

DOES 'NO PESTICIDE' REDUCE SUICIDES?

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ABSTRACT

Introduction: Ingestion of pesticides is the most common method of suicide, particularly in China, Sri Lanka and India. Reported pesticide suicides in India numbered 22,000 in the year 2006.

Method: Four villages in the state of Andhra Pradesh in India that had stopped using chemical pesticides in favour of non-pesticide management (NPM) were visited to assess any change in suicide incidence before and after discontinuation of chemical pesticides. Four similar villages in the same region that continued to use chemical pesticides were used as controls for comparison.

Results: In the pesticide-free villages there were 14 suicides before introduction of NPM and only three suicides thereafter. The percentage of suicides not reported to authorities was 47%.

Conclusion: Restriction of pesticide availability and accessibility by NPM has the potential to reduce pesticide suicides, in addition to psychosocial and health interventions.

Key words: suicide, pesticide, non-pesticide management (NPM), India

INTRODUCTION

An estimated 300,000 people commit suicide by ingestion of pesticides each year. (Gunnel & Eddleston 2003). The World Health Organization (WHO) now estimates that pesticide ingestion is the most common method of suicide worldwide (Bertolote *et al.*, 2006). In high-income countries medicines are the substances chosen by the vast majority of people who self-poison and the associated case fatality rate is low (< 1%). In many low- and middle-income countries pesticides are the most readily available and frequently used method of self-poisoning. Pesticide suicide accounts for 60% of suicides in China (Phillips *et al.*, 2002) and 71% in Sri Lanka (Somasundar & Rajadurai, 1995). Pesticide suicides have also been a major concern in Brazil, Trinidad, Malaysia and Malawi (Bertolote *et al.*, 2006). Non-fatal self-poisoning by pesticides also imposes a huge burden on these countries.

In 2006 there were 22,000 pesticide suicides reported in India, accounting for 20% of all suicides. (Accidental Deaths and Suicides, 2006). A study from the Sunderban region revealed that pesticide ingestion was the most common method of deliberate self-harm in men and women (Chowdhry *et al.*, 2007). A study from Warangal in South India also revealed that the case fatality rate was 22.6% for pesticide ingestion (Srinivasa Rao *et al.*, 2005).

The last decade has witnessed an unprecedented increase in farmer's suicide, particularly in the states of Andhra Pradesh and Maharashtra in India. It has become a national socio-political issue. In Andhra Pradesh the semi-arid region of Telengana had the highest number of suicides. The lure of the white gold (cotton) prompted many cultivators in the region to concentrate on monocrops such as cotton and chillies. Approximately 50% of pesticide consumption in India is used for cotton and Andhra Pradesh is considered the pesticide capital.

Vagaries of the weather, rain-fed cultivation, high cost of pesticides and seeds, lack of agricultural extension services, lack of credit facilities and crop insurance, along with a variety of other factors soon led the farmers into a debt trap. It is estimated that there were 150,000 farmers' suicides from 1997 to 2005 (Sainath, 2007).

In this context, there was a report by Kurungate about a few villages in the Khammam district of Andhra Pradesh that had stopped the use of pesticides. It was decided to visit these villages and assess whether there was any change in the suicide incidence after discontinuation of chemical pesticide use.

METHOD

The district of Khammam is in the Telengana region of Andhra Pradesh and is divided into 46 mandals. It was decided to visit the four villages of Punnukula, Pullaigudem, Kodipunjalavagu and Devijathanda in the Paloncha mandal. The use of chemical pesticides in the above four villages had been discontinued and the practice of non-pesticide management (NPM) had been adopted for control of pests.

Agriculture is the main occupation in these villages and the majority have small land holdings. About two decades ago they were subsistence farmers who cultivated millets, jowar, red and green gram, and pigeon peas. About 15 years ago, influenced by farmers from other districts who had switched over to monocrops like cotton and chillies, which had market potential, these farmers also switched over to cotton and chilli cultivation in large areas. However, the cultivation of these cash crops soon led to difficulties. The 'all-in-one dealer' emerged: the supplier of seeds, fertilizer and pesticides on credit with exorbitant interest rates. The dealer also procured the produce at a low rate. Failure of monsoon, lack of knowledge, poor quality of seeds, and the failure to control pests in spite of somewhat excessive pesticide use landed the farmers in a debt trap (No pesticides, no pests, 2004). In 2000 a local non-government organization (NGO), Socio Economic and Cultural Upliftment in Rural Environment (SECURE), with the technical and financial support of Centre for World Solidarity, Sustainable Agricultural Wing (now Centre for Sustainable Agriculture), decided to start the NPM approach for cotton in the village of Punnukula. The basic principles of NPM are crop diversity, understanding the life cycle of insects and managing pests with locally available natural materials.

