RESEARCH PAPER

Epidemiological Profile and Clinical Outcomes of Acute Poisoning in a Tertiary Care Hospital in South India: A Retrospective Observational Study..

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ABSTRACT
Background: Poisoning remains a major public health challenge, particularly in developing countries where exposure to pesticides, pharmaceuticals, chemicals, and animal envenomation is common. Regional epidemiological data are essential for guiding prevention strategies and improving clinical outcomes.
Methods: A retrospective observational study was conducted at a tertiary care government hospital in Visakhapatnam, India, from October 2022 to March 2023. Medical records of patients admitted with confirmed acute poisoning were reviewed. Data on demographics, type of poisoning, clinical manifestations, sociobehavioral factors, and outcomes were analyzed using descriptive statistical methods.
Results: Eighty-three poisoning cases were included. The highest incidence occurred among individuals aged 21–30 years. Bites and stings, pesticide exposure, pharmaceutical products, and chemical poisoning were the main categories identified. Suicidal poisoning accounted for 56.62% of cases, while accidental poisoning accounted for 43.37%. Loss of consciousness and abdominal pain were the most frequent clinical presentations. Rural populations showed a higher prevalence of snake bites, whereas pharmaceutical poisoning was more common in urban areas. Most patients recovered successfully, and no mortality was reported during hospitalization.
Conclusion: Poisoning predominantly affects young adults and is influenced by environmental and sociocultural factors. Strengthening poison control programs, improving mental health support, and increasing public awareness may help reduce poisoning-related morbidity. Early diagnosis and prompt clinical management contribute to favorable outcomes...
Keywords: Poisoning epidemiology; pesticide toxicity; snake bite; emergency medicine; toxicology; India.
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INTRODUCTION

1.1 Background of Poisoning Epidemiology

Poisoning is a significant global health concern resulting from exposure to toxic substances through ingestion, inhalation, injection, or dermal contact. Acute poisoning represents a frequent cause of emergency department visits and hospital admissions, contributing substantially to morbidity and healthcare burden worldwide [1,7]. The epidemiology of poisoning varies across regions depending on socioeconomic conditions, industrial development, accessibility of toxic agents, and local occupational practices [2,8]. Hospital-based studies indicate that poisoning patterns are dynamic, influenced by lifestyle changes, agricultural activities, and increased availability of pharmaceutical products [3,9]. Toxic effects may manifest immediately or develop progressively depending on the chemical nature, dose, and route of exposure, highlighting the need for continuous epidemiological monitoring [1].

1.2 Global and Indian Burden of Poisoning

Globally, poisoning accounts for a considerable proportion of preventable deaths. The World Health Organization estimates that unintentional poisoning causes nearly 193,000 deaths annually, with a higher burden observed in low- and middle-income countries [10]. Acute poisoning cases exceed three million per year worldwide, and pesticide self-poisoning alone contributes significantly to suicide mortality [11,12]. Developing nations face a disproportionate burden due to limited regulatory control, unsafe storage practices, and lack of awareness regarding toxic substances [19].

In India, poisoning remains a major public health issue, particularly among young adults and rural populations. Organophosphorus compounds, pesticides, therapeutic drugs, and animal envenomation are among the most

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frequently reported causes [13]. Epidemiological studies from different regions of India reveal that easy accessibility to toxic agents, occupational exposure, and psychosocial stressors play important roles in poisoning incidents [14,15]. Furthermore, intentional self-poisoning has emerged as a major contributor to hospital admissions, emphasizing the need for integrated public health interventions and mental health support systems [6].

1.3 Types and Causes of Poisoning

Poisoning arises from a wide range of agents including pesticides, pharmaceuticals, industrial chemicals, environmental toxins, and venomous bites or stings. Globally, pesticides remain a leading cause of severe poisoning and mortality, particularly in agricultural communities [12,16]. Exposure may occur accidentally, occupationally, or intentionally, with ingestion being the most common route [17]. In India and other South Asian countries, organophosphate compounds, aluminium phosphide, household chemicals, and snake envenomation are frequently implicated in poisoning cases [4,13].

