

Three cases of neonatal tetanus in Papua New Guinea lead to development of national action plan for maternal and neonatal tetanus elimination

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Maternal or neonatal tetanus causes deaths primarily in Asia and Africa and is usually the result of poor hygiene during delivery. In 2011, three neonatal tetanus cases were investigated in Papua New Guinea, and all three cases were delivered at home by untrained assistants. The babies were normal at birth but subsequently developed spasms. A neonatal tetanus case must be viewed as a sentinel event indicating a failure of public health services including immunization, antenatal care and delivery care. The confirmation of these cases led to the drafting of the Papua New Guinea National Action Plan for Maternal and Neonatal Tetanus Elimination. This included three rounds of a tetanus toxoid supplementary immunization campaign targeting women of childbearing age (WBCA) and strengthening of other clean delivery practices. The first immunization round was conducted in April and May 2012, targeting 1.6 million WBCA and achieved coverage of 77%. The government of Papua New Guinea should ensure detailed investigation of all neonatal tetanus cases reported in the health information system and perform sub-provincial analysis of tetanus toxoid coverage following completion of all three immunization rounds. Efforts also should be made to strengthen clean delivery practices to help eliminate maternal and neonatal tetanus in Papua New Guinea.

Tetanus causes around 300 000 deaths worldwide each year predominantly in low-income and middle-income countries, and deaths from maternal or neonatal tetanus are concentrated mostly in Asia and Africa.¹ Neonatal tetanus (NNT) is primarily caused by lack of hygiene during delivery, and it usually occurs when the umbilical cord is contaminated while being cut or dressed with non-sterile instruments. Symptoms, in the form of spasms, usually begin three days after birth. Without any specific treatment, more than 95% of infants with NNT die; even with treatment 10%–90% die depending on the intensity of the supportive care.² Evidence suggests that infants surviving NNT suffer from brain damage, which often manifests as neurological abnormality and developmental impairment.³ Cases of NNT are common in rural and disadvantaged settings where babies are born at home and die without registration of either event. Thus, the true burden is always unknown.¹

Around 1500 suspected cases of NNT have been reported from Papua New Guinea to the World Health Organization (WHO) since 1992, an average of 75 per year.⁴ Cases are reported to the National Health Information System based on clinical diagnosis only per the WHO-recommended standards for surveillance of selected vaccine-preventable diseases.⁵ These reported cases are not systematically investigated, impeding the ability of national and provincial managers in effective decision-making. In 2010, there were 50 suspected cases of NNT reported in Papua New Guinea through syndromic surveillance by health workers.⁴ In 2012, Papua New Guinea was classified as one of the 31 countries that had not yet achieved maternal and neonatal tetanus (MNT) elimination.⁶

In Papua New Guinea, vaccination for tetanus has been provided since 2008 as part of the combined diphtheria pertussis-tetanus-Hepatitis B and -

