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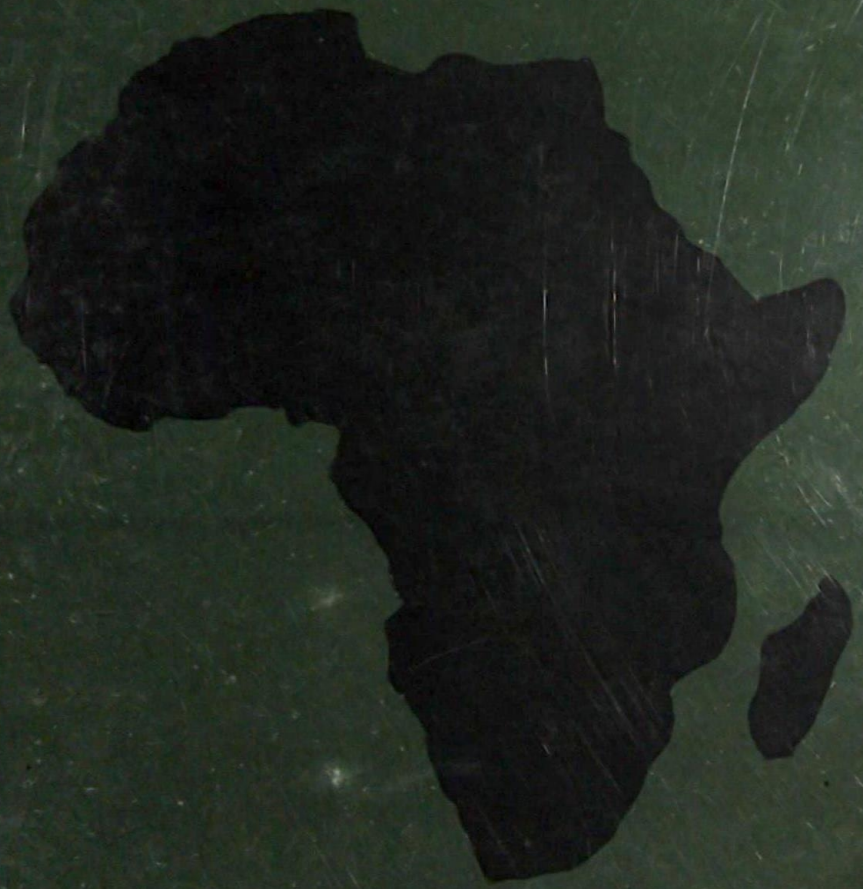

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# Risk factors associated with neonatal tetanus in Ibadan, Nigeria – A revisit

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**Summary**
To identify major risk factors associated with recent occurrence of neonatal tetanus (NNT) in Ibadan Nigeria, 140 cases matched 1:1 with controls were recruited into the study from the major referral hospitals. Maternal age (<20 years), low paternal education, low socio-economic status, primiparity and delivery outside health facilities were associated with significantly increased risk for NNT. Lack of trained attendant at delivery, the type of instrument used to cut the cord and the presence of livestock within the family compound also significantly increased the risk for NNT. Antenatal clinic (ANC) was attended by 86.4% of mothers of cases but only 25.6% of these mothers received full immunization. Three out of four mothers of cases who attended ANC did so with a frequency of 5 to 20 times indicating missed opportunities for immunization. Data also suggest that the main reason for failure to receive full immunization was ignorance on the mothers' part, which reflects inadequate health education by the health system. The study case fatality rate was 79.4 percent. Risk factors observed in this population are generally known, indicating that the problem has not yet received adequate attention. Effort needs to be made towards providing the masses with formal education as well as health education, targeting the population at grass root level. Improving access to antenatal care services as well as improving the quality of these services; outreach efforts on immunization would contribute in no small measure to reducing the incidence of neonatal tetanus in this community.

