

# Neonatal Mortality Due to Tetanus in Iran

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## Abstract

During March and October 1985 surveys on basic health indicators were carried out on 10% of the rural and urban population of the Islamic Republic of Iran. Families were selected by systematic random sampling. In the visited families all deaths occurring during the year preceding the interview were recorded by age, sex and cause. Deaths in the first month of life received particular attention for signs of neonatal tetanus. The neonatal mortality rate was 21 per 1000 live births and neonatal tetanus mortality rate 5 per 1000 live births. It is estimated that over 1000 children died from tetanus in 1984 in Iran. Neonatal tetanus mortality rate was lower in urban areas than in rural areas. The elimination of neonatal tetanus is still in its early stages and immunization of pregnant women (now 32.3% second shot) and training of traditional birth attendants need to be accelerated.

**Key words:** Neonatal tetanus; neonatal mortality; Iran.

While neonatal tetanus is virtually unknown in most industrialized areas, it remains a major problem in many developing countries. Data on its exact incidence are not extensive but community surveys conducted in Asian, Middle Eastern and African countries suggest that neonatal tetanus is a major health problem in many areas, decimating up to 67 out of 1000 live births and sharing up to 72% of all neonatal deaths.<sup>1</sup>

Tetanus is not a contagious disease. It can easily be prevented through immunization. The neonatal form can be prevented by better maternity care. That is why the Expanded Program of Immunization (EPI) of the World Health Organization (WHO) focuses, inter alia, on preventing neonatal tetanus through immunization of pregnant women.

As reports of neonatal tetanus in Iran are practically non-existent, the present survey was undertaken to estimate the magnitude of the problem.

## Materials and methods

In March and April 1985, interviews of 10% of rural dwelling families were conducted throughout the country (except in Kurdistan Province) for investigation of selected random sampling and questioned house to house, by the staff of Department of Malaria Eradication, inter alia, about births and deaths that occurred between 21 March 1984 and 20 March 1985 (Iranian solar calendar year 1363), while performing their annual malaria survey.<sup>2</sup>

The same was conducted in October 1985 by interviewing 10% of urban dwelling families, selected by the same procedure, about births and deaths occurring between 23 September 1984 and 22 September 1985 (Iranian school year), excluding 5 large cities - Tehran, Tabriz, Mashad, Esfahan and Shiraz, and towns of Ilam Province.<sup>3</sup>

The rural survey embraced 1,968,595 individuals and urban one 1,537,377. In both, deaths occurring during one year prior to the date of interview were recorded by age, sex and cause (to the extent possible for the conception of mother or family head).

The death of newborns due to tetanus before one month was subject of particular attention on the part of interviewers, by questioning about criteria explained in WHO EPI modules<sup>4</sup> such as convulsion, cessation of sucking, fever, muscular rigidity and lockjaw (trismus) before death. Therefore diagnosis of death due to tetanus was based on the explanation of interviewer and assertion of mother or father.

## Results

Iran's 24 provinces have been divided into 3 groups depending on rural infant mortality rate (IMR):

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**Table 1.** Neonatal mortality and neonatal tetanus mortality rates in rural and urban Iran, 1984-85.

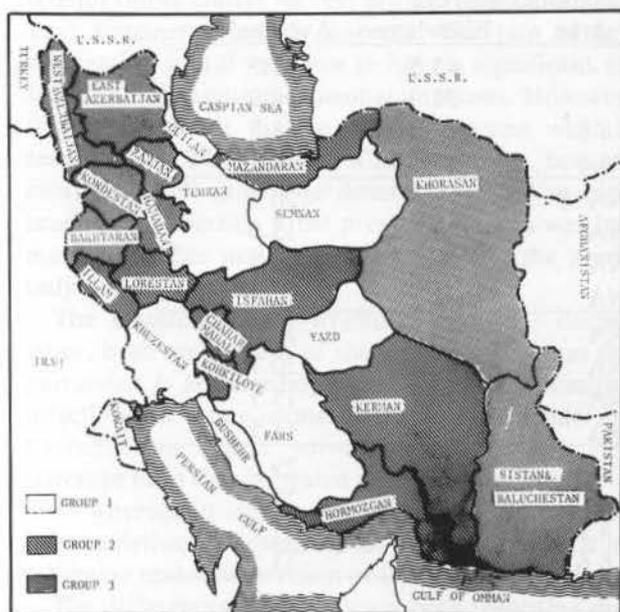
Group of Provinces		Population	Live Births	Neonatal deaths		Neonatal tetanus deaths		Delivery in hospitals††
				Number	Rate†	Number	Rate†	
Group 1*	Rural	529,336	21,196	299	14.1	75	3.5	59.1
	Urban	571,192	22,379	238	10.6	13	0.6	91.2
Group 2	Rural	680,360	29,205	649	22.2	146	5.0	36.3
	Urban	474,025	18,947	282	14.9	29	1.5	77.8
Group 3	Rural	758,899	33,453	1126	33.7	404	12.1	21.6
	Urban	492,160	19,699	402	20.4	43	2.2	68.6
IRAN**	Rural	1968,595	83,845	2074	24.7	625	7.4	35.6
	Urban	1537,377	61,025	922	15.1	85	1.4	81.1
Iran Total**		3505,972	44,870	2996	20.6	710	4.8	60.4

