A Comparative Study of Tetanus Neonatorum

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Introduction:

Neonatal tetanus is a common and highly total disease of tropical and sub-tropical, more primitive countries, due to infection of the umbilical stump by spores of Clostridium tetani, usually conveyed by the use of rusted cutting materials (knife, sickle, blades etc.) /4/ or the application of cow dung dressing. /6/, dirty dressings and clothes. / /. It is an important cause of infant mortality in developing countries., where primitive unhygienic obstetric practices prevail. The first and main symptom of tetanus in neonates is cessation of sucking and crying and then convlsion and fever.

Magnitude of the problem:

The problem of neonatal tetanus can not be understressed, if we look on some of the figures:

a. In fact the No. 1 neonatal problem in babies in the Bheri Zonal Hospital during 2-years' study period was Tetanus neonatorum.[3]

b. From the total 269 tetanus case, 70% was tetanus neonatorum (192 cases) for 3 years period.[4] In Bheri Zonal Hospital about 4% of total admission and 25% of all death occurs from tetanus.

c. Tetanus neonatorum is the main killer of neonates.[9]

d. 103 cases of tetanus neonatorum cut 241 in a one period in Dakar.[7]

e. In Punjab, neonatal tetanus is known as "eight-day disease". Because so many babies die of tetanus on the eighth day of life.[5]

f. Estimated neonatal tetanus mortality rate in U.P. (India) is 72% i.e. 67/1000 live briths.[11]

g. In 6 countries of South East Asia total No. of neonatal tetanus deaths-393067, i.e. 462429 are suffering with 85% mortality rato.[14]

h. almost a million fatalities by neonatal tetanus per year. Epidemiological information is deficient. Routine reporting systems identify no more than 2-5% cases[15].

i. In India it was one of the first four causes of all death[1].

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Aim of this study

As W. H. O. States: "Neonatal tetanus level should serve as one index of the quality and utilisation of material health services"[1], the aim of this study is to compare the present state of neonatal tetanus with that of five or more years on the same hospital after introduction of MCH clinic, which delivers immunization by tetanus toxoid to the expectant mothers, who attend the clinic. As this is a preliminary study, so it may not necessarily show the actual state of affairs.

Methods and Materials:

1. Our study material consists of 47 patients with tetanus, that were admitted to the paediatric ward of Bheri Zonal Hospital for the period of 18 months around October, 1982 to march 1984. (Kartik 2039 to Chaitra 2040 B. S.)

2. For comparision, we have taken two other studies, which were undertaken in the same hospital as ours. The time interval between those two studies & ours is almost 5 years. The First study with which we are going to compare is Dr. D. S. Manandhar's[3] and another is Dr. S M Shrestha's[4] Manandhar's study period was 2 years from Sept. 1975 to August 1977, whereas Shrestha's period including the same, : 3 years study from 1975 to 1977. Where it was hard to find out the exact figures., from these two studies, we have tried to extract some figures from datas in these studies.

INCIDENCE:

Total cases admitted with tetanus in the paediatric ward in our 48 months' study period-47.

From this tetanus in the age group 0-1yrs - 39, i e. 83%
Tetanus in the age group 1-4 yrs - 4, i.e. 8.5%
Tetanus in the age group 5-14yrs - 4, i.e. 8.5%
Total: 47 100%

From the age group 0-1 yr. neonatal tetanus: 33, i.e. 70.2% of the total (i.e. 29.8% cases occur after 1 month of age).

The table No. 1, below shows the comparative study on the incidence of tetanus neonatorum.

TABLE: I

INCIDENCE OF TETANUS NEONATORUM.

Studies	Total cases/months.	Average/month (mean)	Ratio	Study period
I-This study	33/18	1.83	1.1	Oct. 82-March 84
II-Manadhar's	100/24	4.16	1:2.8	Aug. 75-Aug. 77
III-Shrestha's	191/36	5.3	1:2.9	Jan. 75-Dec. 77

If we take 3.76 as mean for three studies/month. and months variable (A) and assuming the months (24 as mean) with variables average/month (B), the figures will be as follows, shown on Table II, below:

TABLE: II

Study	(A)	(B)
I	67.68	43.92
II	90.24	99.9
III	135.25	127.2

From these tables it is obvious that the incidence is relly low than that was in the previous studies, as our study shows marked decline from the mean. Now, Let us see the sex relation can morbidity.