**Keywords:** *Neonatal tetanus, risk factors, antenatal services, teenage mothers, immunization.*

**Résumé**
Pour identifier les majeurs facteurs de risque associés au recent incidence de tétanus neonatlae a Ibadan, Nigeria. Cent quarante cas étaient récruités dans cette étude majeur des hopitaux de reference. L'age maternelle(<20 ans ), faible éducation parental, faible status socio-économiques et l'accouchement dans des facilités de santé étaient associé avec l'augmentation significative. 86.4% des femmes ancientes participaient a la clinique prénatale (ANC) mais seulement 25.6% recevait une compléte immunisation. Trois sur quatre femmes ancientes en clinique prénatale avec une fréquence de 5 sur 20 fois, indiquant des opportinuités manquées d'immunisation. Ces données aussi suggéraient que la raison principale d'échec de recevoir l'immunisation étaient l'ignorance des méres qui reflectait l'éducation de santé inadéquate par ces centres de santé. L'étude du taux de cas de fatalité était de 79.4%. Les facteurs de riques observés dans cette population sont generalement concus, indiquant que le probléme n'a pas récu d'attention adéquate. Les efforts desirés à faire pour apporter la population avec éducation formelle bienque l'éducation de santé en orientation la population des la basse. L'amélioration des facilités des soins de santé précliniques ausii bien que l'amelioration de la qualité des services ; des efforts vibrant en immunisation pourrait contribuer grandement à réduire l'incidence des tétanus chez nouveaux nés dans cette communauté.

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## Introduction

Tetanus occurring in the newborn up till the age of twenty-eight days is termed neonatal tetanus (NNT). It presents most often with progressive difficulty in sucking and the cardinal manifestations are those of opisthotonos, and abdominal wall rigidity [1]. Neonatal tetanus is Delport SD. Neonatal usually associated with under development, and WHO's Regional Committee for Africa adopted a resolution calling upon member states to strive for the eradication of neonatal tetanus in Africa by 1995 [2].

Tetanus is listed among the top five causes of death in the neonatal period in a number of tropical countries, including Nigeria where the prevalence of NNT and the alarmingly high case-fatality figures associated with it makes the disease a major public health problem [3-8]. The true incidence is unknown in Nigeria, owing to lack of complete data in registration of births, morbidity, and mortality in many communities, especially at the grass root level where most births occur [9,10]. However, in 1988, an estimated 135,750 cases and 108,600 deaths due to NNT still occurred in Nigeria [11]. These figures are unacceptably high given the preventable nature of the disease. Although the death toll from neonatal tetanus has been reduced by a third in the last decade world wide, there has been a noticeable surge in deaths from this killer disease in Nigeria, making the country have the largest absolute increase world wide, up by 62% [12,13].

In view of the size of the problem, the present study was carried out to obtain more recent information on major risk factors associated with the development of neonatal tetanus in this community and to make suggestions for reducing its incidence in the community.

## Materials and methods

*Study area*

Ibadan is an indigenous West African city, the capital of Oyo State of Nigeria with a projected population of over 4 million [14]. The city may be divided into three zones, a traditional inner core, a transitional and a sub-urban periphery [15,16]. These zones basically represent three types of socio-economic and cultural areas of Ibadan. The inner core areas form the old part of the city, mainly inhabited by people with low level of education. The areas are highly congested and overcrowded,

have few and poor roads, limited amenities and high rate of public health problems. The transitional area is an interface between the inner core and elite areas. The sub-urban periphery is described as the elite area, containing modern low-density residential estates, occupied by professionals and other high-income groups. The environment here is more wholesome and conducive to healthy living than the inner core or transitional areas.

*Study design*

A case-control study conducted on all secondary and tertiary hospitals in Ibadan. These hospitals are the major referral points for the primary health care centres and all private facilities and they serve all the different socio-economic sectors. All cases seen at the primary level are routinely referred to one of these mentioned hospitals.

*Sampling technique*

All cases of neonatal tetanus (NNT) from these hospitals were admitted into the study until the total required sample size was met. They were matched 1:1 with controls who were admitted into these hospitals for any other disease condition except NNT.

*Case definition*

A case was a baby aged one day to twenty-eight days with the classical signs of tetanus. A control was a neonate matched for age and residential area of parents.

