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A community trial of *Pinak*® medicine in the management of snakebite cases in a rural setting of Western Maharashtra, India

R. G. Raut[1], P. S. Pawar[2] and H. H. Chavan[3]

[1]Primary Health Centre Dimbhe, Maharashtra, India
[2]Sassoon General Hospital, Pune, India.
[3]Zilla Parishad, Pune, India.

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Narodi is a hilly village which has a small river also. Hence, snakebite incidence is more. In 2006 and 2007, there were 17 deaths in a population of 6,000. By cleaning the village (cutting grass in and around the village), and health education, gradually snakebite incidence reduced. But we introduced '*Pinak* tablet' with the hope of reducing deaths due to snakebite. Records of snakebite events also improved. Other factors like transport, type of snakes, toxicity of snake's venom, time to take patients to nearby hospital, and tying ligature were same as before. The only change was that many victims received *Pinak* tablet earlier, usually within 15 to 20 min before transporting victim to hospital. Those who did not take *Pinak* were also rushed to the hospital within same time, but some deaths were noted in those patients by analyzing the two groups of patients; treated with *Pinak* and not treated with *Pinak*. Two groups like 'after' and 'before' *Pinak* were not made because after *Pinak* was started, there were some patients who did not take *Pinak*. Hence, results obtained by are solely due to *Pinak*.

Key words: Narodi, *Pinak* tablet, snakebite, patients.

INTRODUCTION

Snakebite is the most important killing accident and poisoning affecting mankind worldwide. Snake bite is a major health hazard that leads to high mortality and great suffering in victims. Conservative sources estimate that the number of accidents globally reach one million, resulting in 600,000 envenomations and more than 20,000 deaths annually (Chippaux, 1998). In India alone, more than 200,000 cases are reported, and an estimated 35,000 to 50,000 people die each year (Bawaskar, 2004). A community-based retrospective survey in Kenya estimated that only 19% of the annual 151 snake bites per 100,000 people were potentially of venomous snakes (Snow et al., 1994). It is more predominant in hilly and wild areas, though snakebite cases are seen in all districts. Most of the victims of snakebites are rural farmers.

Antiserum is the only therapeutic agent available throughout the world. A major drawback of serum therapy is its prohibitive cost, and chance that victims are often some distance away from medical care when bitten. Serum sickness is a possible side effect of serum therapy that results in inflammation of certain tissues, and hypersensitivity is quite frequent, which may sometimes be lethal. Generally, anti-venom serum is a scarce commodity, and in the world market sometimes, even governments with money to purchase large quantities

*Corresponding author. E-mail: pawarps@gmail.com.

cannot obtain it. There is a crisis in the quality and supply of anti-venom serum in the sub-Saharan Africa due to fallen production and business pressures resulting from privatization of production plants (Theakston and Warrell, 2000). Experts and trained persons are required to administer the anti-snake venom (ASV).

In a study carried out on 119 cases of snakebite in a north Indian hospital, the average dose of anti-venom was 51.2 vials for elapid bites and 31 vials for viper bites, and an overall mortality rate of 3.5% was observed (Sharma et al., 2005).

Ayurveda, the ancient medical discipline of India offers several medicinal plants which are useful in the treatment of snake venom poisoning. Manufactured by Shree Bharadi Ayurvedic Pharmaceuticals, Karad, *Pinak®* is a unique combination prepared from four Indian medicinal plants that is, *Erythrina indica (Pangara mool), Magnefera indica (Amba Chhal), Eugenia jambolana (Jambhul Chhal),* and *Jusminum sambac (Mogra mool*) found to be useful in Ayurveda in the treatment of snake venom poisoning (Nadkarni and Nadkarni, 1989; Satyavati et al., 1987).

In a clinical study conducted in 75 patients of poisonous snake bite, 37 patients treated with Tab. *Pinak®*, given sublingually, were found to benefit significantly, with reduction in signs and symptoms, and there was no mortality (Pawar and Pawar, 2008). Narodi, a small village inhabited by 6,000 people, is situated at a distance of 72 km from Pune in western Maharashtra. The nearest primary health centre, Mahalunge Padwal, is situated at a distance of 23 km. It is a subcentre which consists of Narodi gaothan, Landewadi pinglewadi, Landewadi and Chichodi. Ghodegaon rural hospital and Manchar rural hospitals are functioning at a distance of 15 and 9 km, respectively. Narodi is surrounded by water bodies on three sides; hence snakes are a common site here. Every year particularly during rainy season, many incidences of snake bites and subsequent deaths are reported. With no medical aid for snakebite in the near vicinity and more deaths before reaching hospital, the problem of snake bite was acutely felt. There was no easy solution to this problem. Hence, the present study was taken up to demonstrate the feasibility trial of *Pinak* tablets in the management of snake bite cases in Narodi, a rural community of Maharashtra.