TABLE : III

Study	Total cases	Male	Female	Ratio (F:M)
I	33	23	10	1:2.3
II	100	75	25	1:3
III	192	132	60	1:2.2
Total	325	230	95	1:2.4

In all these three studies male preponderance is obvious, the mean being F:M=1:2.42.

TABLE : IV

	AGE IN DAY AT THE TIME OF ADMISSION																Total
Study/Age in days	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
I cases	-	-	-	10	9	2	2	2	3	2	-	1	-	1	1	-	33
%				3.06	27	6	6	6	9	6		3		3	3	3	100
II cases	6	1	9	24	16	16	5	11	5	5	2	-	4	2	-	-	109
%	-	1	9	24	16	16	5	11	5	5	2	-	4	2	-	-	100
III * ?	R	?	?	?	?	?	2	2	2	2	2	2	?	?	?	=	192

* Datas not shown in the studies.

The graphic representation of this table is shown below. (Histogram-I) From the table IV and Histogram I, it is clear that most of the cases are admitted on the first 10 days of life (Over 75% cases) The maximum being on the 6th., 7th and 8th. days after birth, covering more than 60% cases. There was no case after 16th day.

Maximum babies admitted on:

I 6th. day age-30.3% 75.7% admitted on 6-10th. days of age.
II 6th. day of age 24.0% 82.% " -"- -"- -"-.

TABLE: V

MALE: FEMALE RESPONSE ON TREATMENT. (Result of Treatment.)

Age	Total cases	Recovered		LAMA		Expired		Remarks
		M	F	M	F	M	F	
5th. day	—	—	—	—	—	—	—	
6th. day	10	2	—	—	—	6	2	
7th. day	9	1	1	1	1	2	3	
8th. day	2	—	—	2	—	0	0	
9th. day	2	1	—	—	—	—	—	
10th. day	2	—	—	—	1	1	—	
11th. day	3	2	—	1	—	—	—	
12th. day	2	1	—	—	1	—	—	
13th. day	—	—	—	—	—	—	—	
14th. day	1	—	1	—	—	—	—	
15–21 day	2	2	—	—	—	—	—	
Total	33	9	2	5	3	9	5	

From the table No. V, above, we get the recovery: LAMA: Mortality ratio (11:8:14)=1:0.72: 1.27. The M:F ratio for recovery being 4.5 : 1, for LAMA 1.66 : 1 and for expiry - 1.8 : 1. This shows that male preponderance is obvious everywhere. Let us see that is there any discrimination to the "weak" sex.

TABLE : VI

COMPARATIVE RESULT OF TREATMENT

		Male		III	Female			I
Result of treatment	No.	%	Total		No.	%	Total	
Recovered	9	39			2	20		
I LAMA	5	22			3	30		
Expired	9	39	61%	56%	5	50	80%	50%
Total	23				10			

III * From 132 male 74 (56% from f=60)—30 50%

From the table above, it is seen that female mortality is higher than male mortality & it is true for recovered cases also in reverse sense. The LAMA cases are also higher for the female babies. Is this due to negligency toward the nymphets ? But Dr. Shrestha's study shows that mortality is higher in males than females.

Average duration of stay. For comparision we are giving it in the table VII.

TABLE : VII

AVERAGE DURATION OF STAY

Study	Average duration of stay		
	Total paed.	Tet. Neon. cases	For those who survived.
I	5.57	7.66 days (253/33)	(16.4
II	?	6.23 days	12.2 days.
III	?	?	

From this table it is seen that now patient spend more days than at the study period of I & II.

