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TETANUS NEARLY ELIMINATED AFTER 40 YEARS OF VACCINATION IN RURAL SENGEREMA DISTRICT, TANZANIA

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TETANUS NEARLY ELIMINATED AFTER 40 YEARS OF VACCINATION IN RURAL SENGEREMA DISTRICT, TANZANIA

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ABSTRACT

Objective: To study the incidence of tetanus during the last 50 years in Sengerema, Tanzania.

Design: Analysing the annual reports in the only district hospital, focusing on the number of admissions and mortality for tetanus and malaria.

Setting: Sengerema Hospital, Sengerema district, Tanzania.

Subject: Number of admissions and mortality in Sengerema Hospital due to tetanus.

Interventions: In the seventies and eighties a vaccination campaign was started and organised in order to cover the whole district and to provide immunity for tetanus.

Main outcome measures: From 1962 to 2012, we analysed the incidence and fatality rate of tetanus.

Result: One hundred and fifteen admissions in the sixties, increasing to 183 in the seventies, dropping to 30 in the nineties. For the last ten years 18 patients with tetanus were seen in the only district hospital. Then last year no admissions for tetanus were registered. The number of deaths due to tetanus decreased simultaneously, during the last decade a single fatality case was reported.

Conclusion: During the last decades, we have witnessed the disappearing of tetanus in Sengerema Hospital. The incidence of tetanus can be reduced significantly or eliminated by an effective immunisation programme, even in rural Tanzania.

INTRODUCTION

Tetanus is caused by the bacterium *Clostridium tetani*, the spores of which are widespread in the environment. The disease is caused by the action of a neurotoxin, produced by the bacteria when they grow in the absence of oxygen, for example, in dirty wounds or in the umbilical cord if it is cut with a non-sterile instrument. Tetanus, in particular the neonatal form, remains a significant public health problem in developing countries (1). It is a life threatening preventable infection with a high mortality (2). Tetanus is characterised by muscle spasms, initially in the jaw muscles. The most common presenting symptoms are trismus in 95.7%, neck stiffness in 89.3% and body spasms/stiffness in 73% (3). The incidence of tetanus can be reduced significantly by an effective immunisation programme and proper wound management of the patients (4). The standard care practice in many places is that adults

receive a booster vaccine every ten years and to give the booster to any patient with a puncture wound who is uncertain of when he or she was last vaccinated, or if he or she has had fewer than three lifetime doses of the vaccine. Tetanus can be prevented by vaccination with tetanus toxoid, but the booster may not prevent a potentially fatal case of tetanus from the current wound, because it can take up to two weeks for tetanus antibodies to form (5). In children under the age of seven, the tetanus vaccine is often administered as a combined vaccine, which also includes vaccines against diphtheria and pertussis (6,7). The WHO certifies countries as having eliminated maternal or neonatal tetanus. Certification requires at least two years of rates < 1 case per 1000 live born. After a major public health effort New Zealand was certified as having eliminated tetanus (8).

During the seventies campaigns were started to vaccinate the community against tetanus in Sengerema district, Mwanza region, Tanzania. Our

aim was to determine the current incidence and case fatality rate based on an analysis of patients with tetanus, who had been hospitalised in the only district hospital between 1962 and 2012.

MATERIALS AND METHODS

Design of the study: In Sengerema Designated District Hospital information was obtained on yearly numbers of inpatient admissions, deliveries and death for tetanus for the years 1962-2012.

Setting: Sengerema Hospital was founded in 1959 by the Dutch congregations of the brothers of Mercy and the sisters of Charity. The hospital is localised 10km south of the southern shores of Lake Victoria and about 30km west from Mwanza. In 1976 Sengerema Hospital became Designated District Hospital with treatment free of charge and after 1994 based on cost-sharing.

Sengerema Designated District Hospital is the referral centre for eight health centres and 53 dispensaries in the district. The hospital is providing preventive and curative health services to a population of inhabitants, mainly Wasukuma.

