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POINT OF VIEW

Rethinking Pesticide Suicide Prevention in Southeast Asia Region: Strategies Beyond Bans

Kattamreddy Ananth Rupesh[1,*] and Harisrujan Chinnam[2]

[1]*Assistant Professor of Forensic Medicine and Toxicology, Andhra Medical College, Visakhapatnam*
[2]*University of Tampere, Finland*

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Abstract

Suicide prevention is one of the key targets for all countries mandated under the Sustainable Development Goals by the United Nations. Amongst several methods of suicide, abusing agrochemicals for self-harm is commonplace in Eastern societies. Undeniably, pesticide self-poisoning has reached gargantuan proportions and has become a public health problem in Southeast Asian countries and more particularly in India. A complete ban on Highly Hazardous Pesticides (HHPs) as categorized by WHO seems to be a simple solution but the pesticide industry and the governments have their own reservations. One important argument put forward by them is that these agrochemicals are essential for agricultural productivity, which is primal to solve the hunger problem for the society at large. Hence, it is important to explore alternative strategies beyond bans to tackle this pesticide suicide in the interest of all. This paper explores the use of technology and predictive AI-based surveillance for pesticide abuse risk and integrating it with tele-counselling, along with proper gatekeeper training for vendors, to enhance prevention efforts.

Keywords: Pesticide Suicide, Artificial Intelligence, Mental Health, Risk Surveillance

*Corresponding Author: KA Rupesh
Email: ananth.kattam@gmail.com

In today's world suicide is a pressing issue due to increasing loneliness and reduced human connections. The reasons for suicide are manifold, with financial distress being one of the most common factors in Eastern societies. The Southeast Asia Region (SEAR), comprising of eleven low and middle-income countries (LMIC) and representing about 26% of the global population, accounts for 39% of the world's suicides. Unfortunately, the SEAR has one of highest reported suicide rate, at 17.7 per 100,000 people. It is also pertinent to mention that this number could be an underestimate of the actual number of suicides on ground, owing to heterogenicity in reporting unnatural deaths, variations in research methodology and incomplete health data collection systems [1].

Pesticide poisoning and hanging are the most common methods of suicide in this region [2,3]. The prevalence of pesticide ingestion as a usual method of suicide can be attributed to several factors. These economies are largely agrarian, with pesticides readily available in the market and easily stored in agricultural fields or in households. Moreover, the high lethality of these substances, combined with limited access to healthcare facilities, increases the likelihood of a successful suicidal attempt [2].

Several highly hazardous pesticides (HHPs), as categorised by the WHO, are still in use in these countries e.g. paraquat, aldicarb, carbofuran etc. While bans have been considered an effective method for preventing pesticide misuse for self-harm [4], they are not always universally acceptable or a perfect panacea for all stakeholders in the agricultural industry [5]. Many out of the box strategies to prevent pesticide abuse have been proposed and implemented with varying degrees of success, though often on a limited scale. These include restricting access to pesticides by using community storage systems or providing locked storage boxes in households. Additionally, gatekeeper training for retailers, along with limiting the sale of pesticides to single-use amounts, has been suggested to further reduce the risk of misuse [2,6].

Studies suggesting that pesticide bans reduce suicides often rely on incomplete or context-specific data, failing to consider variations in reporting systems, cultural attitudes towards reporting suicide and the classification of deaths in a jurisdiction. Furthermore, banning essential agrochemicals without providing viable alternatives can harm farmers economically, disrupting livelihoods and financial health of agrarian communities. A more nuanced approach is needed to address the accessibility of harmful substances without undermining their legitimate agricultural uses.

A technology-driven framework for pesticide regulation (Figure 1) is urgently required in the SEAR to mitigate suicides by pesticide ingestion. This approach should be complemented by measures such as promoting safe storage practices and encouraging the sale of pesticides in single-use quantities, thereby reducing accessibility and misuse while ensuring agricultural needs are met responsibly. Technology can provide a practical and effective alternative to outright bans by improving pesticide surveillance. The majority of people who use pesticides for suicide typically gain access by

purchasing them from local retail outlets [7-9].

