retractable in newborn males. The phenomenon of incomplete separation is commonly referred to as 'adhesions', which need to be broken with a blunt probe during paediatric circumcision. By the age of three years, about 10% of males still have an unretractable foreskin, and by the age of 17, the foreskin is completely retractable in almost all males.[58]

2.5. Medical indications for circumcision

The most frequent medical reason for circumcision is phimosis (a stricture of the foreskin that narrows the opening and prevents it from being retracted to uncover the glans) or otherwise untreatable paraphimosis (in which the foreskin is trapped behind the corona and forms a tight band of constricting tissue, causing swelling of the glans and foreskin). Less common medical indications for circumcision are balanoposthitis (inflammation of the foreskin and glans) and

balanitis xerotica obliterans (a chronic sclerosis and atrophic process of the glans penis and foreskin—a risk factor for penile cancer). In addition, preputial neoplasms, excessive skin and tears in the frenulum are also rare medical indications for adult circumcision.[59,60] Contraindications for newborn circumcision include some haematological disorders, jaundice and any abnormality of the penis, including hypospadias and epispadias.[61]

2.6. Paediatric circumcision by medically trained providers

The goal of circumcision is to remove enough shaft skin and inner foreskin to uncover the glans.[62] As with any surgical procedure, there are risks associated with circumcision, and the principles common to all methods of circumcision to reduce risks are: asepsis; adequate but not excessive excision of the outer and inner foreskin; haemostasis (stopping bleeding); and cosmetic appearance.[61]

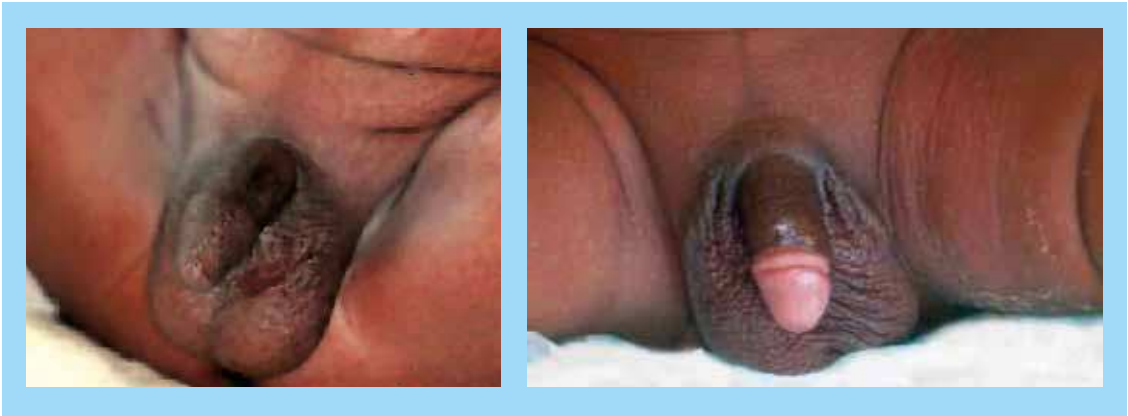


Figure 2: An uncircumcised infant penis (left) and the same penis two weeks after male circumcision (right).

2.6.1. Screening and consent for circumcision

The first procedure prior to circumcision is screening to ensure that the child is suitable for surgery. For neonates, this means that the baby should be a normal full-term delivery with no significant medical problems after birth. Guidelines for informed consent for the circumcision of minors have been published by UNAIDS.[63] The guiding principle is that all decisions must be based on the best interests of the child. For infants, informed consent must be obtained from parents, legal guardians or, in the absence of both, the primary caregiver. This person should be provided with clear and understandable information on the benefits and risks of circumcision in infancy compared with older ages, including when the child is mature enough to decide for himself. In the case of children who have some capacity to appreciate the risks and benefits associated with the procedure, the child's assent should also be sought, and they should be counselled about the risks and benefits in language that they can understand, describing how the procedure will be done, what type of anaesthetic will be used, what possible complications there may be and what type of postoperative care should be provided. After receiving the information about circumcision, parents should be given time to consider the issues before they are asked to sign a consent document.

2.6.2. Anaesthesia in paediatric circumcision

Local anaesthesia is recommended by the World Health Organization (WHO), and is easiest for neonates and infants who can be held still and for boys aged around four to five years upwards, who are able to remain still enough to cooperate with the procedure.[64] For young boys, however, use of local anaesthetic is more problematic, as they are unlikely to be able to remain still during the procedure. General anaesthesia can be used, but has greater associated risks, so it may be preferable to postpone the circumcision until the boy is older and able to cooperate under local anaesthesia. Most circumcisions performed by traditional circumcisers are carried out with no anaesthesia.

A systematic review of randomized controlled trials of pain relief for neonatal circumcision found that a dorsal penile nerve block (DPNB), which blocks the twin dorsal penile nerves and branches, is the most effective method of local anaesthesia[65] and has an excellent safety

Figure 3: Injection of local anaesthetic for a dorsal penile nerve block at the 10 o'clock position at the base of the penis.

record.[66] A second systematic review also showed that due to temporary leg weakness that may be experienced after caudal block, a penile block may be preferred.[67] Compared with a placebo, the topically applied eutectic mixture of analgesics (EMLA[1]) cream is also effective, but less so than the DPNB. Reviews have found that the administration of oral sucrose was superior to no analgesia in neonatal circumcision, but not as effective as DPNB.[68,69] Other methods, such as swaddling, dimmed lighting and repeated doses of oral acetaminophen, can also reduce behavioural distress in neonates.[68] A common practice in Muslim neonatal circumcision in Israel is to breastfeed the baby 30 minutes before the operation (Dr Jamal Garah, personal communication, 29 June 2008).

EMLA 5% cream (containing 2.5% lidocaine and 2.5% prilocaine) has been extensively used for Plastibell circumcision in children of all ages. However, it must be applied with care in neonates because of the potential risk of the development of methaemoglobinaemia with its use. Possible minor adverse events from EMLA cream include transient local skin reactions, such as blanching and redness.

[1] Eutectic mixture: separately, lidocaine and prilocaine are solid bases. When mixed together in equal quanitites by weight, however, they form a eutectic mixture—that is, the melting point of the mixture is lower than the melting points of the individual components. The lidocaine/prilocaine eutectic mixture is an oil with a melting point of 16°C, thus can be formulated into preparations without the use of a non-aqueous solvent. This allows higher concentrations of anaesthetic to be formulated into the preparation and maintained during application.

2.6.3. Surgical methods for paediatric circumcision

Details of commonly used methods for paediatric and adult circumcision are published in the WHO, UNAIDS and JHPIEGO *Manual on male circumcision under local anaesthesia*.[64] The main methods use a shield or device to protect the glans and to achieve haemostasis by crushing or clamping the foreskin (or by ligature for the Plastibell method).

The goals of any surgical circumcision device are shown in Box 1.

Box 1. Important functions of a circumcision device

- Protect glans
- Position foreskin for tissue removal
- Provide a guide for tissue removal
- Control the amount of tissue removed
- Minimal blood loss (haemostasis)
- Ease of training and easy to use
- Low adverse event rate
- Acceptable cosmetic result
- Low cost
- Sterile

In paediatric circumcision, the foreskin may be fused to the glans penis, especially in infancy, and it is then necessary to separate these prior to circumcision by gently stretching the opening of the foreskin with artery forceps. Once the foreskin has been dilated, the foreskin is slowly retracted and separated from the glans penis by gently running a blunt probe around the glans until the corona is exposed and the circumcision procedure can be carried out (Figure 4).

Figure 4: Foreskin being retracted to expose the glans.

Circumcision devices have a shield to protect the glans and may be disposable (e.g. the Plastibell) or reusable (e.g. the Mogen and Gomco clamps). A summary of the advantages and disadvantages of the most common methods is shown in Table 1.

The Plastibell is commonly used in many settings around the world, including by nurses or midwives without surgical training. With the Plastibell, bleeding is controlled by using a ligature which acts as a tourniquet, interrupting the blood supply to the foreskin causing it to separate over time. Wound healing is usually complete within a week. A disadvantage of the Plastibell is that the ring and ligature must stay in place for several days before the skin separates. During this time complications can occur related to the retained ring.

Some newer disposable devices are now available for use in both paediatric and adult circumcision (Table 2).

Table 1. Advantages and disadvantages of common methods of paediatric circumcision[64]

Method	Advantages	Disadvantages	Comments
Dorsal slit	Can be performed in any hospital or clinic equipped with standard surgical instruments	Requires more surgical skill than other methods	Can be undertaken by skilled surgeons who do not regularly perform circumcision
Plastibell	Simple technique Can be performed using EMLA cream anaesthesia	Requires a stock of different sizes of device Plastibell stays attached for 3–4 days until it drops off May require second clinic attendance to have the bell removed	Suitable for clinics dealing with large numbers of babies
Mogen clamp	Technique using one-piece instrument, which is simple to use; simple to teach Produces a crushed welded edge, which does not need suturing	Risk of partial amputation of glans if device is not applied carefully Risk of glans being buried by cross-adhesions	Although suturing is not usually needed, it may be on occasion, thus surgical skills must be available in clinics where these devices are used
Gomco clamp	Simple technique; can be performed with EMLA anaesthesia Produces a circular crushed welded edge that does not need suturing	Clinic needs to have a set of Gomco clamps with different bell sizes Multipart device, with risk that parts will be lost or damaged Parts not readily interchangeable between different clamp sets	Although suturing is not usually needed, it may be on occasion, thus surgical skills must be available in clinics where these devices are used
Metal shield	Simple technique using one-piece instrument (the shield that protects the glands), which is simple to use; simple to teach even to laypeople Can be performed anywhere and with any amount of (neonatal) foreskin	Risk of partial amputation of glans, if circumciser is not careful	Used by mohels and could be found in several formats: one-time use or multi-use with sterilization

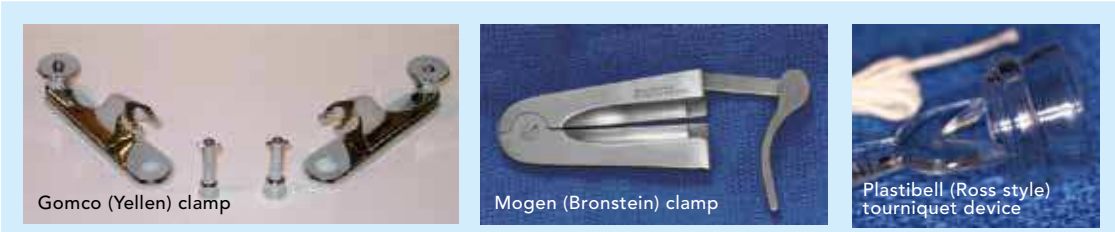


Figure 5: Three different male circumcision devices: Gomco and Mogen (non-disposable) and Plastibell (disposable).

With these new devices, the glans is protected by a shield, the clamp is applied and the foreskin removed with a scalpel. There is generally little bleeding and the device is left on the patient for several days (Figure 6). To our knowledge, there are published data on only two of these clamps—the Tara Klamp[70] and the Shenghuan device (also known as the Shang Ring).[71] Laser circumcision has been used in Singapore and has shown low morbidity rates.[72] In traditional (neonatal) Jewish circumcision, a metal shield is used to protect the glans when cutting off the foreskin and haemostasis is achieved through pressing bandages on the circumcised penis.

Table 2. Summary of new disposable male circumcision devices[73]

Device	Country of origin	Ages	Duration of clamp for haemostasis	Published reference	Web site
Accu-circ	USA	Infant	—		www.accucirc.com
Alisklamp	Turkey	Infant to adult	Several days		www.alisklamp.com
Ismail clamp	Malaysia	Infant to adult	5 to 10 days		www.ismailclamp.com
Kirve Klamp	Turkey	Infant to young adult	3 to 5 days		www.kirveklamp.com
Shenghuan Disposable Minimally Invasive Circumcision Anastomosis Device	China	Five years to adult	7 days	71	
SmartKlamp	Netherlands	Infant to adult	5 days		www.smartklamp.com
Sunathrone	Malaysia	Infant to adult	8 to 12 days		www.sunathrone.com
Tara Klamp	South Africa	Infant to adult	5 days	70	www.taraklampsa.co.za

Of the re-usable clamps, the Mogen clamp has the advantage of consisting of only one part, unlike the Gomco, which has four parts. Both devices crush the foreskin, and bleeding in neonatal or infant circumcision is rare as the clamp crushes the edge of the foreskin.

In infants, the foreskin is long in relation to the penis, and there is less chance of strong penile erection. This has two important consequences compared with adolescent or adult circumcision. First, the longer foreskin may make the procedure less complicated in neonates than in older boys. Second, clamping devices that remain on the penis for a few days are more feasible for children than adults, because there is less chance of the device being pushed off by an erection.[64]

Following circumcision by any of these methods, a piece of gauze impregnated with petroleum jelly should be applied to the wound after removal of the device (Figure 7). No additional dressing is usually required, and the child can be looked after in the normal way. In some settings it is common practice to require infants to remain in hospital until they have been observed passing urine, but this policy has been criticized as unnecessary.[74] Healing is usually complete after about one week.

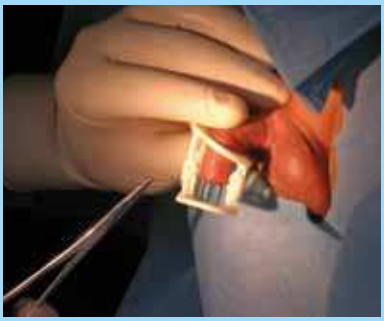


Figure 6: Ali's Klamp being used to circumcised a young boy.

Figure 7: Plain gauze impregnated with petroleum jelly (Vaseline).

2.7. Adolescent and adult circumcision

Adolescent and adult circumcision is more complex than in neonates or children. For example, the recent randomized controlled trials of adult circumcision for HIV prevention used the forceps guided and sleeve methods. Details are given in the WHO, UNAIDS and JHPIEGO *Manual on male circumcision under local anaesthesia*.[64] Adult circumcision requires suturing and dressing, and once bleeding has ceased the wound is dressed and the dressing is left in place for 24–48 hours. A follow-up visit is needed within a week to assess the progress of healing and to look for signs of infection.

2.8. Summary

Circumcision, a common surgical procedure in infants and young boys in many regions of the world, is conducted for religious, social or medical reasons. Local anaesthesia is recommended for paediatric circumcision, especially in neonates, infants and boys old enough to remain still during the procedure. There are several widely used methods of paediatric circumcision, and several new devices for circumcision are available. Comparative studies are needed to evaluate the relative cost, training needed, performance and complication risks of each device, as well as the potential for use in new settings if circumcision services are expanded.

SECTION 3. Methods of the review

3.1. Search strategies

Since expansion of circumcision for HIV prevention is recommended in regions with high rates of heterosexual transmission (in practice, much of southern Africa and parts of eastern Africa), we focused our searches on non-Western regions of the world. Searches were conducted on 6 November 2007 and were updated on 28 July 2009. Additional searches of the Arabic literature were conducted on 29 June, 18 July and 20 July 2008, with follow-up searches on 18 August and 22 August 2008. There was no language restriction.

We searched PubMed with the following search terms: "Circumcision, Male"[Mesh] AND "Infant, Newborn"[Mesh] AND ("Africa"[Mesh] OR "Asia"[Mesh]); "complications "[Subheading] OR "Intraoperative Complications"[Mesh] OR "Postoperative Complications"[Mesh]) AND "Circumcision, Male"[Mesh] AND ("Africa"[Mesh] OR "Asia"[Mesh]); ("Child"[Mesh] AND "Circumcision, Male"[Mesh]) AND ("Africa"[Mesh] OR "Asia"[Mesh]); ("Infant, Newborn"[Mesh] OR "Child"[Mesh]) AND ("Circumcision, Male"[Mesh] OR ("Circumcision, Male/adverse effects"[Mesh] OR "Circumcision, Male/complications"[Mesh] OR "Circumcision, Male/contraindications"[Mesh] OR "Circumcision, Male/mortality"[Mesh])); "Circumcision, Male "[Mesh] AND "Arabic".

In addition, we searched the reference lists of relevant papers, including the previous systematic review of complications of circumcision in Anglophone Africa,[75] and books on circumcision in 10 key academic centres on Middle Eastern studies in the USA, Australia and Israel.

We also searched African Healthline with the following search terms: (CIRCUMCISE OR CIRCUMCISING OR CIRCUMCISIO OR CIRCUMCISION OR CIRCUMCISION-ASSOCIATED OR CIRCUMCISION-INDICATION OR CIRCUMCISION-RELATED OR CIRCUMCISIONS) AND (NEONATAL OR PEDIATRIC OR PEDIATRIC OR PAEDIATRIC OR CHILD); and Medicus for WHO Eastern Mediterranean, IMEMR current contents, the Arabic Medical Library, Iran Medex and ALEF with the following search terms: (CIRCUMCISION OR CIRCUMCISING OR CIRCUMCISION-ASSOCIATED).

Further searches of the LILACS database and the School of Oriental and African Studies library produced 18 further papers and searches of Hebrew University libraries produced Master and PhD research theses focused on the circumcision of males.

A total of 1382 papers were identified through the non-Arabic literature searches. The abstracts of these papers were read and 364 were deemed potentially relevant. Full copies of these papers were obtained from the London School of Hygiene & Tropical Medicine (LSHTM), the British Library or other university libraries in the London area. The Arabic literature searches identified a total of 45 relevant books, monographs, theses and papers.

We also used information from the demographic and health surveys,[27] which collected information on circumcision status (Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Namibia, the Niger, Rwanda, Uganda, the United Republic of Tanzania and Zimbabwe), as appropriate.

We used limited information from the Internet. We used Google to search for the Arabic terms for 'circumcision' and 'male circumcision' and only included sites that contained information by named authors who deemed reliable (medical doctors or organizations dealing with family planning, reproductive health, etc.). After careful review of 521 sites, only 28 qualified for inclusion.

Finally, we used reports from two workshops on neonatal and child circumcision organized by WHO in Abuja (26 to 27 March 2008)[76] and Accra (23 April 2008).[77]

3.2. Data abstraction

Each paper was abstracted using an Access database form and information on each of the following areas was summarized:

- Prevalence of circumcision;
- Ages at which circumcision is performed;
- Types and training of circumcision providers;
- Circumcision methods used;
- Systems for recording and managing complications;
- Incidence of adverse events;
- Attitudes towards medical and traditional circumcision;
- Parent's attitudes;
- Related legislation.

3.3. Results of search

Of 364 published papers thought suitable for data extraction, 293 contained pertinent data and are included in the literature review. Of these, 60 were general review papers and 233 came from specific countries. Despite our focus on the literature from outside the USA, one third of these papers came from North America. The breakdown by region and country is as follows:

- Seventy-five (33%) were from North America (71 from the USA, four from Canada).
- Fifty-six (25%) were from the Middle East and North Africa (including 20 from Turkey and 13 from Israel).
- Forty (17%) were from sub-Saharan Africa (including 16 from Nigeria and nine from South Africa).
- Thirty-five (14%) were from Europe (including 13 from the UK and five from Denmark).
- Thirteen (5%) were from Asia (including four from the Republic of Korea, three from the Hong Kong Special Administrative Region and two from the Philippines).
- Eleven (5%) were from the Pacific region (including seven from Australia).
- Three (1%) were from the Caribbean and Latin America (from Jamaica, Mexico and Trinidad and Tobago).

Table 3 summarizes the type of information included in the papers identified in the literature search.

Table 3. Number of papers on different circumcision topics identified in the literature search

Topic	Number of papers
Prevalence of circumcision	42
Age at circumcision	77
Provider information	70
Method of circumcision	196
Method of recording complications	28
Complications (including case reports)	223
Attitudes of population	13
Attitudes of parents	21
Legislation	10
Cost	10

The most common type of data (n = 223) were on complications of circumcision—these were mostly case reports. Papers detailing methods of circumcision (n = 196), provider information (n = 70) and age at circumcision (n = 77) were also common. There were few papers on the cost of circumcision (n = 10) or legislation of the procedure (n = 10).

In addition, 45 books, monographs, theses and papers and 28 web sites were included from the Arabic literature search. The articles included studies in Egypt, India, the Islamic Republic of Iran, Israel, Saudi Arabia, Turkey, Oman and Pakistan.

3.4. Additional surveys

In addition to searches of the published literature, we conducted two surveys to gather further information on circumcision practices. The first (the 'LSHTM survey') comprised a detailed questionnaire sent to authors of the published literature and their contacts, participants at the WHO workshops on neonatal circumcision in Ghana and Nigeria and members of the Royal College of Obstetricians and Gynaecologists. Completed questionnaires were received from 124 individuals from 23 different countries. Full details of the survey are reported in the Appendix.

A further survey was conducted by colleagues at Bethlehem University among 20 nurses and 10 doctors in three Palestinian hospitals. Data were collected by nursing students through face-to-face semi-open interviews.

3.5. Key papers

Several papers were of particular relevance to our review because they were large studies documenting circumcision complications. For ease of reference, the designs of these key studies are briefly summarized below. The results are discussed in Sections 4–6.

3.5.1. Selected studies from the Middle East and Africa

al-Samarrai AY et al. (1988). A review of a Plastibell device in neonatal circumcision in 2,000 instances. Surgery, Gynecology & Obstetrics, 167(4):341–343.[62]

This prospective study followed 2000 male neonates in Riyadh, Saudi Arabia, circumcised with the Plastibell device on the second to third day of life. The infants were followed up at well baby and immunization clinics.

Amir M, Raja MH, Niaz WA (2000). Neonatal circumcision with Gomco clamp—a hospital-based retrospective study of 1000 cases. Journal of the Pakistan Medical Association, 50(7):224–227.[78]

This prospective study from Saudi Arabia documented complications in 1000 neonates circumcised with the Gomco clamp under local anaesthetic. The mean follow-up time was two years.