Several demographic and environmental factors influence poisoning trends. Rural populations often experience higher rates of pesticide exposure and animal envenomation due to agricultural activities, whereas pharmaceutical overdoses are more prevalent in urban settings [14]. Clinical manifestations vary widely depending on the toxic agent and severity of exposure, ranging from mild gastrointestinal symptoms to life-threatening neurological and respiratory complications [18].

1.4 Rationale and Study Significance

Despite increasing recognition of poisoning as a significant health problem, region-specific epidemiological data remain limited in many parts of India. Understanding local patterns is essential for developing targeted prevention strategies, optimizing clinical management, and improving healthcare resource allocation. Previous studies have highlighted the importance of establishing poison information centres, strengthening surveillance systems, and implementing stricter regulations for highly hazardous pesticides [12,19]. Additionally, identifying demographic risk factors and clinical outcomes can help healthcare professionals design effective intervention programs. Therefore, the present study aimed to evaluate the epidemiological characteristics, clinical manifestations, and outcomes of poisoning cases admitted to a tertiary care hospital in Visakhapatnam, Andhra Pradesh.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

A retrospective observational study was conducted in the Department of General Medicine at a 1300-bedded tertiary care government hospital affiliated with Andhra Medical College, Visakhapatnam, Andhra Pradesh, India. The hospital serves both urban and rural populations and receives poisoning cases through its emergency department.

2.2 Study Population and Duration

The study included patients admitted with confirmed poisoning during a six-month period from October 2022 to March 2023. All eligible patients admitted to inpatient wards during the study period were screened, and a total of 83 poisoning cases were included in the final analysis. All eligible poisoning cases admitted during the study period were included; therefore, no formal sample size calculation was performed.

2.3 Inclusion and Exclusion Criteria

2.3.1 Inclusion Criteria

Patients with documented history or clinical evidence of poisoning

Individuals admitted between October 2022 and March 2023

Patients of either sex and all age groups

Cases presenting with clinical features of intoxication such as miosis, bradycardia, sweating, muscle cramps, salivation, or burning sensation

2.3.2 Exclusion Criteria

Patients who did not meet the inclusion criteria

Poisoning events occurring during ongoing treatment

Patients who absconded before completion of evaluation

2.4 Data Collection Procedure

Data were retrospectively collected from hospital case records and patient charts. Information regarding demographic characteristics, type of poisoning, route of exposure, clinical presentation, treatment provided, and outcomes were extracted using a structured data collection format. Patients were categorized into poisoning groups including chemical poisoning, bites and stings, pharmaceutical products, and pesticide poisoning. Details regarding medication regimen, antidote use, and duration of hospital stay were also recorded. Data accuracy was verified by cross-checking hospital records and case sheets before statistical analysis.

2.5 Clinical and Demographic Variables

The following variables were assessed:

Age and gender distribution

Educational and occupational status

Marital status and region of residence (urban or rural)

Social habits such as alcohol consumption and smoking

Type and manner of poisoning (suicidal or accidental)

Clinical manifestations including loss of consciousness, seizures, abdominal pain, weakness, and headache

Length of hospital stay and clinical outcomes

2.6 Statistical Analysis

Data were entered into Microsoft Excel and analysed using descriptive statistical methods. Continuous variables were summarized as frequencies and percentages, while categorical variables were compared across demographic and clinical characteristics. Cross-tabulation analysis was performed to evaluate the distribution of poisoning types according to age, gender, region, occupation, and social habits. Where appropriate, comparisons between categorical variables were assessed using Chi-square tests. A p-value of <0.05 was considered statistically significant.

2.7 Ethical Considerations

Patient confidentiality was maintained throughout the study. All data were anonymized before analysis, and no identifiable patient information was disclosed. The study was conducted using retrospective hospital records solely for academic research purposes.

3. RESULTS

Descriptive statistical analysis was performed on 83 poisoning cases to evaluate demographic distribution, clinical characteristics, and outcomes.

3.1 Demographic Distribution of Poisoning Cases

A total of 83 poisoning cases were analysed during the study period. The majority of patients belonged to the young adult age group. Most cases were admitted through the emergency department and represented diverse poisoning categories including bites and stings, pesticides, pharmaceuticals, chemical agents, and unknown poisoning.

3.2 Age and Gender Distribution

Table 1. Age- and gender-wise distribution of poisoning cases (n = 83).

