NEONATAL TETANUS IN BANGLADESH: EFFECT OF ACTIVE IMMUNIZATION OF MOTHERS

Makhlisur Rahman

Paper presented in the
Joint WHO South-East Asia Region/Eastern Mediterranean Region
Meeting on Neonatal Tetanus, Lahore, 22-25 February, 1982

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH
GPO Box 128, Dacca-2, Bangladesh

INTRODUCTION

As in many other developing regions of the world, tetanus is a major cause of death in Bangladesh. Most of the deaths occur in neonates. A nationally representative sample survey conducted by the Bangladesh Ministry of Health and World Health Organization in 1977 found 78 percent of all tetanus patients being less than one year of age (1). The survey estimated a national tetanus death rate of 20 per 1,000 live births for Bangladesh. Extrapolation of this findings to the entire country suggests that about 75,000 new born babies contract tetanus annually, and 70,000 of them die.

The conventional approach to the prevention of neonatal tetanus is by the improvement in the midwifery services and the care of the new born. Increasing the proportion of institutional deliveries, provision of better home midwifery services and the education of the mothers in the care of their infants have been found effective in reducing the incidence of neonatal tetanus in every country where these measures have been effectively carried out (2-3). However, practical considerations and the limitations of facilities and resources detract from implementation of such programme in many countries. Attention has therefore been turned to the practicability of maternal immunization as a specific means to combat the diesease.

Any programme that aims to protect all neonates through the active immunization of mothers basically confronts two strategic choices. The first is to

vaccination of women during pregnancy with two immunizations of an aluminium-adsorbed tetanus toxoid. This immunization procedure has been demonstrated to be highly efficacious (5-7). However, questions regarding continuous identification and routine vaccination of pregnant women, keeping adequate records of immunization, maintenance of "cold-chain" in the field, removal of different local beliefs and prejudice in receiving injection during pregnancy and several other administrative and organisational problems remain yet to be answered for evolving an effective nation-wide pregnancy immunization programme. A second strategy is to vaccinate all women of reproductive age (or younger) by mass campaign. The constraints to this approach include logitical difficulties in attaining two vaccinations for the primary immunization and providing booster immunization at appropriate intervals (8-9).

Work at the Matlab field station of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) provided an unique opportunity to study the effectiveness of certain aspects of these two strategies. Matlab is a rural riverine area situated about 45 kms. south-east of Dacca. The field surveillance area presently consists of 149 villages with a population of about 177,000 persons. Since 1963, the ICDDR,B has operated a field research programme in this area involving the provision of diarrhoeal disease treatment services. In order to keep the population under surveillance, a continuous household registration of births, deaths, marriages, and migration was instituted in 1966. Details of the field surveillance area, its people, and field research precedures have been reported in several previous publications (10-11).

In 1974, during a field trial of cholera toxoid vaccine in the Matlab area, two injections of an aluminium-adsorbed tetanus toxoid were provided as a

control to a randomly assigned group of non-pregnant women. Beginning in June 1978, a programme of immunizing women during pregnancy with tetanus toxoid was initiated in conjunction with the implementation of a village-based maternal child health and family planning programme. In the following section we present the findings on the neonatal mortality impact of the two programmes.[1]

FINDINGS

In the 1974 non-pregnancy vaccination programme, 55 percent of the selected women accepted two tetanus injections and 15 percent accepted one injection. The following table summarizes the neonatal mortality experience in women having received one or two injections of tetanus toxoid as compared to those receiving choldra vaccine.