Atikeler MK et al. (2005). Complications of circumcision performed within and outside the hospital. International Urology and Nephrology, 37(1):97–99.79

This Turkish study compared complications among two groups of patients—407 boys circumcised by traditional unlicensed providers outside hospital and 782 boys circumcised by surgeons within hospital.

Bailey RC, Egesah O, Rosenberg S (2008). Male circumcision for HIV prevention: a prospective study of complications in clinical and traditional settings in Bungoma, Kenya. Bulletin of the World Health Organization, 86:669–677.80

This prospective study was carried out in Bungoma district in western Kenya, where male circumcision is almost universal. During the July to August 2004 circumcision season, 1007 males were interviewed 30 to 89 days post-circumcision. Twenty-four men were directly observed during and up to three months post-circumcision. Twenty-one traditional and 20 clinical practitioners were interviewed to assess their experience and training. Approximately 44% of the participants were circumcised traditionally, with the remainder circumcised in a clinical setting.

Ben Chaim J et al. (2005). Complications of circumcision in Israel: a one-year multicenter survey. The Israel Medical Association Journal, 7(6):368–370.81

This study followed 19 478 males born in four major tertiary care medical centres in Israel. All the children were circumcised in non-medical settings within the community. The patients were medically evaluated either urgently due to immediate complications or electively in outpatient clinics. Upon the initial assessment a detailed questionnaire was filled to obtain data regarding the procedure, the performer and the subsequent complications.

Magoha GA (1999). Circumcision in various Nigerian and Kenyan hospitals. East African Medical Journal, 76(10):583–586.82

This prospective study reports complications among 249 boys circumcised under local anaesthesia in Nigeria and Kenya. This paper also documents 50 patients with previous circumcisions who were referred for treatment of complications; 80% of these had been circumcised traditionally by medically untrained providers, under non-sterile conditions.

Mousavi SA, Salehifar E (2008). Circumcision complications associated with the Plastibell device and conventional dissection surgery: a trial of 586 infants of ages up to 12 months. Advances in Urology, 606123.

Complications were compared between 586 boys circumcised with the Plastibell device and conventional dissection surgery in a prospective study in the Islamic Republic of Iran conducted from 2002 to 2008.

Okeke LI, Asinobi AA, Ikuerowo OS (2006). Epidemiology of complications of male circumcision in Ibadan, Nigeria. BMC Urology, 6:21.29

The authors studied circumcision practices and complications among boys attending an infant welfare clinic for immunization. Of the 370 boys examined, 87% were circumcised, of whom 82% had been circumcised within the first month of life, mostly (80%) in hospital.

Ozdemir E (1997). Significantly increased complication risks with mass circumcisions. British Journal of Urology, 80:136–139.20

This paper describes a number of studies undertaken in Turkey to describe complications associated with mass and individual circumcision. One study documented complications among 700 boys circumcised as part of a mass circumcision ceremony at a hospital over a five-day period. A complimentary study was carried out among 600 boys circumcised individually in hospital, mainly for medical reasons.

Yegane RA et al. (2006). Late complications of circumcision in Iran. Pediatric Surgery International, 22(5):442–445.24

This rare study of complications in older boys rather than neonates or infants is a cross-sectional study of 3205 boys aged 6 to 12 in Lorestan Province, Islamic Republic of Iran, of whom 97.5% were circumcised. Of these, 71% had been circumcised after two years of age and 44% had been circumcised by traditional providers.

3.5.2. Selected studies from the United States of America

Christakis DA et al. (2000). A trade-off analysis of routine newborn circumcision. Pediatrics, 105 (1 Pt 3):246–249.83

A retrospective review of male infants born in Washington State from 1987 to 1996. Of the 354 297 male infants born during the study period, 130 475 (37%) were circumcised during their newborn stay.

Gee WF, Ansell JS (1976). Neonatal circumcision: a ten-year overview: with comparison of the Gomco clamp and the Plastibell device. Pediatrics, 58(6):824–827.43

This study reviewed records of 5882 boys born at the University of Washington hospital from 1963 to 1972. Of these, 5521 (94%) were circumcised before discharge from the newborn nursery.

Approximately half the circumcisions were performed with the Gomco clamp and half with the Plastibell device.

Metcalf TJ, Osborn LM, Mariani EM (1983). Circumcision. A study of current practices. Clinical Pediatrics, 22(8):575–579.84

This paper reports four surveys on neonatal circumcision practices and complications in Utah in the late 1970s. Of 15 905 males born in 16 Utah hospitals, 85% were circumcised, mainly for perceived hygiene benefits or because it was socially the norm. The majority of circumcisions were performed by obstetricians in a hospital.

Stang HJ, Snellman LW (1998). Circumcision practice patterns in the United States. Pediatrics, 101:e5.85

This postal survey was conducted in 1996 by randomly selecting physicians delivering or caring for infants. Of the 3500 physicians selected, 1778 (58%) completed and returned the survey. Just over half (54%) of respondents performed at least one circumcision a month, and 45% used anaesthesia (mainly DPNB).

Wiswell TE et al. (1993). Circumcision in children beyond the neonatal period. Pediatrics, 92(6):791–793.45

This study extends a previous one by reviewing post-neonatal circumcision frequency and complications in the first year of life for all 138 597 boys born in US Army facilities from 1985 to 1992. In addition, individual records were reviewed for 476 boys who were circumcised after the newborn period; 77% of boys were circumcised neonatally. Of the boys circumcised in the post-neonatal period, most were circumcised after their first birthday (mean age 2.9 years). The most common method was the sleeve or freehand resection, and 91% were performed under general anaesthesia.

3.6. Summary

This is the first systematic global review of published papers on neonatal and child circumcision practices and complications. We identified 293 relevant papers from 22 countries. Although we did not limit the language of publication, our search methods may have biased our search towards English, Hebrew and Arabic speaking countries.

The most common type of paper were case reports of complications following circumcision, but there were relatively few papers enabling a risk of circumcision complication to be calculated. The largest studies (of hundreds of thousands of circumcisions) come from the USA and Israel, but there are also several large prospective studies from developing countries, including Saudi Arabia, Nigeria and Kenya.

In the following sections we report the results of the review, including descriptions of circumcision methods, providers, complications, costs and legislation.

SECTION 4. Neonatal and infant circumcision

4.1. Introduction

Neonatal circumcision is routinely practised in most countries in the Middle East (including Egypt, the Islamic Republic of Iran, Jordan, Lebanon, the Syrian Arab Republic, Turkey and Yemen), the Gulf States, Israel, the USA and some West African countries, including Senegal, Ghana and parts of Nigeria.[29,30,50,86–88] The event is often, but not always, associated with ceremony. For example, many Nigerian boys are circumcised around the seventh day of life to coincide with the naming ceremony,[82,89–91] Jewish boys are typically circumcised in a religious ceremony on the eighth day after birth (the Bris),[78,81] and in the Comoros Islands infant circumcision occurs during festivities to commemorate the birthday of the prophet Mohammed.[92] In contrast, in Ghana and the USA, neonatal circumcision is typically not associated with ceremony.

4.2. Providers

Neonatal and infant circumcision does not normally require sutures and in many settings is undertaken by non-medically trained personnel. For example, in Israel circumcision is usually conducted by non-medical religious traditional circumcisers (mohel in Hebrew), who are trained and supervised by the Ministry of Religion and the Ministry of Health.[81] There is, however, an increasing tendency among the educated secular population to prefer a medical procedure performed by a physician using a local anaesthetic.[81] These medical circumcisions are often performed by obstetricians, neonatologists, paediatricians, general practitioners and general surgeons, with paediatric urologists generally serving as referral physicians in all cases of circumcision-related complications.

Traditional circumcision is also common in some countries in the Middle East, and account for 90–95% of procedures in Pakistan and 85% of procedures in Turkey.[19] In many Arab countries traditional circumcision is more common in rural areas where no health facility is nearby or among poorer communities. Traditional circumcisers are termed motaher in Arabic and are known as sunnatji in Turkey and dallak in the Islamic Republic of Iran.[26,93,94] Motahers are commonly barbers in Egypt[95], the Islamic Republic of Iran[93] and Pakistan[96] and run family businesses in which the circumcision skills are handed down through the generations.

In contrast, in the USA and the Gulf States neonatal circumcision is routinely undertaken by medically trained staff. For example, a US hospital-based study from 1983 found that 88% of circumcisions were performed by obstetricians.[84] A postal survey sent to 3500 obstetricians, family practitioners and paediatricians in the USA found that of the 1778 respondents, 54% performed at least one circumcision a month.[85] In the Gulf States, circumcision is also mainly provided in hospitals,[21,78,97,98] with the vast majority of providers being surgically qualified. Further, in Saudi Arabia, circumcision by non-qualified people is prohibited.[78,97] A survey of physicians at three hospitals by the Palestinian National Authority found that the vast majority of circumcisions were performed by trained medical personnel at a hospital or health clinic, usually at the age of two weeks old, and almost always before the age of 40 days old.

In the UK, the National Health Service provides circumcision if it is clinically indicated, but in general does not provide non-therapeutic circumcision. The demand for religious circumcision is mostly met by general practitioners and is paid for directly by parents. However, it was recently announced that religious circumcision of children will now be provided under the National Health Service in Scotland.[99] A not-for-profit, nurse-delivered service has been pioneered in the UK city of Bradford and has proved popular.[100]

Figure 8: Traditional circumcision provider (Wanzam) with basic kit provided following training by the Ghana Health Service in Greater Accra.

In many parts of West Africa, neonatal circumcision is routinely available both clinically (by nurses, midwives or physicians) and through traditional providers[101,102] and there is some evidence of changing patterns away from traditional circumcision. For example, in south-west Nigeria one study found that almost all adult males had been circumcised traditionally, but fewer (68%) chose a traditional provider for their sons.[30] The remainder preferred a nurse/midwife (25%) or physician (4%). A 2006 study noted that in Ibadan, Nigeria, 81% of circumcised infants had been circumcised in hospital, and the remainder at home.[29] The most common provider was a nurse (56%), followed by doctors (35%), and only 9% had been circumcised by a traditional provider. The choice of provider is likely to reflect familial or religious tradition, cost, perception of quality and word-of-mouth recommendation. For example, in northern Nigeria, the numbers of circumcisions performed at a teaching hospital decreased sharply in the 1980s, likely due to the introduction of hospital fees.[103] By 1999, the cost of medical circumcision was about 10 times that charged by the cheapest untrained practitioner for traditional circumcision without anaesthesia.

4.3. Methods used

4.3.1. Circumcision by medically trained providers

Figure 9: Infant male circumcision in Korle-Bu Teaching Hospital, Accra, Ghana.

The published literature suggests that the Gomco clamp and the Plastibell device are the most widely used devices. A review of 5521 neonatal circumcisions in the USA from 1963 to 1972 reported similar proportions using the Gomco clamp and the Plastibell (52% versus 48%),[43] but a more recent nationwide survey (1996) found that the Gomco clamp was preferred by 67% of physicians, with the Plastibell used by 19% and the Mogen clamp by 10%.[85] No reasons for preference are given in the paper. The Plastibell is commonly used in many Muslim countries, including

Oman[88,104] and Pakistan.[88,105] For example, a recent survey in Shifa International Hospital in Islamabad revealed that 72% of circumcisions were performed using the Plastibell.[106] In Saudi Arabia, the Plastibell and the Gomco clamp are both commonly used.[62,78] One study suggests that the Gomco clamp has never gained popularity in the Islamic world because of the financial cost and apprehension about using the device to both the circumciser and the patient.[107] The dorsal slit method under local anaesthesia was used in a series of 3824 circumcisions carried out during a planned campaign in the Comoros Islands by surgical teams.[92] The Plastibell is also reported to have been very popular in the Cape Peninsula in South Africa in the 1980s[108] and in a Nigerian study that reported 102 circumcisions using the Plastibell immediately postpartum, rather than on the eighth day, as is traditional.[109] The study found that this immediate postpartum circumcision was acceptable to parents and was practical and safe (no complications were seen among the 102 circumcisions carried out). In Israel, a physician performing a (Jewish) religious circumcision will follow the excision technique similar to that of the mohel, using a shield to protect the glands but adding DPNB for anaesthesia.[110] In the Palestinian Territories, physicians most commonly use the Mogen clamp, with bandages applied for homeostasis. Respondents of the LSHTM survey from the Syrian Arab Republic indicated that the dorsal slit and forceps guided methods are commonly used, with no anaesthetic in neonates and general anaesthetic in infants.

Although local anaesthesia is recommended by WHO for infant circumcision, it is not universally used, even for circumcision by medically trained providers. For example, a study in the United Republic of Tanzania documented the use of the Plastibell without anaesthesia for routine neonatal circumcision and stated that there was a preference not to use local anaesthesia on infants up to the age of two months, in order to avoid the additional cost and potential risks involved.[111] The authors report that many other hospitals throughout the United Republic of Tanzania use no anaesthesia, even in older children. One author argues that anaesthesia is not necessary when circumcision is performed in many Islamic countries because practitioners have a lot of experience and are able to perform the procedure quickly.[107]

In contrast, general anaesthesia is used in children older than one month in New York[44] and in the US Army.[45] The 1996 US postal survey found that only 45% of providers used anaesthesia (most commonly DPNB).[85] Recently trained paediatricians and family practitioners were most likely to use anaesthesia. The respondents who did not use anaesthesia cited concern over adverse drug effects and commented that the procedure does not warrant it.[85] These results suggest that continuing education of practitioners is needed to increase the use of anaesthesia in circumcision.

4.3.2. Circumcision by non-medically trained providers

Traditional neonatal and infant circumcision by non-medically trained providers typically occurs without the use of anaesthesia or sutures—manual pressure is used to stop bleeding. A variety of devices are used. For example, in Bendel State, southern Nigeria, locally made iron knives or glass fragments are sometimes used, and bleeding is stopped by pressure with a cloth, sometimes soaked in antiseptic solution, especially if the provider is a nurse or midwife.[30] After-care consists of daily application of native soap (made from plantain skin ash and palm oil), palm oil kerosene, petroleum jelly or engine oil. In Pakistan, barbers

commonly perform the procedure and instruments are frequently reused without adequate sterilization.[96] In Accra, there are good links between the traditional providers (wanzams) and the formal sector, and traditional providers are given training in basic hygiene and are supplied with disposable gloves and blades.[77] However, the procedure still occurs in non-aseptic conditions.

In Israel, the traditional procedure typically occurs in a celebration hall, a synagogue or the home of the newborn's parents. The mohel (Jewish traditional circumciser) will typically lay the newborn on the knees of a grandfather, who will hold the baby's legs spread open. Sweet wine sucked by the baby minutes before the procedure is used for calming the baby. The penis is disinfected, and using sterile (autoclaved) instruments the mohel will insert the foreskin into a metal shield protecting the glans.[81,110] A scalpel is run across the face of the shield, removing the foreskin. The remaining inner foreskin is subsequently pulled back away from the glans and excised with small scissors, and the wound is bandaged without the use of stitches. The frenulum is not excised in this method, and hence bleeding is minimized. Haemostasis is achieved by tightly wrapping the shaft of the penis with a strip of dry sterile gauze for several hours, usually overnight. The mohel is the only one who unwraps the dressing on his obligatory follow-up visit 24 hours after the circumcision.

Among orthodox Jews, the ancient practice of metitsah, during which the mohel orally suctions small drops of blood after the foreskin is cut, may still occur. This practice is rare, and following the arrival of the HIV pandemic has been replaced with a suction of the blood droplets through a glass tube, also to minimize the few reported transmission cases of herpes simplex virus (HSV) infection from a mohel to a newborn during circumcision.[112–115]

Although most circumcisions in the Palestinian Territories are performed by physicians, when they are performed by traditional motaher they are normally done at home, following methods developed within families using a simple blade and not always under aseptic conditions.

4.4. Knowledge of circumcision practices

The LSHTM survey was completed by 124 respondents, of whom the majority (88%) stated they had direct experience in circumcision practice, training or delivery. However, even among this group of professionals, there were inconsistencies between reported practices and those in the literature. Further, there was considerable variation in responses from practitioners from the same country, indicating that in many settings there may not be accurate knowledge of country-level circumcision practices. For example, the published literature indicates a high prevalence of neonatal circumcision in Ghana, yet 17 out of 57 respondents (30%) reported a country-level prevalence of 50% or less. Similarly, 3 out of 19 respondents from Nigeria reported that circumcision was not commonly performed in children (age 1 to 7 years) or pre-pubescents (age 8 to 11 years). Of those who thought that child circumcision was practised in Nigeria, the reported prevalence varied from less than 5% (two respondents) to over 95% (five respondents). Respondents also had differing perceptions regarding the proportion of procedures delivered in a medical setting and complication rates. Full details of the findings are given in the Appendix.

4.5. Summary

Neonatal and infant circumcision is a relatively simple procedure compared with the circumcision of older children or adults. The type of provider varies by setting, being mainly medically or surgically qualified in the USA and the Gulf States, but not so in other settings, such as West Africa, where nurses, midwives, or traditional providers commonly carry out the procedure. The traditional providers provide a popular service, being cheaper and more accessible than hospitals, but hygiene training may be minimal. In Accra, good links have been established between the Public Health Service and traditional circumcisers in order to provide regular training in safe infant circumcision. Similar models should be explored in other settings

Use of anaesthesia also varies widely, with general anaesthesia common in infant circumcision in the USA and no anaesthesia used in many other settings, especially for traditional circumcision. Local anaesthesia for neonatal and infant circumcision is recommended by WHO, and there is a need to improve the training of circumcision providers in order to increase the use of anaesthesia for neonatal and infant circumcision.

SECTION 5. Child circumcision

5.1. Introduction

In this section we describe patterns of male child circumcision (aged 1 to 11 years) in different settings, including the typical age at circumcision, the types of provider and the methods used.

5.2. Age at circumcision

The typical age at circumcision varies widely by region (Table 4). Boys in many Muslim countries are circumcised after one year of age.[24] For example, in Turkey circumcision normally occurs between the ages of 3 and 13 years old,[18,116,117] in Morocco at ages five to seven years,[25,118] and among the Bedouin tribes of the Negev between the ages of 2 and 12 years old.[119] In the Islamic Republic of Iran, the age at circumcision varies from a few days after birth to 13 years.[24] In Iranian cities the operation tends to be carried out in the hospital where the boy is born two or three days after birth, but in villages and rural areas there is a greater variation in the time of the operation.[93] Similarly, in Pakistan circumcision can take place in hospital in the neonatal period,[106,120] but if boys are not circumcised before hospital discharge the typical age is age three to seven years, or age five to seven years in rural areas.[97]

Circumcision in Asian countries typically occurs at a slightly older age. For example, in Malaysia the median age of circumcision is around 10 years (range 7 to 12 years),[70] and 10 to 15 years in the Republic of Korea,[121–123] with few boys being circumcised neonatally despite the fact that circumcision was introduced to the country through the influence of the USA, where neonatal circumcision is the norm.[123] In the Philippines, where about 80–90% of men are circumcised,[28,35] the majority of boys undergo the procedure between the ages of five to nine years (42%) or 10 to 14 years (52%), with the remainder being circumcised at 15 to 18 years old.[35,124] The Maluku group in eastern Indonesia also commonly practise circumcision, although there is a wide range in age at circumcision: most are circumcised between 5 and 18 years old, but circumcision among Christians in this region is normally performed in neonates.[10]Child circumcision is also common in West Africa. For example, a hospital-based study in Zaria, Nigeria, found that the age at circumcision is around four years old[103] and depends on religion, being typically older for Muslim boys (age four to seven years) than Christians (more likely to be infants).[103] Circumcision among the Etsako and Esan ethnic groups in Nigeria tends to occur either before three months or between 6 and 10 years.[30] Data from the LSHTM survey indicate that circumcision in the Central African Republic and the Sudan is most common in childhood (age one to four years and five to seven years, respectively; see the Appendix). There is a trend towards a younger age at circumcision in West Africa, sometimes because parents want the circumcision to occur before primary school, so that children do not miss lessons.[77] For example, the Bariba ethnic group in north Benin used to circumcise boys in groups at ages 9 to 11 years, but more recently circumcise as infants in private family ceremonies,[125] and the age at circumcision among Muslim boys in northern Nigeria was previously reported as six to seven years, but more recently as three to four years.[76] Similarly, the Mandinga, Wolof and Sérer ethnic groups in Senegal are now circumcised at age 6 to 13 years, whereas previously this was done as adults. In the larger cities of Senegal, circumcision is now more commonly practised in private family ceremonies and in medical centres rather than at community circumcision ceremonies, but the traditional system is still strong in rural areas.[16]

Table 4. Typical age at circumcision by country and adult male circumcision prevalence

	Adult male circumcision prevalence		
Most common age	Low (<20%)	Medium (20–80%)	High (>80%)
Neonatal/infant (<1 year)	Jamaica, New Zealand, UK	Australia, Canada	Ghana, Israel, Kuwait, Nigeria (Christian), Oman, Qatar, Saudi Arabia, United Arab Emirates, USA
Child (1 to 11 years)	Netherlands, Norway, Sweden, Zambia	Namibia, Malaysia, Republic of Korea	Benin, Burkina Faso, Comoros Islands, Côte d'Ivoire, Indonesia, Islamic Republic of Iran, Morocco, Niger, Nigeria (Muslim), Pakistan, Philippines, Senegal, Gambia, Turkey
Adolescent (12 to 20 years)	Swaziland	South Africa, United Republic of Tanzania, Uganda	Kenya, Vanuatu

