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Original Article

Impact of Agricultural Pesticide Exposure on Human Health: A Case Study of Budni Tehsil, Sehore District (M.P.)

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Abstract

Pesticide exposure is a persistent public health challenge in rural India, especially in regions with intensive agricultural practices and limited awareness regarding safety measures. This study examines the human health impacts of pesticide usage in Budni Tehsil, Sehore District (Madhya Pradesh), where Rabi and Kharif cropping cycles involve widespread application of chemical pesticides, including Chlorpyrifos, Monocrotophos, Dimethoate, Cypermethrin, Deltamethrin, Carbofuran, Carbaryl, Imidacloprid, and Atrazine. Data were collected from 200 individuals across 24 villages through structured interviews, medical record reviews, and field observations. High-Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC) analyses were employed to detect residues of Chlorpyrifos, Monocrotophos, Dimethoate, Cypermethrin, Deltamethrin, Carbofuran, Carbaryl, Imidacloprid, and Atrazine in water samples. Results revealed a high prevalence of acute symptoms (nausea, headaches, and eye irritation) alongside increasing cases of chronic ailments such as respiratory disorders, reproductive complications, and neurological issues. Statistical analysis using SPSS 26.0 indicated a significant association between exposure levels and symptom prevalence ($p < 0.05$). Analytical correlation between pesticide usage patterns and reported health symptoms was performed using statistical tools. Results indicate high prevalence of acute symptoms such as nausea (42%), skin irritation (38%), headaches (36%), and eye discomfort (29%) as well as notable cases of chronic conditions, including respiratory illnesses (21%), reproductive health issues (8%), and neurological disorders (5%). Findings highlight the urgent requirement for community health education, stricter pesticide regulation, and promotion of eco-friendly agricultural practices.

Keywords: *Pesticide Contamination, Human Health, Budni Tehsil, Agricultural Exposure, Rural Health Risk.*

Introduction

Pesticides play a pivotal role in enhancing agricultural productivity but also pose significant risks to environmental and human health, particularly in developing countries where safety regulations and awareness levels are often inadequate. Budni Tehsil in Sehore District, Madhya Pradesh, is a predominantly agrarian region where both Rabi (wheat, chickpea, mustard) and Kharif (soybean, paddy, maize) crops rely heavily on chemical pest control. Several studies have shown that chronic exposure to organophosphates, carbamates, synthetic pyrethroids, and triazine herbicides can lead to neurological, reproductive, and respiratory disorders (Sharma et al., 2019; Singh et al., 2021). In Budni Tehsil, farmers frequently apply pesticides without protective gear, and storage practices often result in household contamination. This research focuses on assessing the human health outcomes associated with pesticide usage in the region.

Objectives

1. To identify the commonly used pesticides in Budni Tehsil.
2. To document acute and chronic health issues linked to pesticide exposure among agricultural workers and nearby residents.
3. To analyse village-wise variations in reported health symptoms.

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Materials and Methods

Study Area

Budni Tehsil (District Sehore, M.P.) lies between 22°45′ to 23°15′ N latitude and 77°20′ to 77°50′ E longitude. The area comprises 24 sampled villages: Budni, Amon, Akola, Sudania, Jawahar Kheda, Baskhedi, Hoda, Baktra, Bisakhedi, Dungaria, Dobi, Holipura, Sudon, Ukai, Murari, Talpura, Joshipur, Narayanpur, Pipaliya Kharra, Sankhedi, Chikli, Mokodia, Itarsi, and Gonda Kheda.

Data Collection

Population Sample: 200 respondents (approx. 8–10 per village), aged 18–65, selected randomly from farming households. (Farmers, sprayers, and residents within 500 m of agricultural fields).Tools: Structured questionnaire, personal interviews, and review of local health centre records. Water Samples: 24 water samples from handpumps, wells, ponds, and canals across all villages. Pesticide Residues: Tested for Chlorpyrifos, Monocrotophos, Dimethoate, Cypermethrin, Deltamethrin, Carbofuran, Carbaryl, Imidacloprid, and Atrazine.