The practices that are followed were: (i) deep summer ploughing; (ii) light traps and bonfires; (iii) yellow and white sticky boards in the fields; (iv) pheromone traps for pest surveillance; (v) neem-based extracts; (vi) chilli and garlic extracts to control bollworm and sucking pests; (vii) cow dung and urine extract for controlling aphids and jassids; and (viii) castor and marigold as trap crops.

The NGO faced a tremendous amount of initial resistance and scepticism. At the end of year one positive results became apparent. Production costs were dramatically reduced, yields increased

and net income also increased. By 2003 all the farmers had stopped using pesticides and this model was implemented in three other villages.

These four villages were visited and information on suicide from 1998 to 2006 was obtained from family members, village leaders, self-help groups, general practitioners, and police and government records. The verbal autopsy method to determine the cause of all the deaths in the villages was not performed. However, by speaking to a wide range of people in the villages, we were reasonably confident that we have enumerated the suicides. Four villages in the same mandal that were similar in population, cultivable land and cultivation, but where the use of chemical pesticides still prevailed, were chosen randomly as the control villages, and the number of suicides elicited.

RESULTS

Police records stated that in 1998 there were 388 suicides in Khammam district. The number of suicides had been steadily increasing and in 2006, 516 suicides were reported (men 370, women 146). The suicide rate for Khammam district is calculated as 20.14 per 100,000; 28.48 and 11.55 for men and women respectively.

The NPM villages and villages that were using chemical pesticides (CP) were comparable in population size, cultivable land and the type of crops grown (Table 1).

There were 17 suicides in NPM villages and 23 suicides in CP villages in 1998–2006. Out of the total 40 suicides in the eight villages, 19 were not found in official records and were elicited from the interviews in the village. Hence around 47% of suicides had been unreported (NPM: $n = 11$, CP: $n = 8$).

There were only three suicides after the introduction of NPM practices in these villages. Before 2003 there were 14 suicides in the NPM villages and 15 in the CP villages. After 2003 there were only three suicides in NPM and eight in CP villages. Although the results are not statistically significant, which is attributed to the small numbers, there appears to be a definite trend in the reduction of suicides in the NPM villages (Table 2).

Table 1 Demographics of NPM and CP villages

Name of village	Population	Cultivable land (acres)	Crops	Suicides 1998–2006
NPM villages				
Punnukula	850	600	Rice, cotton, chillies, red gram	3
Pullaigudem	978	1,200	Rice, cotton, red gram	4
Kodipunjavalavagu	474	1200	Rice, cotton, red gram	5
Devijathanda	512	460	Rice, cotton, red gram	5
CP villages :				
Keshavapuram	760	900	Rice, cotton, red and green gram	6
Panduranga Puram	1,100	1,800	Rice, cotton, chillies	8
Rangapuram	410	425	Rice, cotton, red gram and chillies	5
Bikkuthanda	412	600	Rice, cotton, red gram	4

Table 2
Suicides in NPM villages

Village	Year of NPM	Before NPM	After NPM
Punnukula	2001	3	–
Pullaigudem	2003	3	1
Kodipunjalavagu	2002	4	1
Devijathanda	2003	4	1
Suicides in CP villages			
	1998–2003	2003–2006	
Keshavapuram	4	2	
Pandurangapuram	5	3	
Rangapuram	3	2	
Bikkuthanda	3	1	

The majority of the suicides (92%) was by ingestion of pesticides, particularly organophosphorous compounds. Only three suicides were by other methods (hanging 1, self-immolation 1 and benzodiazapenes 1). Only one person had been seen by a general practitioner; the patient was a male alcoholic who bought benzodiazapene from a pharmacy and overdosed. None had ever seen a mental health professional.

The common reasons cited for suicide were: (i) family disputes 26%; (ii) economic issues and debts 32%; (iii) sickness 22%; (iv) alcoholism 10%; and (v) others 10%.

DISCUSSION

Developing countries use 25% of the world production of pesticide but have 99% of pesticide-related deaths (Hawton, 2007). Recognizing the urgent need for immediate action, WHO and International Association of Suicide Prevention have agreed on joint action to reduce mortality and morbidity related to pesticide poisoning (WHO, 2006).