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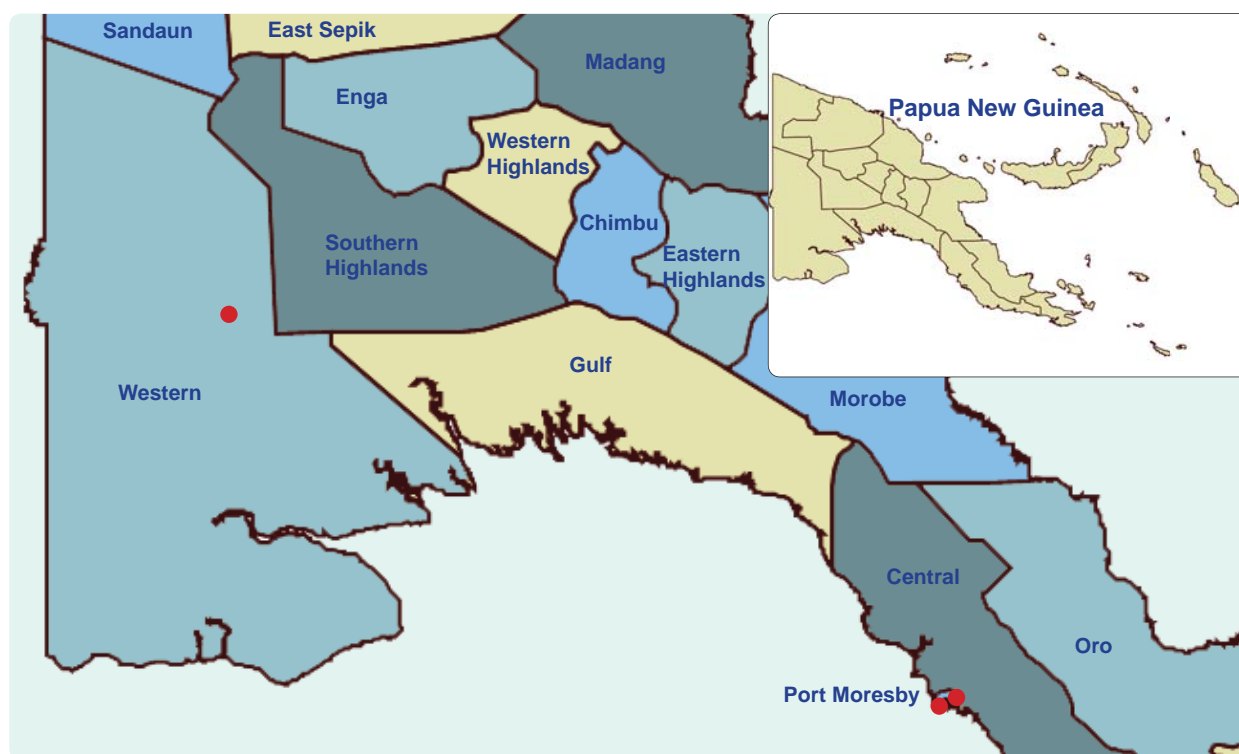
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Figure 1. Map of the location of neonatal tetanus cases, Papua New Guinea, 2011



Haemophilus influenzae B (pentavalent) vaccine. However, accessibility to vaccination programmes is inequitable across Papua New Guinea; provinces such as Western, Eastern Highlands and West Sepik have health services that are not accessible to at least 40% of their population.⁷ Also, the number of maternal health staff decreased by 25% from 1987 to 2000.⁷ In 2011, 61% of children less than one year of age in Papua New Guinea received three doses of pentavalent vaccine, and 51% of pregnant women received tetanus toxoid (TT) vaccine.⁸ According to WHO and the United Nations International Children's Fund, the proportion of births that could be considered protected against tetanus⁶ was around 61% in Papua New Guinea in 2011. Both the TT and pentavalent vaccine coverage in Papua New Guinea varies widely between and within the provinces.

We discuss three cases of NNT that were reported and subsequently investigated in 2011 and the development of national policy of MNT elimination in Papua New Guinea.

The cases

In 2011, two cases of NNT were reported from the paediatric unit of Port Moresby General Hospital

(PMGH) and one case of NNT was reported from Rumginae Rural Hospital (RRH) in Western Province of Papua New Guinea. The two PMGH cases resided in Goilala district, Central Province and the Rumginae case in Middle Fly district, Western Province (Figure 1). Middle Fly is characterized by forests, swamps, rivers and coast, and access is predominantly by dugout canoes, outboard powered dinghies and aircraft due to the vastly scattered villages being separated by large bodies of water.⁹ The average household size of Middle Fly district is 6.8; 89% of the population reside in traditional dwellings, and 87% of the population are engaged in agriculture as the principal economic activity.¹⁰ The Goilala district is a remote district characterized by very rugged topography with more than 70% comprised of deeply dissected valleys and mountains.¹¹ There is no road access to the Goilala district from provincial headquarters in Port Moresby, and the communities are usually serviced by light aircraft landing on treacherous mountain top airstrips.¹¹ TT vaccine coverage for women of childbearing age (WCBA) in Goilala and Middle Fly districts were low at 9% and 12%, respectively, in 2011.