Table 1: Neonatal Mortality Rate by Vaccine Status of Women Who Participated in the 1974 Cholera Vaccine Field Trial, Matlab[a]

Birth Cohort	Cholera Toxoid (1 or 2 injections)	Tetanus Toxoid			
		One Injec.		Two Injec.	
	Rate[b]	Rate	P Value[d]	Rate	P Value
April 1975-March 1976	68.4 (1652)[c]	33.6 (536)	<.01	44.1 (1044)	.025
April 1976-March 1977	54.5 (2734)	49.4 (729)	NS	37.5 (1946)	.025
	59.7 (4386)	43.5 (1263)		39.8 (2990)	

[a]Injections given in July-August 1974

[b]Per 1,000 related live births

[c]Number of live births given in parentheses

[d]Significance level compared with cholera toxoid group

NS = Not Significant

Source: Black et al., 1980(9).

[1]Detailed description of the first programme appears in Black et al., 1980 (9) and that of the second programme in Rahman et al., 1981 (12).

The data in the table show that for infants whose mothers had received two tetanus injections 9-32 months before giving birth, the neonatal death rate was about 20 per 1,000 live births lower than the rate for infants whose mother did not receive tetanus immunization. A later analysis confirmed that even after an average of four and half years (48-64 months), the immunized group had a neonatal mortality rate 15.5 per 1,000 live births lower than that for the non-immunized group (13). This finding suggest that one injection of tetanus toxoid has an effect in the first year, but that efficacy desipates in the second year. This is consistent with other previous studies (3,5).

Table 2 shows the impact of the pregnancy immunization programme on neonatal mortality. During the first two years of the programme about one-third of the pregnant women accepted full immunization (2 injections) and about 5 percent accepted partial immunization (1 injection).

Table 2: Neonatal and 4-12 Day Mortality Among Live Birth Cohorts (September 1978 - December 1979) According to Maternal Tetanus Immunization Status, Matlab

	Immunized[a] Group		Never-Immunized Group		
	Number	Rate	Number	Rate[b]	
Live-birth	934		2379		
0-28 days death	40	42.8	199	83.6	p<0.01
4-14 days death	10	10.7	82	34.5	p<0.01

[a]Received 2 injections of tetanus toxoid

[b]Per 1,000 related live birth

Source: Rahman et al., 1981 (13)

The findings in the table show that full immunization of pregnant women with two tetanus injections reduced neonatal mortality rates by about one-half and neonatal mortality on day 4-14, when tetanus is considered to be the predom

cause of death (3), by about 70 percent. Given the apparent hemogeneity of immunized and never-immunized groups of women in respect to their socio-demographic characteristics as revealed by another study (12), and the fact that almost all births in Matlab area are delivered at home in attendance of untrained midwives and relatives, maternal immunization probably explains the major portion of the significant reduction in neonatal mortality.

DISCUSSION

The findings presented in the preceeding section provide a clear documentation of the impact on neonatal mortality from active immunization of mothers. Acceptance of two tetanus injections by 55 percent of non-pregnant women confirms the beneficial effects that can be expected from a nation-wide mass vaccination campaign. However, since the duration of vaccine protection is limited, 3-4 years as indicated by our study, repeat campaign at regular intervals or the institution of another immunization back-up system will be necessary. This may disrupt rather than strengther village-based basic health services infra-structure, organization and development.

In comparison, pregnancy immunization programme seems to be cost-effective in terms of coverage and booster immunization. The implementation of the programme, however, depends upon the development of an efficient and permanent field infra-structure to identify and reach each pregnant woman with information and vaccine. Even with timely identification and ready availability of services, there is no guarantee that the programme will have significant impact on neonatal mortality unless a significant proportion of women accept the service. Despite an intensive and well designed delivery system in Matlab, vaccine

acceptance rate was disappointingly low, approximately one-third of identified women. Client-related factors such as objection by husband or mother-in-law and community reluctance to accept vaccination of women during pregnancy for fears of harming the fetus were primarily responsible for low acceptance rate (12). Another disappointing aspect of the programme was the failure of acceptance rate to increase overtime as the programme matured. One possible factor inhibiting a positive trend was the community's imprecise diagnosis and perception of tetanus deaths, thereby resulting in neonatal tetanus deaths among vaccinees from causes of death which, according to local nomenclature, overlap with that of true tetanus (12).