Seasonal variation: Though season does not have effect on tetanus neonatorm, & it occures throughout the year,[5] we have found some seasonal variation, which is shown below :

TABLE : VIII

SEASONALITY ON THE INCIDENCE OF TETANUS NEONATORUM

Month:	Bais	Jest	Asha	Shr	Bha	Ashw	Kar	Marg	Paush	Magh	Falg	Chait	Total
No. Cases	—	—	—	3	8	1	4	4	4	7	1	1	33

From this table it may be seen that there is seasonal variation, but it occures all the year round, this must be confirmed in long study period. In Dr. Shrestha's study it is stated that there is seasonal incidence i. e. 166 out of 192 cases (86.46%) occured from July to October, which corresponds to Shrawan to Kartik i. e. rainy season & autumn.

TABLE : IX

AGE AT ADMISSION & MORTALITY (IN DAYS) also expresed in % to show on graph.

Study	Age in days	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total	%
	No.	—	—	—	10	9	2	2	2	3	2	—	1	—	1	1	—	—	33	
I	Exprir	—	—	—	8	5	—	—	1	—	—	—	—	—	—	—	—	—	14	4242
	%	—	—	—	24	15	—	—	3	—	—	—	—	—	—	—	—	—	42.42%	
	No.	—	1	9	24	16	16	5	11	5	5	2	—	4	2	—	—	—	100	
II	Expir.	—	1	8	13	15	14	1	2	—	—	—	—	—	—	—	—	—	54.54%	
	%	—	1	8	13	15	14	1	2	—	—	—	—	—	—	—	—	—	54%	
III	?	?		4	to	———	———	———	———	———	———	———	———	———	15 days				104/192	
																			54.17%	

The graphic representation of this table is shown on Histogram - II from this table & histogram II it is obvious that the maximum mortality occures on 7th day. If proper care is delivered, there may be no death beyond 10th day of life.

Now let us see the fate of tetanus neonatorum, according to the age of the babies, & duration of incubation period on the table No. X, below.

TABLE : X

THE FATE OF BABIES ACCORDING TO THE AGE & INCUBATION PERIOD

			Recovery		Lama/Absc		Mortality		LAMA + Mortality	
Age in days	Total	%	No.	%	No.	%	No.	%	No.	%
6	10	30.3	2	20	—	—	8	80	8	80
7	9	27.3	2	22.2	2	22.2	5	55.5	7	77.8
8	2	6	—	—	2	100	—	—	2	100
9	2	6	1	50	1	50	—	—	1	50
10	2	6	—	—	1	50	1	50	2	100
11	3	9.1	2	66.6	1	33.3	—	—	1	33.3
12	2	6	1	50	1	50	—	—	1	50
13	—	—	—	—	—	—	—	—	—	—
14	1	3	1	100	—	—	—	—	—	—
15--17	2	6	2	100	—	—	—	—	—	—
Total	33	100	11	33.33	8	24.2	14	42.4	22	66.67

From this table it is seen that:-

1. First week of life is very critical period for recovery, as there is very high mortality rate.
2. When there is shorter incubation period of less than a week, it usually leads to severe attack with earlier manifestation of clinical features. With longer incubation period mild attacks are the rule.[7]
3. The LAMA- cases are usually terminally ill, (before 5th. day admission,) & may end fatally.
4. Maximum deaths occur in the first 3 days (72 hrs) of admission. i. e. first week of life so, it is agreed that the age of the patient is important & the length of the incubation period may be a guide for prognosis.[8]

Discussion:

First of all let us think of the factors, that lead to suffering from Tetanus neonatorum. All of the cases with tetanus neonatorum were delivered at home & no immunization was provided to the expecting mothers. Usually they come from the rural areas, villages, that are distant from the hospital & town (Nagar) Panchayat, where facilities for proper [illegible] immunization exist. The cutting of the umbilical cord with [illegible], is [illegible] usually practiced. It may be a important factor of delivering the spores of Cl. [illegible] to the stump, as [illegible] of these cutting materials are ([illegible]) usually [illegible] cutting grass. The unhygienic condition & poor knowledge of health & sanitation are also some of the factors. The Tharu population seemed to be affected usually. The primitive unhygienic obstetric practices, are the main factor to be blamed for including dirty dressings and clothes.