The objectives of this study are: (1) to know the death rate among snakebite victims treated with *Pinak*; (2) to know the death rate among snakebite victims treated without *Pinak* and; (3) to demonstrate feasibility of using *Pinak* tablet in the management of snakebite cases in a community setting.

Ethical permission

Ethical permission of Ethical Committee of B. J. Medical college and Sasoon hospital was obtained before study was started.

METHODOLOGY

The data of snakebite cases and resultant deaths before and after the *Pinak* tablet usage by the community is compared here. The data collection was done by the investigators by:

1. Review of records at the Narodi gram panchayat;
2. Review of records at the Narodi Primary health unit/subcentre;
3. Review of records at the Ghodegaon rural hospital;
4. Interview of village community leaders, surviving patients and their relatives, doctors, auxiliary nurses and midwives of the subcentre;
5. Review of the news/report items from the local newspapers specially for cases prior to introduction of *Pinak*.

The villagers were given health education in the form of lectures and demonstrations on how to put ligature (which is found useful in our experience) to the limb after snakebite, administration of sublingual route of *Pinak* tablets, and identification of snake's species. A booklet on these guidelines was printed and distributed free of charge to the people in the region. Eleven (11) boxes containing *Pinak* tablets were kept at various places such as schools, village-grampanchayat office, anganwadi, post office and some houses to ensure that every snakebite victim gets *Pinak* tablet easily. A meeting of owners of all the vehicles available in the region was conducted and an action plan in the event of snakebite for transport of the victims was chalked out.

Medical care

Procedures for field care include the following:

1. Immobilization of the limb.
2. Apply the tourniquet, one joint above the site.
3. Do not give anything to eat and drink.
4. Remove anything that may constrict the limb.
5. Arrange early transportation to a good hospital.
6. Give ABC if required.

Victims with definite history of snake bite were included in this study. Any case of unknown bite was noted separately. Transport was made available to each victim. Every victim was provided the same set of facilities. *Pinak* tablet was given sub-lingually to victims. A single tablet was given as soon as victim arrived at the depot holding *Pinak*, and victim was sent to hospital for further treatment. No victim required ABC on route to hospital. No victim died on spot or before receiving *Pinak*.

RESULTS

From Table 1, it is seen that there was a total of 53 cases of snake bite out of which 10 people died. The youngest victim was a 12 year old boy and the oldest was 60 years old. Median age of these deaths was 15 years and two of these deaths occurred in Ghodegaon rural hospital, one in Manchar rural hospital, two in a private nursing home and five occurred on the way to Sassoon General Hospital,

Table 1. Yearwise snakebite cases at Narodi subcentre.

Year	Snake bite cases		Unknown bite cases	
	No.	Death (%)	No.	Death (%)
2004	4	2 (50)	2	1 (50)
2005	9	2 (22.2)	9	5 (55.5)
2006	4	1 (25)	7	4 (57.1)
2007	29	4 (13.8)	11	5 (45.5)
2008	7	1 (14.3)	2	0 (0.0)
All	53	10 (18.9)	31	15 (48.4)

Table 2. Yearwise deaths among snakebite patients according to *Pinak* treatment.

Year	Treatment for snakebite				No. of snake bite cases	
	PINAK given		*PINAK* not given			
	No.	Death	No.	Death	No.	Death
2004	0 (0.0)	0 (0.0)	4	2 (50.0)	4	2 (50.0)
2005	0 (0.0)	0 (0.0)	9	2 (22.2)	9	2 (22.2)
2006	0 (0.0)	0 (0.0)	4	1 (25.0)	4	1 (25.0)
Up to 1.8.07	0 (0.0)	0 (0.0)	9	3 (33.3)	9	3 (33.3)
After 1.8.2007	17	0 (0.0)	3	1 (33.3)	20	1 (5.0)
2008	5	0 (0.0)	2	1 (50.0)	7	1 (14.3)
Total	22	0 (0.0)	31	10 (32.3)	53	10 (18.9)

Pinak was made available from 2nd August, 2007.

Table 3. Association between *Pinak* administration and deaths due to snakebite (N = 53).

PINAK	Death	Survived	Total No. of snake bite cases
Given	0 (0.0)	22 (100.0)	22 (100.0)
Not given	10 (32.3)	21 (67.7)	31 (100.0)

Figures in parentheses indicate percentages. $P < 0.001$, highly significant.

Pune. From August 2007, *Pinak* tablet was made available to the local population as described in the study methodology.