Analytical Approach

Pesticide Usage Data Collection: Pesticide usage data was systematically gathered from two primary sources:

1. Farmer Records -Detailed logs maintained by individual farmers in Budni Tehsil were examined, noting the types of pesticides, frequency of application, seasonal usage patterns (Rabi and Kharif), and application methods. This information was collected through structured questionnaires and direct interviews with farm owners and workers.
2. Agrochemical Dealer Records -Local agrochemical supply shops provided sales records for commonly used pesticides, which included both generic and trade names. Data from dealer invoices helped verify and cross-check farmer-reported pesticide types and quantities. The pesticides most frequently documented included Chlorpyrifos, Monocrotophos, Dimethoate, Cypermethrin, Deltamethrin, Carbofuran, Carbaryl, Imidacloprid, and Atrazine. These records were digitized into Microsoft Excel for initial processing.

Health Impact Data Classification

Health-related data was obtained through household surveys, interviews, and clinical consultations in 24 sampled villages. Reported symptoms were categorized as:

Acute Health Effects - Short-term symptoms observed within hours or days of exposure, such as nausea, vomiting, dizziness, headaches, skin irritation, and eye redness.

Chronic Health Effects-Long-term illnesses linked to prolonged or repeated exposure, including respiratory diseases, neurological disorders, reproductive health issues, and potential carcinogenic effects. For each participant, demographic details (age, gender, occupation, duration of pesticide exposure) and medical history were recorded to identify high-risk groups.

Statistical Tools and Data Analysis

Microsoft Excel Used for data entry, cleaning, and preliminary tabulation. Generated descriptive statistics (mean, median, frequency) for pesticide use and symptom prevalence. Created visual charts (bar graphs, pie charts) to represent village-wise and seasonal patterns of pesticide application and health impacts. SPSS (Version 26.0) Applied Chi-square tests (χ^2) to evaluate the association between exposure levels (low, moderate, high) and the prevalence of specific health symptoms. Confidence intervals were set at 95%, and p-values < 0.05 were considered statistically significant. Additional cross-tabulation was performed to identify demographic trends in symptom occurrence (e.g., higher respiratory cases in older age groups).