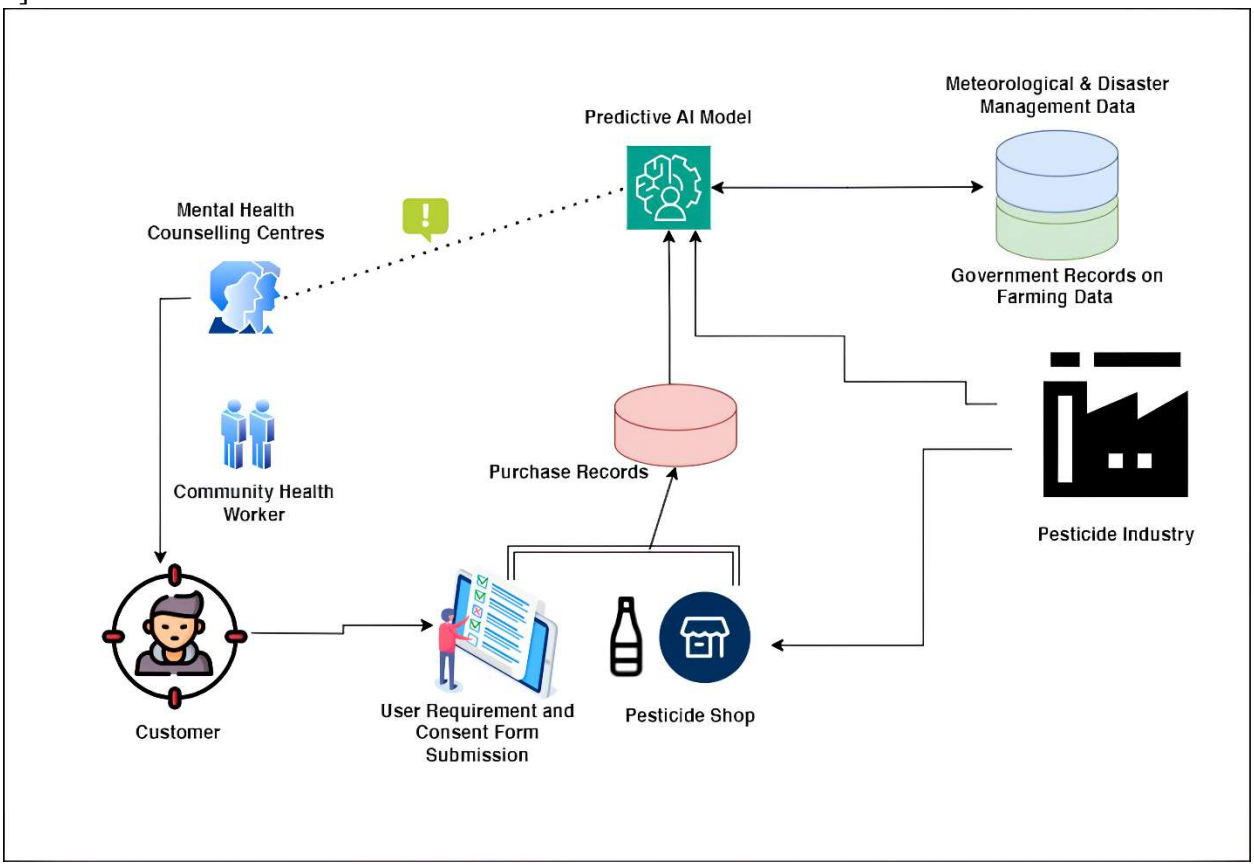

Figure 1. Risk Assessment workflow diagram using AI Predictive Model The pesticide industry and vendors play a critical role in ensuring responsible sales of hazardous pesticides. Customers must complete a digital consent form, providing crop details and social identification to link pesticide use with farming activities and support regulatory oversight. An algorithm cross-references this data with governmental records and uses AI to analyse questionnaire responses, detecting signs of mental distress. If a potential risk is identified, the system alerts the nearest suicide gatekeeper for intervention. When necessary, individuals receive a call from mental health care worker for further support. Some potential questions apart from suicide risk assessment include:

- Have you consulted an agricultural expert about the appropriate pesticide for your crop?
- Which pesticide do you need, and for how much land?
- Did you call the national farmer call centre regarding the pesticide suggestion?
- Have you purchased pesticides for this crop before? If yes, when?