Limiting access to lethal means and methods of self-harm, often referred to as 'means restriction', is an effective strategy to reduce suicide. Restricting access to pesticide has the potential to greatly reduce suicide in developing countries (Vijayakumar *et al.*, 2005). A 10% reduction in suicide by this method would save 30,000 lives.

Gunnel *et al.* (2007) have shown that in Sri Lanka restriction of WHO Class I pesticides in 1995 and endosulphon in 1998 coincided with a reduction in suicides in both men and women of all ages, where as unemployment, alcohol misuse, divorce and years of conflict did not appear to be associated with these declines. Another study from Sri Lanka (Konradson, 2007) on the safe storage of pesticide in boxes in rural areas revealed that the storage practices had improved but that storage of pesticides had moved from the fields to home. Studies from China (Phillips *et al.*, 2002) and Suriname (Graafsma, 2006) have shown that the majority of pesticide suicides were impulsive, hence limiting their access can reduce suicide. A number of other reports have stated that restriction of availability and access to pesticides has the potential to reduce suicide in developing countries.

Information on NPM and suicide is scanty. China, Sri Lanka and India all have a large number of pesticide suicides and a limited number of farmers and areas of land in organic farming. China has 2,910 farmers, 0.06% of cultivable land and 0.3 million hectares in organic farming. India has 5,147 farmers, 0.03% land and 0.03 million hectares, and Sri Lanka 3,301 farmers, 0.65% of land and 0.0015 million hectares in organic farming (Bhattacharya & Chakraborty, 2005).

Thousands of years ago, when cultivation began, it was by using natural sources and hence at the beginning all farming was organic. That it was prevalent from Vedic times in India is evident from the fact that even Rig Veda (2500–1500 BC) mentions organic manure. Arthashastra (300 BC) by Kautilya mentioned several manures like oil cake, excreta of animals etc.

Until 1950 Indian agriculture was traditionally organic. The green revolution was ushered in India and had been the cornerstone of India's achievement, transforming the country from food deficiency to self-sufficiency (Bhattacharya & Chakraborty, 2005). Food production increased along with the consumption of pesticides, resulting in the issue of farmers' suicide and pesticide suicide currently posing a major challenge.

The purpose of this explorative report was to assess whether introduction of NPM practices has an impact on suicides and preliminary findings suggest that there is a trend in the reduction of suicides in NPM villages.

A variety of factors may be responsible for this trend; chief among them being reduced access and availability of pesticides. Changes in the economic status could be another important factor. All the villagers who were interviewed were unanimous in their view that the cost of cultivation has come down, their net income has increased and many have cleared their debts. They were also able to procure a better price for their produce because of its better quality. This was very apparent in the production of chillies, where after switching over to NPM, there was no discolouration due to pesticide. The NGO stimulated a strong sense of community and the presence of an active self-help group fostered co-operative ventures such as the purchase of a neem seed-crushing machine etc., which increased cohesion in the community. Employment opportunities also increased because organic pesticides were produced locally.

However, family disputes, alcoholism and domestic violence are still prevalent and these psychosocial and mental health issues need intervention.

The strength of this report is that the villages were visited personally and unreported suicides (47%) were elicited. The gross under-reporting of suicides and pesticide suicides has been documented by many studies in India (Gajalakshmi & Peto, 2007; Gunnel *et al.*, 2007; Alex *et al.*, 2007). The major limitation of this report is the very small number of villages and suicides studied.

The example of NPM villages has stimulated many villages in Andhra Pradesh to become pesticide free (Reddy, 2007). The government of Andhra Pradesh has announced an assistance of Rs 182 Cr (Rs 1.82bn; US\$42.6m) for this project (Jeyasekar, 2007).

CONCLUSION

The reduction of pesticide suicide requires a multi-pronged strategy involving government, policy makers, planners, agricultural and chemical industry, NGOs and a variety of stakeholders. NPM could also play an important role. NPM is also likely to be economically attractive to resource-scarce countries as it not only reduces costs but also meets the increasing demand for organic products worldwide, which is estimated to be about US\$35m. The practice of NPM has

the potential for many positive outcomes. Reducing the access to pesticide has the potential to reduce suicide (and attempt) by ingestion of pesticides. Health issues related to chronic exposure to pesticides are also likely to be reduced. NPM also addresses environmental concerns and cost-effectiveness. A sustained reduction in pesticide suicide is possible with effective psychosocial and health intervention and means restriction.

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