Seasonal variation in Non Neonatal Tetanus: 7 years Retrospective Record based Study

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Abstract—*Non-neonatal tetanus (NNT) is a public health problem because of inadequate immunization and awareness in population. But it is not given due weightage so there is scarcity of studies regarding NNT. This present retrospective study was conducted in Isolation ward of SMS Medical Hospital, Jaipur weith the aim to study the seasonal variation of NNT if exist. A record based cross-sectional study of tetanus patients admitted since 1st Jan 2004 to 31st Dec 2010 in isolation ward of SMS Hospital, Jaipur, Rajasthan. Seasonal variation of admitted tetanus patients and its association on outcome of patients was analysed. It was found that post monsoon season has significantly higher number of cases admitted in each year of 7 years of study period so it may be associated with occurrence of tetanus which needs further exploration through studies. Although minimum cases were admitted in winter but CFR of tetanus was observed significantly higher in winter season.*

Key words- Non-Neonatal Tetanus (NNT), Seasonal Trend, Case Fatality Rate

1. Introduction

Tetanus described 3000 years ago in ancient Egypt. Inadequate immunization coverage in pregnant women, unclean delivery practice and cord care, and social taboos (application of cow dung or ghee on umbilical stump) are the most important risk factor for neonatal tetanus (NT). In contrast to this, 50% of cases of non neonatal tetanus (Non NT) had an identifiable lower limb injury as a portal of entry and but in 20% cause remain obscured.[1-3] In remaining cases of NNT etiological factor are penetrating injuries of upper limb, head, face, neck and trunk, otorrhoea, abortion, puerperum, vaccination, injection, surgical operation as a cause of tetanus.

As far as the seasonal variation is concern in case of tetanus, there is extreme scarcity of studies conducted in this direction. A handful of articles mentioned about prevalence of tetanus among various season without showing any statistical significance. Most of them observed that it is more prevalent in the hot, dry season while others reported that it is more common in the wet or humid seasons.[4]

Convincing the scarcity of available studies concluding regarding association of seasonal variation with tetanus; this study was designed to find out any seasonal variation in tetanus. As if seasonal variation comes out to be a significant epidemiological factor for prevalence of tetanus then it would be definitely helpful in planning future strategy towards elimination of tetanus.

2. Methodology

After taking approval from Institutional Ethics committee, this retrospective record based study was conducted. Records of tetanus patients admitted since 1st Jan 2004 to 31st Dec 2010 in isolation ward of Sawai Man Singh (SMS) Hospital, Jaipur, Rajasthan; were retrospectively analyzed. These patients were either admitted directly or shifted from other health care facility. This hospital serves as a main referral centre in Rajasthan and is attached to a medical college.

A total of 1513 confirmed cases of NNNT were enrolled for evaluation after exclusion. Because of lucidity in laboratory test for confirmation of tetanus, the diagnosis was based on the clinical

judgement of attending physician and exclusion of other causes of disease. Health-care providers use the following definition adopted by the Council of State and Territorial Epidemiologists and CDC in 1990:

"A confirmed case is an acute onset of hypertonia and/or painful muscular contractions (usually of the muscles of the jaw and neck) and generalized muscle spasms without other apparent medical cause, as reported by a health professional."

For the purpose of seasonal variation: Seasons were grouped according to Indian meteorological department [5](8) i.e. January and February grouped under winter season, March to May grouped under summer, June to August in monsoon and September to December were grouped under post monsoon season.

Out of 1513 tetanus patients admitted since 1st Jan 2004 to 31st Dec 2010 in isolation ward, 159 (100 male & 59 female) left against medical advice (LAMA) or absconded during their hospital stay. These patients were excluded while assessing few variables like CFR, duration of hospital stay, survival or death.