AGE	SNAKE BITE		PESTICIDE POISONING		PHARMACEUTICAL PRODUCTS		UNKNOWN POISONING		CHEMICAL POISONING		TOTAL (%)
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
0-10 years	0	0	0	0	0	0	0	0	0	0	0%
11-20 years	5	0	0	1	1	1	2	2	0	1	(13)15.66%
21-30 years	3	3	1	0	5	5	1	2	0	0	(20)24.09%
31-40 years	2	1	1	1	0	9	1	1	1	2	(19)22.89%
41-50 years	5	3	1	0	0	2	1	1	0	1	(14)16.86%
51-60 years	4	0	0	0	6	0	1	0	0	0	(11)13.25%
61-70 years	3	0	0	0	1	0	2	0	0	0	(6)7.22%
Total	22	7	3	2	13	17	8	6	1	4	(83)100%

Poisoning cases were most frequently observed among individuals aged 21–30 years, followed by 31–40 years. No poisoning cases were reported in children aged 0–10 years. Chemical poisoning predominated across several age groups, whereas snake bites were more common among males and pharmaceutical product poisoning was more frequent among females. Overall, young adults constituted the highest-risk population.

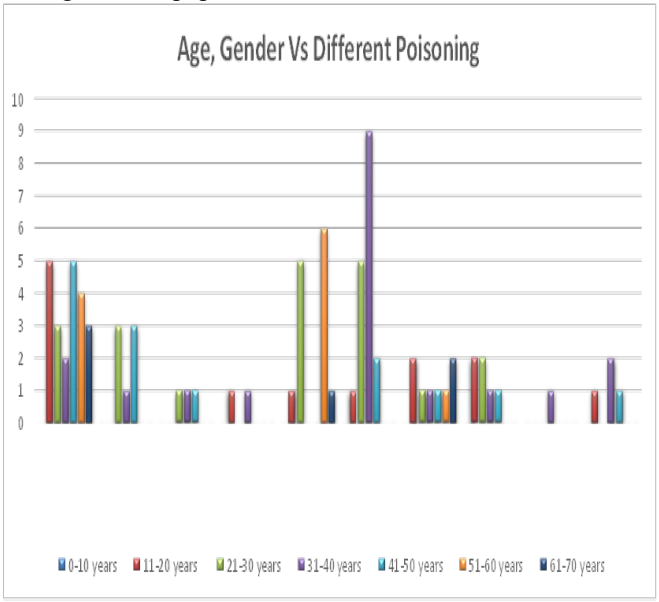


Figure 1. Percentage distribution of poisoning cases by age group.

3.3 Types of Poisoning Agents

The major poisoning categories identified included bites and stings, pesticide poisoning, pharmaceutical products, chemical poisoning, and unknown agents. Bites and stings constituted a significant proportion of cases, followed by pesticide exposure. Pharmaceutical products and chemical poisoning were also commonly reported, particularly among females.

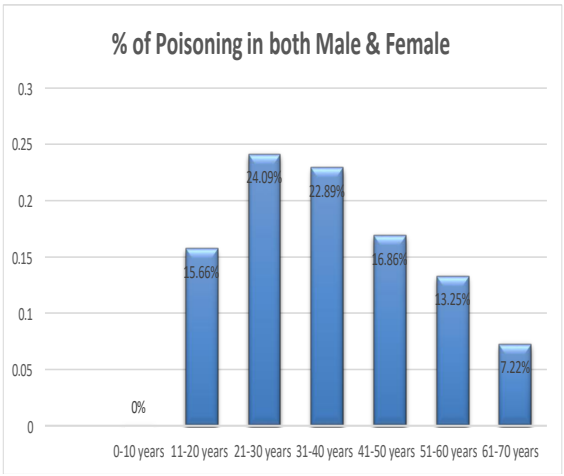
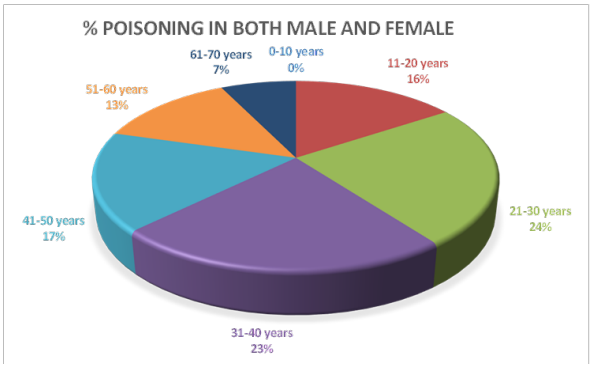


Figure 2. Distribution of poisoning types among study participants.



