Tetanus disease and deaths in men reveal need for vaccination
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Abstract With efforts focused on the elimination of maternal and neonatal tetanus, less attention has been given to tetanus incidence and mortality among men. Since 2007 voluntary medical male circumcision has been scaled-up in 14 sub-Saharan African countries as an effective intervention to reduce the risk of human immunodeficiency virus (HIV) acquisition among men. As part of a review of adverse events from these programmes, we identified 13 cases of tetanus from five countries reported to the World Health Organization (WHO) up to March 2016. Eight patients died and only one patient had a known history of tetanus vaccination. Tetanus after voluntary medical male circumcision was rare among more than 11 million procedures conducted. Nevertheless, the cases prompted a review of the evidence on tetanus vaccination coverage and case notifications in sub-Saharan Africa, supplemented by a literature review of non-neonatal tetanus in Africa over the years 2003–2014. The WHO African Region reported the highest number of non-neonatal tetanus cases per million population and lowest historic coverage of tetanus-toxoid-containing vaccine. Coverage of the third dose of diphtheria–tetanus–polio vaccine ranged from 65% to 98% across the 14 countries in 2013. In hospital-based studies, non-neonatal tetanus comprised 0.3–10.7% of admissions, and a median of 71% of patients were men. The identification of tetanus cases following voluntary medical male circumcision highlights a gender gap in tetanus morbidity disproportionately affecting men. Incorporating tetanus vaccination for boys and men into national programmes should be a priority to align with the goal of universal health coverage.

Introduction
Tetanus is a rapidly progressing, painful disease with a high mortality rate, yet is inexpensive to prevent. Although tetanus toxoid was first licensed as a vaccine in 1937, tetanus remains a public health problem in many parts of the world and is often fatal, even within modern intensive care facilities.1–3 According to World Health Organization (WHO) recommendations, a series of three tetanus-toxoid-containing vaccine doses should be given in infancy, followed by booster doses at the age of school entry, in adolescence and in adulthood to induce longer-term immunity.1,5 WHO’s focus on the elimination of maternal and neonatal tetanus by 2015 led to vaccination strategies targeting women of reproductive age and infants.5–6 Less attention, however, has been given to the immunization of males after infancy. Data on child and adult vaccination coverage and tetanus incidence and mortality among men are limited.

Emerging reports of cases of tetanus following voluntary medical male circumcision in different sub-Saharan African countries drew our attention to the possibility of a gender disparity in tetanus morbidity that disproportionately affected men. In this paper we report a summary of the reported tetanus cases, together with a review of the evidence on tetanus vaccination coverage and case notification in sub-Saharan Africa, supplemented by a review of the literature on non-neonatal tetanus over the past 10 years.

Emerging reports

Context
Voluntary medical male circumcision is an effective intervention to reduce the risk of human immunodeficiency virus (HIV) acquisition among men. When the intervention is scaled-up, HIV incidence is reduced and costs are saved for health programmes and budgets.6 In 2007, WHO and the Joint United Nations Programme on HIV/AIDS recommended the intervention in countries with a high prevalence of HIV and historically low rates of male circumcision.7 By the end of 2015 over 11 million men had been circumcised through voluntary medical male circumcision programmes in 14 priority countries in eastern and southern Africa: Botswana, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, the United Republic of Tanzania, Uganda, Zambia and Zimbabwe (unpublished data, WHO, 2016). As an elective procedure chosen by often healthy men to reduce future HIV risk, ensuring its safety is a priority. Three conventional surgical methods (dorsal slit, forceps-guided and sleeve resection) and two device methods (clamps or collars that remain in place for 1 week) have been used. WHO has recommended 10 standards for quality assurance, including infection prevention and control,8 and has encouraged each country to carry out adverse event surveillance, particularly when implementing new methods. WHO made an initial review of adverse events identified from voluntary medical male circumcision programmes in 2014 and continues to do so through post-market surveillance and country reports.