*Sample size and computation*

The total sample size was 260, 130 cases and 130 controls after correcting for design effect.Sample size was calculated for the different risk factors and the largest number was chosen.

The instrument used was a standardized and structured questionnaire administered to mothers of cases and controls. Information collected included socio-demographic data, parity and immunization history, delivery record, cord care, skin piercing and cultural practices such as method of circumcision, ear lobe piercing and scarification; the outcome of the illness was noted.

Informed consent was obtained from all the mothers and permission to carry out the study was obtained from the institutions used. Data were entered into the computer using EPI Info version 6 software, two by two tables were generated and Chi-square test was used to examine the statistical significance of the association between the independent and dependent variables at 95% confidence interval.

## Results

Two hundred and eighty subjects were enrolled in the study. Of this number, there were 140 cases and 140 controls. There were 81 (57.9%) males and 59 (42.1%) females in the study group while the control group consisted of 73 (52.1%) males and 67 (47.9%) females. The male/female ratio for cases and controls were 1.4:1 and 1.1:1 respectively. Ninety-six percent (135) of the cases were admitted between the ages of 5 and 14 days. A total of four hundred and sixty-eight (468) neonates were admitted into the hospitals in the study site during the period of study, out of which one hundred and eighty (180) were tetanus cases.

Table 1 shows the comparison of risk factors in 1:1 matched case-control. Twenty-two (15.7%) of the mothers of

**Table 1:** Comparison of risk factors in 1:1 matched case-control

| Risk factors | | Exposure status Yes | No | Odds ratio | 95% confidence Interval | P value |
|---|---|---|---|---|---|---|
| Maternal age <20yrs. | cases | 22 | 118 | | | |
| | controls | 7 | 133 | 3.54 | 1.37-9.49 | <0.01 |
| Nil paternal education | cases | 16 | 124 | | | |
| | controls | 3 | 137 | 5.89 | 1.57-26.1 | <0.01 |
| Nil maternal education | cases | 17 | 123 | | | |
| | controls | 11 | 129 | 1.62 | 0.69-3.87 | NS |
| Low socio-economic class | cases | 72 | 68 | | | |
| | controls | 38 | 102 | 2.84 | 3.24-9.96 | <0.0001 |
| Primiparity | cases | 88 | 52 | | | |
| | controls | 66 | 74 | 1.90 | 1.68-4.83 | <0.01 |
| 3rd trimester nate-natal clinic booking | cases | 72 | 68 | | | |
| | controls | 36 | 104 | 3.06 | 1.79-5-23 | <0.0001 |
| None or incomplete maternal tetanus immunization | cases | 109 | 31 | | | |
| | controls | 37 | 103 | 9.79 | 5.47-17.6 | <0.0001 |
| Delivery outside health facility | cases | 84 | 56 | | | |
| | controls | 17 | 123 | 10.86 | 5.68-20.9 | <0.0001 |
| Untrained personel at delivery | cases | 77 | 63 | | | |
| | controls | 14 | 126 | 11.00 | 5.54-22.1 | <0.0001 |
| Non sterile cord cutting tool | cases | 34 | 106 | | | |
| | controls | 14 | 126 | 2.89 | 1.40-5.99 | <0.01 |
| Traditional cord dressing | cases | 40 | 100 | | | |
| | controls | 29 | 111 | 1.53 | 0.83-2.75 | NS |
| Animals within Residence | cases | 64 | 76 | | | |
| | controls | 46 | 94 | 1.72 | 1.06-2.88 | <0.05 |

*NS = Not significant at the 0.05 level*

NNT cases and 7 (5.0%) of mothers of control were teenagers. There was a statistically significant association between teen age and the occurrence of NNT ($P<0.01$). No paternal education was associated with an increased risk of NNT in the babies ($P<0.01$) whereas no maternal education was not statistically significant ($P>0.05$). A significantly higher number of parents of cases compared with parents of controls (72 vs 38) were from the low socio-economic class ($P<0.0001$).