In eastern, central and southern Africa, the age at circumcision is strongly influenced by cultural and religious practices. For example, in Kenya, where circumcision is highly prevalent in most ethnic groups, except among the Luo (circumcision prevalence 17%), Turkana (40%) and Maasai (77%),[27] the age at circumcision is typically younger (2 to 12 years) in coastal regions and older (14 to 20 years) in the Rift Valley and Nyanza provinces and southern regions.[126] A study in Lagos, Nigeria, and Nairobi found that of 249 consecutive patients presenting at hospital for circumcision or for complications following circumcision, 62% were aged 13 to 24 years, with the remainder being mainly neonates.[82] In the United Republic of Tanzania circumcision prevalence also varies with ethnicity, and most commonly occurs in adolescence, although a younger age at circumcision (2 to 15 years) is reported in the Eastern Province and around Tanga.[111,126] The Sukuma tribe in the north-west of the country is traditionally non-circumcising, although about 20% are currently circumcised, which typically occurs in the late teens or early twenties.[127] In Uganda, where circumcision is most common in the eastern region (prevalence 55%) and is rare (<10%) in the north and south-west,[27] age at circumcision is typically during early adolescence.[126] For example, in rural Rakai, south-west Uganda, 80% of circumcised boys had been circumcised at age 12 or younger.[128]

In southern Africa, child circumcision tends to be less common, and when it occurs the procedure is typically carried out in adolescence or early adulthood as an initiation to manhood. For example, in South Africa the Xhosa commonly practise circumcision—this is usually performed in adolescence or adulthood between the ages of 12 and 20 years as a rite of passage to adulthood.[129,130] However, a report from Zambia states that boys are generally circumcised slightly younger, at 7 to 10 years old,[131] and the 2006 demographic and health survey in Namibia found that 84% of those circumcised had the procedure at age 12 or younger.[27]

Circumcision in Europe is largely confined to Muslim and Jewish boys, or those with a medical indication for the procedure, such as phimosis. Muslim boys are typically circumcised

in childhood. For example, in Norway and Sweden approximately 59% of Muslim boys were reported circumcised younger than the age of 10, and 21% circumcised at age 10 or older.[132] Similarly, studies from Demark indicate that circumcision is commonly performed between four and six years old (range 0–14 years);[133–135] other European studies indicate that circumcision is performed at ages up to seven years in France,[136] one to six years in Poland[137] and three years among Muslim boys in the Netherlands.[138] One study in the Netherlands found that the age at circumcision was younger among Moroccan Muslims (two to three years old) than Turkish Muslims (four to nine years old).[138]

5.3. Providers

As with neonatal and infant circumcision, both medical and traditional providers perform child circumcision in many settings. The choice may depend on the culture, cost, location and socioeconomic status of the parents. In some settings, including Indonesia and rural areas of Turkey and Egypt, child circumcision is most commonly carried out by informal health-care providers who have no formal training and who learn by observation and experience.[10,20,22,97] For example, in Indonesia the procedure tends to be regarded as too simple for surgeons and urologists, and most providers are not medically trained or professionally qualified.[10] However, Muslim community groups in Indonesia can arrange for mass circumcisions for the children of poor families, and the practitioners then tend to be medical students, male nurses and young general practitioners.[10] Most medical practitioners interviewed in one study said they learned

Figure 10: Operation Abraham Collaborative trainers introducing the clamp method in Swaziland. (© *Inon Schenker)*

the technique through participation in a mass circumcision event. In the Sudan, circumcision is reportedly commonly performed by medical personnel in a health facility or in the home (Appendix), with respondents from our survey stating that local or general anaesthetic was commonly used for boys aged one to seven years and topical or local anaesthetic for boys aged 8 to 11 years. In the 2006 Namibian demographic and health survey, 70% of circumcised males reported having had the operation performed by a health professional.[27]

In the Republic of Korea and Malaysia, child circumcision is carried out exclusively by medically qualified providers.[36,70,123] A survey of 4225 parents in Busan, Republic of Korea, found that 86% thought urologists were the most suitable surgeons for circumcision, while the remainder chose a general surgeon, obstetrician/gynaecologist or paediatrician.[123] Similarly, in Malaysia most circumcisions are performed under local anaesthesia either in hospital by surgeons or outside hospitals by general practitioners,[70] and the government organizes group circumcisions by general practitioners in the capital city. In the Philippines, the dorsal slit procedure is carried out by medical professionals with specialized medical facilities, equipment and anaesthesia in clinics and in semi-private premises such as town and community halls during mass circumcision missions organized by medical mission teams or politicians.[35] However, the proportion of Filipino males circumcised traditionally versus medically is not known—one study of 114 circumcised males in urban and semi-rural settings found that about two thirds had been circumcised by non-medical providers.[124]

5.3.1. Factors determining the choice of provider

There is relatively little data on the reasons for choosing certain providers. The 2008 WHO workshop on male circumcision in Nigeria reported that, among Muslims in northern Nigeria, about 70% of parents prefer to take their sons to a traditional practitioner, because they trusted these providers and found them more accessible than hospitals.[76] There is some evidence that the proportion of circumcisions performed medically is increasing in some countries, especially among those of higher socioeconomic status. For example, among 3125 boys aged 6 to 12 years in the west of the Islamic Republic of Iran in 2002, parents with lower levels of education were much more likely to choose traditional providers (72% of illiterate parents chose traditional circumcision, compared with 18% of university graduates).[24] In Turkey, traditional circumcisions appear to be becoming less common in urban areas and those with higher levels of education, as more parents opt to have the children circumcised in hospitals by surgeons or as an outpatient procedure by general practitioners.[18,79,139] For example, a study in Ankara found that 13% of circumcised boys had been circumcised by a traditional provider and the rest by paediatric surgeons or urologists,[18] and only 5% of parents were intending to use a traditional provider for any future sons.[18] Similarly, a study in rural upper Egypt found that the proportion of men circumcised by an informal health-care provider increased with age from 60% of those aged under 30 to 91% of those aged over 30 years,[23] suggesting a change in practice over time. The proportion being circumcised medically is also reported to be increasing in the Philippines[35] and among the Babusu in western Kenya.[140]

5.4. Methods used

5.4.1. Circumcision by medically trained providers

As outlined in Section 2.6.3, the most common methods for paediatric circumcision are the dorsal slit, Gomco clamp, Mogen clamp and Plastibell.[64] If the child is old enough to keep still, local anaesthesia is recommended.[64] However, as with neonatal and infant circumcision, anaesthesia practices vary for child circumcision. For example in Java, Sumatra and eastern Indonesia, no anaesthesia is used.[10] In contrast, general anaesthesia was reported in 91% of circumcisions of boys older than one year born in US army facilities in 1985–1992,[45] and is also used for children aged over one year in Saudi Arabia.[78] The most common method used in the US study was the sleeve (freehand) technique, which involves making two circular incisions on the foreskin and removing the strip of foreskin between them. This can be virtually bloodless, but requires a higher degree of surgical skill than the other methods.[64] The LSHTM survey also revealed marked variations in the use of anaesthesia between countries (Appendix) and suggested that in many cases circumcision is performed in older children without anaesthesia. For example, 23 out of 55 respondents from Ghana stated that circumcision may be performed in children aged 8 to 11 years old without anaesthetic.

The sleeve technique has been reported for child circumcision in Turkey[20] and Jordan,[141] where it is used to revise circumcisions in patients with redundant penile skin or a concealed penis. The Turkish study compared the routine standardized clamp technique with the sleeve technique and found that the sleeve technique provided better cosmetic results, despite the disadvantage of taking longer to perform.[20] The sleeve technique was compared with a new disposable clamp, the SmartKlamp Circumcision Device,[139] in a non-randomized study in Turkey. This study compared 130 circumcisions with the SmartKlamp with 70 sleeve-technique circumcisions on boys with a mean age of 4.7 (two to nine years) and 3.9 (two to seven years), respectively. Using the SmartKlamp was faster than the sleeve technique, and postoperative pain and complication rates were fairly similar, although the numbers were small (overall complication rate 4%). The authors concluded that the advantages of the SmartKlamp were the speed and reliable haemostasis directly after the procedure. Disadvantages were that nocturnal pain was more frequent among boys circumcised with this device and that analgesics were required for longer. In the LSHTM survey, respondents from the Sudan indicated that the Mogen clamp was frequently used for child circumcision.

To date there is little published literature on the other new disposable methods (Table 2). Complications associated with child circumcision are detailed in Section 6.3.

5.4.2. Circumcision by non-medically trained providers

As with neonatal and infant circumcision, traditional circumcision among children often takes place in the community under non-aseptic conditions, with no use of sedation or sutures.[24,81] For example, a study from Zaria, Nigeria (mean age of circumcision four years old), notes that traditional providers in the area lacked even rudimentary knowledge of operative procedures.[103] In some cultures, boys cannot be considered to be men unless circumcised,[18] and the circumcision ceremony itself may mark the passage to manhood and occur during adolescence. A description of traditional circumcision among the Babukusu ethnic group in Kenya, who traditionally circumcise at ages 12 to 20 years, is given in Box 2.

Box 2. The Bukusu traditional model of circumcision[140]

Prior to the circumcision, initiates are traditionally secluded for up to six months. At one point during their sequestration, the young males are spiritually 'put to death and reborn' in a circumcision grove by the ritual circumcision chief. Only those already initiated or awaiting circumcision may enter the sacred grove. When the family determines that it is a boy's year to be circumcised, the boy must visit his mother's brother to inform the uncle that this will be his year to become a man. If the uncle agrees, he must provide a bull to be slaughtered, and other relatives should help to prepare food and brew for the circumcision day. The day prior to the ceremony, the boy arrives at the uncle's residence for the slaughtering of the bull. The boy then must carry a large portion of the meat on his head back to his father's compound. Early the next morning, before sunrise, the boy and his male relatives go to a stream and, as the boy bathes in the cold water, ritual songs are sung. When they return to the compound, the boy is circumcised in front of his many male relatives by an elder and his assistant, who is likely later to become a circumciser himself. The initiate must stand rigid without moving, and if his feet move or his facial expression changes, his family is disgraced. If he is especially brave, he jumps up and down after the cut, blood splashing over the observers. The initiate sometimes holds a small rooted tree above his head, which is to give him strength throughout the procedure. The circumciser's assistant sprinkles dried and pounded clay on the initiate's penis to prevent the prepuce from sliding forward again. To prevent the wound from becoming infected a fibre ring is wrapped around the penis until it heals and the boy carries medicine with him to care for his wounds. A cohort of initiates is secluded for three months together in a hut. If they leave, they are required to hide themselves under a grass hood. Girls are not supposed to come within sight of them. When the seclusion period is over, the initiates bathe in a river and are told how to behave as men, what their responsibilities are as protectors of the village, as owners of cattle, as husbands of women and as fathers of children. They are presented with a shield and spear and told to be warriors and guardians of the village. They are then eligible as men to build a separate hut in their father's compound, to have their own garden, to have rights to land, to herd their own cattle and to acquire their first wife.

Bailey RC, Egesah O (2006). Assessment of clinical and traditional male circumcision services in Bungoma District, Kenya: Complication rates and operational needs, Washington DC, USAID.

In Turkey, circumcision is an important social event for the family[18] and the traditional technique uses a self-made device similar to the Mogen clamp that involves pulling the foreskin in front of the glans, placing a shield to protect the glans and excising the skin[20]. This is usually performed without anaesthesia[117] or with a mild topical analgesia[18]. In Punjab Province, Pakistan, relatives and guests are invited to celebrate the event. The boy is held in a seated position with both legs apart and a probe, a cutter made from wood and a razor are used to excise the foreskin.[97] The operation is performed with no anaesthesia, no sutures and with unsterilized instruments. Ash is used to establish haemostasis, and other substances, including ghee, dung and urine, may also be applied.[120,142]

In Indonesia, the traditional procedure of circumcision is called sunatan, and in some parts of eastern Indonesia traditional providers carry out the ceremony in the mountains at the site of cold mountain springs, where the cold water acts as a partial anaesthetic.[10]. Bamboo clamps are used to fix the four sides of the foreskin and a sharp knife or razor is used to cut off the foreskin. Another traditional method also uses a bamboo clamp that is fixed to the foreskin to cut off the blood flow to the superfluous skin. The clamp is released for urination and then replaced. After a few weeks, the foreskin shrivels and is cut away without bleeding.[10] Similarly, in the Philippines the traditional procedure is community-based and is often performed without anaesthesia by laymen in public places using ordinary implements such as a household knife or razor and a piece of wood that is inserted under the foreskin.[35]

Group circumcisions also occur in rural Egypt, Turkey, Morocco, the Philippines and parts of rural eastern and southern Africa.[15,20,22,102,143] In these ceremonies, the same tools may be used for consecutive circumcisions without adequate cleaning between each one.

5.5. Partial circumcision

The amount of foreskin removed by different (mainly traditional) circumcision methods can vary. For example, among the Meru in central Kenya, a freehand method is used in which a smaller part of the foreskin is removed and part of the outer layer of the foreskin is retained. This is sometimes termed partial circumcision.[144] In some forms of partial circumcision in eastern Africa, the remaining outer layer of the foreskin remains suspended from the penis. In Lesotho, the self-reported prevalence of circumcision is 48%,[27] but this figure is thought to be an overestimate as there is wide prevalence of incomplete circumcision, some of which are only an incision without removal of any foreskin.[1] A recent study from Mwanza, United Republic of Tanzania, found relatively high rates of misclassification of both self-reported and clinically assessed circumcision status among adolescent boys, which may be partly due to partial circumcisions.[145] The study of traditional circumcision among the Babukusu in Kenya also found that circumcisions were highly variable, with some resulting in insufficient skin removal and others with excessive skin removed, including non-foreskin tissue from the penile shaft.[28] Similarly, adult and adolescent Ethiopian Jews immigrating into Israel undergo 'correctional' circumcision to further remove (small or large) foreskin portions not cut by the traditional circumcisers in their home villages. This is required as the Jewish definition of circumcision is the complete removal of the foreskin.[146] There are also different definitions of circumcision by Muslim scholars. For example, according to Abu'I-Barakat in *Kitab al-Ghaya*, either the whole or the majority of the foreskin should be removed. Others state that partial removal of the foreskin is sufficient providing the cut goes all around the tip.[147] Partial circumcision is also practised in Indonesia, where circumcision does not always involve the foreskin being cut.[10] For example, in Sumatra, Indonesia, the retained skin may be tied in a bundle or left as a flap with a hole through which horsehair or other stimulants can occasionally be attached prior to intercourse.[10] This form of circumcision is thought to originate from the introduction of Islam to the region centuries ago, as adult men had died of traditional circumcision, so the Islamic leaders changed the nature of the ceremony to overcome the communities' fears.

5.6. Summary

Age at circumcision depends on the setting and culture. In general, child circumcision (i.e. between the ages of 1 and 11 years) commonly occurs among Muslim boys in many countries, as well as in the Republic of Korea, the Philippines and among certain ethnic groups in eastern, central and southern Africa. Other ethnic groups, especially in eastern and southern Africa, tend to circumcise in adolescence as a rite of passage to manhood. As with neonatal circumcision, providers may be clinically or non-medically trained, and the methods used depend on the training. In general, traditional circumcision is more common in rural areas and among less-educated parents, and there is a trend towards the provision of circumcision by medically trained providers in some settings.

A variety of devices are available for the circumcision of boys, with the most common being the Gomco clamp and the Plastibell. However, compared with neonates and infants, the circumcision of boys is more complex and the use of local anaesthesia is problematic, since it is more difficult for the boy to remain still during the procedure. It may be preferable to wait until the boy is old enough to keep still during the procedure, or to use general anaesthesia. Circumcision of boys by non-medically trained providers often takes place under non-aseptic conditions and with no anaesthesia. Ongoing training of providers is needed to educate them on appropriate methods of anaesthesia and hygiene practices.

Validity of self-reported circumcision can vary, especially in settings where partial circumcisions occur. Further research is needed to ascertain methods of improving the accuracy of self-reported circumcision status, for example by using visual aids.

A number of new devices are now available that are suitable for the circumcision of males of all ages, from infancy to adulthood. To date, there is little published data on the performance of these devices, and a detailed review and comparative studies of safety, cost and client satisfaction are needed.

SECTION 6. Complications following circumcision

6.1. Introduction

As with any surgical procedure, circumcision can result in complications.[61,148,149] The most common early (intra-operative) complications tend to be minor and treatable: pain, bleeding, swelling or inadequate skin removal. However, serious complications can occur during the procedure, including death from excess bleeding and amputation of the glans penis if the glans is not shielded during the procedure.[29,81,103,150–152] Late (postoperative) complications include the formation of a skin bridge between the penile shaft and the glans, infection, urinary retention, meatal ulcer, impetigo,[153] fistulas loss of penile sensitivity, sexual dysfunction and oedema of the glans penis.[62]

Our literature search found many case reports and case series of circumcision-related complications, but relatively few studies that reported the proportion of circumcised males with a complication. For an accurate estimate of risks, active follow-up of circumcised boys is needed. Hospital-based studies of circumcision-related complications are usually retrospective and record-based.[45,49,81] Complications in these studies are commonly recorded from discharge sheets, so tend to underestimate the true frequency of complications because events occurring after discharge are not captured. Furthermore, not all postoperative complications will be seen again at the same hospital. We therefore present results separately for prospective and retrospective studies. Age at circumcision and type of provider (medical or non-medical) were also thought a priori to be associated with frequency of complications, and we present results stratified by these factors. We define neonatal as age up to 28 days, infant as 28 days to 11 months, and child as 12 months to 12 years. Many studies included boys circumcised at a range of ages. We included studies in which the mean or median age at circumcision was age 12 years or younger.

An additional problem in estimating complication risks is that precise definitions are not often given. For example, 'bleeding' may mean oozing, which is readily stopped by compression, or more severe bleeding requiring a blood transfusion. Therefore, to report complications as consistently as possible between studies, we excluded all cases of oozing or minor bleeding as well as some other minor complications (noted under the individual studies). Cases of excess residual foreskin or inadequate circumcision are also excluded—these are adverse outcomes of circumcision and may involve further surgery, but are not medical complications per se. We have also reported serious adverse events separately—these include complications defined as 'severe' or 'serious' by authors, or with long-term or life-threatening sequelae.

In this section we describe the proportion of neonates, infants and children with adverse events following circumcision, focusing on larger prospective studies of consecutive patients rather than individual case reports.

6.2. Complications following neonatal or infant circumcision

We identified 16 prospective studies, from 12 countries, of complications following neonatal and infant circumcision (Table 5).[29,44,62,74,78,81,100,104,109,111,154–159] Of these, most used the Plastibell,[62,100,104,109,111,154,155] with others using the Gomco clamp,[44,74,78,158] freehand circumcision[81,157] or a combination of methods.[155,156,159]

The median frequency of any adverse event was 1.5% (range 0–16%) and the median frequency of any serious adverse event was 0% (range 0–2%). Three studies reported that 1–2% of boys had a serious complication.[29,155,156] One study, a Canadian study of 100 neonates circumcised in 1961–1962 using the Gomco clamp or the Plastibell reported one severe infection requiring antibiotics and one severe meatal ulcer[156] Less severe complications were reported in a further 13 boys in this study. The other two studies with serious complications were from Nigeria. In one, among 141 boys circumcised in three hospitals in south-east Nigeria, complications were assessed at a six-week postoperative visit or if they presented earlier with any complication.[155] Three boys (2.1%) had a urethral laceration. The most common complications in this study were minor, including bleeding (9%) and meatal stenosis (3.5%). Complications were substantially more common when circumcision had been performed freehand (27%, excluding incomplete circumcision) rather than using the Plastibell (8%), and when performed by midwives (19%) rather than by doctors (7%). Moreover, among the doctors, the reported frequency of complications at the public university teaching hospital was 1.6%, compared with 20% at private hospitals, where the level of training and supervision was lower. A much higher frequency (90%) was seen at the mission hospital, which acts as a referral centre for complicated circumcisions. Three circumcisions had been performed by a traditional birth attendant, and all three had resultant complications (one bleeding, one incomplete circumcision and one urethral fistula). The other study was among 322 infants attending a welfare clinic in Ibadan,[29] in which there were two cases of amputation of the glans penis and one buried (trapped) penis. Overall in this study, complications were reported in 9.3% of boys, with a further 11% having excess residual foreskin. The most common complication was excessive loss of foreskin (n = 16; 5%). Unusually, no cases of bleeding, wound infection or haematoma were reported in this study. The method used was not reported for the majority of infants, and complications were most frequent when the procedure was performed by nurses rather than by doctors or traditional circumcisers (data not given).

Of the remaining 13 studies, five reported adverse events in 0.3% or fewer boys,[74,81,104,109,158] four in around 2%,[62,78,111,154] and the remaining four studies reported adverse events in up to 16% of boys.[44,100,157,159] The studies with the highest frequency of complications were in Pakistan and the UK. The study in Pakistan reported on 200 infants circumcised under local anaesthesia at a military hospital using either the freehand or bone-cutter method (a forceps-guided method that does not shield the glans).[157] Bleeding (defined as requiring more than an application of a pressure bandage) was reported in 9% of boys, and 7% had a local infection of the skin and mucosa. In the UK study, 1129 infants were circumcised by nurses using the Plastibell under local anaesthesia,[100] and overall 125 (11.1%) of infants required some degree of follow-up, with complications seen in 5.5%. The most common complication involved the Plastibell ring device itself (3.6%), which is left on after the procedure and normally takes 7 to 10 days to fall off. The problems included delayed separation of the ring, incomplete separation of the ring, or the ring becoming stuck on the penile shaft. In all cases, the ring was removed without the need of anaesthesia and the authors report that this removal was quick, simple and atraumatic.