In our study total cases with tetanus admitted to the paediatric ward of Bheri Zonal Hosaital were 47, the three ages group 0-1 yr, 1-4 yrs, and 5-14 yrs. were comprised of 39 (83%). 4 (8.5%). respecectively. From the age group 0-1 years. 33 were suffering from neonatal tetanus, which accounts for 70.1 of the total cases (33 out of 47) & the age group above 1 month to 14 yrs. 29.8% (14 cases.) The preschool children, i. e. up to 4 yrs. age group comprised in total 91.5% cases.

In our study, (I), there was 1.83 cases per month in average, where as In Manandhar's (II) study, it is 4.16 month & in Shrestha's (III) sttdy, it is 5.3% month. i. e. in the ratio 1:2.7:2.9 let us take the mean of these three figures, 3.77 cases / month. then it would make in I= 67.68 month, in II=90.24 cases for 24 months and in III=135.36 In case if we take time period= const.(24 month), with individual mean, then it will make 43.92. 99.9 & 127.2 for I, II,& III respectively. In each comparision it is obvious that there is certain in the incidence of Neonatal tetanus, being 48.76% & 75.14% less in our case. Where as they are higher than 100% in I & II studies.

Though the references 3, 4, 11, 12, & other provide with information that male preponderance is marked & in our study too it was found that male dominance in the incidence can't be denied, (the ratios in all the threes, being over 2.1)., some researchers deny the fact stating "the M:F ratio is biased". 5, 13, 14/ It would be interesting to find out the actuality rather than just to deny it, as immunological basis & many other factors must be assessed to conclude the epidemiological state of the males, why there is male preponderance ?

The usual age (In days) at time of amission of our study is before 10 th. day of life, which covers 75.7% of total neonatal tetanus cases, the maximum being 6, 7& 8 th days, which corresponds with Manandhar's 82%, & with Akbar et al's 13. Dr. Shrestha's II 4 study shows it occured from 4 to 15 days after delivery.

The male- female ratio on mortality could not be compared. In our series it is 1.8:1, which corresponds with Stanfields', with 1. 6:1. /14/

In our study it is found that 33.33% cases get recoverd without any sequale (this is the case in tetanus), & 24.24% cases left against medical advice (LAM-). We confess that the LAMA cases are terminally ill especially before 5 th. day of admission. & if proper care is not deliverd, they end fatally. Well, in our study, the maximum fatality were in the 6th & 7th. day of life, that usually corresponded with small age & "before 72 hrs. of admission, and only one terminated on 10 th day. In Manandhar's study (II), the fatality is marked on 4 th. to 10 th. day (? of admission.) This is in accordance with Stanfield's study 14, who states that number of deaths rise fairly from 4 th. to 7-8 th. day, then fall away slowly, & with other references 6, 11, 12,.

Now about mortality rate. "Mortality in some areas may be as high as 60 to 90% and tetanus neonatorum declares itself in the first week of ten days of life and usually is

severe." /8/. In neonatal tetanus high mortality rate is stated to be varying from 21-90% /5/, to 25% /7/, 94% /14/, 24-87% /14/, 37-68 /4/ and our study shows mortality rate of 42,42%, Manandhar's study (II) 54% and Shrestha's (III) - 54. it shows relatively less mortality as recorded, which may be explained by the fact that early hospitalization, proper care and growing consciousness toward the disease is the rule. It is suggested to compare the neonatal tetanus mortality rate with per 1000 live births and proportion of neonatal deaths to total tetanus cases in %. But, it is pity that we do not have exact figures of live births (due to home delivery) and tetanus cases to compare with.

To compare the fate of neonatal tetanus on sex, we compared our figures and found that the recovery rate is high for male child (M:F=2:1) whereas LAMA and expiry cases high for female child (1:1.3). This may be explained by the fact that three is ceriain negligency toward the famale child in the family. But Dr. Shrestha's study shows there is no discrimination in the mortality rate.