Tetanus case reports

We examined summary reports of all tetanus cases reported to the national voluntary medical male circumcision programmes and submitted to WHO. Additional details were requested from ministries of health as needed. We identified reports of 13 cases of tetanus in which the client presented for care within 14 days of a voluntary medical male circumcision procedure; eight cases resulted in death (Table 1). The cases, recorded from April 2012 up to March 2016, were reported from five of the 14 priority African countries: Kenya, Rwanda, Uganda, the United Republic of Tanzania and Zambia.
The circumcision methods included both conventional surgery (eight patients, of whom five died) and an elastic collar compression device method (five patients, of whom three died). The period from surgery or device placement to symptom onset ranged from 5 to 12 days, with a mean of 11.8 days to clinical diagnosis. Mean time to death was 15.8 days for the eight patients who died. Using a standardized case definition,12 of the 13 cases were consistent with a causal association with male circumcision. Health-care providers who examined the patients for tetanus reported that the circumcision wound was septic in seven patients, whereas the same circumcision wound was noted to be clean in six patients at a circumcision follow-up visit before tetanus was diagnosed. It is possible that health-care providers unfamiliar with the appearance of circumcision wound healing may have misclassified the wound as septic. Alternatively, the infection could have occurred after the last circumcision visit or could have been from another injury. Five patients had other potential wound sites including injuries and infections of the lower limbs. A home remedy had been applied to the circumcision wound in five patients treated with surgery and possibly in two patients with devices. Hygiene conditions of the person or his home were noted to be poor in five patients.

Nine of the 13 patients were adolescents (aged 10–19 years). All men who were working had outdoor-based occupations such as farming and brick-making. Based on records or patients’ recall, only one of the 13 patients had a history of tetanus vaccination. However, three patients had received tetanus toxoid immediately before the procedure; one patient because pre-surgical vaccination was the routine practice of the clinic that provided the circumcisions and two patients because the programme instructions were updated in 2015. One of these patients died after device-type circumcision.

### Non-neonatal tetanus risk

#### Tetanus notifications

These emerging reports of tetanus cases after voluntary male circumcision prompted us to review the global data on non-neonatal tetanus. We examined the official WHO database for country-specific annual numbers of reported tetanus cases.10 Although non-neonatal tetanus (i.e. cases in patients over the age of 28 days) is not a reportable condition, some countries report both neonatal and non-neonatal cases. Neonatal tetanus reporting to the WHO notifiable surveillance system has very low notification efficiency, ranging from 3% to 11%,13 and cases of non-neonatal tetanus have not been routinely reported by most countries. Due to this differential reporting, comparisons across individual countries and WHO regions were difficult. As an indication, however, in 2013 the WHO African Region had the highest reported number of non-neonatal tetanus cases at 4.0 per million population (3732 cases among the total regional population of 927 370 712; Table 2), followed by the South-East Asia Region at 1.9 per million population (3432 cases among 1 855 067 643 people). Of the 12 African countries reporting any cases of non-neonatal tetanus, Uganda – the only country among them implementing voluntary medical male circumcision for HIV prevention – had the highest number of non-neonatal tetanus cases at 67.1 per million population (2522 cases among 37 578 880 people; Table 3).

#### Tetanus vaccination coverage

We also analysed the global joint WHO and United Nations Children’s Fund database12 for official data on countries’ coverage of the third dose of infant diphtheria–pertussis–tetanus (DPT3) vaccine from 1980 to 2013, grouped by WHO region. Coverage of fourth, fifth and sixth booster doses are not routinely reported. In 1980, when WHO started collecting data on DTP3 vaccination coverage, all regions apart from the Americas and European had coverage under 20%. Since then, global coverage of DTP3 vaccination increased steeply (Fig. 1) and by 2013 the lowest regional coverage was 75% in the WHO African Region and the global average was 86%.