Three studies reported substantial variation in complication frequencies by age or circumcision method. For example, a US study of circumcision by the Gomco clamp stratified by age at circumcision found no complications in 98 boys circumcised neonatally, but that 12/32 (30%) of infants aged 3 to 8.5 months had postoperative bleeding requiring suture repair.[44] These 32 boys were circumcised under general anaesthesia, and no complications from the anaesthesia were reported. In another study, complications were seen more frequently using the Plastibell technique (12/381; 3.1%) than the sleeve technique (4/205; 1.95%).[159]

A further 10 studies on neonatal/infant circumcision were retrospective hospital-record based studies (Table 6). Five of these were from the USA, two from Pakistan and one each from Israel, Oman and Turkey. The reported frequencies of complications were slightly lower than for the prospective studies, with five studies finding very low frequencies (≤0.6%)[49,83,98,160,161] and four in the range 2–4%.[43,105,162,163] The study reporting the highest proportion (4% in neonates, 10% in infants) included late complications (most commonly foreskin adhesions (7.8%)), with three cases (1.3%) of meatitis and three requiring revision of the circumcision (1.3%). As with prospective studies in neonates and infants, few serious adverse events were reported (<0.2% in all studies except among infants in one US study, where 3/230 (1.3%) of infants required circumcision revisions[84]).

In addition to the published studies, participants at the WHO-sponsored workshop in Ghana, where neonatal circumcision is almost universal, reported that few complications are seen. For example, only 16 circumcision-related complications were seen at the main teaching hospital in Accra in 2007 out of the many thousands of circumcisions that were performed in the city.[77]

Table 5. Summary of frequency of complications in prospective studies of neonatal and infant circumcision

Author	Country	Year of study	Setting	Number of patients	Age	Type of provider	Method used	Anaesthesia used	Follow-up period	Frequency of adverse events[a]	Frequency of serious adverse events[b]
al Samarrai et al.[62]	Saudi Arabia	1980s	Hospital	2000	2 to 3 days	Member of junior staff with supervision	Plastibell	None	6 weeks plus immunization clinic visits	1.4%[c]	0%
Amir et al.[d 78]	Saudi Arabia	1996–1998	Hospital	1000	Mean 9 days	Surgeon	Gomco clamp	Local	1 year	1.6%	0%
Banieghbal[158]	South Africa	2005–2008	Hospital	583	Neonatal		Gomco clamp	Local	1 month	0.3%	0%
Ben Chaim et al.[81]	Israel	2001	Community	19 478	Mean 8 days	83% mohel 17% physician	Freehand	None	—	0.1%	0.1%
Bhat et al.[104]	Oman	1999	Hospital	250	Neonatal (min. 1 day old)	Paediatrician	Plastibell	None	—	0%	0%
Duncan et al.[154]	Jamaica	2000–2003	Hospital	205	Neonatal	Surgeon	Plastibell	Local	1 week	1.5%	0%
Horowitz & Gershbein[44]	USA	1996–1998	Hospital	130	98 neonatal (age 4 to 30 days) 32 infants (age 3 to 8.5 months)	Paediatric urologist	Gomco clamp	Local (neonates) General (infants)	3 days	Overall: 7.4% Neonatal: 0% Infants: 30%	0%
Manji[111]	United Republic of Tanzania	1992–1998	Hospital	368	7 days to 9 months	Paediatrician	Plastibell	None	—	2.8%[e]	0%
Mousavi & Salehifer[159]	Islamic Republic of Iran	2002–2008	Hospital	586	<12 months	Surgeon	50% sleeve 50% Plastibell	Local	—	Sleeve: 1.95% Plastibell: 3.1%[f]	Sleeve: 0% Plastibell 2.1%
Okafor et al.[109]	Nigeria	2002	Hospital	102	Immediate postpartum	Experienced surgeon	Plastibell	None	1 year	0%	0%
Okeke et al.[g 29]	Nigeria	2005	81% hospital 19% home	322	8 days to 13 months	55% nurses 35% doctors 9% traditional	—	None	3 months	9.3%	1.0%
Osuigwe et al.[155]	Nigeria	2001	Hospital	141	7 to 9 days	54% doctors 44% midwives 2% traditional birth attendants	68% Plastibell 31% freehand	None	6 weeks	13.5% Plastibell: 8% Freehand: 27.3%	2.1%
Palit et al.[100]	UK	1996–2005	Hospital	1129	Mean age 11 weeks	Trained nurses under supervision of consultant urologist	Plastibell	Local	3 months	5.5%	0.1%
Patel[156]	Canada	1961–1962	Hospital	100	3 to 5 days old	98% medical doctors 2% traditional providers	51% Gomco 47% Plastibell 2% ritual	Not stated	—	15%[h]	2%
Perlmutter et al.[74]	USA	1992–1993	Hospital	51	Neonatal	Obstetric resident or attending obstetrician	Gomco	None	Up to 2 hours	0%	0%
Rehman et al.[157]	Pakistan	2003–2004	Hospital	200	Infant	Surgeon	50% freehand 50% bone cutter	Local	1 week	16%	0.5%

[a] Cases of minor bleeding stopped with simple pressure or 'conservative management' and excessive foreskin/inadequate circumcision are not included.

[b] Includes complications defined as 'serious' or 'severe' by authors or with long-term or life-threatening sequalae (partial amputation of glans, urethral laceration, need for re-surgery or plastic surgery).

[c] Eighteen patients with yellowish patches of sloughed tissue and erythema who did not have an infection confirmed through cultures, four patients with irregular skin margin and four patients with inadequate skin excision were excluded.

[d] In these studies patients who had undergone circumcision were identified retrospectively, but wherever possible patients were actively followed-up to obtain accurate complication risks.

[e] Risks by age at circumcision: 7–14 days: 0.9%; 15 days–2 months: 4.7%; 2–9 months: 11.5%.

[f] Excludes 'excess mucosa' and 'delayed Plastibell falling off'.

[g] Patients were identified through an immunization clinic and a physical examination was conducted to confirm circumcision status and the presence and type of complications. Uncircumcised boys were followed up to identify boys circumcised at a later age and any complications.

[h] Thirty-one cases of mild oozing, seven cases of mild infection with no antibiotic treatment were excluded.

Table 6. Summary of frequency of complications in retrospective studies of neonatal and infant circumcision

Author	Country	Year of study	Setting	Number of patients	Age	Type of provider	Method used	Anaesthesia used	Follow-up period	Frequency of adverse events[a]	Frequency of serious adverse events[b]
Al-Marhoon & Jaboub[98]	Oman	1997–2000	Hospital	171	Neonatal	Surgeon	Plastibell	Local	As parents want	1.2%[c]	0% (2 needed sutures)
Christakis et al.[83]	USA	1987–1996	Hospital	130 475	Neonatal	—	—	Not stated	—	0.2%	0.2%
Eroglu et al.[163]	Turkey	2001–2002	Hospital	214	Neonatal	Surgeon	Gomco clamp	Local	—	2.3%	0% (1 needed suture)
Gee & Ansell[43]	USA	1963–1972	Hospital	5521	Neonatal	Supervised medical student, resident, or physician	52% Gomco clamp 48% Plastibell	Not stated	Prior to discharge	1.7% Gomco clamp 2.3% Plastibell	0.2%[d]
Iftikhar[160]	Pakistan	1998–2001	Hospital	316	0–12 yrs (72% within 1 week of birth)	Paediatric surgeon	Plastibell (<2 yrs old) Open technique (≥2 yrs)	Local (children <2 yrs old) General (≥2 yrs)	—	0.6%	0%
Metcalf et al.[84]	USA	1974–1979	Hospital	591	61% neonatal 39% post-neonatal	—	—	Not stated	—	4% neonatal 10% infantse	0.3% neonatal 1.3% infants
O'Brien et al.[162]	USA	1985–1986	Hospital	1951	Neonatal	—	43% Gomco 9.5% Plastibell 14.5% electrocautary 33.1% not specified	Not stated	—	3.1% overall	0%
Rafiq[105]	Pakistan	2000	Hospital	100	Neonatal	Surgeon	Plastibell	None	—	2%	0%
Shulman et al.[161]	Israel	1955–1963	Hospital	8000	Neonatal	Mohel	—	Not stated	—	0.3%	0.1%
Wiswell & Geschke[49]	USA	1980–1985	Hospital	100 157	Neonatal	Surgeons	—	Not stated	—	0.2% 'serious'	0.2%

[a] Cases of minor bleeding stopped with simple pressure or 'conservative management' and excessive foreskin/inadequate circumcision are not included.

[b] Includes complications defined as 'serious' or 'severe' by authors or with long-term or life-threatening sequalae (partial amputation of glans, urethral laceration, need for re-surgery or plastic surgery).

[c] Excludes one patient unable to pass urine for 24 hours.

[d] The authors note that 14 patients (0.2%) had 'really significant' complications—one life-threatening haemorrhage, four systemic infections, eight circumcisions of infants with hypospaidas and one complete denudation of the penile shaft.

[e] Six patients with hygiene concerns were excluded.

6.3. Complications following child circumcision by medically trained providers

We identified 10 prospective studies of complications in children aged one year old or older following circumcision by medically trained providers (Table 7).[20,70,92,135,138,139,164–167] The median frequency of any adverse event was 6% (range 2–14%), and the median frequency of any serious adverse event was 0% (range 0–3%). Adverse events were seen most commonly among boys circumcised mainly for medical, rather than religious or cultural, reasons, possibly because the underlying medical condition results in a more complicated procedure. In one of these studies, among boys circumcised in the UK mainly for phimosis, 4/140 boys (2.8%) required acute re-admission to hospital,[167] and the frequency of adverse events was 6.4%. In the other, a Danish study of boys circumcised mainly for balanitis or phimosis, 1/43 (2.3%) boys required re-operation following Plastibell circumcision.[135] Of the other studies, in which boys were circumcised mainly for non-medical reasons, two studies reported an adverse event in about 2% of boys,[70,92] three reported adverse events in 2–5%,[139,166,167] and higher frequencies (7–14%) were seen in studies from the Netherlands,[138] India,[164] the Islamic Republic of Iran[165] and Turkey.[20] Complications included bleeding, infection, meatal stenosis and problems with the Plastibell device. The study from the Netherlands reported on complications among 94 Muslim boys circumcised under local anaesthesia outside the hospital. Of these, 13 were seen again because of bleeding (n = 4), infection (n = 2) or swelling (n = 7);[138] excluding the two cases of mild bleeding, the frequency of complications was 12%. The Indian study was also small (n = 15) and reported two cases of minor wound separation, which did not require further surgical intervention.[164] The study in the Islamic Republic of Iran was a randomized controlled trial comparing petroleum jelly to no topical medication after circumcision in 394 boys, in which a total of 13 (3.3%) boys developed meatal stenosis, 26 (6.6%) had infections at the circumcision site and 43 (10.9%) had post-circumcision bleeding. Complications were significantly less frequent among boys who parents were randomized to use a lubricant (petroleum jelly) on the circumcision site compared with no topical medication.[165] Finally, the Turkish study reports complications following a hospital-based mass circumcision exercise, in which 700 boys were circumcised over five days. Excluding the cases of bleeding stopped by simple compression, 8% of boys had a complication, most commonly infection (2.7%) and inadequate foreskin removal accompanied by secondary phimosis (2.1%).

Table 7. Summary of frequency of complications in prospective studies of child circumcision undertaken by medical providers

Author	Country	Years	Setting	*n*	Age	Type of provider	Method used	Anaesthesia used	Indication	Follow-up period	Frequency of adverse events[a]	Frequency of severe adverse events[b]
Ahmed[92],[168]	Comoros Islands	1997–1998	Home	3824	2 to 8 years	Trained surgical aids, nurses and midwives	Dorsal slit	Local	Routine	11 days	2.3%	0.5%
Aldemir et al.[139]	Turkey	2006	Hospital	200	2 to 9 years	Urologist	65% SmartKlamp 35% conventional dissection technique	Local	Routine	6 weeks	5% (4.6% Smart clamp, 5.7% conventional technique)	1%
Bazmamoun et al.[165]	Islamic Republic of Iran	2006–2007	Hospital	394	Mean 9mths (range 9 days–23 mths)	Surgeon	Sleeve method	Not mentioned	Routine	6 months	7–10%[c]	0%
Griffiths et al.[167]	UK	1985	Hospital	99	Mean 4.3 years (range 3 months–14 years)	—	Dissection circumcision	Caudal epidural in boys aged over 12 months	85% medical (phimosis/balanitis) 11% religious 4% other	3 to 5 weeks	6.4%[d]	2.8%[e]
Ozdemir[20]	Turkey	1990s	Mass circumcision in hospital	700	8 days to puberty	—	Forceps guided	Local	Routine	—	8%[f]	0%
Schmitz et al.[138]	Netherlands	1997	Health centre	94	Median 3 years (range 2–24 years)	Residents of general practice under the supervision of a surgeon	Freehand	Local	Religious (all Muslim boys)	1 week	12%	0%
Schmitz et al[70]	Malaysia	2001	Community	64	Median 10 years (range 7–12 years)	Medical assistants supervised by medical doctors	Tara Klamp	Local	Routine	6 weeks	1.6%	0%
Sharma[164]	India	2003	Hospital	15	2 to 25 years	Surgeons	Dorsal slit	Local, or general in younger boys	Medical or religious	90 days	13.3%	0%
Sorensen & Sorensen[135]	Denmark	1981–1983	Hospital	43	Mean 6.5 years (range 1–13 years)	Surgeon (early stage of training)	Plastibell	Not stated	Medical	Mean 29 months	Immediate postoperative (reported) 9.3%g Late complications (reported) 0%h	0%
Subramaniam & Jacobsen[166]	Singapore	—	Hospital	152	Mean 7 years	Surgeon	CO2 laser	Not stated	Not given	—	4.6%	0.7%

[a] Cases of minor bleeding stopped with simple pressure or 'conservative management' and excessive foreskin/inadequate circumcision are not included.

[b] Includes complications defined as 'serious' or 'severe' by authors or with long-term or life-threatening sequalae (partial amputation of glans, urethral laceration, need for re-surgery or plastic surgery).

[c] Thirteen boys had meatal stenosis and 26 had infection. It is not clear whether there is an overlap between these two groups.

[d] Defined by the authors as any admission to hospital or further surgery.

[e] Acute re-admissions to hospital.

Table 8. Summary of frequency of complications in retrospective studies of child circumcision undertaken by medical providers

Author	Country	Years	Setting	*n*	Age	Type of provider	Method used	Anaesthesia used	Indication	Frequency of adverse events[a]	Frequency of severe adverse events[b]
Ahmed et al.[103]	Nigeria	1981–1995	Hospital	1563	Mean 4 years	Medical	—	Not stated	Routine	0.3%	—
Atikeler et al.[79]	Turkey	1999–2002	Hospital	782	Mean 6 years	Surgeon	—	Not stated	Medical indication or religious reasons	2.6%	0%
Cathcart et al.[169]	UK	1997–2004	Hospital	66 519	0 to 15 years	Surgeon	—	Not stated	98% medical	1.2%	0%
Lazarus et al.[170]	South Africa	1999–2005	Hospital	79	'Boys'	—	—	Not stated	Medical or religious	5.1%	2.5%
Leitch[171]	Australia	1960s	Hospital	200	Mean 2 years	—	—	Not stated	71% medical 29% cultural	11%	0%
Millar & Roberts[108]	South Africa	1985–1987	Hospital	129	3 months to 10 years	—	Plastibell	No	19 revisions	12%	—
Ozdemir[20]	Turkey	1990s	Hospital	600	8 days to puberty	—	Forceps guided?	Local	Routine	1.7%	0%
Peng et al.[71]	China	2005–2007	Hospital	160	5 to 12 years	Surgeon	Shenghuan disposable device	Local	Mainly medical	Complications while wearing device: 17.5%[c] Complications after removal of device: 0.6%	0.6%
Rizvi et al.[97]	Pakistan	1981–1991	Hospital	3096	'Children'	Medical	—	Not stated	—	1.6%	—
Wiswell et al.[45]	USA	1985–1992	Hospital	476	Mean 3 years	78% urologists	Freehand or sleeve	91% general	Cultural (67%) Medical (33%)	1.7%	0.2%
Yegane et al.[24]	Islamic Republic of Iran	2002	Community	1766	71% after 2 years of age	Surgeons, urologists, general practitioners, paediatricians, and paramedics	—	Not stated	—	4.6% overall (late complications) 2.8% urologists/ surgeons 6.1% general practitioners/ paediatricians 9.1% paramedics	0%

[a] Cases of minor bleeding stopped with simple pressure or 'conservative management' and excessive foreskin/inadequate circumcision are not included.

[b] Includes complications defined as 'serious' or 'severe' by authors or with long-term or life-threatening sequalae (partial amputation of glans, urethral laceration, need for re-surgery or plastic surgery).

[c] Seventy cases of swelling pain from nocturnal erection excluded.

Adverse events in 11 retrospective studies tended to be less frequent than for the prospective studies, probably due to under-ascertainment of complications. Most studies reported no serious adverse events (Table 8), but one[170] reported that 2/79 (2.5%) boys required circumcision revisions following circumcision by the Plastibell device. Frequencies of any adverse event varied from 0.3% in a study from Nigeria (five minor complications reported out of 1563 circumcisions in a hospital over a 15-year period[103]) to 12% (15/129) in South Africa (mostly bleeding, haematoma and infection) and 17.5% (28/160) among boys circumcised with a new disposable device (the Shenghuan Disposable Minimally Invasive Circumcision Anastomosis Device) in China (mainly mild oedema (10%), but also moderate oedema and two cases of infection).

6.4. Complications following circumcision by non-medically trained personnel

Table 9 summarizes the five studies of complications following circumcision by non-medically trained providers. In these studies, frequencies of adverse events are generally higher, and complications more serious, even including penile amputation.[103] A high frequency of complications was seen in a retrospective study from Turkey of 407 boys circumcised at two traditional mass circumcision events.[79] The mean age of the boys at the time of circumcision was seven years (range 1–14 years) and the procedure had taken place in non-sterile conditions by unlicensed providers. Overall, complications were seen in 73% of boys, with the most common complications being wound infection (14%), subcutaneous cysts (14%), bleeding that needed suturing (12%) and haematoma (6%). Five boys (1.3%) developed a urinary infection requiring hospitalization and intravenous antibiotics. A further 12% of boys were deemed to have incomplete circumcision. In addition, three patients with hypospadias had been circumcised, indicating inadequate screening of the boys, as the procedure is contraindicated if hypospadias is present.

The retrospective study from the Philippines interviewed 114 males aged 13 to 51 (mean age 25.9 years), of whom 94% reported having been circumcised below the age of 14 years. Most (68%) had been circumcised by non-medical personnel, 60% reported post-circumcision complications (inflammation and swelling) to their circumciser and four (3.5%) reported profuse bleeding.[35] In contrast, in a household-based study in south-west Nigeria, respondents reported very few complications (2.8%) following circumcision, mainly by traditional providers.[30] Among 750 child circumcisions, there were 12 cases reported of excessive bleeding, six infections, two cases of tetanus and one death. The authors report that although they include the death there was insufficient information to be certain that it was caused by circumcision. A study from the Islamic Republic of Iran reported a late-phase complication frequency of 2.7% following traditional circumcision and a further 5% had excessive residual foreskin. This was similar to circumcisions performed by urologists or surgeons (2.8%), but lower than for general practitioners/paediatricians (6.1%) or paramedical personnel (9.1%). The authors argue that this is because traditional circumcisers in the Islamic Republic of Iran are experienced and paramedical personnel do not receive effective training.

Table 9. Summary of frequency of complications in retrospective studies of child circumcision undertaken by non-medical providers

Author	Country	Years	Setting	Number of males	Age at circumcision	Type of provider	Frequency of adverse events[a]	Frequency of serious adverse events
Ahmed et al.[103]	Nigeria	1981–1995	Community	1360 (approx.)	Mean 4 years	Traditional	3.4%	—
Atikeler et al.[79]	Turkey	1999–2002	Community	407	Mean 7 years	Traditional	73%[b]	—
Lee[35]	Phillipines	2002	Community	114	42% 5 to 9 years 52% 10 to 14 years 5% 15 to 18 years	32% medical 68% traditional	63%[c]	3.5%
Myers et al.[30]	Nigeria	—	Community	750	Infant/child	68% traditional 25% nurse/midwife 4% medical doctor	2.8%	—
Yegane et al.[24]	Islamic Republic of Iran	2002	Community	1359	71% after 2 years of age	Traditional circumcisers	2.7% (late complications)	0%

[a] Cases of minor bleeding stopped with simple pressure or 'conservative management' and excessive foreskin/inadequate circumcision are not included.

[b] This very high rate of complications consisted of bleeding (24%), infection (14%), incomplete circumcision (12%), subcutaneous cysts (15%), haematoma (6%), ischaemia (3%), penile adhesion (3%) and other conditions. Of the 97 cases of bleeding, 48 could not be stopped by haemostatic bandage and were sutured. Infections were treated with parenteral or oral antibiotics.

[c] Of these, 94% were reported swollen or inflamed penises. Four respondents (3.5% of those circumcised) reported profuse bleeding.

6.5. Summary

Circumcision is a common surgical procedure, but few epidemiological studies have reported on the frequency of adverse events, which are most commonly bleeding and infection. Our review shows that serious adverse events are rare, but there is a wide variation in reported frequencies of adverse events following circumcision. This is likely to be due to several factors directly associated with complications, such as age at circumcision, the training and expertise of the provider, the sterility of the conditions under which the procedure is undertaken and the indication (medical/cultural) for circumcision. In addition, there is variation due to methodological issues such as duration of follow-up, epidemiological study design and definition of complications.