Avereage duration of stay in our study is 7/66 days whereas in Manandhars' study (II), it is 6.23 days. For those who survived, average days of stay is 16.45 and 12.2 days respectively. Stanfield agrees that the mean duration of survial in the babies with tetanus neonatorum is between 7-8 days, which correspond with ours. The mortality rate gradually falls, 1-5 days of illness being critical and the recovery rate gradually increases, being almost 100% from 8th. day of life.

Though there is no seasonal variation /5/, but in our study it was seen that rainy season and winter season are manifested by higher incidence. But it must be considered in long period of study. Dr. Shrestha's shows/4/-seasonal incidence from July to October.

The minimum the age the maximum the mortality /5/ is confirmed.

LIMITATION OF STUDY:

Several limitations of this study must be considered. The number of study cases is small, the crucial health indicator, i.e. community morbidity pattern is not taken into comparision as well as the incidence of neonatal tetanus per 1000 of live-births.

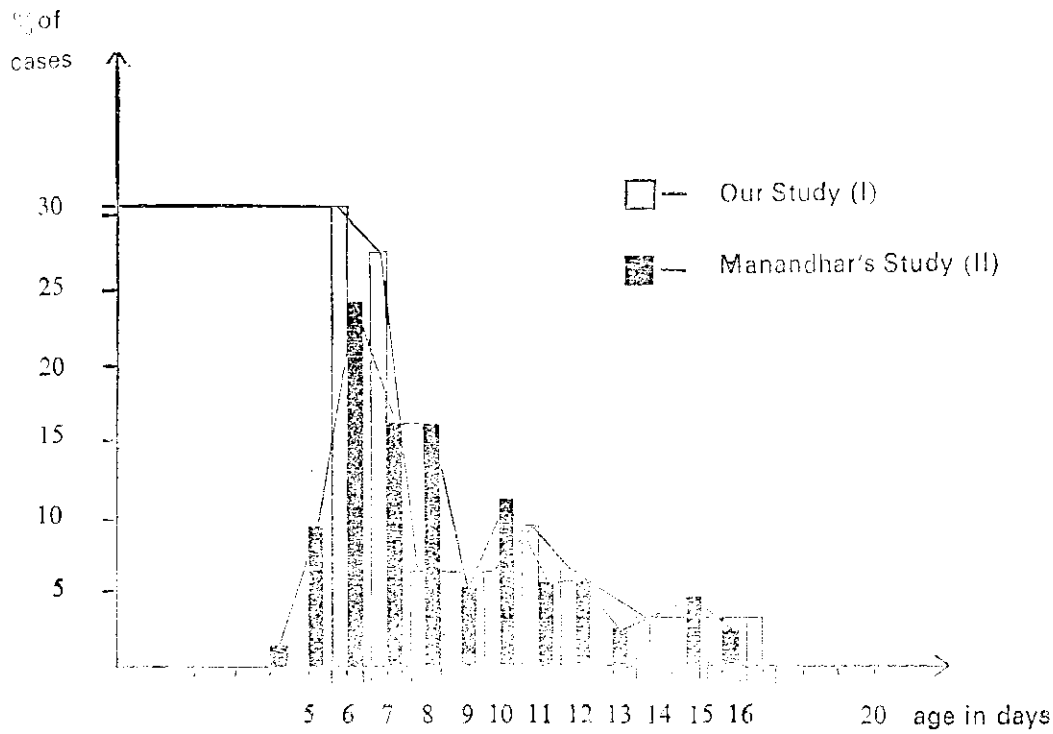
Conclusion :

- The problem of tetanus neonatorum not only in Nepal, but in the countries of tropics and sub – tropics is acute.
- There is certain decrease in the incidence of tetanus neonatorum than it was 5 years' ago in the Bheri Zonal Hospital. But it is still high.
- The male preponderance on the incidence rate is obvious.
- The first 10 days of life cover 83% of the total neonatal tetanus cases.