Fig. 2 shows DTP3 vaccination coverage in the nine African countries implementing voluntary medical male circumcision that have reported a case of tetanus after the procedure or that have

### Table 1. Key features of 13 cases of tetanus after voluntary medical male circumcision reported to the World Health Organization from 2012 to 2016

| Procedure date | Country            | Client’s age, years | Procedure method | Days to symptoms | Days to diagnosis | Days to death | Circumcision wound | Unclean substance applied to wound | Alternate exposure route on body |
|----------------|--------------------|---------------------|------------------|------------------|------------------|--------------|-------------------|-----------------------------------|---------------------------------|
| Mar 2016       | Rwanda             | 34                  | Device           | 8                | 11               | 12           | Clean             | Unknown                          | No                               |
| Sep 2015       | Rwanda             | 39                  | Device           | Unknown          | 14               | N/A          | Clean             | Unconfirmed                      | Yes                              |
| Mar 2015       | Uganda             | 11                  | Surgery          | 7                | 10               | 12           | Septic            | Yes                               | No                               |
| Mar 2015       | Uganda             | 19                  | Surgery          | 10               | 12               | N/A          | Clean             | Unknown                          | Yes                              |
| Nov 2014       | United Republic of Tanzania | 18 | Surgery          | 11               | 16               | 35           | Septic            | Yes                               | Unknown                          |
| Sep 2014       | Uganda             | 32                  | Device           | 7                | 8                | 14           | Septic            | Unknown                          | Unknown                          |
| Sep 2014       | Uganda             | 11                  | Surgery          | 11               | 12               | 17           | Septic            | Yes                               | Yes                              |
| Aug 2014       | Kenya              | 15                  | Surgery          | 11               | 11               | 13           | Septic            | Yes                               | No                               |
| Aug 2014       | Uganda             | 19                  | Device           | 11               | 12               | 14           | Septic            | Unknown                          | Unknown                          |
| May 2014       | Rwanda             | 47                  | Device           | 12               | 12               | N/A          | Clean             | Unconfirmed                      | Yes                              |
| Jun 2013       | Uganda             | 18                  | Surgery          | 8                | 15               | N/A          | Clean             | Unknown                          | Yes                              |
| Dec 2012       | Zambia             | 12                  | Surgery          | 5                | 8                | 9            | Septic            | Yes                               | No                               |
| Apr 2012       | Zambia             | 16                  | Surgery          | 12               | 12               | N/A          | Septic            | Unknown                          | No                               |

N/A: not applicable.
Table 2. Cases of non-neonatal tetanus reported in 2013, by region of the World Health Organization

| Region                          | Population* | No. of reported tetanus cases | No. of non-neonatal cases per 1 000 000 population¹ |
|--------------------------------|-------------|-------------------------------|---------------------------------------------------|
|                                |             | All   | Neonatal | Non-neonatal |                                 |
| African Region                 | 927 370 712 | 6 508 | 2 776    | 3 732        | 4.0                             |
| Region of the Americas         | 966 494 922 | 457   | 20       | 437          | 0.5                             |
| Eastern Mediterranean Region   | 612 580 145 | 1 513 | 1 280    | 233          | 0.4                             |
| European Region                | 906 995 743 | 102   | 0        | 102          | 0.1                             |
| South-East Asia Region         | 1 855 067 643 | 4 153 | 721      | 3 432        | 1.9                             |
| Western Pacific Region         | 1 857 588 557 | 2 127 | 679      | 1 448        | 0.8                             |

¹ 2013 World Health Organization (WHO) mid-year country population estimate.
² Non-neonatal tetanus (occurring after the first 28 days of life) is not a reportable condition and therefore many countries do not report this figure to WHO.
³ Due to reporting differences between countries, this number should not be interpreted as the incidence. It is provided as an indication of the scale of the problem; direct comparisons between Regions should not be made.
⁴ Source: World Health Organization, online database.

Table 3. African countries reporting any cases of non-neonatal tetanus

| Country               | Population* | No. of reported tetanus cases | No. of non-neonatal cases per 1 000 000 population¹ |
|-----------------------|-------------|-------------------------------|---------------------------------------------------|
|                       |             | All   | Neonatal | Non-neonatal |                                 |
| Angola                | 21 471 617  | 360   | 33       | 327          | 15.2                             |
| Burkina Faso         | 16 934 383  | 27    | 0        | 27           | 1.6                              |
| Democratic Republic of the Congo | 67 513 680 | 1 359 | 1 327    | 32           | 0.5                              |
| Liberia              | 4 294 078   | 8     | 0        | 8            | 1.9                              |
| Madagascar           | 22 924 850  | 556   | 8        | 548          | 23.9                             |
| Mali                 | 15 301 650  | 37    | 12       | 25           | 1.6                              |
| Mauritania           | 3 889 882   | 4     | 0        | 4            | 1.03                             |
| Niger                | 17 831 269  | 71    | 1        | 70           | 3.9                              |
| Nigeria              | 173 615 344 | 556   | 468      | 88           | 0.5                              |
| Senegal              | 14 133 280  | 78    | 4        | 74           | 5.2                              |
| South Sudan          | 11 296 174  | 32    | 25       | 7            | 0.6                              |
| Uganda               | 37 578 880  | 2 928 | 406      | 2 522        | 67.1                             |