Vaccination: All mother and child health (MCH) activities in the district are carried out under the supervision of the district MCH-coordinator, trained in primary healthcare. There are statistic clinics in the district in combination with 16 outstations, reached by the mobile MCH-clinics. Aims in MCH work was to get fully vaccinated all under-fives and antenatal women in the district. As vaccination three times DPT, polio and measles were given, including BCG vaccination once because it is leaving a scar on the arm indicating whether the child has been vaccinated or not. In the seventies and eighties a vaccination campaign was organised in order to cover the whole district and to provide immunity for tetanus, measles and BCG vaccination as well because it is a vaccination to be given only once and leaving a scar on the arm as indicator. The aim was to have monthly clinics to reach a fully vaccinated condition in all under-fives and pregnant women.

Data collection, analysis: The annual reports of Sengerema Hospital of the last 50 years were analysed, using the International Classification of Diseases (ICD) of the World Health Organization (9). Reporting of diseases was included since 1962. All diagnoses of patients admitted in Sengerema Hospital at the inpatient department (IPD) or seen at the outpatient department (OPD) were registered and case fatality rates were recorded by medical officers during their weekly administration. The diagnosis was based on the presentation of tetanus symptoms. There are currently no blood tests that can be used to diagnose tetanus. The proportion of

total admissions and total deaths due to tetanus and other infectious diseases were calculated for the last five decades. Data were based on ten-year period to prevent under- and over diagnosis. We used robust analytic methods to generate estimates of number of admission and deaths due to tetanus and calculated the case fatality rate (CFR) for each decade between 1962 and 2012 in Sengerema Hospital, Tanzania, the only district hospital in this rural area. The proportion of total admissions, total deaths as well as the case fatality rate for tetanus were calculated in ten-year periods. To reduce variation in underreporting (10) and misclassification (11) during some years, we made cohorts of ten years period.

Epidemiology: The prevalence is the proportion of a population found to have tetanus, comparing the number of people found to have the condition with the total number of people studied, as a percentage or as the number of cases per 100,000 people. "Period prevalence" is the proportion of a population that has the condition at some time during a given period. The incidence is a measure of new cases arising in a population and "period incidence" is the proportion of new cases arising in a population over a given period (in this study ten years interval). Annual reports were collected and grouped with intervals of ten years. The period incidence was then calculated.

RESULTS

Annual reports were available since 1962. In most annual reports basic data were available like number of admissions in 98% (49 of the 50 annual reports), and deliveries in 96%.

Primary health care: During the seventies campaigns were started to vaccinate the community against tetanus in Sengerema district. The vaccination programme has been operating since 1976 as a primary health care (PHC) project. Many villages were for nearly 100% covered. The mobile clinics took care for 45% of all vaccinations given in the district; Oxfam was paying expenditures of fuel. A tremendous high number of vaccinations could be given in this outreach program. For example, in 1987 tetanus vaccination to pregnant women was given to 8.171 women of the 15.000 expected deliveries in the district. Many villages were for 80%-100% covered for the attending children and pregnant women.

According to population census, the population increased from 243.001 persons in 1978 to 501.195 in 2002 (12). With the assumption that the increase of population is about 3,5 % annually (crude birth rate of 4,6 % minus crude death rate of 1,1 %) we calculate that in 1962 an estimated 175.000 people were living in Sengerema district with an increase in population in 1962 to 633.034 in 2012 (13).

Admissions: The number of inpatients each year in Sengerema Hospital showed an increase from 7.000 in 1962 to 90.000 in 2011; this increase was seen in each decade (Figure 1). The frequency of admissions

due to tetanus increased between 1963 and 1983 and decreased afterwards (Figure 2). In 2011 no cases of neonatal tetanus were admitted in the hospital anymore.