Some countries require a prescription to buy certain pesticides to prevent misuse and protect public health. In Brazil, an agronomist's prescription is needed for hazardous pesticides. The European Union restricts some pesticides to certified professionals. In the United States, the EPA classifies certain pesticides as "Restricted Use," allowing only licensed applicators to buy them. Sri Lanka has also enforced

prescription-based sales for some pesticides to reduce suicides. These regulations help control pesticide use, prevent poisoning, and lower the risk of self-harm. Prescription-based dispensing of pesticides and the verification of a farmer's status are currently far from feasible in these countries owing to several infrastructural limitations in the LMIC. A mandatory data collection QR code on every pesticide container sold at retail stores can be a starting point. Vendors and/or customers (could be a potential victim of pesticide ingestion) would scan the QR code to record essential data, including customer identity, purpose of purchase, and intended use etc. to name a few. The system would incorporate a brief mental health semi structured questionnaire [8] (standardised by mental health professionals in local language) to identify potential suicide risks. Vendors could serve as gatekeepers if properly trained to recognize and restrict the sale of pesticides to intoxicated or suspicious individuals. Nevertheless, it is essential to make it a legal requirement for vendors to collect data and link them to a broader tech and AI-based ecosystem to ensure effective monitoring and regulation.

Data collected from pesticide transactions can be connected to a real-time monitoring system powered by AI-driven risk assessment and community engagement. If the system detects suspicious or high-risk purchases—such as the customer/buyer having signs of mental distress—it can trigger alerts to local community health workers, family members, or mental health helplines, facilitating timely intervention to prevent suicides. For online purchases, similar checks and data integration would ensure compliance with safety protocols, especially given the rising trend of non-agricultural individuals purchasing pesticides from e-marketplaces to commit suicide.

Predictive AI can analyse patterns to identify risks, while vendors, trained under the regulatory framework, would act as key gatekeepers in mitigating these risks, supported by technology to reduce their burden. This system creates a comprehensive, tech-enabled approach to suicide prevention, connecting community resources for swift action.

No purchasing transaction should be completed until the buyer/customer fills out a mandatory questionnaire and watches a video on the safe use of pesticides. Additionally, all purchases must be linked to a digital database, and even cash transactions must comply with a QR-based registration of buyer/customer information. While this process may seem cumbersome initially, optimizing the questionnaire and data collection following a pilot project and vendor sensitization can make it practical. It is undeniable that expanding this project on a massive scale needs to tap on the behavioural bottlenecks in optimal implementation due to socio-cultural factors prevalent in the LMIC.

Going by the "polluter pays" principle or the doctrine of strict liability, the pesticide manufacturing companies should be held accountable for funding the necessary tech and AI infrastructure to support this system. The basic version of the system is estimated to cost ₹8–12 lakh INR ($10,000–$15,000), covering essential software development, database integration, and low-cost infrastructure. Annual maintenance is projected at $1,200–$2,500. Privacy should

be ensured through data encryption, role-based access controls, and compliance with National IT regulations, with data stored on local servers to reduce costs while maintaining security. Training vendors and gatekeepers on system use and flagged case management will add ₹50,000–₹1 lakh ($600–$1,200) to the budget altogether to have a system in place without compromising core functionality.

In India, existing systems like Kisan Call Centres and Tele-MANAS (Tele Mental Health Assistance and Networking Across States) provide a foundation that can be integrated into a comprehensive pesticide regulation framework. By sharing the data collected from vendors with these helpline operating systems in real-time, we not only can restrict access to pesticides but also offer counselling to the person in need at the same time. This way, we are not just preventing misuse of pesticides for self-harm but bringing mental health support closer to the suffering individual.

One more point worth mentioning here is that if there is a blanket ban on these pesticides, people may resort to different means/method of suicide. However, vendor-based surveillance will become a *high impact intervention node* as it capitalises on tapping on the *critical behavioural leverage point*. It could be exploited as one of the key rate-limiting steps in preventing suicide in rural areas. This vendor-based surveillance enables us to identify and intervene with individuals contemplating suicide at the right time before they are successful in their agenda. As a next step, this system could be integrated with meteorological and disaster management departments. These departments can share their data with vendors. This data can help vendors stay informed about natural calamities or drought-induced crop failures. Such events may lead to an increased risk of pesticide purchases for self-harm. By receiving timely alerts, vendors can be more vigilant and intervene when necessary.