¹ 2013 World Health Organization (WHO) mid-year country population estimate.
² Non-neonatal tetanus (occurring after the first 28 days of life) is not a reportable condition and therefore many countries do not report this figure to WHO.
³ Due to reporting differences between countries, and likely data quality issues, this number should not be interpreted as the incidence. It is provided as an indication of the scale of the problem; direct comparisons between countries should not be made.
⁴ Source: World Health Organization, online database.

low DTP3 coverage (≤ 75% coverage in at least 2 years since the year 2000). Among these countries, the DTP3 vaccination coverage reached 80% on average in 2005 and ranged from 65% in South Africa to 98% in Rwanda in 2013. As far as we are aware, most of the 14 priority countries for voluntary medical male circumcision have no policy for vaccinating males against tetanus after infancy.

**Literature review**

To supplement evidence from the surveillance data, we conducted a literature review to gather additional information on non-neonatal tetanus. We searched the PubMed database using the MeSH terms “tetanus” and “Africa South of the Sahara”. We restricted the results to human studies in the period 2003–2014 and included all studies on adolescents and adults in any language. We excluded studies related to neonatal tetanus as well as case reports. At a minimum we reviewed all abstracts, including English versions of non-English publications, and obtained the full text of selected manuscripts.

Our database search resulted in 259 studies, of which 28 were on non-neonatal tetanus; we included a further four studies identified from references or by colleagues. These 32 studies originated from 10 African countries; all were based on hospital inpatient cases. Their key features are summarized in Table 4. Across the studies, a median of 71% of patients admitted to hospital with tetanus were men. The median age of tetanus patients (estimated from the mean and median ages, as reported in the articles) was 32.7 years. Non-neonatal tetanus cases comprised 0.3–10.7% of all hospital admissions, and in one Côte d’Ivoire study, surgery-related tetanus constituted 11.0% of all 273 non-neonatal tetanus admissions. The median case fatality rate from non-neonatal tetanus was 44.0% and ranged from 0% of 12 inpatients in a small Nigerian study to 80.0% of 175 children in another Nigerian study. Ten studies listed lower limb injuries as one of the main causes of tetanus, and two studies mentioned male circumcision among their infection sources. Based on the eight studies reporting vaccination status, high proportions of tetanus inpatients had not been vaccinated (range: 83–100%) or had unknown vaccination status.

**Discussion**

Our investigation into tetanus cases identified through voluntary medical male circumcision programmes and an analysis of available global data highlights a gender gap in tetanus morbidity that disproportionately affects men. The occurrence of tetanus following voluntary medical male circumcision was rare – with 13 cases reported from programmes that have conducted over 11 million procedures by the end of 2015 – and may be no higher than the background incidence of tetanus among men in these countries.

National tetanus case reporting and hospital studies suggest that the incidence...
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of non-neonatal tetanus may be substantial in some countries in the WHO African Region, and that the majority of inpatient cases are among men. As non-neonatal tetanus is not reportable in most low- and middle-income countries, the underlying tetanus burden may be higher than we found. The efforts worldwide towards the goal of elimination of maternal and neonatal tetanus has reduced tetanus incidence and mortality in those groups through vaccination during pregnancy and clean delivery and cord-care practices. However, adolescent and adult men seem to have been largely missed by vaccination programmes, as implementation of the WHO-recommended fourth to sixth doses of tetanus vaccine to adolescents and adults has been limited. Only one of the 13 tetanus cases reported by voluntary medical male circumcision programmes had a known history of tetanus vaccination. Three clients received a dose of tetanus-toxoid-containing vaccine immediately before male circumcision; two recovered from the tetanus infection and one died.