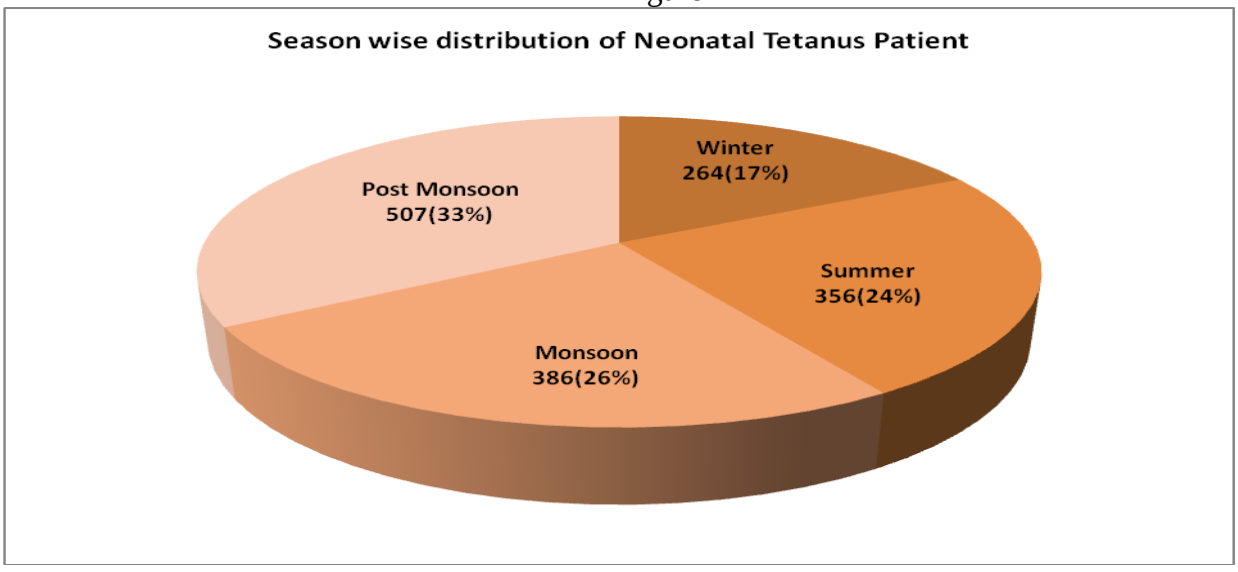
All possible variables available in the records were entered into the Microsoft Excel 2007 spread sheet in the form of master chart. Data thus collected were classified and analysed with the help of Microsoft Excel 2007 and Statistical software Priemer version 6 to get inferences. For significance P value < 0.05 was considered significant.

3. **Results**

Study population of elderly Out of 1513 patients 970 (64.11%) were male and 543 (35.88%) were female with male to female ratio 9:5. Mean age of tetanus patient was 21.75±19.34 years.

Out of 1513 patients admitted during the 7 year of study period, maximum numbers i.e.507 (33.51%) of patients were admitted in post-monsoon period followed by in monsoon, summers and winters. Winters had least number of cases i.e. only 264 (17.45%). This difference in proportion of tetanus cases admitted in different four seasons were observed significant (p<.001). (Figure 1)

Figure 1



Chi-Square Test =105.456 at 3 DF, P Value <.001, LS = HS

When year-wise distribution of cases over a period of 7 year of study period were seen, It was observed that proportion of patients was almost on decreasing trend constituting maximum 249 (16.46%) cases in year 2004 and minimum cases 174 (11.5%) in year 2010. Although the proportion of cases were decreasing with the time but it was also observed that seasonal variation was almost same in

each year. Maximum number of cases was admitted in post monsoon season in each year whereas minimum cases were admitted in winter season. This difference in distribution of cases as per the season was found significant (P<.001) in each year. (Table 1)

Table No. 1
Year-wise Seasonal Distribution of Tetanus Cases

S. No.	Year	Seasons				Total	Chi-square Test at DF 3
		Winter	Summer	Monsoon	Post Monsoon		P value, LS
1	2004	38	64	67	80	249	19.893 P<.001, **HS**
2	2005	42	50	78	60	230	16.765 P<.001, **HS**
3	2006	55	52	51	84	242	16.419 P=.001, **S**
4	2007	40	44	60	73	217	17.026 P<.001, **HS**
5	2008	30	52	43	91	216	51.111 P<.001, **HS**
6	2009	24	54	51	56	185	19.395 P<.001, **HS**
7	2010	35	40	36	63	174	15.969 P<.05, **S**
8	**Total**	**264**	**356**	**386**	**507**	**1513**	