Our findings therefore speak strongly for the need of individual national programmes to tailor their strategic choices to their own unique circumstances. In the rural Bangladesh setting, our recommendations from the Matlab experience would be vaccine campaigns backed up by immunization during pregnancy. The vaccine campaigns would have the advantage of easier logistics in terms of "cold-chain" maintence of the vaccine and presumed higher level of acceptance by non-pregnant women. Human resources devoted to these campaigns however should not disrupt the long-term development of village-based basic health services, which would also identify and offer vaccine to pregnant women.

It should be recognised that it will take many years before the gap between technology potential and realization will be narrowed and an effective rural health infra-structure will be sufficiently developed to shoulder the responsibility of vaccinating all mothers against tetanus neonatorum. In the meantime, some other complementary measures should be identified and implemented. One such measure seems to be the training of traditional birth attendants [illegible].

There is general agreement that neonatal tetanus is associated with home delivery by relatively untrained personnel in unsanitary surroundings. Infection is presumed to occur in the unhealed umbilical stump in such cases (14). The source of infection are thought to be the prevalent practice of applying substances like cow-dung, ash or burnt earth, pepper and turmeric in the umbilical cord and the use of unsterile instruments to cut it (15-18). Islam et al. in a study in Teknaf, a rural area in Bangladesh, observed that in 78 percent of births, bamboo splits were used to cut the umbilical cords, and razor blades were used in 22 percent cases (19). In rare cases, only in 0.4 percent, trained midwives or physician attended the deliveries. The study found a neonatal mortality rate about five times higher among the new born babies when ash or burnt earth was applied to untied umbilical cord.

The government of Bangladesh has launched a nation-wide programme of training the interested TBAs and providing necessary delivery kits. A potential additional benefit that may accrue from such a programme is the reduction of neonatal mortality due to birth injury and respiratory distress. A recent analysis of results of the government pilot project in Tangail, an administrative district of Bangladesh, shows that tetanus neonatorum reduced from 24.1 per 1,000 live births in the comparison area to 1.3 in the pregnancy immunization area and 5.6 in the trained TBA area (20). The overall neonatal mortality rate was however found lower in the trained TBA area, 23.8 per 1,000 live births compared with 38.9 per 1,000 live births in the pregnancy immunization area. The corresponding neonatal mortality rates from birth injuries and respiratory distress syndrome were 25.1, 23.4 and 7.0 per 1,000 live births in the comparison area, pregnancy immunization area and trained TBA area respectively. The critical factor there was the training of TBA to screen high risk pregnancies, to promote better

maternal nutrition during pregnancy and in the proper conduct of labour.

Fundamental to any programme that aims to protect neonates from tetanus is the eradication of misconceptions which inhibit acceptance of vaccination during pregnancy, and the displacement of harmful delivery practices, such as use of uncleaned old clothes during labour. Eradication of misconceptions may be attempted by educating people through popular mass media and community level health workers. However, practices such as the wearing of an amulet during pregnancy or the belief in "panipora" (water that is blown while reciting version from holy books or incantations) during labour should not be discouraged. These practices may appear irrelevant in medical terms, but provide a sense of socio-psychological security to the women.

Discontinuation of harmful hygienic practices requires sustained interventi and compassionate health education. Most of these practices are rooted in long time traditional beliefs and practices. One possible measure, particularly in Muslim communities, may be to encourage religious teachers to emphasise [illegible] of Islamic prescriptions for cleanliness and personal hygiene. According to Islam, cleanliness is the half of one's religious belief. In Bangladesh, almost every woman attend some religious school in her childhood. Teaching of proper hygienic practices can easily be encouraged in these schools.

REFERENCES

1. World Health Organization. Expanded Programme on Immunization: Tetanus. Weekly Epidemiological Record, 53(36):269(1978).