This tech-oriented and AI driven model has its own challenges ranging from privacy, acceptance at vendor level, to scalability. But it offers a balanced approach to regulating agrochemicals without resorting to complete bans. It uses technology to raise awareness and involve all key stakeholders—producers, vendors, buyers, health workers, and policymakers—in recognizing the risks of pesticide misuse and working together to prevent pesticide-related suicides.

There are multiple data privacy issues emerging from this paradigm, and vendors need to be sensitized to act professionally. Moreover, the country's digital data protection laws should be strictly enforced while handling this data.

A brief SWOT analysis of the proposed policy:

Strength: This model does not require a large physical setup to tackle the problem. The entire intervention is virtual, utilizing existing infrastructure, and any additional costs for new infrastructure are minimal.

Weakness: Persuading stakeholders and ensuring vendor adaptability to the new model could be challenging, despite government support.

Opportunity: This approach has the potential to prevent many deaths. Furthermore, we can engage freelance collaborators, including experts in pesticide science, mental health, and public policy, to contribute to effective solutions.

Threat: Resistance from pesticide companies may pose a significant challenge to implementation.

By integrating tele mental health helplines, predictive AI, and community-based interventions, this framework addresses one of the root causes of pesticide misuse by restricting access. For the time being, the companies and the governments should be at least ready to adopt such strategies if they aren't happy to ban pesticides outrightly in view of the increasing productivity to tackle the food needs of the growing population.

Although bans may appear to be the most straightforward solution to the issue of pesticide-based suicides, we should also consider other viable alternatives that don't create unwarranted resistance from governments or companies. A technology-driven regulatory system that incorporates data collection, artificial intelligence, and community engagement offers a practical and a thinkable solution.

By working in the areas of public education and pesticide risk assessment, and employing real-time intervention, Southeast Asian countries can move toward a pesticide abuse-free future. This approach enables targeted interventions, improving both access control and ensures mental health support to the needy. This in a way, is better and effective for all the stakeholders involved.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

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References

1. Vijayakumar L, Daly C, Arafat Y, Arensman E. Suicide prevention in the Southeast Asia Region. Crisis. 2020; 41(Suppl 1):S21–9. Available from: http://dx.doi.org/10.1027/0227-5910/a000666.
2. Vijayakumar L. Challenges and opportunities in suicide prevention in South-East Asia. WHO South East Asia J Public Health. 2017; 6(1):30–3. Available from: http://dx.doi.org/10.4103/2224-3151.206161.
3. Jordans MJD, Kaufman A, Brenman NF, Adhikari RP, Luitel NP, Tol WA, et al. Suicide in South Asia: a scoping review. BMC Psychiatry. 2014; 14(1):358. Available from: http://dx.doi.org/10.1186/s12888-014-0358-9.
4. Dandona R, Gunnell D. Pesticide surveillance and deaths by suicide. Lancet Glob Health. 2021; 9(6):e738–9. Available from:

http://dx.doi.org/10.1016/s2214-109x(21)00174-1.

5. Sarkar S. Despite historic bans, south Asia still struggles with pesticide suicides. BMJ. 2023; 381:678. Available from: http://dx.doi.org/10.1136/bmj.p678.
6. Phillips MR, Gunnell D. Restrictions of access to pesticides in suicide prevention. In: Wasserman D, Wasserman C, editors. Oxford Textbook of Suicidology and Suicide Prevention. Oxford University Press; 2021; p. 713–8.
7. Weerasinghe M, Konradsen F, Eddleston M, Pearson M, Jayamanne S, Gunnell D, et al. Vendor-based restrictions on pesticide sales to prevent pesticide self-poisoning - a pilot study. BMC Public Health. 2018;18(1):272. Available from: http://dx.doi.org/10.1186/s12889-018-5178-2.
8. Weerasinghe M, Konradsen F, Eddleston M, Pearson M, Gunnell D, Hawton K, et al. Risk factors associated with purchasing pesticide from shops for self-poisoning: a protocol for a population-based case–control study. BMJ Open. 2015;5(5):e007822. Available from: http://dx.doi.org/10.1136/bmjopen-2015-007822.
9. Weerasinghe M, Jobe L, Konradsen F, Eddleston M, Pearson M, Jayamanne S, et al. Differences in the characteristics of people who purchase pesticides from shops for self-harm versus those who use pesticides available in the domestic environment in Sri Lanka. Trop Med Int Health. 2023;28(12):901–11. Available from: http://dx.doi.org/10.1111/tmi.13941.