In general, complications occur less frequently among neonates and infants than among older boys, with the majority of prospective studies in neonates and infants finding no serious complications and relatively few other adverse events, which were minor and treatable. The prospective studies in older boys also found virtually no serious adverse events, but a higher frequency of complications (up to 14%), even when conducted by trained providers in sterile settings.[166] The lower frequency of complications among neonates and infants is likely to be attributable to the simpler nature of the procedure in this age group and to the healing capability of the newborn. Further, a major advantage of neonatal circumcision is that suturing is not usually necessary, whereas it is commonly needed for circumcisions in the post-neonatal period. This advantage is illustrated by the US study in which no complications were seen among 98 boys circumcised in the first month of life, but 30% of boys aged 3 to 8.5 months had significant postoperative bleeding.[44] There are alternatives to suturing, either with disposable clamps or with alternatives such as cyanoacrylate glue[164] and further research in this area is needed.

Several studies stress the importance of careful training, the experience of the provider and the sterility of the setting. This was most clearly noted in a Nigerian study[155] in which 24% of the boys reported complications (including retention of excess residual foreskin), but only 1.6% of those circumcised at a public university teaching hospital by medical doctors reported complications. A further example is the study from the Comoros Islands, which reported the results of an exercise in which specific training had been given to surgical aids and nurses to perform circumcisions. The proportion of boys with complications (2.3%) was reported to be a great improvement on that by traditional non-medically trained providers.[92,168] The high frequency of adverse events following circumcision by untrained providers in non-sterile settings is striking in two studies of traditional circumcision, which found an alarmingly high prevalence of around 80%.[79,80] Notably, in one of these the self-reported frequency was much lower, illustrating the under-ascertainment that can occur in retrospective studies. Mass circumcisions are particularly risky, even when undertaken in a hospital. For example, a Turkish study of 700 children circumcised during a five-day period recorded a complication frequency of 8%, likely due to the difficulty in providing sufficient sterile equipment and conditions.[20] The reason for surgery can also influence the risk of adverse events, as seen in the studies of child circumcision, where more complications were generally seen if circumcision was conducted for medical rather than religious reasons.

Our systematic review was restricted to circumcision complications among boys aged 12 years or under. However, there are several published studies of circumcision complications among adolescent and adult men (Table 10) that indicate a generally higher frequency of complications than seen in neonates, infants and children. In the three randomized controlled trials of circumcision in adult men, complications were observed in 2–7% of HIV uninfected men[4,172,173] and in 6–8% of HIV infected men.[4,173] The most detailed observational study was conducted among the Babukusu

Table 10. Frequency of complications in studies of adolescent and adult circumcision

Author	Country	Years	Setting	*n*	Age	Type of provider	Method used	Anaesthesia used	Indication for circumcision	Follow-up period	Frequency of adverse events[a]	Frequency of severe adverse events
Auvert et al.[4]	South Africa	2002–2004	General practitioner offices	1495 HIV-negative	18 to 24 yrs	Experienced general practitioners	Forceps guided	Local	Enrolled in trial	1 month	3.6%	—
Auvert et al.[4]	South Africa	2002–2004	General practitioner offices	73 HIV-positive	18 to 24 yrs	Experienced general practitioners	Forceps guided	Local	Enrolled in trial	1 month	8.2%	—
Bailey et al.[80]	Kenya	2004	Home or community	445	66% aged below 15 yrs	Traditional	—	None	Cultural	30 to 89 days	35%	24%[b]
Bailey et al.[80]	Kenya	2004	Home or community	12		Traditional	—	None	Cultural	~3 months	83%	33%[c]
Bailey et al.[80]	Kenya	2004	Hospital, health centre or private office	562	90% aged below 15 yrs	Clinician[d]	—	Local or rarely, general	Cultural	30 to 89 days	18%[e]	19%
Bailey et al.[80]	Kenya	2004	Hospital, health centre or private office	12	—	Clinician	—	Local (83%) General (17%)	Cultural	~3 months	92%	25%
Bowa & Lukobo[179]	Zambia	2004–2006	Urology outpatient clinic	900	5 months to 96 yrs	Trained clinical officer	Dorsal slit method	Local	Cultural	8 weeks	3.0%	0.06% at 8 weeks
Kigozi et al.[173]	Uganda	2003–2005	Trial operating theatre	2326 HIV-negative	15 to 49 yrs	Trained physician	Sleeve method	Local	Enrolled in trial	6 weeks	7.4%	0.2% severe (3.3% moderate)
Kigozi et al.[173]	Uganda	2003–2006	Trial operating theatre	420 HIV-positive	15 to 49 yrs	Trained physician	Sleeve method	Local	Enrolled in trial	6 weeks	6.0%	0% severe (3.1% moderate)
Krieger et al.[172]	Kenya	2002–2005	Trial clinic	1475	18 to 24 yrs	Medical and clinical officers	Forceps guided	Local	Enrolled in trial	90 days	1.8%	0% severe (0.7% moderate)
Magoha[82]	Nigeria and Kenya	1981–1998	Hospital	249	32% neonates 6% children 61% adolescent/ adult	Surgeon	Forceps guided	Local	72% cultural/ religious 12% parental request 16% medical	—	11%	2.8% severe[f]
Peltzer & Kanta[180]	South Africa			78	Median age 19 yrs (range 16–25)	Doctors and nurses following 1 day of training		Local	Cultural (Xhosa initiates)	—	3.8%	0%

[a] Cases of minor bleeding stopped with simple pressure or 'conservative management' and excessive foreskin/inadequate circumcision are not included.
[b] Wound not healed at 60 days after surgery.
[c] Permanent adverse sequale.
[d] Anyone considered by the participant to be a clinician.
[e] Including an unknown number with residual foreskin.
[f] Includes severe haemorrhage (*n* = 3), scrotal laceration (*n* = 2), penile shaft denudation (*n* = 1) and glandular injury (n = 1).

ethnic group in western Kenya. Of 562 adolescents circumcised by a medical provider (or reported as such), 18% had a complication, as did 35% of boys circumcised traditionally.[80] A substudy in the same population directly observed 24 boys undergoing medical and traditional circumcision and found that of those circumcised medically only one boy had no adverse events, and three permanent adverse sequelae were reported, including one very serious life-threatening case caused by a 'medical practitioner' who was later found to have no documented medical qualifications.[80] Among the 12 directly observed traditional circumcisions, complications were seen in 10 boys (83%), and four (33%) were judged to have permanent adverse sequelae. None had fully healed by 30 days postoperation. Detailed examination showed that traditional circumcision was also associated with slower healing, more swelling, laceration and keloid scarring.[80] These results show that under non-sterile conditions, adolescent and adult circumcision can frequently be associated with severe complications. Other case series of circumcision complications among adolescents and young men also report severe morbidity and mortality.[10,97,101,130,174,175] Reported complications tend to be more common in this age group than for neonates and infants, even when circumcision is conducted under 'gold standard' conditions such as in randomized controlled trials.

A major challenge in our review was to standardize the definition of complications. For example, Okeke et al.[29] reported complications in 20% of boys, of which half were excessive residual foreskin—an adverse event, but arguably not a medical risk. These cases were excluded where possible. Similarly, the paper by Gee et al.[43] cites a total of 110 complications out of 5521 (2.0%), but states that only 14 complications (0.2%) were considered 'really significant' (one life-threatening haemorrhage, four systemic infections, eight circumcisions of infants with hypospadias and one complete denudation of the penile shaft). The other complications included bleeding, infection, circumcision of hypospadiasis and a Plastibell ring that was too tight. The problem of defining complications is also highlighted in the early (1961–1962) study in Canada in which moderate or severe complications (bleeding, infection, meatal ulcer, meatal stenosis and phimosis) were seen in 15 infants (15%) and a further 68 infants had mild bleeding, meatal ulcers or infections.[156] Complication risks in this study have previously been reported as 55%,[149] which includes any bleeding, including oozing. A further example is the Australian study,[171] which reported complications in 8% of boys, which included several cases of mild bleeding that either ceased spontaneously or with simple management such as digital pressure. We have attempted to report 'severe' or 'serious' adverse events as a separate outcome, but data on this are often limited and it would be useful to produce a standard classification of mild, moderate and severe complications following circumcision so that in the future studies may be more easily comparable. Other limitations are related to the design of the epidemiological studies. The length of follow-up varies between, and within, studies, and may affect the estimated frequency of complications. For this reason we tend not to term the frequency as a 'risk'. It is also possible that the lower frequencies of complications in prospective studies are due to improved procedures by practitioners or improved hygiene by patients as a result of participating in the study. Finally, a number of studies are small and the estimates of the frequency of complications will be correspondingly imprecise.

One study of circumcision among patients with inherited bleeding disorders[91] was excluded, as this report focuses on complications in general populations. In this study, of 71 patients diagnosed from 1961 to 1996, 52% had a record of post-circumcision bleeding. In many settings boys are not asked about a family history of bleeding disorders, and this can potentially lead to severe circumcision-related complications.

Circumcision is commonly practised and will continue to occur for religious, cultural and medical reasons. In general, complications are minor and treatable, especially at young ages, but a high frequency of complications, and severe complications, is seen when the procedure is undertaken by inexperienced providers, in non-sterile settings or with inadequate equipment and supplies. Further prospective studies with monitoring of risks following circumcision are needed to document complications using standardized definitions and to compare the risks associated with different methods and age at circumcision and to evaluate the impact of specific and ongoing training of providers. Such studies are under way in some settings where circumcision services are being expanded for HIV prevention. A set of guidelines on expansion of circumcision services produced by WHO and UNAIDS includes operational guidance for scaling up circumcision for HIV prevention, a surgical manual for circumcision under local anaesthesia, guidance for decision-makers on human rights and ethical and legal considerations for protocols for monitoring and evaluation.[176]

There is a clear need to improve the safety of circumcision at all ages through improved training or retraining for both traditional and medically trained providers and to ensure that providers have adequate supplies of the necessary equipment and instruments for safe circumcision. Strategies for training and quality assurance are needed and will be context-specific. In Swaziland, Operation AB demonstrated a comprehensive model of training teams of medical providers in safe and swift adolescent and adult circumcisions, with improved sterilization equipment and client education, at community-level clinics.[177] In Ghana, where neonatal circumcision is almost universal, the formal health service provides training to traditional providers in Accra, with training on basic hygiene and the provision of necessary equipment, such as sterile gloves and dressings.[102] In South Africa it has been suggested that community health nurses create opportunities to educate traditional circumcisers of adolescents and adults on the basic hygiene requirements to be met before, during and after circumcision.[102] USAID, the Program for Appropriate Technology in Health (PATH) and Management Sciences for Health (MSH) have designed a training programme in the Eastern Cape for training traditional providers about safe circumcision practices.[178] Links between the formal and informal health sectors should be explored elsewhere to institute quality standard practices for both traditional and medical circumcisers, for example wearing sterile gloves, using sterile instruments and appropriate after-care, and for creating a formal structure through which to monitor and regulate the conduct of circumcision. Through these steps, it is likely that the safety of this common procedure can be substantially improved.

SECTION 7. Public health considerations

7.1. Introduction

Aside from the major public health issue of the safety of circumcision provision, other considerations include costs, legal issues, the health consequences of the procedure and cultural acceptability. In this section we review the findings on costs, legal issues and cultural acceptability from the literature review and give a brief summary of the health consequences, which have been extensively reviewed elsewhere.[1,51,181,182]

7.2. Cost and cost-effectiveness

We found relatively little information on the cost of circumcision in developing countries in the published literature. In the United Republic of Tanzania the user fee for the Plastibell was about US$15–20 between 1992 and 1998. This included sterilization, sterile dressing and sheets, gloves and the Plastibell ring.[111] In the Comoros Islands the average cost was about US$10.[92] At the WHO workshop in Ghana in 2008 it was reported that traditional providers charge about US$ 15 for circumcision and hospital providers charge US$45,[77] and in northern Nigeria circumcision by a traditional provider was in the range US$0–34,[76] and was US$13 in hospital settings under local anaesthesia, up to US$50 if general anaesthesia was used. A study from Anambra State, south-east Nigeria, in 2004 reported a cost of US$3 for hospital circumcision using a traditional method and US$4 for Plastibell circumcision.[155] In Bungoma, Kenya, in 2004 the cost charged by a traditional provider was around US$5, compared with US$8 (range US$5–30) for circumcision by a medical provider.[80]

In a community-based study in the Philippines, respondents paid for their circumcision in cash (52%) or in-kind (6%). About one third (36%) said that they used the services at no cost but by courtesy of the community.[124] In another Filipino study men reported paying up to US$ 1 for traditional providers and US$2–4 for medical circumcision.[35] In Israel, most traditional circumcisers consider circumcision as a religious command to be performed for free, and parents provide a gift (cash and in-kind). The Ministry of Religious Affairs recently published a fee range of US$200–290 for neonatal circumcision, to guide parents as to an acceptable fee should it be charged.

The cost of neonatal circumcision by medical practitioners in other settings is estimated to be US$ 35 in Canada (in 1984),[183] US$40–53 in the Palestinian Territories, US$120 in a nurse-led service in the United Kingdom,[184] US$165 in the USA (in 1996),[185] US$715 in Israel and US$ 500 under the UK National Health Service.[186]

Cost-effectiveness studies of adult circumcision for preventing HIV infection have been conducted in sub-Saharan Africa following randomized controlled trials. The cost per adult circumcision was between US$30 and US$60, depending on the programme, and the estimated cost per HIV infection averted was between US$100 and US$350 in high-prevalence settings, decreasing with increasing HIV incidence.[187] In contrast, discounted lifetime HIV treatment costs have been estimated for various settings and typically exceed US$7000 per HIV infection if only first-line treatment is provided, and twice as much if second-line treatment is available. The Expert Group on Modelling the Impact and Cost of Male Circumcision for HIV Risk Reduction concluded

that circumcising any adult age group was likely to be cost-saving in the short term compared with the lifetime HIV treatment costs.[187]

There have been several cost–benefit analyses of the impact of neonatal circumcision, all from the USA. The results vary depending on the assumptions of the risks and benefits of neonatal circumcision, and most were conducted prior to the results of the adult circumcision trials showing partial protection against HIV infection.[183,185,188–192] The most recent analysis,[185] which included a protective effect against HIV as well as a range of conditions, including urinary tract infection, phimosis, balanoposthitis, penile cancer and HIV infection, found that neonatal circumcision saved an average of US$183 (range US$93 to US$303 in 95% of simulations), assuming a cost per neonatal circumcision of US$200, which is substantially higher than the estimates for most countries.

7.3. Legislation

In many countries there appears to be little or no legislation around the provision of neonatal and child circumcision. Any future expansion of circumcision services must ensure that the procedure is carried out safely, under conditions of informed consent, without discrimination and within a legal, regulatory and policy framework that ensures accessibility, acceptability and quality of service provision. A national legal and regulatory self-assessment has been developed by UNAIDS and is now available.[63]

In South Africa, traditional surgeons are now required by law to be officially recognized and registered with the provincial Department of Health,[175] and the Children's Act 2007 makes the circumcision of males under 16 unlawful except for religious or medical reasons. Most other countries do not currently have laws dealing specifically with circumcision. Exceptions are Israel and Saudi Arabia. Israeli legislation is very specific about circumcision. Up to six months of age, the procedure is considered a religious ritual act and can be performed by medical or traditional circumcisers. A voluntary medico-religious committee supervises the training and performance of traditional and medical circumcisers. Above the age of six months, circumcision is considered to be a surgical procedure that should only be carried out by qualified and licensed surgeons and in an approved surgical theatre.[146] Similarly, in Saudi Arabia circumcision by non-qualified people is prohibited.[78,97] One Iranian paper states that circumcisions should be performed by trained surgeons and urologists and should be legally prohibited by unqualified providers,[24] and there was a strong recommendation from a Palestinian survey of circumcision providers that traditional motaher should undergo formal training and be legally and medically authorized to perform circumcisions.

In the UK, circumcision is also not grounded in statute, but judicial review assumes that, provided both parents consent, non-therapeutic neonatal circumcision is lawful[193] provided that it is performed competently and is believed to be in the best interests of the child. Further, if the child is old enough to express a view, he should be involved in decisions about whether he should be circumcised. However, in a recent retrospective review of 62 non-therapeutic circumcisions undertaken in the UK, both parents consented to the procedure in only four cases (6.2%), and in no case was the patient's consent obtained.[194]

7.4. Cultural acceptability of neonatal male circumcision

One concern around the potential for circumcision as an HIV prevention measure is that it may not be acceptable in communities that do not traditionally circumcise. A recent comprehensive review[182] addresses this issue by summarizing eight quantitative and five qualitative studies assessing the acceptability of offering circumcision services among traditionally non-circumcising groups in eastern and southern Africa. The studies were carried out between 1991 and 2003 in Botswana, Kenya, Malawi, South Africa, Swaziland, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe. Women as well as men were included in 10 of the studies, which enabled an assessment of female perspectives on the acceptability of male circumcision. Overall, 71% (50–74%) of men and 81% (62–89%) of women were willing to have their sons circumcised (Figure 11). The response varied with how the questions were posed and the context of the study. For example, one of the highest acceptability levels was recorded in Botswana after an informational session in which participants were told about the health benefits and risks associated with the procedure.[195] Significantly, these studies were conducted prior to the publication of the results of the randomized controlled trials that confirmed the benefit of circumcision against HIV infection.

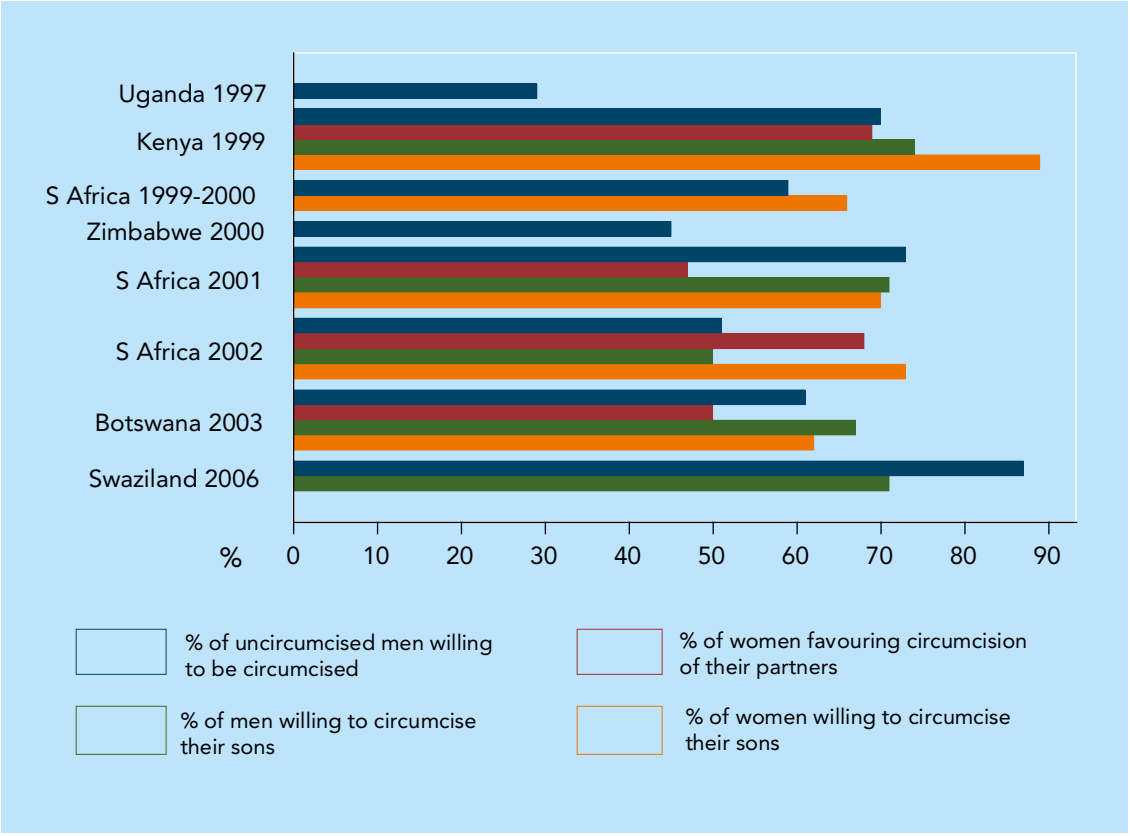


Figure 11. Acceptability of safe, low-cost male circumcision in southern and eastern African countries.[182]

In these studies the main barriers to the acceptability of circumcision were fear of pain, concerns for safety and the cost of the procedure. In areas where traditional circumcision is uncommon, the

preference was overwhelmingly for a medical practitioner to be the provider, as this was perceived to be safer. All studies reported fear of infection, bleeding, excessive pain and possible mutilation at the hands of traditional circumcisers.

There have also been studies of the acceptability of child circumcision outside sub-Saharan Africa. In two Korean studies, where about 60% of males are circumcised,[1] over 90% of parents thought their son should be circumcised, the main reason overwhelmingly being for improved penile hygiene (89%).[40,196] The primary barriers were lack of medical evidence of the benefits and fear of pain, complications or a poor cosmetic result. Circumcision was more popular among better educated parents and those with a higher socioeconomic status. A recent study in Mysore, India, found that 82% of non-Muslim mothers of uncircumcised boys would definitely circumcise their sons if the procedure was offered in a safe hospital setting free of charge.[42] Only 18% of non-Muslim mothers stated that the procedure was culturally unacceptable.