We found that infant tetanus-toxoid-containing vaccine coverage levels in the African Region as a whole, and in some countries in particular, were historically low, although they have increased greatly since 1980. Countries with a history of low coverage of infant immunization, and no national policy or practice for tetanus vaccine administration to adolescent or adult men, could be expected to have a large proportion of adolescent and adult men who are insufficiently protected against tetanus infection. These men are therefore at risk of acquiring tetanus from injuries or surgical procedures. Voluntary medical male circumcision programmes must maintain quality assurance standards, including infection control, and inform clients of the risk of tetanus if the circumcision wound is exposed to substances that might be contaminated with Clostridium tetani spores, including home remedies.

Incorporating tetanus vaccination into voluntary medical male circumcision programmes should be seen as a priority. In vaccine-naïve individuals, two tetanus-toxoid-containing vaccine doses spaced 4 weeks apart are needed, with a further 2-week interval before performing the procedure. Providing a booster dose at least seven and ideally 14 days before voluntary medical male circumcision in individuals who are not fully vaccinated may induce partial immunity; an additional dose given after the procedure would also provide longer-term immunity. In the long term, tetanus vaccination, which costs less than 1 United States dollar, should be included in school-based programmes for both girls and boys at ages 4–7 years and 12–15 years, with additional targeting of...
| Reference | Country | Study period | Population | Total no. of hospital admissions | Non-neonatal tetanus cases |
|-----------|---------|--------------|------------|----------------------------------|---------------------------|
|           |         |              |            |                                  | No. | Average age, ab years | Male, % | Case fatality rate, % |
| Sawe et al. (2014) | United Republic of Tanzania | 2009–2011 | ICU admissions at four tertiary hospitals | 5 627 | 135 | – | – | 71.0 |
| Muteya et al. (2013) | Democratic Republic of the Congo | 2005–2009 | All tetanus admissions | 1 029 | 22 | 39.4 | 95.2 | 52.4 |
| Traoré et al. (2013) | Guinea | 2001–2012 | Tetanus cases at all hospitals in Conakry | 8 649 | 239 | – | 73.0 | 75 |
| Oshinaike et al. (2012) | Nigeria | 2006–2011 | Tetanus admissions, age > 10 years | 9374 | 218 | 29.4 | 75.6 | 56.2 |
| Bankole et al. (2013) | Nigeria | 2000–2009 | Adult tetanus admissions | 78 009 | 190 | 30.4 | 75.0 | 16.3 |
| Amare et al. (2012) | Ethiopia | 2001–2009 | Tetanus admissions, age ≥ 13 years | – | 68 | 33.8 | 77.9 | 35.3 |
| Minta et al. (2012) | Mali | 2004–2009 | Tetanus admissions, age ≥ 15 years | 1 839 | 119 | 32.9 | 84 | 46.2 |
| Aba et al. (2012) | Côte d’Ivoire | 2003–2008 | Surgical tetanus cases | 273 | 29 | 36.0 | 79 | 45.0 |
| Amare et al. (2011) | Ethiopia | 1996–2009 | Tetanus admissions, age ≥ 13 years | – | 171 | 33.0 | 75.4 | 38.0 |
| Ugwu and Ugwu (2011) | Nigeria | 1999–2008 | Children after intramuscular injection | 175 | 12 | – | 60.0 | 80.0 |
| Akhuwa et al. (2010) | Nigeria | 2005–2008 | Post-neonatal tetanus cases | – | 18 | 5.8 | 77.0 | 5.9 |
| Fawibe (2010) | Nigeria | 2002–2006 | Adult tetanus admissions | 3 514 | 41 | 33.0 | 85.7 | 57.1 |
| Tadesse et al. (2009) | Ethiopia | 2003–2008 | Adult tetanus admissions | – | 29 | 35.0 | 65.5 | 41.4 |
| Dao et al. (2009) | Mali | 2001–2004 | All tetanus admissions | 965 | 57 | 39.0 | 69.0 | 38.9 |
| Zziwa et al. (2009) | Uganda | 2005–2008 | All tetanus admissions | 25 118 | 145 | – | 66.0 | 38.4 |
| Chukwuibike et al. (2009) | Nigeria | 1996–2005 | Tetanus admissions, age ≥ 16 years | 8 762 | 86 | 30.2 | 58.1 | 42.9 |
| Ajose and Odusanya (2009) | Nigeria | 2004–2006 | Adult tetanus admissions | – | 164 | 29.6 | 75.6 | 70.1 |
| Towey and Ojara (2008) | Uganda | 2005–2006 | All ICU admissions | 218 | 17 | – | – | 47.0 |
| Soumaré et al. (2008) | Senegal | 1999–2006 | Post-circumcision tetanus at infectious diseases clinic | 27 295 | 1 291 | 9.0 | n/a | 7.4 |
| Onwuekwe et al. (2008) | Nigeria | 1999–2003 | All tetanus admissions | – | 12 | 29.8 | 58.0 | 0.0 |
| Komolafe et al. (2007) | Nigeria | 1995–2004 | Adult tetanus admissions | – | 79 | – | 70.9 | 45.0 |
| Sanya et al. (2007) | Nigeria | 1990–2001 | Adult tetanus admissions | – | 288 | 36.1 | 69.3 | 63.9 |
| Melaku et al. (2006) | Ethiopia | 1985–2000 | All tetanus admissions | 3 548 | 146 | 32.3 | 69.9 | 49.3 |
| Ndour et al. (2005) | Senegal | 1999–2002 | Tetanus after intramuscular injection | – | 46 | 34.5 | 63 | 60.8 |
| Amsalu et al. (2005) | Ethiopia | 1989–1998 | Children with tetanus diagnosis | – | 51 | 9.0 | 54 | 31.4 |
| Soumaré et al. (2005) | Senegal | Mar–Sep 2002 | Children with tetanus, age 1–15 years | 757 | 40 | 8.8 | 75.0 | 8.0 |
| Soumaré et al. (2005) | Senegal | Sep–Dec 2002 | Tetanus admissions, age > 4 years | – | 30 | 36.0 | 70.0 | 26.7 |
| Ojini and Danesi (2005) | Nigeria | 1990–1999 | Tetanus admissions, age ≥ 10 years | – | 349 | 29.8 | 66.0 | 37.0 |
| Seydi et al. (2005) | Senegal | 2001–2003 | Tetanus admissions, age > 28 days | 4 123 | 440 | 20.0 | 70.7 | 22.0 |