\*For definition of Groups, refer to text (Results Section)

\*\*Population weighted

†Per thousand live births

††From a 1987 survey



**Figure 1.** Islamic Republic of Iran, provinces grouped by neonatal tetanus mortality rates. For actual 1984-85 rates, see table 1.

group with mortality rate of less than 55 per 1000, group 2 with IMR between 55-75 per 1000 and group 3 with mortality rate of more than 75 per 1000.<sup>1</sup>

The map shows geographical distribution of deaths due to neonatal tetanus according to the data collected by retrospective studies. (Figure 1)

As a rule, urban IMR has been lower than rural, which may be ascribed to the fact that in cities and towns, up to 99% and an average of 81% of deliveries are conducted in maternity homes/hospitals (table 1).

Although no similar facilities are available for rural areas, obviously some villagers refer for parturition to nearby towns but their number cannot be considerable and the majority are left to traditional birth attendants (TBA), not many of them yet trained. As a result, out of all deaths in the first month in rural areas (2074 out of 83854 live births, i.e. 24.7 per 1000) 625 i.e. 30% were due to tetanus, whereas, of all urban neonatal deaths (922 out of 61025 live births, i.e. 15.1 per 1000), 85 i.e. nearly 10% were due to the disease.

In group 1, including 8 provinces (Boushehr, Fars, Gilan, Khuzistan, Markazi, Semnan, Tehran and Yazd), neonatal mortality rate in rural and urban areas (excluding Shiraz and Tehran cities) were respectively 14.1 and 10.6 per 1000 live births. In the same provinces neonatal tetanus mortality was 3.5 per 1000 live births in rural and 0.6 per 1000 in urban areas. In other words, in rural areas, 25% of deaths during the first month of life were due to tetanus whereas in towns 6% of neonatal deaths were due to tetanus.

In group 2, comprising 9 provinces (Char-Mahal and Bakhtiari, Esfahan, Hamedan, Hormozgan, Ilam (rural only), Kerman, Kohkiluyeh and Boyer-Ahmad, Lorestan and Mazandaran) neonatal mortality rate was 22.2 per 1000 in rural, and 14.9 per 1000 in urban areas (excluding Esfahan City); the mortality rate due to neonatal tetanus were 5 and 1.5 per 1000 respectively. In these provinces, 22% and 10% of neonatal deaths in rural areas and in towns respectively were due to tetanus.

Finally, in group 3, including 7 provinces (Azar-bayejan E and W, Bakhtaran, Khorassan, Kurdistan (only urban), Sistan and Balchistan and Zanjan) neonatal mortality rate in rural areas was 33.7 per 1000, and in towns (excluding Mashad and Tabriz) the rate was 20.4. The rates due to tetanus were 12.1 and 2.2 respectively. This means that 36% and 11%

**Table 2.** Tetanus Toxoid (TT) Immunization of pregnant women in Iran (1983-86).

Year	1983	1984	1985	1986
Target Population	1680000	1706000	1856000	1916019
TT1*	112022	320407	653398	734507
TT2**	61348	220659	430655	619593
TT2/Target Population***	3.7%	12.9%	23.2%	32.3%

\*First dose of tetanus toxoid

\*\*Second dose of tetanus toxoid

\*\*\*Percent of target population that received 2 doses.

**Table 3.** Percentage of mothers given Tetanus Toxoid (TT) during pregnancy. Expanded Program of Immunization (EPI) Cluster Surveys (1984-1987)

	Area and Antigen	International Review Team	National Surveys		Average**
			Tehran	Elsewhere	
Group 1*	Rural TT1†	-	-	43.5	43.5
	2†	-	-	36.9	36.9
	Urban TT1	-	8.8	29.0	18.5
	2	-	6.6	25.6	14.1
Group 2	Rural TT1	7.3	NA††	32.3	20.9
	2	6.0	NA	25.0	15.0
	Urban TT1	11.7	NA	28.2	21.1
	2	10.0	NA	21.5	14.1
Group 3	Rural TT1	5.0	NA	50.5	27.8
	2	2.7	NA	38.7	20.7
	Urban TT1	6.0	NA	26.7	15.3
	2	3.0	NA	19.7	11.5
Average**	Rural TT1	6.0	-	40.5	29.6
	2	5.0	-	31.4	23.1
	Urban TT1	8.8	8.8	28.1	17.9
	2	6.5	6.6	23.2	13.3

\*See table 1 for the definition of groups.