One study in Turkey assessed attitudes towards circumcision among haemophiliacs and their parents.[17] Circumcision is potentially risky among haemophiliacs, although possible with the use of fibrin glue, which aids local haemostasis and tissue sealing.[197] Of the 39 boys in this study, [29] (74%) were circumcised. Almost all boys and parents knew that circumcision was risky in haemophiliacs, but 87% thought that a haemophiliac patient must be circumcised. Sixty per cent of the boys and 85% of the families of uncircumcised boys were anxious about circumcision—the primary concern was risk of haemorrhage. Twenty-five per cent of individuals said being circumcised was only an obligation, 51% said it was an important event and 19% stated that it was the most important thing in life.[17]

Several studies have examined the parental decision-making role for child circumcision. A study in Bendel State, south-west Nigeria, asked about the primary decision-makers for the children's circumcision operations. The father was the primary decision-maker in 75% of cases and the father's parents in 13% of cases. Mothers made the decisions in 11% of cases.[30] In the Republic of Korea, where circumcision happens at an older age, the decision of whether or not to circumcise was most often made by the father (35%), followed by the mother (32%), the boy himself (28%) and a health-care provider (5%). The main reason given for circumcision in this study was to improve penile hygiene (89%).[123] One study conducted in Israel in a very small non-circumcising community found that the primary reason for parents choosing not to circumcise their babies, of whom 83% were Jewish, was based on child rights.[198] The main fears of these parents regarding their decision not to circumcise were almost universally around the social consequences of the child being anatomically different (with an uncircumcised penis) than most of his peers.

7.5. Health consequences of male circumcision

Circumcision is associated with a reduced risk of several infections, including urinary tract infection in infants, HIV and some other sexually transmitted infections.[1,51,181] There are several likely biological mechanisms for this. The area under the foreskin is a warm, moist environment that may enable some pathogens to persist and replicate, especially when penile hygiene is poor.[199] In addition, the inner mucosal surface of the foreskin is only thinly keratinized,[200] unlike the heavily keratinized penile shaft and the outer surface of the foreskin,[201] and may be more susceptible to minor trauma and abrasions that facilitate the entry of pathogens.[20]

7.5.1. Circumcision and urinary tract infections in male infants

Uncircumcised infants are more likely to harbour a reservoir of uropathogenic organisms (e.g. *Escherichia coli*) in the urethral meatus and periurethral area;[202] these uropathogenic bacteria adhere especially well to the inner mucosal surface of the foreskin, compared with the keratinized surface.[203] These very adherent, more abundant uropathogenic organisms may then ascend to the bladder and kidneys, causing urinary tract infections and pyelonephritis.[204]

There is strong epidemiological evidence that circumcision reduces the risk of urinary tract infections several-fold, with a systematic review and meta-analysis of 12 studies finding a summary odds ratio of 0.13 (95% confidence interval 0.08–0.20).[205] Assuming a complication rate of 2%, the authors found that the benefit of circumcision on urinary tract infections outweighed the risk only in boys at high risk of urinary tract infection (e.g. those who previously had a urinary tract infection). Another risk–benefit analysis found a complication rate of 0.2% (as a discharge diagnosis) and estimated that six urinary tract infections could be prevented for every complication.[83] In addition to the English language review, the search of the Arabic literature revealed unpublished data from Israel that provided some evidence that urinary tract infections were more likely to result from circumcisions performed by traditional mohels compared with those performed by physicians.[206]

7.5.2. Circumcision and HIV infection

As mentioned above, randomized controlled trials have shown that circumcision reduces the risk of heterosexually acquired HIV infection in men by 50–60%.[2–4] Observational studies suggest that the protective effect is similar if circumcision occurs neonatally.[207] There are several mechanisms by which the foreskin may specifically increase the risk of HIV acquisition. Firstly, there is an increased risk of genital ulcer diseases in uncircumcised men,[208] which in turn increases the risk of HIV, as the disrupted mucosal surface of the ulcer increases the risk of HIV acquisition.[209] Secondly, the foreskin may increase the risk of HIV infection directly as tissue from the inner surface of the foreskin mucosa contains accessible HIV-1 target cells (CD4 + T cells, macrophages and Langerhans cells).[210] The density of these HIV-1 target cells in the outer foreskin is similar to that in the glans penis, but those in the inner foreskin are closer to the epithelial surface than those situated elsewhere in the penis, due to the relative lack of keratin.[200] Within the inner foreskin Langerhans cells are more likely to be found near the epithelial surface than other cells, and are likely to be the first to be infected by HIV-1.[211] More direct evidence of the susceptibility of the foreskin to HIV-1 infection comes from Patterson et al.,[210] who found that infectivity of the inner mucosal surface (assessed by quantity of HIV-1 DNA one day after ex vivo infection with explant culture) was greater than that of cervical tissue, a primary site of HIV-1 acquisition in womenIn an uncircumcised man, the cells in the inner foreskin are directly exposed to vaginal secretions during heterosexual intercourse, and the superficial location of the HIV-1 target cells presumably increases the risk of infection. In contrast, in a circumcised man the penile shaft is covered with a thickly keratinized epithelium that provides some protection from infection.[200]

7.5.3. Circumcision and the risk of other sexually transmitted infections

There is increasing evidence from randomized controlled trials and from observational studies that circumcised males have a lower risk of several reproductive tract infections, including human papillomavirus,[212–214] which causes penile cancer, *Chlamydia trachomatis*,[215] *Trichomonas vaginalis*[215]

and possibly herpes simplex virus type-2 infection.[208,216] In addition, some studies indicate that the female partners of circumcised men have a lower risk of cervical cancer, which is caused by human papillomavirus.[28,217] Recent evidence also suggests that the female partners of circumcised men have reduced risks of some vaginal infections.[216]

7.6. Summary

There is relatively little published documentation on the cost of circumcision or on legal issues around the provision of circumcision. Data suggest that the cost varies widely, being generally lower among traditional providers. The maximum cost of child circumcision reported in developing countries was US$ 50 for circumcision under general anaesthesia in Nigeria. More typically, reported user fees were around US$ 10, but there is little published data on this and further studies are needed. As a comparison, the cost of adult circumcision in randomized controlled trials was around US$ 30–60. Further work is needed to document the current costs of neonatal, child and adult circumcision, and to update cost–benefit analyses in light of the protective effect against HIV, as well as against diseases such as cervical cancer.

Neonatal and child circumcision is predominantly conducted for religious and cultural reasons and will continue to be a very common procedure where it is currently practised for these reasons. In addition, studies show that circumcision is highly acceptable in settings where it is not currently practised. All services, either existing or newly initiated, must clearly be provided as safely as possible and under conditions of informed consent, following the legal and regulatory framework set out by UNAIDS.

SECTION 8. Conclusions and recommendations

Our review of the published literature shows that there is relatively little literature on this very common surgical procedure, but that neonatal, infant and child circumcision is generally a safe procedure when conducted by trained and experienced providers in hygienic conditions. There is a lack of a standardized operating practice for circumcision, including the management and reporting of adverse events. Further prospective studies of circumcision risks are needed, with rigorous documentation using standardized definitions, and to compare the relative risks of different methods, the optimal age for circumcision and the impact of specific and ongoing training of providers.

Unacceptable levels of risk have been recorded in some prospective studies of child circumcision by medical providers, and there is an urgent need to improve the safety of the procedure through renewed training where necessary. Setting-specific strategies for such training are needed, including guidelines for safe neonatal and child circumcision, both in settings where it is conducted already and where it may be introduced for HIV prevention. The risks following the traditional circumcision of older boys tend to be even higher and are a cause of unnecessary morbidity. Methods to improve training and practices are urgently needed in order to avoid unnecessary morbidity and could follow the examples of the good

links between the formal and informal health-care services for the provision of traditional neonatal circumcision in Israel and Ghana.

The use of anaesthesia for circumcision varies widely, with general anaesthesia common in infant circumcision in the USA, local anaesthesia used in other settings and no anaesthesia used in most other places, especially for traditional circumcision. Local anaesthesia for neonatal and infant circumcision is recommended by WHO and there is a need to improve the training of circumcision providers in order to educate them on appropriate methods of anaesthesia and on hygiene practices.

A number of new devices are now available that are suitable for the circumcision of males of all ages, from infancy to adulthood. To date, there is little published data on the performance of these devices, and detailed reviews and comparisons of safety, cost and client satisfaction are needed.

Neonatal and child circumcision is routinely practised in many countries for religious, cultural or medical reasons. The procedure is undertaken by a range of providers, with the choice of provider depending on family or religious tradition, cost, availability and perception of service quality. As a traditional religious and cultural practice, circumcision is likely to continue to be highly prevalent around the world, and, in addition, is now being considered for HIV prevention. Every effort must be made to ensure that the procedure is undertaken as safely as possible, by trained and experienced providers with adequate supplies and in hygienic conditions.

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APPENDIX. Survey on knowledge of circumcision practices

Introduction

To collect data from countries poorly represented in the published literature, we e-mailed a questionnaire on circumcision practices to the authors of the articles identified through the literature search, known researchers working on circumcision, the participants at two WHO workshops in Nigeria and Ghana and members of the Royal College of Obstetricians and Gynaecologists based in the Middle East, Africa and Asia. Completed questionnaires were received from 124 individuals from 23 different countries (Table A1). The majority were from Ghana and Nigeria, where the questionnaire was distributed to the participants at WHO workshops on neonatal and young boy circumcision practices. For most countries the collected data are in addition to information gathered from the published literature, but survey responses from individuals in the Central African Republic, the Sudan and the Syrian Arab Republic represent the sole source of information on circumcision in those countries.

All but four respondents stated that circumcision was widely practised in their country. Those who stated that circumcision was not widely practised came from South Africa, the Hong Kong Special Administrative Region and Singapore. The majority of respondents had experience in service delivery (Table A1) and in circumcision training. Fifteen respondents (12.1%) stated they had no direct experience in circumcision practice, training or delivery.

Prevalence of circumcision

Reported circumcision prevalence was highest in the Middle East and North Africa, with the majority of respondents from this region reporting a prevalence of at least 75%. However, one respondent (out of three) from the United Arab Emirates stated that the prevalence of circumcision was 25–50% (Table A2). A prevalence of greater than 95% was commonly stated by respondents from Egypt, Qatar, Saudi Arabia, the Syrian Arab Republic and Turkey, which is consistent with the published literature.

The reported prevalences in countries from sub-Saharan Africa and Asia were considerably more variable. In sub-Saharan Africa the majority of respondents from Nigeria cited a high prevalence (75% or above), although 3/19 (16%) of respondents stated that the country-level prevalence was 50–75%. A high prevalence was also cited by the respondents from Ghana, where the majority (35/57; 61.4%) cited a prevalence greater than 75%. In both Ghana and Nigeria the published literature revealed a high prevalence (>80% and 95%, respectively). Respondents from South Africa and Zimbabwe cited a low or intermediate prevalence (<50%), again consistent with the published literature.

In Asia, reports were also generally consistent with the published literature. Respondents from Bangladesh and the Philippines cited a high prevalence (>75%), respondents from India cited a low/intermediate prevalence and respondents from the Hong Kong Special Administrative Region cited a low prevalence. In contrast, the three respondents from Malaysia reported prevalences of either 25–50% or 50–75%, yet the published literature indicates that the country-level prevalence is greater than 80%.

Table A1. Country of residence of respondents and experience with circumcision

Country	Number of respondents	Professional experience of respondents with circumcision[a]					
		No experience	Service delivery	Health policy	Circumcision training	Research	Other
Middle East and North Africa							
Egypt	6	3	3	3	2	0	0
Morocco	1	0	0	0	0	1	0
Oman	1	0	1	1	1	0	0
Pakistan	5	1	3	0	2	0	0
Qatar	1	0	1	0	0	0	0
Saudi Arabia	6	2	3	1	0	0	0
Sudan	3	1	0	1	0	0	Trained during housemanship (1)
Syrian Arab Republic	1	0	1	0	0	0	0
Turkey	2	0	0	0	0	0	As a urologist (1)
United Arab Emirates	4	3	0	0	0	0	As head of gynaecology and obstetrics (1)
Sub-Saharan Africa							
Central African Republic	1	0	1	1	0	0	
Ghana	57	0	32	2	28	1	Family trade (2), as an anaesthetist (1), a gift from god (1)
Mauritius	1	0	0	0	0	0	Experience of religious circumcisions (1)
Nigeria	19	1	16	4	4	5	0
South Africa	4	0	4	1	1	0	0
United Republic of Tanzania	1	0	1	0	1	0	0
Zimbabwe	1	0	1	0	1	0	0
Asia							
Bangladesh	1	0	1	0	0	0	0
Hong Kong SAR	2	0	1	0	0	0	Limited experience during training (1)
India	2	1	0	0	0	0	0
Malaysia	3	1	2	1	1	0	Experience of religious circumcisions (1)
Philippines	1	1	0	0	0	0	0
Singapore	1	1	0	0	0	0	0
Total	**124**	**15**	**71**	**15**	**41**	**7**	**10**

[a] Respondents could provide more than one answer

Table A2. Overall prevalence of male circumcision by region and country

	<25%	25–50%	50–75%	75–95%	>95%
Middle East and North Africa					
Egypt (6)	0	0	0	1	5
Morocco (1)	0	0	0	0	0
Oman (1)	0	0	0	1	0
Pakistan (5)	0	0	0	2	3
Qatar (1)	0	0	0	0	1
Saudi Arabia (6)	0	0	0	0	4
Sudan (3)	0	0	0	1	1
Syrian Arab Republic (1)	0	0	0	0	1
Turkey (2)	0	0	0	0	1
United Arab Emirates (4)	0	1	0	2	0
Sub-Saharan Africa					
Central African Republic (1)	0	0	0	0	0
Ghana (57)	0	0	13	24	11
Mauritius (1)	0	0	0	0	0
Nigeria (19)	0	0	3	4	9
South Africa (4)	2	2	0	0	0
United Republic of Tanzania (1)	0	0	0	0	0
Zimbabwe (1)	1	0	0	0	0
Asia					
Bangladesh (1)	0	0	0	1	0
Hong Kong SAR (2)	1	0	0	0	0
India (2)	2	0	0	0	0
Malaysia (3)	0	1	2	0	0
Philippines (1)	0	0	0	0	1
Singapore (1)	0	0	0	0	0

Numbers in brackets represent the total number of respondents; numbers relate to the number of respondents who gave that answer. Note: not all respondents answered this question.

Age at circumcision

Respondents from the Middle East cited the neonatal period as the most common age at circumcision (Table A3). Circumcision during infancy and childhood was also reported in some countries of this region (Egypt, Oman, Pakistan, Saudi Arabia and the United Arab Emirates). Childhood (one to seven years) was cited as the most common age at circumcision by respondents from the Sudan and Turkey. This is broadly in line with the published data. No respondents from this region cited the most common age at circumcision as greater than seven years of age.

Respondents from parts of sub-Saharan Africa, including Nigeria, South Africa and Ghana, reported that neonatal circumcision occurred commonly, and circumcision during the infant and childhood periods was cited by respondents from the Central African Republic, Ghana, Nigeria and the United Republic of Tanzania. Circumcision at older ages was cited in South Africa (adolescents) and Zimbabwe (adults). There were few respondents from Asia, but the most common age at circumcision in Asia appeared to vary considerably by country (Table A3).

Table A3. Most common age at circumcision

	Neonatal (birth to one month)	Infants (one month to one year)	Children (one to seven years)	Pre-pubertal (8 to 11 years)	Adolescents (12 to 17 years)	Adults (18+ years)
Middle East and North Africa						
Egypt (6)	5	1	0	0	0	0
Morocco (1)	0	0	0	0	0	0
Oman (1)	0	1	0	0	0	0
Pakistan (5)	3	2	0	0	0	0
Qatar (1)	1	0	0	0	0	0
Saudi Arabia (6)	3	1	1	0	0	0
Sudan (3)	0	0	2	0	0	0
Syrian Arab Republic (1)	1	0	0	0	0	0
Turkey (2)	0	0	2	0	0	0
United Arab Emirates (4)	2	1	1	0	0	0
Sub-Saharan Africa						
Central African Republic (1)	0	0	1	0	0	0
Ghana (57)	32	19	4	0	0	0
Mauritius (1)	0	0	0	0	0	0
Nigeria (19)	16	1	2	0	0	0
South Africa (4)	3	0	0	0	1	0
United Republic of Tanzania (1)	0	1	0	0	0	0
Zimbabwe (1)	0	0	0	0	0	1
Asia						
Bangladesh (1)	0	0	1	0	0	0
Hong Kong SAR (2)	1	0	1	0	0	0
India (2)	1	0	0	0	0	1
Malaysia (3)	1	0	0	2	0	0
Philippines (1)	0	0	0	1	0	0
Singapore (1)	0	0	0	1	0	0

Numbers in brackets represent the total number of respondents; numbers relate to the number of respondents who gave that answer. Note: not all respondents answered this question.

Neonatal and infant circumcision

Of the 124 completed questionnaires, 115 stated that neonatal circumcision was performed in their country. Four respondents did not answer this question. The other five respondents, from the Central African Republic, the Hong Kong Special Administrative Region, Malaysia, Morocco and the Sudan, stated that neonatal/infant circumcision was not performed routinely in their country or territory.

Prevalence

The reported prevalence of neonatal and infant circumcision in countries in the Middle East and North Africa was high in most countries (Table A4). The majority of respondents from Egypt

(4/6), Oman (1/1), Qatar (1/1) and Saudi Arabia (3/5) cited prevalence as above 95%. A high prevalence (75–95%) was also cited by the majority of respondents from the United Arab Emirates (2/3). An intermediate to high prevalence (50% or above) was cited by the five respondents from Pakistan. Interestingly, one respondent from Saudi Arabia and one respondent from the United Arab Emirates cited a prevalence of 5–25%, which is inconsistent with the published literature. The prevalence of neonatal and infant circumcision was reportedly low in the Sudan, the Syrian Arab Republic and Turkey (<25%). However, the respondent from the Syrian Arab Republic had previously noted that circumcision was highly prevalent in that country and was most commonly conducted neonatally.

The prevalence of neonatal/infant circumcision in sub-Saharan Africa varied considerably between countries (Table A4). A higher prevalence (>50%) was commonly cited by respondents from Ghana and Nigeria, while a lower prevalence was reported by the few respondents from South Africa, the United Republic of Tanzania and Zimbabwe. These overall observations are consistent with the published literature. However, there was considerable variation in the reported country-level prevalences. For example, while the majority of respondents from Nigeria (16/19) and Ghana (38/57) cited prevalence as 50% or higher, one respondent from each country cited prevalence as 5–25%. A lower prevalence was consistently reported by respondents from Asia; the highest cited prevalence was 25–50%, in Malaysia (Table A4).

Age at circumcision

The most common age that circumcision is performed among neonates and infants in the Middle East and North Africa varied considerably between respondents from the same country (Table A4). For example, one respondent from Egypt cited one to two days as the most common age, three respondents cited less than three months and one respondent cited 4 to 12 months as the most common age. Responses from sub-Saharan Africa were a little more consistent, with 18/19 respondents from Nigeria citing less than three months as the most common age at circumcision, probably reflecting the fact that many Nigerian boys are circumcised on the eighth day of life (Table A4).

Providers

Medical staff such as general practitioners, clinical officers, obstetricians and urologists/surgeons were commonly cited as the most common provider of neonatal/infant circumcision in many countries in the Middle East, North Africa and Asia (Table A4). While many respondents cited medical personnel as the main providers in African countries, traditional providers were also very commonly named. Traditional providers also commonly perform the procedure in Pakistan, the Sudan and the Syrian Arab Republic.

Table A4. Age, prevalence, provider and location of circumcision procedure among neonates and infants

Country[a]	Country prevalence	Most common age at circumcision	Percentage of procedures delivered in a medical setting	Most common provider	Locations in which the procedure commonly takes place[b]
Middle East and North Africa					
Egypt (6)	50–75% (1) 75–95% (1) >95% (4)	1 to 2 days (1) <3 months (4) 4 to 12 months (1)	21–40% (1) 41–60% (2) 61–80% (2) 81–100% (1)	Clinical officer (1) General practitioner (1) Obstetrician (1) Traditional provider (1) Urologist/surgeon (2)	Medical facility[c] (6) Home (3) Religious building[d] (1)
Oman (1)	>95% (1)	4 to 12 months (1)	81–100% (1)	Clinical officer (1)	Medical facility[c] (1)
Pakistan (5)	50–75% (2) 75–95% (1) >95% (1)	<3 months (3) 4 to 12 months (1)	21–40% (4)	General practitioner (1) Traditional provider (2) Technician (1)	Medical facility[c] (5) Home (5)
Qatar (1)	>95% (1)	1 to 2 days (1)	81–100% (1)	Obstetrician (1)	Medical facility[c] (1)
Saudi Arabia (5)	5–25% (1) 75–95% (1) >95% (3)	1 to 2 days (1) <3 months (3) 4 to 12 months (1)	61–80% (2) 81–100% (3)	Urologist/surgeon (5)	Medical facility[c] (5) Home (1)
Sudan (1)	<5% (1)	4 to 12 months (1)	61–80% (1)	Traditional provider (1)	Medical facility[c] (1) Home (1)
Syrian Arab Republic (1)	<5% (1)	1 to 2 days (1)	21–40% (1)	Traditional provider (1)	Medical facility[c] (1)
Turkey (2)	<5% (1) 5–25% (1)	4 to 12 months (2)	41–60% (2)	Clinical officer (1)	Medical facility[c] (2)
United Arab Emirates (3)	5–25% (1) 75–95% (2)	<3 months (3)	81–100% (3)	General practitioner (1) Urologist/surgeon (2)	Medical facility[c] (3)
Sub-Saharan Africa					
Ghana (57)	5–25% (1) 25–50% (16) 50–75% (1) 75–95% (30) >95% (7)	<3 months (1)[e]	41–60% (1)[e]	Traditional provider (1)[e]	Medical facility[c] (39) Home (54) Religious building[d] (1) Circumcision house (2) Private facility (1) Scan centre (1)
Nigeria (19)	5–25% (1) 25–50% (1) 50–75% (6) 75–95% (2) >95% (8)	1 to 2 days (1) <3 months (18)	<20% (1) 21–40% (7) 41–60% (5) 61–80% (1)	General practitioner (4) Midwife (4) Nurse (4) Traditional provider (7)	Medical facility[c] (18) Home (18) Religious building[d] (5)
South Africa (4)	<5% (2) 5–25% (1) 25–50% (1)	1 to 2 days (2) <3 months (2)	<20% (1) 61–80% (2) 81–100% (1)	Obstetrician (3) Religious provider (1)	Medical facility[c] (2) Home (1) Religious building[d] (1)
United Republic of Tanzania (1)	25–50% (1)	4 to 12 months (1)	41–60% (1)	General practitioner (1)	Medical facility[c] (1)
Zimbabwe (1)	<5% (1)	<3 months (1)	<20% (1)	General practitioner (1)	Medical facility[c] (1)
Asia					
Bangladesh (1)	<5% (1)	No data	<20% (1)	Urologist/surgeon (1)	Medical facility[c] (1)
Hong Kong SAR (1)	5–25% (1)	1 to 2 days (1)	81–100% (1)	Urologist/surgeon (1)	Medical facility[c] (1)
India (1)	<5% (1) 5–25% (1)	<3 months (1) 4 to 12 months (1)	21–40% (1) 41–60% (1)	Urologist/surgeon (2)	Medical facility[c] (2) Home (1)
Malaysia (2)	<5% (1) 25–50% (1)	1 to 2 days (1) <3 months (1)	<20% (1) 81–100% (1)	General practitioner (1) Obstetrician (1)	Medical facility[c] (2) Home (1)
Philippines (1)	No data	No data	No data	General practitioner (1)	Medical facility[c] (1)
Singapore (1)	<5% (1)	1 to 2 days (1)	81–100% (1)	Urologist/surgeon (1)	Medical facility[c] (1)

[a] Numbers in brackets represent the number of respondents. [b] Respondents could give more than one answer. [c] Medical facilities include hospitals, health centres and dispensaries. [d] Religious buildings included churches, mosques and synagogues. [e] Data missing from 56 Ghanaian attendees at a WHO workshop.