Figure 1
Population and admissions Sengerema District

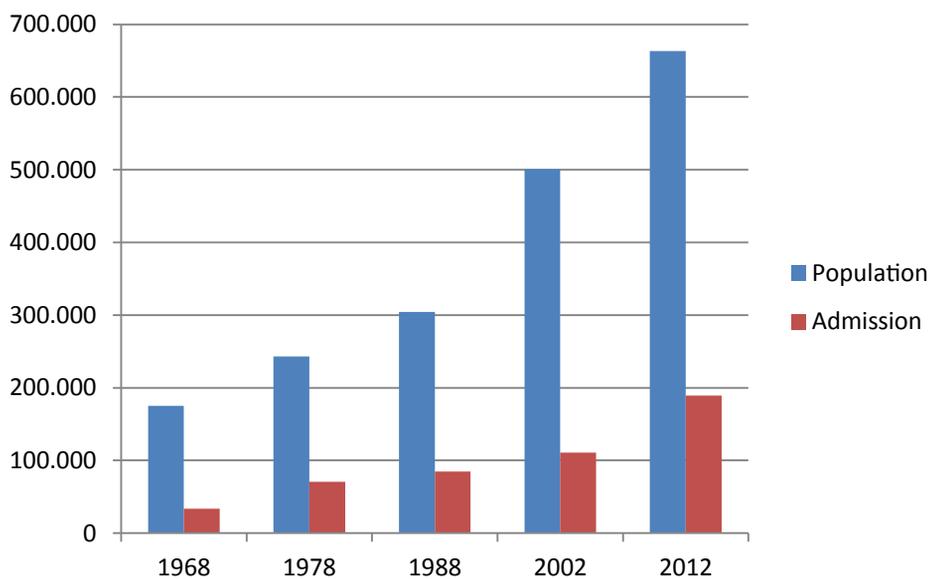


Figure 2
Number of admissions (incidence) and mortality due to tetanus, Sengerema District Hospital, Tanzania, period 1962-2012

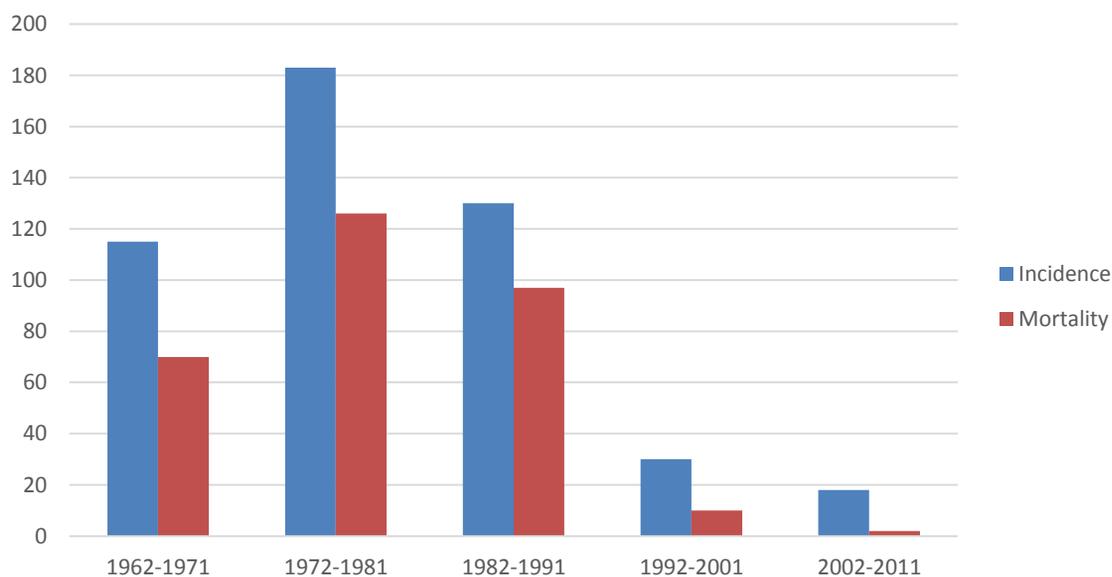
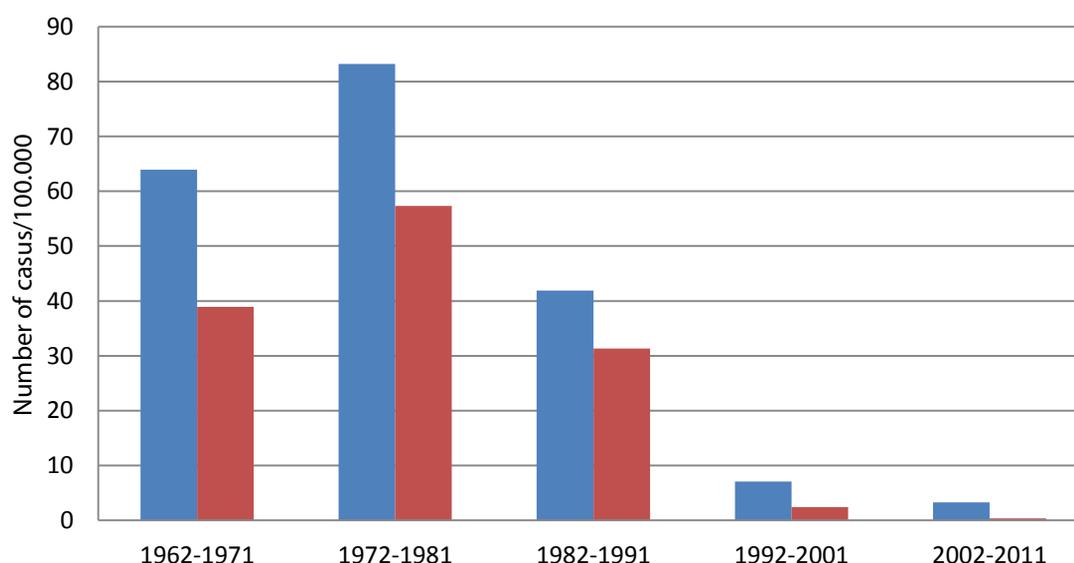