\*\*Population weighted.

†Tetanus toxoid, first; and second doses.

††Not applicable.

of neonatal deaths in rural areas and in towns respectively were due to tetanus.

In general, in rural areas neonatal mortality rate is 24.7 per 1000, of which 7.4 i.e. 30% is due to tetanus, while in investigated towns the same rate is 15.1 per 1000, of which 1.4 per 100 i.e. about 10% is due to tetanus.

### Discussion

The present study is based on the results of surveys conducted for other purposes than investigation of neonatal tetanus and should merely be considered as a preliminary report, to be completed in the future.

Elimination of neonatal tetanus in Iran is still in its early stages and is based mainly on women immunization and TBA training. The socio-economic conditions also play a major role.<sup>3</sup>

Tetanus toxoid (TT) application to women in child-bearing age is still insignificant in Iran and even its application to pregnant women yet requires intensification as the figures in table 2 show (from returns of routine immunization performance by health units, regularly submitted to WHO).

The results of 126 cluster surveys conducted in 1984-1987 for EPI evaluation, in all 24 country's provinces (normally 2 surveys in each but 13 in Tehran

**Table 4.** Percentage of deliveries in proper conditions\*

Area	Group 1†	Group 2	Group 3	Total (Weighted)
Rural	65.5	58.7	35.6	52.9
Urban	94.4	78.8	70.6	85.1

\*From Expanded Program for Immunization (EPI) Survey

†Refer to table 1 for definition of groups.

province, of which 8 in Tehran City) about TT application to pregnant women are shown in table 3.

The exceptional high coverage in group 3 rural, belongs to one district in Azarbayejan W; otherwise there seems some correlation between TT coverage of pregnant women and the incidence of neonatal tetanus (more cluster surveys are still needed to make firm statements in this respect). The rate of immunization is still very low to have a significant effect on the prevention of neonatal tetanus. However, it is pointed out that in many instances what is recorded as TT1 is actually TT2 or booster, because most staff still think two doses are needed in each pregnancy, whereas, if the pregnant woman was immunized in her previous pregnancy(ies), she needs only one shot (or none).

The maintenance of hygienic conditions during labor, both on the part of the midwife as well as the parturient, is another important factor in preventing infections including neonatal tetanus. The results extracted from cluster surveys conducted for EPI coverage have demonstrated that in large cities up to 99% whereas in rural areas only 53% of pregnant women deliver in maternity homes and hospitals or otherwise under supervision of trained TBA (table 4).

The differences are significant both regarding different rural areas and regarding rural versus urban areas. This is reflected in the average mortality due to neonatal tetanus.

Lack of adequate number of trained TBAs also contributes to this high mortality rate. Table 5 shows the number of TBAs trained in 1984-1986 period.

Circumcision in large towns is done more or less within the first week of life and normally by

**Table 5** Training of Traditional Birth Attendants (TBAs) in the years under consideration

Year	1983	1984	1985	1986	1987
Number of participating Provinces	6	7	23	12	23
Number trained	216	343	2411	1228	4198

surgeons. The same applies to some extent in all towns. On the other hand, as a rule circumcision in rural areas is done at the preschool age and mainly by the village barber.

Ear piercing (and in Sistan and Baluchistan nostril piercing) is normally done on grown girls by anybody. Tattooing and scarification, when in practice, may be done on newborn. Thus the role these secondary factors play on the occurrence of neonatal tetanus is yet to be clarified.

Many socio-economic factors also play a significant role in increasing the neonatal tetanus mortality.

### Conclusion

The rate of tetanus related mortality is high in Iran. The three major factors that can lessen the mortality are (a) better immunization, (b) better training of TBAs, and (c) provision of better living facilities and changes in socio-economic status.

### References

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3. Malek-Afzali, H; Survey of mortality and birth in Iran's urban population, 1984-85; Daroo Va Darman;1986;4:7 (in Persian).
4. World Health Organization; Expanded Programme on Immunization; Training on Immunization; Training for mid-level managers; Conduct Disease Surveillance, 1980, p8.
5. Weekly Epidemiological Record, 1987, 62(7):40.

## **Erratum:**

In the article by Malik-Afzali and Chamsa, entitled "Neonatal Mortality Due to Tetanus in Iran" (JIMA 1988;20:104-110), the following corrections should be noted:

Page 104, Abstract, line 6: over 1,000 children – should read: over 10,000 children.

Page 105, Table 1, column "Live Birth":total

44,870-should read : 144,870.

Page 105, text below map, line 1, read: group with – should read: group 1 with . . .

Page 105, text below map, line 3: . . . 75 per 1,000 – should read 75 per 100<sup>2</sup>.

Page 107, Table 5, title row: "1987" – should read "total".

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