Location

There was a considerable variation within many countries in the reported proportion of procedures performed in a medical setting (Table A4), which possibly reflects the fact that common neonatal circumcision practices are poorly known in many countries. Medical facilities (hospitals, health centres and dispensaries) were commonly cited as the main location in which the procedure was performed. Home was also cited as a common location for circumcision, and in particular this location was common in Ghana, Nigeria and Pakistan. The observations that circumcision is commonly practised in a medical setting by medical personnel may reflect the fact that many respondents (except for those in Ghana) were medically trained. This may also reflect an observation in the published literature that there is a trend away from traditional circumcision.

Anaesthesia, surgical management and circumcision procedures used

The published literature indicates that the Gomco clamp and the Plastibell are the most commonly used techniques. Respondents from the electronic survey indicated that a wide range of methods were employed for neonatal and infant circumcision (Table A5). In Nigeria and Ghana there was some suggestion that the forceps guided method was a more commonly used technique. In Saudi Arabia there was some evidence that the Plastibell and the Gomco clamp were more popular, consistent with published data. While the Plastibell was popular in some regions of South Africa during the 1980s, the results of the electronic survey indicate that the Gomco clamp is more commonly used now.

The reported type of anaesthesia used for neonatal and infant circumcision varied considerably between different respondents within countries (Table A5). Respondents frequently cited that no anaesthesia was used for neonates, but there was evidence in some countries that anaesthesia was more commonly used for infants. The reported lack of anaesthesia used for infant circumcision is consistent with the published literature for these regions and supports the call for improved training of circumcision providers in the use of anaesthesia.

Respondents commonly stated that neonates and infants were routinely followed up post-surgery (Table A5), although this may reflect the fact that many of the respondents were medical personnel. Medication was reportedly given routinely to patients in many Middle Eastern, North African and Asian countries. There was some evidence that medication was given more commonly only as a treatment in some sub-Saharan countries (South Africa and Zimbabwe).

Table A5. Anaesthesia, surgical management and circumcision procedure among neonates and infants

	Neonates			Infants		
Country[a]	Anaesthesia[b]	Procedure[b]	Post-surgical management[b]	Anaesthesia[b]	Procedure[b]	Post-surgical management[b]
Middle East and North Africa						
Egypt (6)	None (6) Topical (1) Local (1) General (1)	Plastibell (2) Mogen clamp (2) Gomco clamp (2) Forceps guided (3)	Follow-up visit (5) Written instructions (2) Routine medication (3) Medication as treatment (4)	None (4) Topical (2) Local (1) General (4)	Dorsal slit (1) Plastibell (1) Mogen clamp (3) Gomco clamp (1) Forceps guided (3)	Follow-up visit (5) Written instructions (2) Routine medication (4) Medication as treatment (3)
Oman (1)	None (1) Topical (1)	Plastibell (1)	No data	Local (1) General (1)	Forceps guided (1)	Follow-up visit (1) Routine medication (1)
Pakistan (5)	None (3) Topical (2) Local (3) General (1)	Dorsal slit (2) Plastibell (3) Mogen clamp (1) Gomco clamp (1) Forceps guided (2) Tools made by traditional provider (1)	Follow-up visit (4) Written instructions (1) Routine medication (1) Medication as treatment (3)	None (2) Topical (2) Local (3) General (3)	Dorsal slit (2) Plastibell (3) Mogen clamp (1) Gomco clamp (1) Forceps guided (2)	Follow-up visit (3) Routine medication (3) Medication as treatment (2)
Qatar (1)	Topical (1)	Gomco clamp (1)	Routine medication (1) Medication as treatment (1)	No data	No data	No data
Saudi Arabia (5)	None (3) Topical (2) Local (1) General (1)	Dorsal slit (1) Plastibell (2) Gomco clamp (4) Forceps guided (1) Bone cutting (1)	Follow-up visit (5) Routine medication (3) Medication as treatment (1)	Topical (1) Local (2) General (4)	Dorsal slit (1) Plastibell (1) Gomco clamp (3) Forceps guided (3)	Follow-up visit (4) Routine medication (2) Medication as treatment (1)
Sudan (1)	Local (1) General (1)	No data	Routine medication (1)	Local (1) General (1)		Routine medication (1)
Syrian Arab Republic (1)	None (1)	Dorsal slit (1) Forceps guided (1)	Follow-up visit (1) Medication as treatment (1)	General (1)	Dorsal slit (1) Forceps guided (1)	Follow-up visit (1) Medication as treatment (1)
Turkey (2)	Local (2) General (1)	Dorsal slit (2) Alisklamp (1)	Follow-up visit (1) Written instructions (1) Routine medication (1)	Local (1) General (2)	Dorsal slit (2) Alisklamp (1)	Follow-up visit (1) Written instructions (1) Routine medication (1)
United Arab Emirates (3)	None (1) Local (1) General (1)	Dorsal slit (1) Forceps guided (1)	Follow-up visit (2) Routine medication (1) Medication as treatment (1)	Local (2) General (2)	Dorsal slit (1) Forceps guided (1)	Follow-up visit (2) Routine medication (2) Medication as treatment (1)

Sub-Saharan Africa						
Ghana (1)	None (51) Topical (2) Local (17) General (6)	Dorsal slit (12) Plastibell (10) Mogen clamp (2) Gomco clamp (8) Forceps guided (45)	Follow-up visit (50) Written instructions (18) Routine medication (22) Medication as treatment (26)	None (36) Topical (2) Local (22) General (9)	Dorsal slit (13) Plastibell (10) Mogen clamp (2) Gomco clamp (10) Forceps guided (41)	Routine medication (1)
Nigeria (19)	None (18) Topical (6) Local (7) General (1)	Dorsal slit (9) Plastibell (11) Gomco clamp (1) Forceps guided (12) Surgical excision methods (1)	Follow-up visit (12) Written instructions (1) Routine medication (4) Medication as treatment (5)	None (11) Topical (6) Local (8) General (6)	Dorsal slit (6) Plastibell (9) Gomco clamp (1) Forceps guided (10) Surgical excision methods (1)	Follow-up visit (9) Written instructions (2) Routine medication (4) Medication as treatment (3)
South Africa (4)	Local (2)	Plastibell (1) Mogen clamp (1) Gomco clamp (3) Forceps guided (1)	Follow-up visit (1) Medication as treatment (2)	General (1)	Plastibell (1) Mogen clamp (1) Gomco clamp (2) Forceps guided (1)	Follow-up visit (1) Medication as treatment (1)
United Republic of Tanzania (1)	None (1) Local (1)	Plastibell (1) Conventional (1)	Follow-up visit (1)	None (1) Local (1)	Plastibell (1) Conventional (1)	Follow-up visit (1)
Zimbabwe (1)	General (1)	Mogen clamp (1) Gomco clamp (1)	Follow-up visit (1) Written instructions (1) Medication as treatment (1)	General (1)	Mogen clamp (1) Gomco clamp (1)	Follow-up visit (1) Written instructions (1) Medication as treatment (1)
Asia						
Bangladesh (1)	General (1)	No data	Written instructions (1) Routine medication (1)	General (1)	No data	Written instructions (1) Routine medication (1)
Hong Kong SAR (1)	Local (1)	Plastibell (1)		Local (1)	No data	No data
India (2)	General (2)	Dorsal slit (2) Forceps guided (1)	Follow-up visit (2) Routine medication (1)	General (2)	Dorsal slit (1)	Follow-up visit (2) Routine medication (1)
Malaysia (2)	Topical (1) Local (1) General (1)	Dorsal slit (1) Plastibell (1)	Follow-up visit (2) Written instructions (1) Routine medication (1)	Topical (1) Local (1) General (1)	Dorsal slit (1) Plastibell (1)	Follow-up visit (2)
Philippines (1)	No data	Dorsal slit (1)	No data	No data	Dorsal slit (1)	No data
Singapore (1)	No data	Plastibell (1)	No data	No data	No data	No data

[a] Numbers in brackets represent the number of respondents. [b] Respondents could give more than one answer .

Child circumcision

Of the 124 completed questionnaires, 98 stated that neonatal circumcision was performed in their country. Sixteen respondents did not answer this question. The other 10 respondents, from Egypt (1), Ghana (1), Nigeria (3), Qatar (1), Saudi Arabia (3) and the Syrian Arab Republic (1), stated that child circumcision was not performed routinely in their country.

Prevalence

The reported prevalence of child circumcision was generally high among countries in the Middle East and North Africa (Table A6). For example, the cited prevalence was greater than 75% in Egypt (4/4), Oman (1/1), Pakistan (3/5), Saudi Arabia (1/2), Turkey (2/2) and the United Arab Emirates (1/1). The reported prevalence of circumcision varied markedly both between and within countries in sub-Saharan Africa. A large proportion of respondents from Ghana (47%) and Nigeria (64%) stated that the prevalence of circumcision was 75% or greater, but some respondents also stated that prevalence was 25% or less. The reported prevalence of child circumcision was lower in South Africa (25–50%) and the United Republic of Tanzania (5–25%). In Asia, the reported prevalence was highest in Muslim countries (Bangladesh, Malaysia) and the Philippines, which is consistent with published data.

Age at circumcision

Childhood (1 to 11 years) was reported to be the most common age for circumcision in many Asian countries (Table A3). For most Asian countries the procedure was performed later than in Middle Eastern and North African countries, with many respondents stating that the most common age for the procedure was during mid-childhood (five to seven years) or late childhood (8 to 11 years) (Table A6). This is consistent with published data, which show that typically boys from Asia are circumcised between 10 and 15 years (Section 5.2). The most common age for circumcision during childhood varied considerably between different countries in sub-Saharan Africa: early childhood (one to four years) was commonly cited by respondents from the Central African Republic, Ghana and the United Republic of Tanzania, whereas the majority of respondents from Nigeria stated that mid-childhood (five to seven years) was the most common age.

Providers

As with the neonatal/infant procedure, most respondents from the Middle East and North Africa stated that medical staff such as general practitioners and urologists/surgeons were the most common providers of child circumcision (Table A6). This contrasts with the published literature, which indicates that, particularly in rural areas of Turkey and Egypt, circumcision was performed by informal providers with no official training (Section 5.3). The only respondents from this region who claimed that traditional providers were the most common providers were from Pakistan. Traditional providers were more frequently named as the most common provider by respondents from sub-Saharan Africa; for example, 55% of Nigerian respondents thought that most circumcisions were undertaken by traditional providers. In many Asian countries traditional providers were also identified as the most common circumcision provider—this is in contrast to the provision of neonatal/infant circumcision, where most respondents from Asian countries named medical personnel.

Location

In most countries medical facilities were common locations for child circumcision. The home was the second most frequently named location for the procedure to be performed. Religious buildings, circumcision houses and villages/towns were also cited as common places for the procedure to be performed.

Anaesthesia, surgical management and circumcision procedures used

Anaesthesia is used more frequently when circumcision is performed on children than on neonates/infants (Tables A5 and A7). For example, in Egypt all six respondents stated that circumcision may be performed on neonates without any anaesthesia, whereas only one (out of four) respondents indicated that this would happen for children. In some countries there were reports that anaesthesia was more likely to be used for older children. For example, in Ghana 31 (56%) respondents thought that the procedure may be performed on young children (aged one to seven years) without anaesthesia, whereas 42% stated the same would occur when circumcision was performed on older boys (8 to 11 years). Notably, many respondents, from several countries, stated that no anaesthesia is used for children. As expected, respondents were more likely to state that no anaesthesia was used for children if they came from a country where traditional providers were the main provider of circumcision.

A wide range of procedures, both within and between countries, was named by the respondents. Consistent with the published literature (Section 5.4.1), the sleeve resection technique was named as a commonly used method for children by one respondent from Turkey. As with neonates/infants, the forceps guided method appeared to be commonly used for the circumcision of children.

Respondents commonly stated that patients were examined at a follow-up visit after the procedure and there was some suggestion that this was more likely in younger children in some countries (Egypt, Nigeria, Hong Kong Special Administrative Region). Routine medication is provided to children in many countries, but medication as a treatment only was less commonly named by respondents. Exceptions to this include South Africa and the United Republic of Tanzania, where respondents stated that medication was provided as a treatment only and was not given routinely.

Table A6. Age, prevalence, provider and location of circumcision procedure among childre

Country[a]	Country prevalence	Most common age at circumcision	Most common provider	Locations in which the procedure commonly takes place[b]
Middle East and North Africa				
Egypt (4)	>95% (4)	1 to 4 years (2) 5 to 7 years (1)	General practitioner (2) Urologist/surgeon (2)	Medical facility[c] (4) Home (1)
Morocco (1)	No data	No data	No data	Medical facility[c] (1) Home (1) Barbers' (1)
Oman (1)	>95% (1)	1 to 4 years (1)	General practitioner (1)	Medical facility[c] (1)
Pakistan (5)	<5% (1) 75–95% (1) >95% (2)	1 to 4 years (3)	Urologist/surgeon (1) Traditional provider (3)	Medical facility[c] (5) Home (2)
Saudi Arabia (2)	5–25% (1) >95% (1)	5 to 7 years (2)	Urologist/surgeon (2)	Medical facility[c] (2)
Sudan (2)	<5% (1) >95% (1)	5 to 7 years (2)	Urologist/surgeon (1) Nurse (1)	Medical facility[c] (1) Home (2)
Turkey (2)	75–95% (1) >95% (1)	1 to 4 years (1) 5 to 7 years (1)	Clinical officer (1)	Medical facility[c] (2) Home (1)
United Arab Emirates (1)	>95% (1)	1 to 4 years (1)	General practitioner (1)	Medical facility[c] (1) Private clinics (1)
Sub-Saharan Africa				
Central African Republic (1)	>95% (1)	1 to 4 years (1)	Nurse (1)	Medical facility[c] (1) Home (1)
Ghana (55)	<5% (2) 5–25% (3) 25–50% (2) 50–75% (13) 75–95% (18) >95% (8)	1 to 4 years (23) 5 to 7 years (8) 8 to 11 years (6)	[d]	Medical facility[b] (38) Home (47) Religious building[d] (1) Circumcision house (3) Scan centre (1)
Nigeria (11)	<5% (2) 5–25% (1) 50–75% (1) 75–95% (2) >95% (5)	1 to 4 years (2) 5 to 7 years (4) 3 to 5 years (1)	General practitioner (3) Midwife (1) Traditional provider (6)	Medical facility[c] (11) Home (9) Religious building[d] (4) Town/village (1) Traditional provider's place (1)
South Africa (2)	25–50% (1)	No data	Urologist/surgeon (1)	Medical facility[c] (1)
United Republic of Tanzania (1)	5–25% (1)	1 to 4 years (1)	Clinical officer (1)	Medical facility[c] (1)
Asia				
Bangladesh (1)	75–95% (1)	4 to 8 years (1)	Traditional provider (1)	Medical facility[b] (1) Home (1)
Hong Kong SAR (2)	5–25% (1)	5 to 7 years (2)	Urologist/surgeon (2)	Medical facility[c] (2)
India (2)	<5% (1) 5–25% (1)	5 to 7 years (1) 8 to 11 years (1)	Urologist/surgeon (2)	Medical facility[c] (2)
Malaysia (3)	25–50% (1) 50–75% (2)	5 to 7 years (1) 8 to 11 years (2)	General practitioner (1) Traditional provider (1)	Medical facility[c] (3) Home (2)
Philippines (1)	50–75% (1)	8 to 11 years (1)	Traditional provider (1)	Medical facility[c] (1) Home (1) Backyard (1)
Singapore (1)	5–25% (1)	8 to 11 years (1)	Religious practitioner (1)	Medical facility[c] (1)

[a] Respondents could give more than one answer. [b] Medical facilities include hospitals, health centres and dispensaries. [c] Religious buildings included churches, mosques and synagogues. [d] Data missing from 55 Ghanaian attendees at a WHO workshop.

Table A7. Anaesthesia, surgical management and circumcision procedure among children

	Children (1 to 7 years)			Children (8 to 11 years)		
Country[a]	Anaesthesia[b]	Procedure[b]	Post-surgical management[b]	Anaesthesia[b]	Procedure[b]	Post-surgical management[b]
Middle East and North Africa						
Egypt (4)	None (1) Topical (2) Local (2) General (3)	Dorsal slit (1) Mogen clamp (2) Forceps guided (1)	Follow-up visit (3) Written instructions (1) Routine medication (3) Medication as treatment (2)	None (1) Topical (1) Local (1) General (4)	Dorsal slit (1) Mogen clamp (2) Forceps guided (1)	Follow-up visit (2) Written instructions (1) Routine medication (3) Medication as treatment (2)
Morocco (1)	No data	No data	No data	No data	No data	No data
Oman (1)	Local (1) General (1)	Forceps guided (1)	Routine medication (1)	General (1)	Forceps guided (1)	Routine medication (1)
Pakistan (5)	None (3) Topical (3) Local (4) General (3)	Dorsal slit (3) Forceps guided (2) Dissection (1) Traditional methods (1) Tools made by traditional provider (1)	Follow-up visit (5) Written instructions (1) Routine medication (2) Medication as treatment (3)	None (2) Topical (3) Local (3) General (2)	Dorsal slit (2) Forceps guided (1) Dissection (1)	Follow-up visit (5) Written instructions (1) Routine medication (2) Medication as treatment (3)
Saudi Arabia (2)	Local (1) General (2)	Forceps guided (2)	Follow-up visit (2) Routine medication (2) Medication as treatment (1)	Local (1) General (2)	Forceps guided (2)	Follow-up visit (2) Routine medication (2) Medication as treatment (1)
Sudan (2)	Local (2) General (1)	Mogen clamp (1)	Follow-up visit (1) Routine medication (2)	Topical (1) Local (2)	Mogen clamp (1)	Follow-up visit (1) Routine medication (2)
Turkey (2)	Local (1) General (2)	Dorsal slit (1) Plastibell (1) Alisklamp (1) Sleeve resection (1)	Follow-up visit (2) Written instructions (1) Routine medication (1)	Local (2) General (1) Alisklamp (1) Sleeve resection (1)	Dorsal slit (1)	Follow-up visit (2) Written instructions (1) Routine medication (1)
United Arab Emirates (1)	Local (1)	Dorsal slit (1)	Follow-up visit (1) Routine medication (1)	Local (1)	Dorsal slit (1)	Follow-up visit (1) Routine medication (1)

Sub-Saharan Africa						
Central African Republic (1)	Local (1) General (1)	No data	Follow-up visit (1)	Local (1) General (1)	No data	Follow-up visit (1)
Ghana (55)	None (31) Topical (2) Local (25) General (14)	Dorsal slit (14) Plastibell (6) Mogen clamp (1) Gomco clamp (7) Forceps guided (45) Freehand (5)	Follow-up visit (50) Written instructions (17) Routine medication (20) Medication as treatment (17)	None (23) Topical (2) Local (27) General (15)	Dorsal slit (14) Plastibell (6) Mogen clamp (1) Gomco clamp (7) Forceps guided (44) Freehand (5)	No data
Nigeria (11)	None (3) Topical (5) Local (9) General (9)	Dorsal slit (6) Plastibell (3) Mogen clamp (2) Gomco clamp (1) Forceps guided (10)	Follow-up visit (8) Routine medication (8) Medication as treatment (4)	None (2) Topical (3) Local (7) General (8)	Dorsal slit (6) Plastibell (3) Mogen clamp (2) Gomco clamp (1) Forceps guided (10)	Follow-up visit (7) Routine medication (6) Medication as treatment (4)
South Africa (2)	General (1)	Gomco clamp (1) Forceps guided (1)	Medication as treatment (1)	General (1)	Gomco clamp (1) Forceps guided (1)	Medication as treatment (1)
United Republic of Tanzania (1)	Local (1)	Dorsal slit (1)	Follow-up visit (1) Medication as treatment (1)	Local (1)	Dorsal slit (1)	Follow-up visit (1) Medication as treatment (1)
Asia						
Bangladesh (1)	None (1) Local (1) General (1)	No data	No data	None (1) Local (1) General (1)	No data	No data
Hong Kong SAR (2)	General (2)	Dorsal slit (1)	Follow-up visit (2) Routine medication (1)	General (1)	Dorsal slit (1)	Follow-up visit (1)
India (2)	General (2)	Dorsal slit (2) Forceps guided (1)	Follow-up visit (2) Routine medication (1)	General (2)	Dorsal slit (1)	Follow-up visit (2) Written instructions (1) Routine medication (1)
Malaysia (3)	Topical (1) Local (2)	Dorsal slit (1) Plastibell (1)	Follow-up visit (2) Written instructions (1) Routine medication (1)	None (1) Topical (1) Local (2)	Dorsal slit (2) Traditional with leaves (1)	Follow-up visit (2) Written instructions (1) Routine medication (1)
Philippines (1)	No data	Dorsal slit (1)	Follow-up visit (1)	No data	Dorsal slit (1)	Follow-up visit (1)
Singapore (1)	No data	No data	No data	No data	No data	No data

[a] Numbers in brackets represent the number of respondents. [b] Respondents could give more than one answer.