Distribution of poisoning types among study participants

3.4 Clinical Manifestations

Clinical presentation varied according to the type of poisoning. Loss of consciousness was the most frequently reported symptom, followed by abdominal pain, weakness, headache, and seizures. Other manifestations included visual disturbance and speech impairment.

Table 2. Clinical manifestations observed different types of poisoning.

Clinical manifestation	Bites and stings	Organophosphorus	Insecticides	Chemical poisoning	Unknown	Pharmaceutical products
Loss of consciousness	11	5	4	1	1	5
Visual disturbance	3	2	1	0	0	1
Speech disturbance	2	1	0	0	0	0
Seizures	1	0	0	0	1	2
Abdominal pain	1	0	2	4	2	3
Weakness	4	2	0	0	0	2
Headache	1	1	1	0	1	2
Others	18	5	5	5	4	8
Total cases	29	17	7	5	5	10

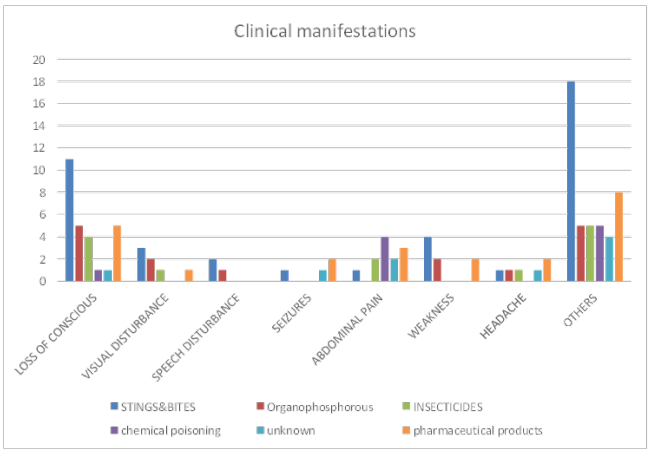


Figure 3. Frequency of clinical manifestations across poisoning categories.

3.5 Marital Status and Sociodemographic Factors

Married individuals showed higher exposure to bites and stings as well as pesticide poisoning compared with unmarried participants. Among males, bites and stings were predominant, whereas pesticide poisoning was more frequently reported among married females.

Table 3. Distribution of poisoning cases based on marital status.

TYPE OF POISONING	MARRIED		UNMARRIED	
	MALE	FEMALE	MALE	FEMALE
CHEMICAL	1	4	0	0
BITES & STINGS	16	4	6	3
PHARMACEUTICAL PRODUCTS	4	5	1	2
PESTICIDES	14	7	11	5
TOTAL	35	20	18	10

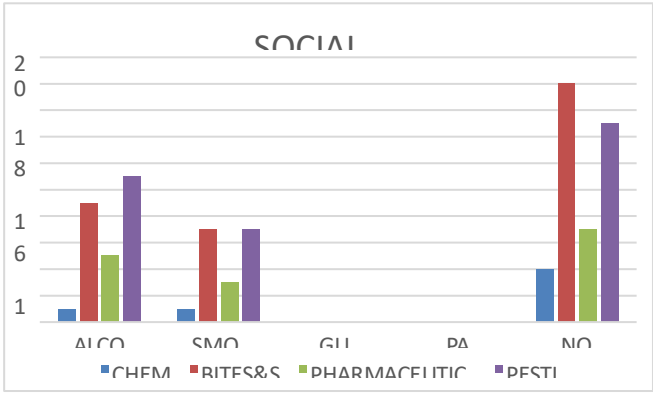
3.6 Regional Distribution (Urban vs Rural)

A comparison between urban and rural populations revealed distinct patterns. Snake bites and pesticide poisoning were more prevalent among rural residents, while pharmaceutical product poisoning was more frequently reported in urban areas. Male patients constituted the majority of cases in rural localities.