(continues ...)

*B* Statistically significant.
adults to ensure long-lasting protection from this disease.

Some of the limitations of our analyses are that first, many countries do not report non-neonatal tetanus cases to WHO. This reporting difference may lead to the burden of tetanus appearing greater in some countries or regions than in others. For this reason, we have limited our interpretation of these data to an indi-
cation of broad trends in tetanus rates and not an analysis of incidence. Second, our review of the literature was limited to one database. However, we believe it was sufficient to gain a general picture of the burden of non-neonatal tetanus in sub-Saharan Africa.

In conclusion, although both men and women are at risk of tetanus infection, our analyses show that there is an underlying burden of tetanus among adolescent and adult men who have been largely missed by vaccination programmes. Incorporating tetanus-toxoid-containing vaccine for boys and men into national immunization programmes should be encouraged to reduce the morbidity and mortality from this prevent-
able disease. Enhanced personal hygiene and wound-care practices should also be emphasized after voluntary medical male circumcision. Elevating non-neonatal tetanus to a reportable condition would fill the knowledge gap about the incidence. The convergence of cost-effective solutions to two public health problems affecting men – HIV and tetanus – offers an opportunity for service synergies and enhanced health equity. Addressing this gender gap, and aligning with goals for universal health coverage and access to vaccines for all, should be an explicit pol-
icy goal for national health programmes and relevant partners.

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Dedicated to the memory of Dr Martha H Roper whose public health career contributed to preventing illness and deaths from tetanus.

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**Competing interests:** None declared.