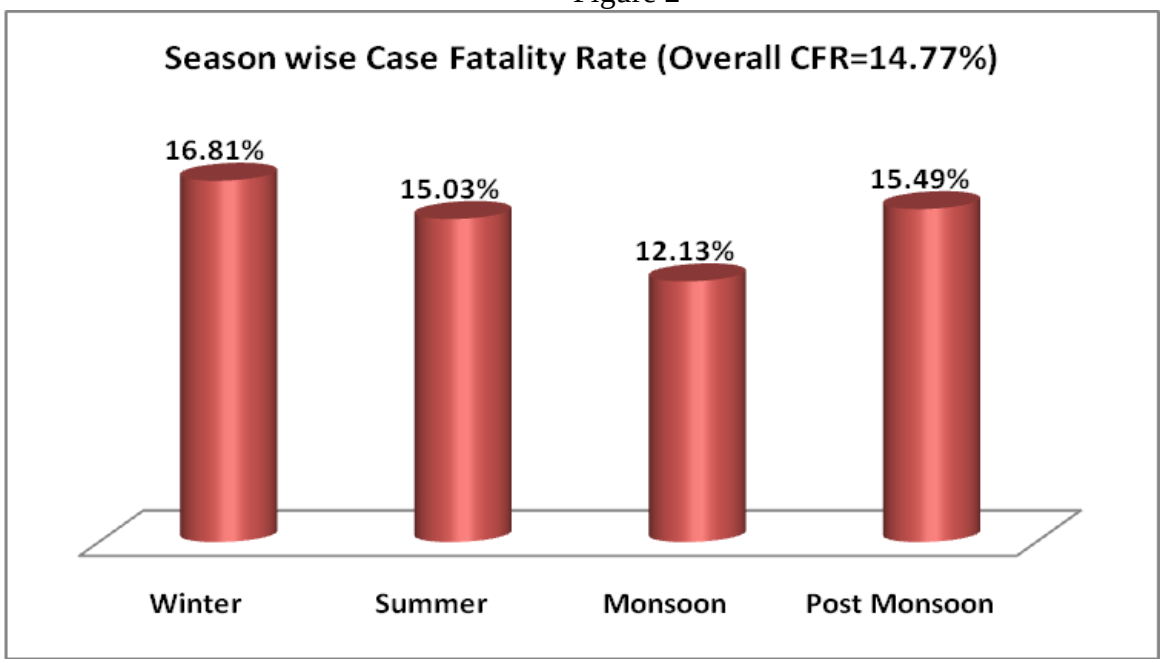
It was also observed that difference in proportion of cured and discharge cases as per the the different seasons were highly significant (P<.001). And likewise it was also observed that difference in proportion of expired cases as per the different seasons were also highly significant (P<.001). (Table 2)

Table No. 2
Seasonal association of Outcome of NNT Cases

S.No.	Seasons	Prognosis		Total
		Discharged	Expired	
1	Winter	198	40	238
2	Summer	277	49	326
3	Monsoon	297	41	338
4	Post Monsoon	382	70	452
5	**Total**	**1154**	**200**	**1354**
	X^2 TEST AT DF3	X^2=79.2, P<.001, **S**	X^2=15.52, P=.002, **S**	

When case fatality of tetanus was observed, overall CFR was observed 14.77% (200 cases out of 1354 cases). It was observed that minimum cases (40 i.e. 20% of total deaths due to tetanus) were expired in winter season with maximum CFR (16.81%). Minimum CFR (12.13%) was observed in monsoon season. This difference in distribution of CFR is also found highly significant (P<.001). (Figure 2)

Figure 2



Chi-Square Test =17.201 at 3 DF, P Value <.001, LS = HS

Seasonal difference does not result in to significant difference (P>.05) in male and female proportion, rural or urban dominance, and difference in proportion of patient among various age groups

4. Discussion

The present study found that Retrospective analysis of tetanus patient data over a period of 7 year came out with significant seasonal variation in proportion of tetanus. Post monsoon season has one third of total tetanus burden as well as one third of total mortality. More than one third of patients were mainly distributed in months of June-July and November-December. Seasonal difference does not result in to significant difference in male and female proportion, rural or urban dominance, and difference in proportion of patient among various age groups.

Although many authors are in well support of the observations of this study but other have the different view. As in 1969 Ashley said that the first symptom occurred in the six month period, May to October in 73% of the cases.[6] (5). Over the whole 30 year period in Italy highest incidence rates were observed during the summer, with an average of 37% of the cases occurring between June and August.[7] (6). The incidence of tetanus in Nigeria is higher in the hot dry season than in the wet.

It is believed that the reduced incidence during the rainy season is due to reduced outdoor activity, increased wearing of shoes and the washing away of animal waste that sometimes litters the streets. On the other hand, the cases observed during the wet seasons were attributed to occupations of affected patients like farmers, manual labourers and traders as these groups of people are more prone to sustaining injuries during the wet season[4] (4). Another study result from Nigeria demonstrated relatively even distribution of cases throughout the dry and rainy season[2] (2). Contrary to that Panwar etall [8] (7) reported that the maximum number of case occur during the dry months of October to January and this could be attributed to abundant dust found in these months, which harbours *Clostridium Tetani* spores.

This seasonal variation of the present study may be explain with the explaination given by Shoesmith[9] (9) who wrote in his article "Germination of spores is actively stimulated by a combination of methionine, lactate, nicotinamide and sodium, all of which may be readily available in a natural environment such as damaged or dead tissue. Under aerobic conditions germination is slow and methionine, lactate, nicotinamide and sodium are all necessary. With these compound present under anaerobic condition the time for 50% germination is shortened by about 60%." High proportion of tetanus in post monsoon season remain attributed to either more favourable provision of anaerobic condition or even with condition remain aerobic there is sufficient production of stimulant nutrients. Whatever reason remained behind, steps should be taken forwards in prevention of tetanus with concern of its more cases in post monsoon season.

CONCLUSIONS

More than Post monsoon season has significantly higher number of cases in each year of 7 years study period so it may be associated with occurrence of tetanus which needs further exploration through studies. As per these observations it can be sought to draw our prevention strategy for tetanus elimination predominantly in post-monsoon season.

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