Table 4. Regional distribution of poisoning types in urban and rural populations.

Locality	Organophosphorus		chemical poisoning		insecticides		Unknown		Snake bite		Pharmaceutical products	
	male	female	male	female	male	female	male	female	male	female	male	female

Urban	7	2	1	3	3	3	3	2	3	1	2	6
Rural	5	3	0	1	1	0	0	0	20	5	1	1



3.7 Occupation and Educational Status

Students and farmers represent a large proportion of poisoning cases. Pesticide poisoning was particularly common among farmers, whereas students were more frequently affected by pharmaceutical exposures. Literate individuals showed a higher prevalence of pesticide poisoning compared with illiterate participants.

Table 5. Sociodemographic characteristics.

OCCUPATION	CHEMICAL	BITES & STINGS	PHARMACEUTICALS	PESTICIDES	TOTAL
SALARIED	0	0	3	2	5
FARMER	0	11	0	13	24
LABOUR	1	7	1	7	16
STUDENT	1	8	3	21	33
HOUSEWIFE	3	3	5	5	16
TOTAL	5	29	9	46	89

TYPE OF POISON	LITERATE			ILLITERATE		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
CHEMICAL	1	4	5	0	0	0
BITES & STINGS	9	5	14	14	1	15
PHARMACEUTICALS	5	4	9	0	3	3
PESTICIDES	14	11	25	8	5	13

3.8 Social Habits and Poisoning Patterns

Alcohol consumption and smoking were commonly observed. These behavioural factors appeared to correlate with increased exposure risk.

3.9 Manner of Poisoning (Suicidal vs Accidental)

Suicidal poisoning accounted for 56.62% of cases, while accidental poisoning accounted for 43.37%. Pesticide poisoning contributed to the majority of suicidal cases, whereas bites and stings were largely accidental.

Table 6. Types and manner of poisoning among study participants.

	ACCIDENTAL			SUCIDAL			TOTAL
TYPE OF POISONING	MALES	FEMALES	TOTAL	MALE	FEMALE	TOTAL	
CHEMICAL	0	0	0	1	4	5	5
BITES&STINGS	22	7	29	0	0	0	29
PHARMACEUTICAL PRODUCTS	1	1	2	4	6	10	12

PESTICIDES	5	0	5	17	15	32	37

3.10 Hospital Stay Duration

Length of hospital stay varied according to the type of poisoning. Pesticide poisoning cases generally require longer hospitalization compared with other categories. Most patients were discharged within three days, although some required extended care.

Table 7. Duration of hospital stay according to poisoning type.

TYPE OF POISONIG	within 24hrs	2nd day	3rd day	4th day	5th day	6th day	1 week	2-3 week
CHEMICAL	0	1	1	1	0	2	0	0
BITES & STINGS	5	6	11	5	0	1	1	0
PHARMACEUTICALS	1	3	3	1	2	0	1	1
PESTICIDE	6	5	7	3	8	1	2	6
TOTAL	12	15	22	10	10	4	4	7

3.11 Outcomes (Recovery and Mortality)

The overall recovery rate was approximately 99.9%, and no deaths were reported during hospitalization. All patients received appropriate medical management and were discharged following clinical improvement.

Table 8. Clinical outcomes (recovery and mortality) in different poisoning types.

TYPE OF POISONING	RECOVERED	DEATH	TOTAL
CHEMICAL	5	0	5
BITES & STINGS	29	0	29
PHARMACEUTICALS	12	0	12
PESTICIDES	37	0	37

4. DISCUSSION

4.1 Key Findings

The present study evaluated the epidemiological and clinical profile of poisoning cases admitted to a tertiary care hospital in Visakhapatnam, India. A total of 83 cases were analysed, with young adults aged 21–30 years representing the most affected group. Suicidal poisoning constituted more than half of the cases, while accidental exposures were largely associated with bites and stings. Chemical agents, pesticides, pharmaceutical products, and animal envenomation were the predominant causes of poisoning. Loss of consciousness and abdominal pain were the most frequently observed clinical manifestations, and nearly all patients recovered successfully with no reported mortality during hospitalization.