Graphic Representation of two Studies:

Age of Pts. (In days) at time of Admission

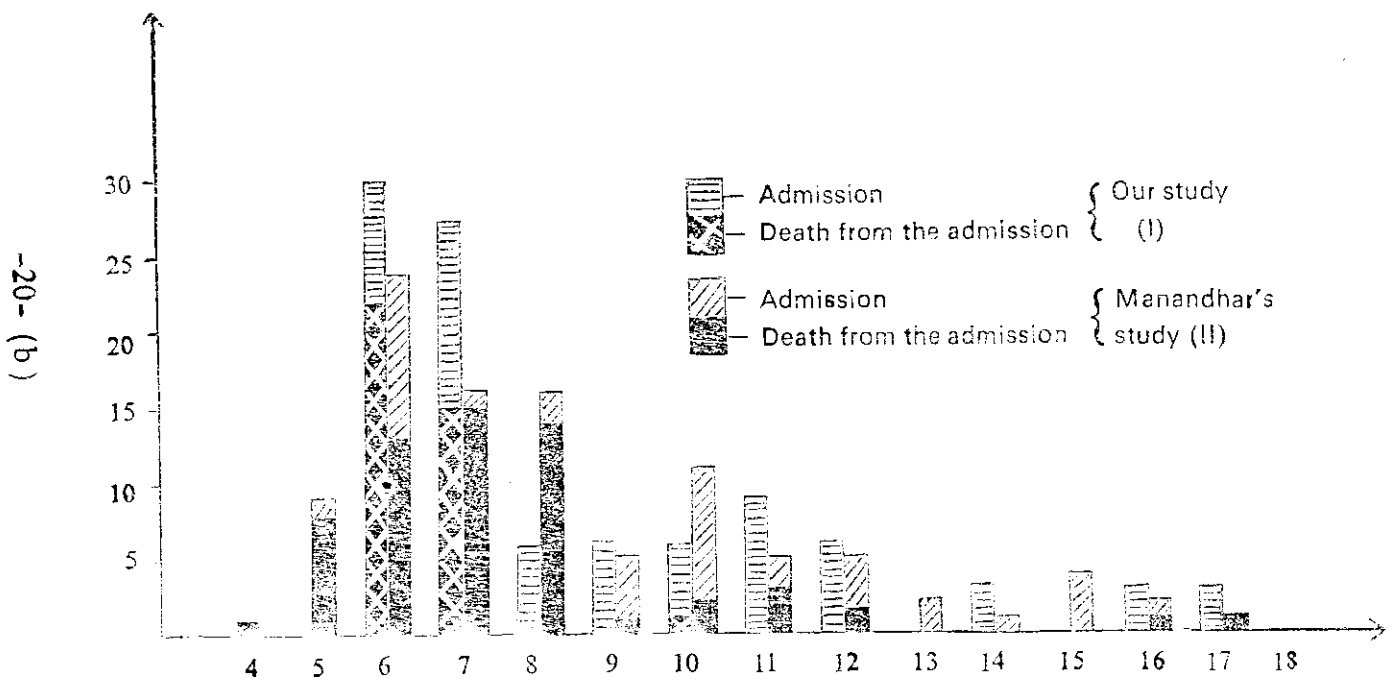
(Expressed in %)



Histogram-I

Age at Admission & Mortality (in days)

(Expressed in %)



HISTOGRAM-II

- The mortality rate on the first week of life is almost 86%, i. e. first 3 days of hospital admission.
- The recovery rate is around 33%
- The mortality rate - 42.4% & LAMA cases - 24%
- Total recovery is noted only after 7 days of hospitalization. So the first week must be considered critical & if there is no death on the first week of life & the patient has not expired during the first 72 hrs. of admission, that case can be taken as hopeful: prognostically.
- There is definite relation between the age & incubation period. The minimum the age of patient, the maximum the chances of fatality & the minimum the incubation period the mortality is maximum.
- Early diagnosis & hospitalization may affect the recovery rate & hence reduce the morbidity rate.

Recommendations :

As already stated quoted from WHO meeting on prevention of neonatal tetanus, "Neonatal tetanus level should serve as index of the quality & utilization of maternal health services.," The only recommendation we'd like to put forward is mass immunization, with special reference to the pregnant woman, which is practiced in our country by two projects: Family Planning and Maternal Child Health Project and Expanded Programme for Immunization. And hope that they won't miss rural population.

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