

# Neonatal Tetanus in Southern Iran: Predisposing and Prognostic Factors

Sh. Beheshti,\* A. Khajehdehi,\*\*  
GR. Rezaian,\*\* P. Khajehdehi\*\*

## Abstract

**Background:** The predisposing and prognostic factors for neonatal tetanus (NNT) have not been adequately studied in southern Iran.

**Objective:** The present study was undertaken in Fars Province to further clarify the status of neonatal tetanus in this region.

**Methods:** The mortality rate was correlated with demographic and clinical findings in 112 cases of neonatal tetanus. In addition, the height and weight of NNT patients were compared to those of 112 age- and sex-matched normal neonates.

**Results:** Patients were predominantly males (82%) with a male to female ratio of 4.8:1. Although the clinical presentation and outcome of male and female patients were very similar, both groups had a significantly ( $p < 0.05$ ) lower birth weight compared to their control counterparts. None of the mothers had been immunized against tetanus and 92% had delivered at home under unsterile conditions. The mortality rate was 44% and strongly related to the age of the patients on admission.

**Conclusions:** Male sex, low birth weight, and a lack of immunization of mother, all predispose the newborn to tetanus. The mortality rate was inversely proportional to the age of the newborn.

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**Keywords** • Neonatal tetanus • predisposing factors • prognostic factors

## Introduction

**D**espite the ongoing efforts of WHO's Expanded Program on Immunization, neonatal tetanus (NNT) still remains a major cause of infant mortality in the developing countries.<sup>1-5</sup> Deaths due to tetanus mainly go unreported because most of the births and deaths occur in rural areas where birth and mortality records are inadequate along with limited access to medical care facilities.<sup>4-6</sup> The number of cases reported, therefore, is merely an underestimate of the true burden of the disease. This study was conducted to assess the status of neonatal tetanus and to evaluate the predisposing and prognostic factors in these patients, in Fars Province in the southern part of Iran, where the disease is endemic.<sup>7-11</sup>

\*Department of Clinical Pathology, \*\*Department of Internal Medicine, \*\*\*Shiraz University of Medical Sciences, Shiraz, Iran.

**Correspondence:** Sh. Beheshti, MD, Nemazee Hospital, PO Box: 71935-1334, Shiraz, Iran  
**Fax:** +98-711-6279733  
**E-mail:** beheshts@sums.ac.ir

Parameter	Males (n=93)	Females (n=19)	p value
Mean±SD age (days)	9.0±3.6	10.2±3.2	NS*
Mean±SD height (cm)	49.3±2.5	48.7±3.0	NS
Mean±SD weight (kg)	3.1±0.43	3.2±0.41	NS
Mean±SD incubation period (days)	6.4±2.2	6.8±3.1	NS
Mean±SD hospital stay (days)	16.1±10.6	15.7±13.8	NS
Cord entry	88	15	0.04
Spasticity	91	19	NS
Poor feeding	73	16	NS
Opisthotonus	63	10	NS
Risus sardonicus	34	5	NS
Lock jaw	78	18	NS
Convulsion	88	13	0.002
Jaundice	52	2	0.01
Severe cases	93	18	NS
Expired	44	5	NS

\*NS: Not significant

### Patients and Methods

All cases of neonatal tetanus who were admitted to the pediatric neonatology wards of our main university hospitals from 1975 to 1999 were studied. Demographic data, clinical signs and symptoms, severity of the disease, hospital course and their outcome were determined in the entire study group and were compared in male and female neonates as separate groups too.

Data regarding the vaccination status of the mother, place of delivery (home/hospital) and type of cord handling were determined.

To assess the possible role of weight and height as predisposing factors for NNT, these parameters were compared with those of 112 age- and sex-matched healthy neonates born in the same period of the study. Non-Iranian neonates, were excluded from the study.

#### Statistical analysis

All obtained data were analyzed by STATISTICA software, using Chi-square, Fisher's exact and non-paired Student *t* tests. Multiple regression analysis was used to assess the mortality determinants. A *p*-value <0.05 was considered significant.

### Results

All patients had received immediate care which

included tetanus antitoxin, antibiotics, proper wound cleansing and other supportive measures such as ventilatory support, if needed.

#### Predisposing factors

Of 112 patients, there were 93 (82%) males and 19 (18%) females with a male to female ratio of 4.8:1 (*p*<0.0001). Although the characteristics and outcome of the male and female patients were mainly similar (Table 1), both groups were significantly underweight compared to their control counterparts (Table 2).

None of the mothers had had adequate immunization with tetanus toxoid and 92% of them delivered at home by local birth attendants, under unsterile conditions and unclean cord handling. Cord entry was therefore, responsible in 103 (92%) of the patients. The site of entry could not be determined in the remaining eight patients except in one in whom circumcision antedated the affliction, hence, suspected to be the possible site of entry.