2. Bytchenko, B. Geographical Distribution of Tetanus in the World, 1951-60: A Review of the Problem. Bulletin of the World Health Organization, 34:71-104(1966).

3. Newell, K.W. et al. The Use of Toxoid for the Prevention of Tetanus Neonatorum: Final Report of a Double Blind Controlled Field Trial. Bulletin of the World Health Organization, 35:863-871(1966).

4. Miller, J.K. The Prevention of Neonatal Tetanus by Maternal Immunization. Journal of Tropical Pediatrics and Environmental Child Health, 18(2):160-167(1972).

5. Schofield, F.D. et al. Neonatal Tetanus in New Guinea. Effect of Active Immunization in Pregnancy. Brit. Med. J., 2:785-789(1961).

6. Suri, J.C. et al. Active Immunization of Women in Pregnancy for Prevention of Neonatal Tetanus. Bulletin of the World Health Organization, 31:349-357(1964).

7. Macleanam, R. et. al. Immunization against Neonatal Tetanus in New Guinea. Bulletin of the World Health Organization, 32:683-697(1965).

8. Meira, A.R. Duration of Immunity after Tetanus Vaccination. Lancet, 659-661(September 1973).

9. Black, R.E. et. al. Reduction of Neonatal Tetanus by Mass Immunization of Non-pregnant Women--Duration of Protection from one or two Doses of Alumium-adsorbed Tetanus Toxoid. Bulletin of the World Health Organization, 58(6):927-920(1980).

10. Ruzicka, L.T. and Chowdhury, A.K.M.A. Demographic Surveillance System Matlab, Volume One--Methods and Procedures. International Centre for Diarrhoeal Disease Research, Bangladesh, Scientific Report 9:1-28(1978).

11. Rahman, M. et al. Contraceptive Distribution in Bangladesh: Some Lessons Learned. Studies in Family Planning, 11(6):191-201(1980).

12. Rahman, M. et al. Factors Related to Acceptance of Tetanus Toxoid Immunization Among Pregnant Women in a Maternal-child Health Programme in Rural Bangladesh. The International Centre for Diarrhoeal Disease Research, Bangladesh. Scientific Report 43:1-33(1981).

13. Rahman, M. et al. Reduction of Neonatal Mortality by Immunization of Non-pregnant Women and Women during Pregnancy with Aluminium-Absorbed Tetanus Toxoid. The International Centre for Diarrhoeal Disease Research, Bangladesh, Scientific Report No. 41,1-25(1981).

14. Bhat et al. Neonatal Tetanus - A Clinical Study of 100 Cases. Indian Pediatrics, 16(2):159(1979).

15. Wyon, J. B. and Gordon, J.E. The Khanna Study: Population Problems in the Punjab. Harvard University Press, Cambrige, Massachusetts, 176(1971).

16. Chen, P.C.Y. The Traditional Birth Attendants and Neonatal Tetanus. The Malaysian Experience. The Journal Tropical Pediatrics and Environmental Child Health, 22(6):263(1976).

17. Marshall, F.N. Tetanus of the Newborn. Advances in Pediatrics,15:70(1968).

18. Bhatia, S. et al. Indigenous Birth Practices in Rural Bangladesh and Their Implications for a Maternal and Child Health Programme. International Centre for Diarrhoeal Disease Research, Bangladesh, Scientific Report 26(1979).

19. Islam, S. et al. Birth Care Practice and Neonatal Tetanus in a Rural Area of Bangladesh. International Centre for Diarrhoeal Disease Research, Bangladesh, Scientific Report, 38:1-19(1980).

20. Rahman, S. The Effect of Traditional Birth Attendant and Tetanus Toxoid in Relation of Neonatal Mortality. Paper presented in the Seminar on Infant and Child Mortality organized by the Institute of Statistical Research and Training, University of Dacca and Department of Sociology, Cornell University, Dacca, January 9, 1982.