The predominance of young adults in poisoning cases highlights the influence of occupational exposure, psychosocial stressors, and easy access to toxic substances. The higher proportion of males observed in this study may reflect increased exposure to environmental hazards and agricultural activities, which has been reported in previous regional analyses [2,14]. Additionally, the high recovery rate observed suggests effective clinical management and early intervention in the study setting.

4.2 Comparison with Previous Studies

The demographic patterns identified in this study are consistent with earlier research conducted in India and neighbouring countries. Studies by Radhakrishnan et al. and Chatterjee et al. reported that young adults constitute most poisoning cases, with intentional self-poisoning being a major contributor to hospital admissions [1,2]. Similar findings have been documented by Latif et al. and Bannur et al., who noted that pesticide poisoning remains highly prevalent among individuals in the productive age group [3,4].

Globally, pesticide exposure has been recognized as a leading cause of poisoning-related mortality, particularly in

low- and middle-income countries where regulation and safe storage practices may be inadequate [12,19]. The current study also observed a high proportion of pesticide-related and envenomation cases, which aligns with findings from Kamath et al. and Mittal et al., emphasizing the role of agricultural exposure and rural residence in poisoning epidemiology [13,14]. Furthermore, the predominance of suicidal poisoning observed in this study is consistent with global reports highlighting self-poisoning as a common method of suicide, especially among young adults in developing regions [6,15].

The absence of mortality in the present study contrasts with some earlier investigations reporting fatality rates ranging from 1% to 15% [2,5]. This difference may be attributed to early presentation, improved emergency care, and timely administration of antidotes at the study centre.

4.3 Public Health Implications

The findings of this study have important implications for public health policy and clinical practice. The high proportion of suicidal poisoning underscores the need for integrated mental health services and community-based awareness programs aimed at early identification of individuals at risk. Strengthening poison information centres and implementing stricter regulations on highly hazardous pesticides could significantly reduce the incidence of poisoning, as suggested by global health organizations and epidemiological studies [10,12].

Rural populations appear particularly vulnerable to bites and stings as well as pesticide exposure, indicating a need for targeted education on safe agricultural practices and early access to healthcare facilities. Public health initiatives focusing on safe storage of toxic substances, awareness regarding early symptoms of poisoning, and rapid referral systems may further improve outcomes. Additionally, incorporating toxicology training into emergency care protocols may help healthcare providers manage poisoning cases more effectively.

4.4 Strengths and Limitations

This study has several strengths, including the comprehensive evaluation of demographic, clinical, and sociobehavioral variables in poisoning cases admitted to a tertiary care hospital. The inclusion of multiple poisoning categories allowed for a broad assessment of regional epidemiological patterns.

However, certain limitations should be acknowledged. The retrospective design may have introduced information bias due to reliance on hospital records. The single-centre nature of the study may limit generalizability to other regions. Additionally, advanced statistical modelling was not performed, which may restrict the ability to identify independent predictors of outcomes. Future multicentre studies with larger sample sizes and prospective designs are recommended to validate these findings and provide deeper insights into poisoning epidemiology.

5. CONCLUSION

The present study highlights the epidemiological characteristics and clinical outcomes of poisoning cases admitted to a tertiary care hospital in Visakhapatnam, India. Poisoning predominantly affects young adults, with pesticide exposure, pharmaceutical products, chemical agents, and bites and stings representing the major causes. Suicidal poisoning accounted for a substantial proportion of cases, indicating the influence of psychosocial and environmental factors. Clinical manifestations varied widely, with loss of consciousness and abdominal pain being the most common presentations.

The findings emphasize the importance of early diagnosis, prompt medical management, and improved public awareness in reducing morbidity associated with poisoning. Strengthening poison control services, promoting safe handling and storage of toxic substances, and integrating mental health support into emergency care may help prevent intentional and accidental poisoning events.

Although the recovery rate observed in this study was high, continued surveillance and multicentre research are necessary to better understand regional poisoning patterns and to develop targeted preventive strategies. Future studies incorporating larger sample sizes and advanced analytical approaches may further improve clinical management and public health interventions related to poisoning.

6. ACKNOWLEDGMENTS

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