All three cases (two males and a female) were delivered at home on the floor, and the births were attended by untrained assistants (Table 1). The umbilical cord was cut in two of these cases with a bush

Table 1. Characteristics of mother and births for the three neonatal tetanus cases, Papua New Guinea, 2011

Characteristic	Case 1	Case 2	Case 3
District of origin	Goilala	Goilala	Middle fly
Age of mother	16 years old	29 years old	23 years old
First pregnancy	No	No	No
Antenatal care of mother in present/past pregnancy	No/No	No/Yes	No/No
Tetanus Toxoid received by mother in present/past pregnancy	No/No	No/Yes	Unknown/Unknown
Delivery conditions	Floor at home	Floor at home	Floor at home
Birth attendants	Untrained relative	Untrained attendant	Untrained attendant
Cord-cutting practices	Old razor blade	Bush knife	Bush knife
Cord-tying practice	Strings from used rope	Strings from rice bag	Strings from grass skirt
Onset of symptoms	Day 5	Day 7	Day 12
Died	No	No	Yes

knife, while in the other an old razor blade was used. The umbilical cords in these three cases were tied with strings from a rope, a rice bag and a grass skirt. All three babies were reportedly normal at birth and had normal crying and sucking for the first two days of life. All three babies started having difficulty in sucking after two days, and they developed symptoms of convulsions and spasms at an average of eight days after birth. The youngest of the multi-gravidae mothers was 16 and the eldest 29 years. Only one of the mothers received any antenatal care or TT vaccination in her past pregnancies, while none of these mothers received any antenatal care or TT vaccination in the current pregnancy. The two cases that were admitted to PMGH survived, while the case at RRH died three days after admission to the hospital; there was no fatality among the mothers. Follow-up of the cases discharged from PMGH was not possible due to the geo-topography of their residential location; hence, no comment can be made on the final clinical outcome in regards to neurological and developmental status of these cases after discharge.

The policy

The confirmation and detailed investigation of these three cases by hospital physicians in 2011, along with the reported suspected cases of NNT by the health workers through the syndromic surveillance system, led to the drafting of the National Action Plan for Elimination of Maternal and Neonatal Tetanus in Papua New Guinea.¹² The action plan targeted WCBA (15–45 years) for three rounds of nationwide supplementary immunization activities with TT. This

is in line with the WHO position paper on tetanus.¹³ A “high-risk approach” to control NNT in countries where the elimination target (<1 case per 1000 live births at the district level) has not yet been reached. This high-risk approach should be targeted towards all WCBA and immunization doses must be delivered using a campaign-style immunization programme of three doses of TT with an interval of at least four weeks between doses one and two and of at least six months between doses two and three. Strengthening other measures to prevent MNT in the country, including clean delivery, training of midwives and community health workers, and improvement in ante-natal care services, were also highlighted in the national elimination plan.

The first immunization round targeted 1.6 million WCBA and was conducted in April and May 2012. Around 1.3 million (77%) women were reached with the TT vaccine during the first round.¹⁴ This supplementary immunization campaign was administered using multiple approaches at fixed site (maternal and child health clinics at health centres, school vaccination sessions, markets and congregation site sessions), day mobile and overnight patrol outreach sessions. The second immunization round was conducted in October through December 2012; final coverage results are pending.

DISCUSSION

These three NNT cases in Papua New Guinea must be viewed as sentinel events indicating a triple failure of public health in routine immunization, antenatal care

and clean delivery/cord care services. Unsafe cord practices were evident in all three cases. As reported in Papua New Guinea as early as 1991, unsafe birth practices, including cutting the cord with sharpened sea shells, fresh bamboo knives, metal blades or knives, were common practices.¹⁵ Strengthening clean delivery practices is one component of the National Action Plan that aims to decrease the incidence of such unsafe practices. Following the introduction of a programme promoting clean delivery practices and the replacement of cow dung for postnatal umbilical cord care with clean water or milk in Kenya and Tanzania, there was significant reduction in annual NNT incidence. After introduction of the programme in 1981, NNT rates fell sharply, and by 1988 annual death rates had dropped to 0.75 per 1000 births in the intervention areas compared with 82 per 1000 in control areas. These changes were both culturally acceptable and safer alternatives.¹⁶

Although cases of NNT have been reported every year in the National Health Information System, it was the reporting and confirmation of these three NNT cases by physicians at PMGH and RRH that led to the formulation of the National Action Plan for Elimination of Maternal and Neonatal Tetanus in Papua New Guinea. In order to achieve the elimination of MNT in Papua New Guinea, the other components of the National Action Plan need to be implemented, including the third and final immunization round, the strengthening of clean delivery practices and NNT surveillance. More detailed investigations of NNT cases reported in the health information system as well as sub-provincial analyses following completion of all three immunization rounds should be conducted.

Conflicts of interest

None declared.

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