As it can be seen from Table 2 that There were a total of 53 cases of snake bites, out of which 10 people died. As at 1st August, 2007, *Pinak* tablet was not available and deaths were observed due to snake bite (up to 50.0%). Once *Pinak* tablet was made available, the death rate dropped. When the death rate was analysed as per the *Pinak* tablet administration, it was observed that there was not a single case of death among the snakebite group that was given *Pinak* tablet. There was one case of death of a patient due to snakebite observed after 1st August, 2007, who was not given *Pinak* tablet due to logistic problems.

As it can be seen from Table 3, out of the 53 cases of snakebite studied from 2004 to 2008, 22 patients were given *Pinak* tablets. When the incidence of deaths among these total snakebite cases was studies according to administration of *Pinak* tablets, it was evident that out of the 31 patients, 10 (32.3%) had died; while none of the patients who were administered *Pinak* died, which was highly significant. So, it can be seen that *Pinak* was acting as a protective factor in cases of snakebite. Among the admitted patients, it was observed that administration of *Pinak* tablets not only prevents death but also the following:

1. As it can be seen from Table 4 that; all patients on *Pinak* tablets were relieved of their signs and symptoms

Table 4. ASV required and duration of hospital stay.

Group	No. of patients	ASV vials required	Hospital stay
Pinak given	1*	0	2
	5	2	2
	5	5	2
	6	10	3
Pinak not given	1	31	5
	1	48	5
	1	61	8

*60 year old patient was allergic to ASV, treated with *Pinak*, recovered in two days. Most of the snakes observed in the area are Kraits and cobras.No adverse reaction was noted in *Pinak* given group. No gangrene was observed in any patient.

earlier than patients on ASV, hence recovery time also reduced significantly.
2. Patients with ASV reaction were successfully treated with *Pinak* tablet.

In the present study, one patient in Neuroparalysis group had allergic reaction to ASV, so he was given only *Pinak* tablets and recovered within 2 days.

DISCUSSION

Snake venom, mostly liquid, is secreted as specialized saliva from modified parotid glands. Its main function is to immobilize the prey and assist in digestion. Active agents in venom are enzymes which are antigenic. Enzymatic proteins in venom impart its destructive properties. The amount of venom injected depends upon various factors of the bite on the naked skin, elapsed time since the last bite, the degree of threat the snake feels, and the size of the prey.

Traditional healers have reputation of treating difficult snake bite cases and are trusted by their patients. In both study areas, cases of deaths in victims attended by traditional healers were very rare (less than 3%). In a Colombian study, healers interviewed reported only 4.4% death in cases they handled (Mebs, 2000). Snake bites in rural areas are commonly treated with plant extracts (Asuzu and Harvey, 2003; Houghton and Osibogun, 1993; Mebs, 2000; Otero et al., 2000; Pawar and Pawar, 2008; Yang et al., 1998).

Though medicinal plants remain largely unnoticed and neglected, protective activity of plant extracts have been confirmed in biological assays: resverotrol (3,4'5-trihydroxy trans-stilbene) from a snake bite herbal Cissus assamica (Asuzu and Harvey, 2003); reduction of venom-induced effects of *Naja nigricollis* in rats by pre-incubation with *Parkia biglobosa* extracts (Houghton and Osibogun, 1993) and activation of coagulative (prothrombin) activity by *Mucuna pruriens* seed extract (Mors, 1991). Anti-inflammatory activity in *Bidens pilosa* is recorded (Geissberger and Sequin, 1996; Guerranti et al., 2001; Geissberger and Séquin, 1991).

There was an acute and serious problem of fatality due to snake bite faced by the Narodi village people in the past. The geographic conditions were very difficult to deal with. Under those conditions, many deaths occurred. We took this venture because till date also, hundreds die due to snakebite inspite of having ASV. There is no safe, polyvalent, oral medicine like *Pinak* tablet readily available, immediately after snakebite anywhere. But once *Pinak* tablet was made available, it was observed that the death rate dropped significantly.

Hypothesis for venom neutralization

This includes the following:

1. Protein precipitation
2. Enzyme inactivation
3. Chelation action
4. Adjuvant action
5. Anti-oxidant action
6. Protein folding
7. Combination of the above which is observed with herbal combination like *Pinak*.

More studies are required to know the exact mechanism of action.

Limitations

1. Snake is not seen many times after bite; hence it is labelled as unknown bite.

2. Some deaths occurred before *Pinak* started, and were not properly certified and reported as snake bite deaths.

Conclusion

The death rate among snakebite victims treated with *Pinak* was significantly lower than observed among those treated without *Pinak*. The use of *Pinak* tablets in management of snake bite cases in a community setting is feasible.

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