Figure 3
Prevalence and mortality due to tetanus, Sengerema District, Tanzania, period 1962-2012



Mortality: The mortality amongst patients with tetanus was $305/476=64\%$ during the whole study period of 50 years. During the last decade a single fatal case was reported.

Epidemiology: Based on the fact that Sengerema Hospital is the only hospital in the district we were able to calculate the period incidence (Figure 2) and estimate the prevalence (Figure 3).

DISCUSSION

The results of this study must be interpreted with care. Underreporting and misclassification of diseases are common. In Sengerema Hospital this classification is done by medical doctors. The diagnosis is based on the presentation of tetanus symptoms and underestimation of classical symptoms of tetanus is uncommon. Postpartum autopsy was seldom done. Changes in disease frequency may be related to population changes, increased access to and use of medical facilities, increased disease recognition and variation in diagnostic pattern. It is also uncertain to what extent admission patterns truly reflect the pattern of disease in a community where most deaths may occur at home. The trends, however, observed in this study in tetanus admissions rates most likely reflect what is happening in the community. In the absence of community-based data, the use of facility-based information may provide insight on disease trends. Hospital-based morbidity and mortality statistics can therefore be used as indicator of progress in disease prevention (14).

Tetanus is an international health problem, as *Clostridium tetani* spores are ubiquitous. It occurs

worldwide but is more common in hot, damp climates with soil rich in organic matter. Spores can be introduced into the body through puncture wounds. In agricultural areas, a significant number of human adults may harbour the organism. The spores can also be found on skin surfaces and in contaminated heroin. In developed countries, heroin users, particularly those that inject the drug, appear to be at high risk for tetanus (15).

Mortality rates reported in the literature vary from 48% to 73%, which indicate that tetanus is a rather dangerous disease (2-4). The average case fatality rate in our study in Sengerema Hospital over these years was 64%, in agreement with the literature.

The incidence and mortality of tetanus has dramatically dropped in Sengerema district, like in developed countries due to effective vaccination.

Unlike many infectious diseases, recovery from naturally acquired tetanus does not usually result in immunity to tetanus. In recent years admission rate for tetanus decreased and the fatality rate dropped.

In conclusion, Sengerema district, Tanzania, tetanus was once a common disease. The incidence of tetanus was reduced significantly by an effective immunisation programme.

The decreasing trend in admission and fatalities rates for tetanus reflects the increased immunity in the community following extensive immunisation.

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