Eighty–eight (62.9%) of the mothers of cases and 66 (47.1%) of the mothers of controls were in their first pregnancy. Primiparity was associated with a significantly increased risk of NNT ($P<0.01$). Among mothers of cases who attended ANC, 87(71.9%) made 5-20 visits to the clinic. Mothers of 19 (13.6%) cases and 4 (2.9%) controls did not attend ante-natal clinic at all. Eleven (57.9%) of nineteen mothers of cases who failed to attend the ANC reported that it was due to ignorance, 6 (31.6%), for lack of funds, and 2(10.5%) because of religious belief. Late ANC booking (booking during the third trimester) was found to be statistically significantly associated with increased risk for NNT, 72(51.43%) mothers of cases and 36(25.71%) mothers of controls had late ANC booking ($P<0.0001$). Six (4.3%) mothers of cases commenced ANC in the first trimester of pregnancy while 17(12.1%) of the mothers of control did so in the same period.

Only 31 (22.2%) of all mothers of cases received full immunization with two doses of tetanus toxoid, while 47 (33.6%) received one dose and 62 (44.3%) had none at all. On the other hand, a higher number of mothers of controls 103 (73.5%) were fully immunized while only 18 (12.9%) had one dose and 19 (13.6%) received none. Thirty-four (54.8%) of 62 mothers of cases who were not immunized at all claimed it was due to ignorance about immunization, 12(25.5%) of the 47 mothers who received only one dose reported that they were unaware of a second dose.

A significantly lower percentage of cases compared with the controls (40 vs 87.9%) were delivered in a health facil-

ity ($P<0.0001$). Of the 84 cases delivered outside the health facility, 35.7% were born at home, 1.4% at the herbalists, 0.7% on the farm, while 19.3% were delivered in churches (mission homes). More cases than controls were delivered outside the health facility. The study found a statistically significant association between place of delivery and the occurrence of NNT ($P<0.0001$). The presence of untrained personnel at delivery was also found to be significantly associated with the occurrence of NNT ($P<0.0001$).

Unsterile instruments were used to cut the cord of 91(65%) of cases while this was used in 39 (27.9%) of controls ($P<0.01$). Methylated spirit was used for dressing the umbilical cord in 40(28.6%) of babies with NNT, rag and fomentation with "eru" ( a substance prepared by grinding the seed of a local tree, culturally believed to give heat that aids healing) in 87 (62.1%), local foodstuff (yam flour) was used in 10 (7.1%) and poultice prepared by the herbalist in 3 (2.1%). These types of dressing were also used in 111(79.3%), 28 (20%), 1(0.7%) and 0(0%) of controls respectively.

Only 2 (1.4%) of the babies with NNT and 8 (5.7%) of babies in the control group had been circumcised. None of the babies in both study and control groups had scarification marks. Among the females, 25(42.4%) cases and 23 (34.3%) controls had their ear lobes pierced ($P>0.05$).

Pets and domestic animals had access to the homes of 66(47.1%) of cases and 46(32.9%) of controls in both rural and urban locations, this was found to be significantly associated with the occurrence of NNT ($P<0.05$). Goats were found in the homes of 43 (65.2%) of cases and 25(54.3%) of controls. Chicken, cats, dogs and sheep were also found in various proportions in homes of both cases and controls. The floor was cemented in 97.1% and 100% of cases and controls respectively and none of the homes used cow-dung for polishing their floors and walls.

All nineteen neonates who had the onset of their illness within the first four days of life died, giving a case fatality of 100%. High fatality rates were also observed among babies in the 5 - 7 days age group (86.7%). Age specific fatality rate dropped as age at onset of illness increased ($x^2=41.7$, $P<0.0001$). Nine (6.4%) of the babies were discharged home against medical advice. The overall fatality rate was 79.4% (Table 2). The male/female death ratio was 1.3:1.