### References

| Reference | Country | Study period | Population | Total no. of hospital admissions | Non-neonatal tetanus cases |
|-----------|---------|--------------|------------|---------------------------------|----------------------------|
| Mchembe and Mwafongo (2005) | United Republic of Tanzania | Jan–Dec 2004 | Tetanus admissions | – | 22 | 91.0 | 72.7 |
| Tanon et al. (2004) | Côte d’Ivoire | 1985–1998 | All tetanus admissions | 62,313 | 1,870 | 28.0% | 71.0 | 31.9 |
| Hesse et al. (2003) | Ghana | 1994–2001 | All tetanus admissions | – | 158 | 32.7% | 76.6 | 50.0 |

ICU: intensive care unit.

Note: Dashes indicate data not available or not applicable.

Extended Table

| Reference | Country | Study period | Population | Total no. of hospital admissions | Non-neonatal tetanus cases |
|-----------|---------|--------------|------------|---------------------------------|----------------------------|
| Mchembe and Mwafongo (2005) | United Republic of Tanzania | Jan–Dec 2004 | Tetanus admissions | – | 22 | 91.0 | 72.7 |
| Tanon et al. (2004) | Côte d’Ivoire | 1985–1998 | All tetanus admissions | 62,313 | 1,870 | 28.0% | 71.0 | 31.9 |
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ICU: intensive care unit.

Note: Dashes indicate data not available or not applicable.

**Melchan**

**Case Reports**

**Summary**

Our analyses show that there is an underlying burden of tetanus among adolescent and adult men who have been largely missed by vaccination programmes. Incorporating tetanus-toxoid-containing vaccine for boys and men into national immunization programmes should be encouraged to reduce the morbidity and mortality from this preventable disease. Enhanced personal hygiene and wound-care practices should also be emphasized after voluntary medical male circumcision. Elevating non-neonatal tetanus to a reportable condition would fill the knowledge gap about the incidence. The convergence of cost-effective solutions to two public health problems affecting men – HIV and tetanus – offers an opportunity for service synergies and enhanced health equity. Addressing this gender gap, and aligning with goals for universal health coverage and access to vaccines for all, should be an explicit policy goal for national health programmes and relevant partners.
Résumé

Les cas de tétanos et de décès liés au tétanos dans la population masculine révèlent la nécessité de la vaccination

Avec l'orientation des efforts sur l'élimination du tétanos maternel et néonatal, une moindre attention a été portée sur l'incidence et la mortalité du tétanos dans la population masculine. Depuis 2007, la circoncision masculine volontaire s'est intensifiée dans 14 pays d'Afrique subsaharienne, en tant qu'intervention efficace pour réduire le risque d'acquisition du virus de l'immunodéficience humaine (VIH) chez les hommes. Dans le cadre d'une analyse des effets indésirables de ces programmes, nous avons identifié 13 cas de tétanos, dans cinq pays, qui ont été notifiés à l'Organisation mondiale de la Santé (OMS) jusqu'à mars 2016. Huit patients sont décédés et un seul patient avait un antécédent connu de vaccination antitétanique. Sur plus de 11 millions de procédures réalisées, les infections tétaniques suite à une circoncision masculine volontaire ont été rares. Néanmoins, ces cas d'infection nous ont poussés à mener une étude des données disponibles sur la couverture antitétanique et sur la notification des cas en Afrique subsaharienne, complétée par une revue de la littérature sur les tétanos non-néonatal en Afrique sur la période de 2003 à 2014. Sur la période étudiée, les pays répertoriés dans la région africaine de l'OMS correspondent au plus grand nombre de cas de tétanos non-néonatal pour un million d'habitants et à la plus faible couverture vaccinale par anatoxine tétanique. En 2013, dans les 14 pays considérés, le taux d'administration de la troisième dose du vaccin diphtérie-tétanos-poliovérité se situait entre 65% et 98%. Selon les études réalisées dans des hôpitaux, le tétanos non néonatal est responsable de 0,3 à 10,7% des admissions, pour lesquelles 71% des patients, en moyenne, sont des hommes. L'identification des cas de tétanos déclarés après une circoncision masculine volontaire a permis de révéler une disparité homme-femme en termes de mortalité, en défaveur des hommes. L'intégration de la vaccination antitétanique des garçons et des hommes dans les programmes nationaux devrait être une priorité pour poursuivre l'objectif de couverture sanitaire universelle.