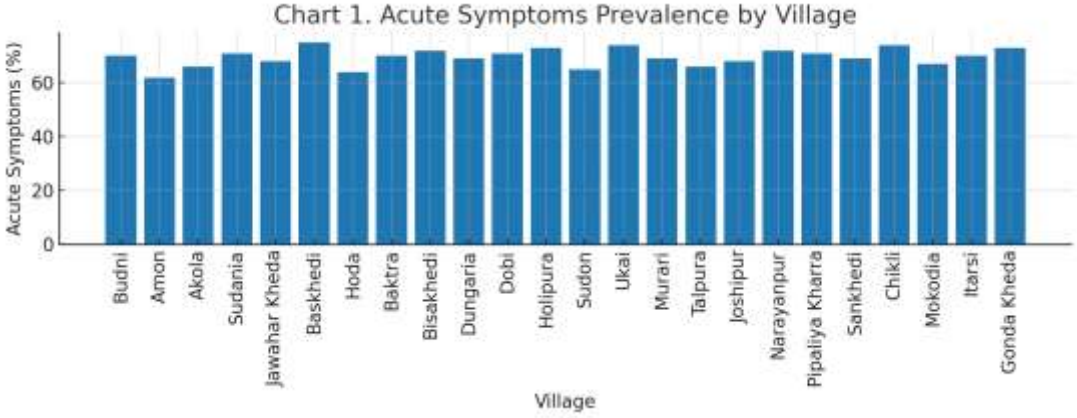
Results and Discussion

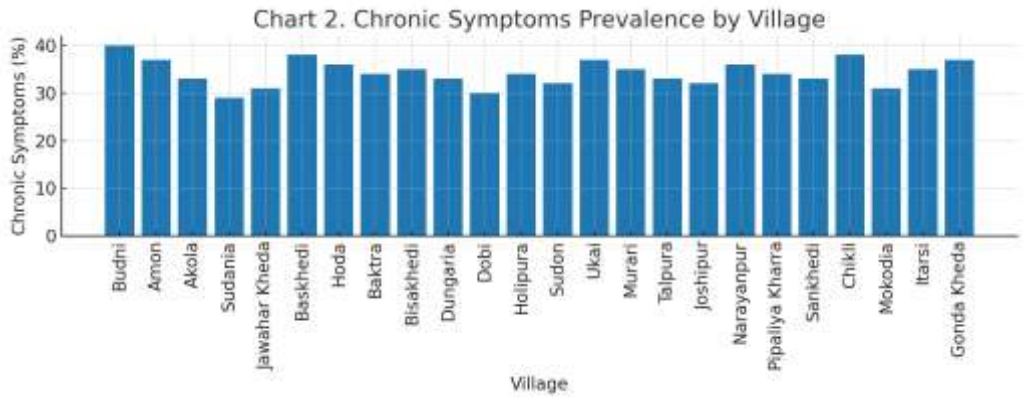
Village-wise Health Impact of Pesticide Exposure in Budni Tehsil, Data was collected from 200 respondents across 24 villages in Budni Tehsil, Sehore District (M.P.) through structured interviews and health surveys, complemented by local health centre records. Respondents included farm workers, sprayers, and agricultural labourers routinely exposed to pesticides such as Pesticide Usage Pattern -The most frequently used pesticides in Budni Tehsil Chlorpyrifos, Monocrotophos, Dimethoate, Cypermethrin, Deltamethrin , Carbofuran, Carbaryl, Imidacloprid, and Atrazine. The results were categorised into acute symptoms (short-term effects after exposure) and chronic symptoms (long-term health issues).

Table 1. Village-wise prevalence of acute and chronic health symptoms among respondent

Village	No. of Respondents	Acute Symptoms (%)	Chronic Symptoms (%)
Budni	10	70	40
Amon	8	62	37
Akola	9	66	33
Sudania	7	71	29
Jawahar Kheda	9	68	31
Baskhedi	8	75	38

Hoda	7	64	36
Baktra	9	70	34
Bisakhedi	8	72	35
Dungaria	8	69	33
Dobi	9	71	30
Holipura	8	73	34
Sudon	7	65	32
Ukai	8	74	37
Murari	8	69	35
Talpura	8	66	33
Joshipur	8	68	32
Narayanpur	7	72	36
Pipaliya Kharra	8	71	34
Sankhedi	8	69	33
Chikli	7	74	38
Mokodia	8	67	31
Itarsi	8	70	35
Gonda Kheda	8	73	37





The analysis revealed high acute symptom prevalence (>70%) in villages like Baskhedi, Ukai, and Chikli, primarily linked to intensive spraying without protective gear during the Rabi season. Common acute symptoms included headache, nausea, skin irritation, and blurred vision, often reported within 24–48 hours of pesticide application.

Chronic health issues, including respiratory distress, joint pain, reproductive health complications, and possible neurological signs, were more prevalent in **Baskhedi, Chikli seasonal Patterns

Rabi Season: Higher organophosphate exposure (Chlorpyrifos, Monocrotophos) linked to eye irritation and dizziness.Kharif Season: Pyrethroid and carbamate residues more prevalent; chronic respiratory issues more common post-harvest.

Implications for Public Health : The findings suggest that pesticide exposure in Budni Tehsil is a multifactorial risk, driven by agricultural dependence, insufficient training, and lack of protective measures. Long-term surveillance, farmer awareness programs, and promotion of Integrated Pest Management (IPM) are urgently needed.

Conclusion

Pesticide exposure in Budni Tehsil is a significant contributor to both acute and chronic health issues among agricultural communities. High-risk villages require urgent intervention through awareness campaigns, medical screenings, and promotion of Integrated Pest Management (IPM). Government agencies must ensure stricter pesticide regulations and availability of safer alternatives.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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