#### Prognostic factors

The overall mortality rate was about 44% which was independent of patient's sex, birth weight or presenting signs and symptoms (Table 3). However, using multi-variable regression analysis, there was a strong positive correlation between the mortality and age on admission of the patients (*p*<0.0005, *r*=0.36). Non-survivors succumbed after a mean±SD hospital stay of 7.7±6.1 days

Parameter	Male neonates			Female neonates		
	Healthy (N=93)	NNT (N=93)	p value	Healthy (N=19)	NNT (N=19)	p value
Mean±SD height (cm)	49.5±2.51	49.3±2.5	NS	49.1±3.1	48.7±3.0	NS
Mean±SD weight (kg)	3.3±0.41	3.1±0.43	0.01	3.4±0.31	3.2±0.41	0.01

NNT: Neonatal tetanus, NS: Not significant

**Table 3: Determinants of mortality in 112 patients with neonatal tetanus**

Parameter	Expired	Survived	p value
Mean±SD age (days)	7.84±3.28	10.3±3.9	0.0005
Mean±SD height (cm)	48.6±3.0	49.9±1.9	NS
Mean±SD weight (kg)	3.0±0.43	3.2±40.41	NS
Mean±SD incubation period (days)	5.8±2.0	6.9±3.3	NS
Mean±SD hospital stay (days)	7.7±6.1	26.2±13.8	<0.0001
Cord entry	45	58	NS
Home delivery	45	58	NS
Spasticity	47	63	NS
Poor Feeding	40	49	NS
Opisthotonus	32	41	NS
Risus Sardonius	17	22	NS
Lock Jaw	39	57	NS
Jaundice	29	25	NS
Severe cases	49	62	NS
Convulsion	46	55	NS

NS: Not significant

which was much shorter than the survivors ( $p<0.0001$ ). Home delivery had no effect on the outcome.

### Discussion

The male sex preponderance with a male to female ratio of 5:1 in our hospital-based study, was striking. The male sex therefore, might have a possible predisposing role for acquisition of neonatal tetanus. Traverso et al,<sup>5</sup> have also noted a similar sex predilection. Although the exact reasons for this sex difference is not quite clear to us, the above authors have attributed the issue to earlier hospitalization of male neonates because of their local societal values.<sup>5</sup> A lower-than-normal birth weight, could also act as a predisposing factor since both our male and female patients had a significantly ( $p<0.05$ ) lower birth weights compared to the normal healthy neonates. Inter-group weight difference, however, was not detected.

Although there has been a sharp decline in the incidence of neonatal tetanus as a result of implementation of routine vaccination programs for expecting women, training of more competent and skilled rural midwives and the successful role of the "Health House" personnel in providing vaccination facilities,<sup>12</sup> the overall home delivery and unclean cord handling was noted in over 90% of our NNT patients. All of these patients were delivered under unsterile conditions by untrained local birth attendants. This underlines the importance of such a practice as a major predisposing factor in the incidence of NNT. Similar observations have been made by other investigators too.<sup>2,4,5</sup> Therefore, while the main preventive measure should be directed toward the proper vaccination of all expecting women, home deliveries by untrained traditional

attendants should be discouraged and legally prohibited too. Gupta and associates<sup>13</sup> found that only complete immunization of pregnant women and the use of clean instruments for cutting the umbilical cord were independently associated with a risk reduction for neonatal tetanus. The latter finding has been confirmed by others too.<sup>4</sup>

Circumcision was reported in 3 patients two of whom had undergone the operation under sterile condition in a hospital setting, making it an uncommon site of entry in our male neonates. The mortality rate was about 44% in our series which is similar to that reported by other investigators.<sup>2,14</sup> Mortality had a very strong correlation with the patient's age on admission, the younger the newborn, the higher was the mortality rate. Similar observations have also been made by Gurkan and associates.<sup>2</sup>

The impact of home delivery, poor cord management and lack of antenatal care in a health facility on the outcome of NNT has been shown in several recent studies.<sup>14-16</sup> Delivery at home however, had no correlation with mortality in our series. Other factors such as a short incubation period,<sup>2,14,17</sup> presence of risus sardonius<sup>2,17</sup> and fever<sup>17</sup> have also been said to be associated with higher mortality. Such associations however, were not observed in the present study.

### Conclusions

These results suggest that proper antenatal nutritional support and immunization of all expecting women, prohibition of non-hygienic home deliveries and promotion of hospital deliveries by health education of mothers and traditional birth attendants might help prevent the disease and to save thou-

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sands of lives which are otherwise lost as a result of NNT throughout the world.

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