Случаи заболевания и смерти мужчин от столбняка показывают необходимость вакцинацииРезюме

Сосредоточение усилий на борьбе со столбняком новорожденных и матерей привело к тому, что меньше внимания стало уделяться заболеваемости столбняком и смертности от него среди мужчин. С 2007 года в 14 странах Африки к югу от Сахары расширилось участие населения в программах добровольного медицинского обрезания мужского пола, что сделало возможным снижение риска заражения вирусом иммунодефицита человека (ВИЧ) среди мужчин. В ходе анализа нежелательных явлений, вызванных этими программами, были определены 13 случаев заболевания столбняком, о которых известно, что у всех пациентов была антисыворотка против столбняка и у 71% из них заболевание проявилось почти сразу после вмешательства. В исследовании были изучены случаи столбняка, известные до 2016 года, когда была обнаружена связь между частотой случаев столбняка и применением вакцинации против столбняка. Среди всех 11 миллионов человек, подвергнутых процедуре добровольного медицинского обрезания, частота случаев заболевания столбняком была невелика. Тем не менее, борьба с этим заболеванием является приоритетом для всех стран, включая Африку к югу от Сахары. Дополнительно с этим анализом был проведен обзор литературных источников, относящихся к заболеваемости столбняком (в том числе неонатальным) в Африке за период между 2003 и 2014 годами. Большинство случаев заболеваний столбняком (в том числе неонатальных) на миллион жителей в Африке к югу от Сахары было отмечено в 14 странах в 2013 году. Согласно результатам исследований, проведенных с участием пациентов больниц, диагноз столбняка (в том числе неонатального) был поставлен у 3–10,7% поступивших в больницы мужчин. Выводы из проведенных исследований показывают, что вакцинация против столбняка может стать важным аспектом для улучшения здоровья мужчин. Внедрение вакцинации против столбняка для маленьких и взрослых мужчин в национальные программы должно быть приоритетом для достижения согласованности в борьбе с этой проблемой.
Resumen
La enfermedad del tétanos y las muertes en hombres revelan la necesidad de vacunación

Dado que se han concentrado los esfuerzos en la eliminación del tétanos materno y neonatal, se ha prestado menos atención a la incidencia y mortalidad del tétanos en los hombres. Desde 2007, ha aumentado la circunscpción médica masculina voluntaria en 14 países subsaharianos, puesto que se trata de una intervención efectiva para reducir el riesgo de contagio del virus de la inmunodeficiencia humana (VIH) en los hombres. Como parte de una revisión de los fenómenos adversos derivados de estos programas, se identificaron 13 casos de tétanos de cinco países notificados a la Organización Mundial de la Salud (OMS) hasta marzo de 2016. Ocho pacientes murieron y solo uno estaba vacunado contra el tétanos. Tras practicar la circunsción médica masculina voluntaria, el tétanos era poco frecuente entre más de 11 millones de intervenciones realizadas. No obstante, los casos dieron lugar a una revisión de la prueba de la cobertura de vacunas contra el tétanos y las notificaciones de los casos en el África subsahariana, junto con una revisión documental del tétanos no neonatal en África durante los años 2003 a 2014. La OMS de la región africana informó del mayor número de casos de tétanos no neonatal por cada millón de habitantes y de la menor cobertura de la vacuna con toxoido tétancico de la historia. En 2013, la cobertura de la tercera dosis de la vacuna de la difteria, tétanos, polio abarcó de un 65% a un 98% en los 14 países. En estudios centrados en los hospitales, el tétanos no neonatal abarcó entre un 0,3% y un 10,7% de admisiones, y una media de 71% de los pacientes eran hombres. La identificación de los casos de tétanos tras la circunsción médica masculina voluntaria destaca una diferencia desproporcionada entre hombres y mujeres en cuanto a la morbilidad por tétanos, en detrimento de los hombres. La incorporación de vacunas contra el tétanos para niños y hombres en programas nacionales debería ser prioritaria para ajustarse al objetivo de cobertura sanitaria universal.

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