**Table 2:** Outcome of illness in relation to age at onset of illness

| Age at onset of illness (Days) | Patients N (%) survived | Died | DAMA | Total | Age specific fatality rate (%) |
|---|---|---|---|---|---|
| 0-4 | 0(0.0) | 19(100.0) | 0(0.0) | 19(13.6) | 100.0 |
| 5-7 | 11(12.5) | 72(81.8) | 5(5.7) | 88(62.9) | 86.7 |
| 8-14 | 16(48.5) | 13(30.4) | 4(12.1) | 33(23.6) | 44.8 |
| Total | 27(19.3) | 104(74.3) | 9(6.4) | 140(100.0) | 79.4 |

*Keyword: DAMA = Discharged against medical advice*
*N = Number*

## Discussion

This study identifies the major risk factors associated with the occurrence of neonatal tetanus (NNT) in Ibadan and environ and indicates that neonatal tetanus continues to be common and serious problem in this community. This is borne out of the fact that NNT constituted a little over one third (38.5%) of the total neonatal admissions in the study sites during the study period. Osinusi *et al* [17] and Njinyam [18] who worked in Ibadan reported rates of 7.3% and 22.4% respectively. Idoko [19] also reported a rate of 9.2% from Benue, Oruamabo [20] reported 10.2% from Port Harcourt, while Grange [9] reported a rate of 15% in Lagos. In the present study, data were collected from the major referral hospitals, consequently most of the areas in Ibadan and its environ were covered.

In addition, the use of health facility is notably highest in the South West zone where the study was conducted [21]. In this study, 40% of the NNT cases were delivered in health facilities, this being in contrast to the Tompkins series in which none of the babies with NNT was delivered in a health facility [22]. The NNT rate observed among mothers who delivered in facilities is however higher than the rates of 18%, 20% and 25% reported by Blackson[7], Daramola [23] and Oyedeji et al[24] respectively. Though health facility delivery was associated with significantly lower risk for NNT, the risk was not totally absent. This may suggest that there is need to look more critically at the role the health facilities play in the continued occurrence of NNT. In the past it was blamed almost entirely on the lack of awareness and non-utilization of health facilities [22],

In this study, more than eighty percent of mothers of cases attended antenatal clinic but only 25.6% of these mothers received full immunization. Nearly three out of four mothers of cases who attended the ANC did so with a frequency of 5 to 20 times indicating missed opportunities for immunization. The average incubation period for NNT is about 6 days with a range from 3-28 days indicating that many babies may have been infected at delivery or shortly after, given that the age of the youngest children at onset of symptom was 4 days and under. The impact of the national program on immunization on the prevalence of NNT in Nigeria has not been impressive [5,21].

It is therefore important that the WHO's recommended anti tetanus schedule of five doses for all women of child bearing age which has been adopted by the Federal Ministry of Health be implemented nation wide. Opportunities for immunizing mothers should be identified and optimized. Failure to properly health educate mothers and the general public could also account for the low vaccination rates among mothers. Missing appointment days and vaccines being out of stock may have played a role in the low coverage [5]. Out of facility deliveries remain a challenge as some mothers deliver at home, in the mission homes and at the herbalists due to the relatively high cost of delivery in the health facilities. Efforts should therefore be made to meet with the various delivery centres and ensure that patronizing mothers receive immunization. This study, in contrast to findings by several authors [25,26] shows that the use of unsterile instruments for cutting the umbilical cord increased the risk for NNT but that the type of cord dressing was not a significant factor [25,26].

While continued emphasis has been placed on female education and rightly so, the role of paternal education on maternal, infant and child morbidity and mortality has not been adequately examined and addressed. In this study, low paternal education was associated with increased risk of NNT while nil maternal education was not. Similar findings were observed in another study [27]. Men are the major decision makers and bread-winners in most families and must receive some education, the effect of which includes promotion of the health of family members.

Low socio-economic status and poor paternal education, teenage pregnancy, the presence of livestock within the home environment are indicative of parents living in a deprived environment due to poverty and low earnings. This typifies the way of life in the traditional parts of the community. Neonatal tetanus is largely a disease of the underprivileged. Administering tetanus immunization to all mothers irrespective of their cultural leanings and home environment is therefore the ideal practice.

In conclusion, improving access to ANC services as well as improving the quality of services given at the antenatal and other delivery centres, and other outreach efforts on immunization will contribute to a large extent in reducing the incidence of neonatal tetanus in this community.

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