Complications

As found in the published literature, the most commonly reported complication of circumcision was excess bleeding, followed by wound infection (Tables A8 and A9). Other commonly reported complications included insufficient and excessive skin removal and haematoma/abnormal swelling. There was some evidence from Ghana and Nigeria, where sufficient data were available, that complications rates were higher in children than in neonates/infants. The perceived complication risk was very variable both between and within countries. This is consistent with the observation that a large number of countries stated that complications were often not routinely recorded. Where recording systems were in place the most common methods were through recording in the patient's medical notes or in hospital/health centre registers.

Table A8. Circumcision complications among neonates and infants

Country[a]	Most common complication	Overall risk of complications (per 1000 procedures)	Recording of complications[b]
Middle East and North Africa			
Egypt (6)	Excess bleeding (2) Insufficient skin removal (1) Wound infection (1) Haemorrhage (1) Bleeding (1)	<1 (2) 1–5 (2) 6–10 (1) 21–50 (1)	Not routinely recorded (4) In the patient's medical records (2)
Oman (1)	Excess bleeding (1)	6–10 (1)	In the patient's medical records (1)
Pakistan (5)	Haematoma/abnormal swelling (1) Wound infection (3) Frenal oozing (1)	<1 (2) 11–20 (1) 5–20 (1)	Not routinely recorded (3) In the patient's medical records (1) At follow-up visits (1)
Qatar (1)	Excess bleeding (1)	<1 (1)	Recorded by urologists (1)
Saudi Arabia (5)	Excess bleeding (2) Wound infection (1) Bleeding (1)	11–20 (2) 21–50 (1)	In the patient's medical records (5)
Sudan (1)	Excess bleeding (1)	51–100 (1)	Not routinely recorded (1)
Syrian Arab Republic (1)	Excess bleeding (1)	<1 (1)	Not routinely recorded (1)
Turkey (2)	Excess bleeding (1) Post-circumcision phimosis (1)	6–10 (1)	Complications recorded at 1 day and 7 days post-surgical visit (1) Routinely recorded (1)
United Arab Emirates (3)	Insufficient skin removal (1)	1–5 (2) 11–20 (1)	Not routinely recorded (1) In the patient's medical records (1) Recorded by the surgeon performing the procedure (1)
Sub-Saharan Africa			
Ghana (57)	Excess bleeding (1)[c]	<1 (13) 1–5 (6) 6–10 (8) 21–50 (2)	Not routinely recorded (28) Recorded in the health centre register (5)
Nigeria (19)	Excess bleeding (7) Excessive skin removal (2) Insufficient skin removal (2) Wound infection (4)	<1 (2) 1–5 (7) 6–10 (4) 21–50 (2) 51–100 (2)	Not routinely recorded (7) In the patient's medical records (3) Recorded in the health centre register (2) Reported to the supervising doctor (1) Recorded during follow-up (1) Only complications presenting to hospital are recorded (2)
South Africa (4)	Excess bleeding (2) Wound infection (1)	1–5 (2) 6–10 (1)	Not routinely recorded (1) In the patient's medical records (2)
United Republic of Tanzania (1)	Wound infection (1)	3–9 (1)	Not routinely recorded (1)
Zimbabwe (1)	Excess bleeding (1)	<1 (1)	In the patient's medical records (1)
Asia			
Bangladesh (1)	Excess bleeding (1)	6–10 (1)	In the patient's medical records (1)
Hong Kong SAR (1)	Wound infection (1)	6–10 (1)	In the patient's medical records (1)
India (2)	Haematoma/abnormal swelling (1)	<1 (1) 1–5 (1)	Not routinely recorded (1) In the patient's medical records (1)
Malaysia (2)	Wound infection (1)	<1 (2)	Not routinely recorded (2)
Philippines (1)	No data	No data	Not routinely recorded (1)
Singapore (1)	No data	<1 (1)	No data

[a] Numbers in brackets represent the number of respondents. [b] Respondents could give more than one answer. [c] Data missing from the 56 Ghanaian attendees at a WHO workshop.

Table A9. Circumcision complications among children

Country[a]	Most common complication	Overall risk of complications (per 1000 procedures)	Recording of complications[b]
Middle East and North Africa			
Egypt (4)	Excess bleeding (1) Wound infection (2)	<1 (1) 1–5 (1) 21–50 (1)	Not routinely recorded (2) In the patient's medical records (1)
Morocco (1)	No data	No data	No data
Oman (1)	Excess bleeding (1)	21–50 (1)	In hospital records (1)
Pakistan (5)	Excess bleeding (1) Wound infection (2)	<1 (1) 1–5 (1) 6–10 (1) 11–20 (1)	Not routinely recorded (2) In the patient's medical records (1) At follow-up visits (1)
Saudi Arabia (2)	Insufficient skin removal (1)	1–5 (1)	In the patient's medical records (2)
Sudan (2)	Wound infection (1)	1–5 (1) 6–10 (1)	Not routinely recorded (1)
Turkey (2)	Excess bleeding (1)	1–5 (1)	At follow-up visits (1)
United Arab Emirates (1)	Excess bleeding (1)	1–5 (1)	Not routinely recorded (1)
Sub-Saharan Africa			
Central African Republic (1)	Excess bleeding (1)	No data	No data
Ghana (55)	No data	<1 (11) 1–5 (2) 6–10 (7) 11–20 (2) 21–50 (1)	Not routinely recorded (44) In the health centre register (6)
Nigeria (11)	Excess bleeding (4) Insufficient skin removal (1) Wound infection (1) Haematoma/abnormal swelling (1)	1–5 (1) 6–10 (1) 11–20 (4) 21–50 (2)	Not routinely recorded (3) In the patient's medical records (1) Hospital register (2) At follow-up visits (1)
South Africa (2)	Excess bleeding (1)	<1 (1)	In the patient's medical records (1)
United Republic of Tanzania (1)	No data	11–20 (1)	Not routinely recorded (1)
Asia			
Bangladesh (1)	Excess bleeding (1)	21–50 (1)	Not routinely recorded (1)
Hong Kong SAR (2)	Wound infection (1)	6–10 (1)	In the patient's medical records (1)
India (2)	Haematoma/abnormal swelling (1)	1–5 (1) 11–20 (1)	In the patient's medical records (1)
Malaysia (3)	Wound infection (2)	<1 (2)	In the patient's medical records (1) At follow-up visits (1)
Philippines (1)	No data	No data	Not routinely recorded (1)
Singapore (1)	No data	No data	No data

[a] Numbers in brackets represent the number of respondents. [b] Respondents could give more than one answer.

SURVEY OF MALE CIRCUMCISION PRACTICES & POLICIES

Male circumcision is the most common surgical procedure worldwide. There is currently increasing interest in male circumcision following results from three randomised controlled trials showing a reduced risk of HIV acquisition in men.

The London School of Hygiene & Tropical Medicine is currently conducting a survey of male circumcision practices globally. This survey is funded by the Bill & Melinda Gates Foundation.

We would greatly appreciate your co-operation in this survey by responding to the following questions about male circumcision practices and policies in your country.

Please email the completed questionnaire to natasha.larke@lshtm.ac.uk or fax to +44 207 636 8739

Date (day/month/year):...../...../.....

Name:.....

Country:.....

District/ Province:.....

(please state the district/ province in which you work or have experience of male circumcision)

Institution:.....

Position/Title:.....

Email address:.....

SECTION 1: Background

Q1a Is male circumcision widely practiced in your country?

Q1b Approximately what proportion of males are circumcised in your country and district/province?

a) Country:

b) District/ Province:

Q1c What is the most common age for male circumcision in your country?

Q1d What is your professional experience (if any) with male circumcision? (please check all that apply)

No experience
Service delivery
Health policy
Provision of circumcision training
Research
Other: Please specify:

Thank you in advance for your time in completing this questionnaire, which will be acknowledged in the final report.

SECTION 2: Circumcision among boys aged up to 1 year

Q2a **Does neonatal and/or infant male circumcision occur in your country?**

If you answered 'No' please skip to Section 3, page 9.
If you answered 'Yes' please answer the questions below

Q2b **At what age are male neonates and infants typically circumcised in your country?**

If you answered 'on a specific day after birth', please specify the day:

Q2c **(i) Approximately what percentage of males in your country and/or your district/province have been circumcised by age 1 year?**

a) Country:

b) District/ province:

(ii) Approximately what percentage of deliveries in your country and/or your district/province occurs in medical settings (e.g. hospitals, clinics)?

a) Country:
Proportion delivered in medical setting %

b) District/ province:
Proportion delivered in medical setting %

Q2d **Who carries out the neonatal/infant male circumcision procedure? (please check all that apply)**

- ☐ General practitioner
- ☐ Urologist/surgeon
- ☐ Clinical Officer
- ☐ Nurse
- ☐ Midwife
- ☐ Obstetrician
- ☐ Traditional provider
- ☐ Religious provider
- ☐ Other (please specify)

Q2e	Of these, which is the most common type of provider? (Please select one option from the dropdown list)

Q2f	What training in male circumcision, if any, do the providers of neonatal/ infant circumcision have? Please provide information for all types of provider if the training varies for different providers.

- General practitioner
- Urologist/surgeon
- Clinical Officer
- Nurse
- Midwife
- Obstetrician
- Traditional provider
- Religious provider
- Other (specified in Q2d)

Q2g Where does the neonatal/infant circumcision procedure take place? (please check all acceptable locations, not only the most common)

- ☐ At hospital
- ☐ At health centre/dispensary
- ☐ At other health facility
- ☐ At home
- ☐ In a Church/ Synagogue /Mosque
- ☐ At another location (please specify)

Q2h Which types of anaesthesia are commonly used for medical circumcision? (please check all that apply)

i) Neonatal (birth to 1 month)

- ☐ None
- ☐ Topical (e.g. EMLA 5% cream)
- ☐ Local (e.g. penile nerve block with lidocaine)
- ☐ General
- ☐ Other (please specify)

ii) Infants (1 month to 1 year)

- ☐ None
- ☐ Topical (e.g. EMLA 5% cream)
- ☐ Local (e.g. penile nerve block with lidocaine)
- ☐ General
- ☐ Other (please specify)

Q2i Which procedures are most commonly used? (please check all that apply)

i) Neonatal (up to 1 month)

- ☐ Dorsal slit
- ☐ Plastibell
- ☐ Mogen clamp
- ☐ Gomco clamp
- ☐ Forceps guided
- ☐ Other (please specify)

ii) Infants (1 month to 1 year)

- ☐ Dorsal slit
- ☐ Plastibell
- ☐ Mogen clamp
- ☐ Gomco clamp
- ☐ Forceps guided
- ☐ Other (please specify)

Q2j	Please describe post-surgical management including management of complications (please check all that apply)

i) Neonatal (up to 1 month)

Follow-up visit (please specify when)

Written instructions to parents (please attach a copy if possible)

Medications provided routinely

Medications provided as additional treatment as needed only

ii) Infants (1 month to 1 year)

Follow-up visit (please specify when)

Written instructions to parents (please attach a copy if possible)

Medications provided routinely

Medications provided as additional treatment as needed only

Q2k	Are complications typically recorded? If so, how?

Q2l	What is the overall risk of complication for neonates/infants per 1000 procedures? (please estimate if not known)

Q2m	(i) Which is the most common complication?

Please specify complication if 'other' was selected in the list above:

	(ii) How often (roughly) does each complication occur? (please answer for all complications if possible)

Approx # per 1000 procedures

Excess bleeding.

Wound infection

Haematoma/abnormal swelling

Accidental injury to penis

Excessive skin removal

Insufficient skin removal

Anaesthesia complications

Other (specified above)

Q2n **What is the typical cost of a male circumcision for different types of providers?**

Please specify currency:

i) Neonatal (up to 1 month)

Type of provider (1):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

Type of provider (2):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

Type of provider (3):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

ii) Infants (1 month to 1 year)

Type of provider (1):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

Q2n **What is the typical cost of a male circumcision for different types of providers? (continued)**

Type of provider (2):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

Type of provider(3):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

SECTION 3: Male circumcision among boys aged 1-11 years

Q3a **Does male circumcision occur among boys aged 1-11 years in your country?**

If you answered 'No' please skip to Section 4, page 15.

If you answered 'Yes' please answer the questions below

Q3b **At what age are boys of 1-11 years typically circumcised in your country? (please check one response only)**

between the ages of 1-4 years

between the ages of 5-7 years

between the ages of 8-11 years

immediately after leaving elementary school at age years

at a specific age of years

between the ages of and years

Q3c **Approximately what percentage of boys in your country and your district/province have been circumcised by age 12 years old?**

a) Country:

b) District/ province:

Q3d **Who carries out the circumcision procedure for children aged 1-11 years (please check all that apply)**

General practitioner

Urologist/surgeon

Clinical Officer

Nurse

Midwife

Obstetrician

Traditional provider

Religious provider

Other (please specify)

Q3e	Of these, which is the most common type of provider for boys aged 1-11 years? (please select one answer from the dropdown list)

Q3f	What training in male circumcision, if any, do these providers have? Please provide information for all types of provider if the training varies for different providers.
☐	General practitioner
☐	Urologist/surgeon
☐	Clinical Officer
☐	Nurse
☐	Midwife
☐	Obstetrician
☐	Traditional provider
☐	Religious provider
☐	Other (specified in Q3d)

Q3g	Where does the circumcision procedure take place? (please check all acceptable locations not only the most common)
☐	At hospital
☐	At health centre/dispensary
☐	At other health facility
☐	At home
☐	In a Church/ Synagogue /Mosque
☐	At another location (please specify)

Q3h Which types of anaesthesia are commonly used for medical circumcision? (please check all that apply)

i) Children (age 1-7 years)

- ☐ None
- ☐ Topical (e.g. EMLA 5% cream)
- ☐ Local (e.g. penile nerve block with lidocaine)
- ☐ General
- ☐ Other (please specify)

ii) Prepuberty (age 8-11 years)

- ☐ None
- ☐ Topical (e.g. EMLA 5% cream)
- ☐ Local (e.g. penile nerve block with lidocaine)
- ☐ General
- ☐ Other (please specify)

Q3i Which procedures are most commonly used? (please check all that apply)

i) Children (age 1-7 years)

- ☐ Dorsal slit
- ☐ Plastibell
- ☐ Mogen clamp
- ☐ Gomco clamp
- ☐ Forceps guided
- ☐ Other (please specify)

ii) Prepuberty (age 8-11 years)

- ☐ Dorsal slit
- ☐ Plastibell
- ☐ Mogen clamp
- ☐ Gomco clamp
- ☐ Forceps guided
- ☐ Other (please specify)

Q3j Please describe post-surgical management (please check all that apply)

i) Children (age 1-7 years)

- ☐ Follow-up visit (please specify when)
- ☐ Written instructions to boy and/or parents (please attach if possible)
- ☐ Medications provided routinely
- ☐ Medications provided as additional treatment as needed only

ii) Prepubertal (age 8-11 years)

- ☐ Follow-up visit (please specify when)
- ☐ Written instructions to boy and/or parents (please attach if possible)
- ☐ Medications provided routinely
- ☐ Medications provided as additional treatment as needed only

Q3k	Are complications recorded? If so,how?

Q3l	What is the overall risk of complications for boys aged 1-11 years per 1000 procedures? (please estimate if not known)

Q3m	(i) Which is the most common complication?

Please specify complication if 'other' was selected in the list above:

(i) How often (roughly) does each complication occur? (please answer for all complications if possible)

Approx # per 1000 procedures

Excess bleeding.

Wound infection

Haematoma/abnormal swelling

Accidental injury to penis

Excessive skin removal

Insufficient skin removal

Anaesthesia complications

Other (specified above)

Q3n What is the typical cost of a male circumcision for different types of providers?

Please specify currency:

i) Children (aged 1-7 years)

Type of provider (1):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

Type of provider (2):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

Type of provider (3):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

ii) Pre-puberty (aged 8-11 years)

Type of provider (1):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

Fee to provider

Surgical costs (consumables & equipment)

Follow-up

Q3n **What is the typical cost of a male circumcision for different types of providers? (continued)**

Type of provider (2):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

Type of provider (3):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

SECTION 4: MALE CIRCUMISION AMONG ADOLESCENTS AND ADULTS

Q4a **Does circumcision occur among males aged 12 or older in your country?**

If you answered 'No' please skip to Section 5, page 18.

If you answered 'Yes' please answer the questions below

Q4b **Who carries out the circumcision procedure for males aged 12 years or older (please check all that apply)**

- ☐ General practitioner
- ☐ Urologist/surgeon
- ☐ Clinical Officer
- ☐ Nurse
- ☐ Traditional provider
- ☐ Religious provider
- ☐ Other (please specify)

Q4c **Which is the most common provider for males aged 12 years or older? (please select one from the dropdown list)**

- ☐ General practitioner
- ☐ Urologist/surgeon
- ☐ Clinical Officer
- ☐ Nurse
- ☐ Traditional provider
- ☐ Religious provider
- ☐ Other (please specify)

Q4d **What training in male circumcision, if any, do these providers have? Please provide information for all types of provider if the training varies for different providers.**

- ☐ General practitioner
- ☐ Urologist/surgeon
- ☐ Clinical Officer
- ☐ Nurse
- ☐ Traditional provider
- ☐ Religious provider
- ☐ Other (specified in Q4b)

Q4e	Where does the adolescent/adult circumcision procedure take place? (please check all acceptable locations not only the most common)

- ☐ At hospital
- ☐ At health centre/dispensary
- ☐ At other health facility
- ☐ At home
- ☐ In a Church/ Synagogue /Mosque
- ☐ At another location (please specify)

Q4f	Which type of anaesthesia is often used for adolescent/adult medical circumcision? (please check all that apply)

- ☐ None
- ☐ Topical (e.g. EMLA 5% cream)
- ☐ Local (e.g. penile nerve block with lidocaine)
- ☐ General
- ☐ Other (please specify)

Q4g	Which procedures are most commonly used? (please check all that apply)

- ☐ Dorsal slit
- ☐ Plastibell
- ☐ Mogen clamp
- ☐ Gomco clamp
- ☐ Forceps guided
- ☐ Other (please specify)

Q4h	Please describe post-surgical management (please check all that apply)

- ☐ Follow-up visit (please specify when)
- ☐ Written instructions to client (please attach a copy if possible)
- ☐ Medications provided routinely
- ☐ Medications provided as additional treatment as needed only

Q4i What is the typical cost of an adolescent/adult male circumcision for each type of provider?

Please specify currency:

Type of provider (1):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

Type of provider (2):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

Type of provider (3):

Most common unit cost:

Range: Minimum cost to maximum cost

Please check all the items included in this cost:

- Fee to provider
- Surgical costs (consumables & equipment)
- Follow-up

SECTION 5: MALE CIRCUMISION POLICIES AND LEGISLATION

Q5a **(i) Is there any current legislation or regulations regarding male circumcision in your country?**

If you answered 'No' please go to question 5b below.

If you answered 'Yes' please answer parts (ii) and (iii) in the boxes below

(ii) If you answered yes to the question above, please provide a reference to this legislation or regulation e.g. a parliamentary bill, Ministry of Health directive, local government order

Reference:

(iii) If you answered yes to the question above, please provide brief details of the current legislation or regulations.

i) For neonates and infants (age up to 1 year)

ii) For children and pre-pubescent boys (age 1-11 years)

Q5b **Is there typically a procedure of informed consent?**

i) For age up to 1 year

If you answered yes, please describe and attach the information sheet if possible:

ii) For ages 1-11 years

If you answered yes, please describe and attach the information sheet if possible:

ii) For ages 12 years and older

If you answered yes, please describe and attach the information sheet if possible:

Finally, please could you let us have contact details of others in your country who might be able to provide further details on male circumcision in different settings

1.	Name:	
	Position:	
	Email address:	
	Telephone/fax number:	

2.	Name:	
	Position:	
	Email address:	
	Telephone/fax number:	

3.	Name:	
	Position:	
	Email address:	
	Telephone/fax number:	

We would also greatly appreciate if you could list any relevant publications on male circumcision from your country

Thank you very much for taking the time to complete this questionnaire. We look forward to sending you our final report.

NOTES

UNAIDS
20 AVENUE APPIA
CH-1211 GENEVA 27
SWITZERLAND

Tel.: (+41) 22 791 36 66
Fax: (+41) 22 791 48 35
e-mail: distribution@unaids.org

www.unaids.org

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