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Research Article

TRENDS OF POISONING CASES IN TERTIARY CARE CENTRE OF HARYANA - A RETROSPECTIVE ONE YEAR AUTOPSY BASED STUDY

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ABSTRACT

Since the early age of civilisation, poisonous substances have been reported to be adversely affecting human life, both in terms of morbidity and mortality. With advancement in the field of agriculture, industry etc. has made wide and easy availability of various poisonous substances.

The present study was conducted in the Department of Forensic Medicine, Pt. B. D. Sharma Post Graduate Medical Sciences (P.G.I.M.S), Rohtak, Haryana, from 1st January 2016 to 31st December 2016 to know the trends of poisoning in the tertiary care centre based on Medico-legal autopsy records conducted in the Departmental Mortuary. The cases were then analysed on various parameters to find the trends and other significant feature of poisoning in this region of Haryana.

There were 224 (77%) male and 68 (23%) female victims involved in this study and maximum cases belonged to second and third decade of life (22.94% and 42.46% respectively). Most incidences of poisoning occurred in the month of August (14.04%) followed by May (13.01%). Most of the victims belonged to rural areas (66.09%) belonging to agriculture by profession (28.08%) and lower Socio-economic condition (58.56%). Most common manner of poisoning was suicidal (56.50%) and maximum incidences took place at home (64.72%). Aluminium phosphide was the leading cause of poisoning (35.27%) followed by insecticides (32.19%). Maximum suicides were reported with aluminium phosphide (61.21%) and accidental poisoning with insecticides (44.09%).

In our study pattern of poisoning corresponds with the pattern found in most other studies. The study that, a holistic approach for controlled use and distribution of agricultural pesticides, establishment of poison information centres, availability of antidotes in rural area, creating awareness among people and Psychological counselling of young adults can help effectively to resolve the problem.

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INTRODUCTION

Poison can be defined as a substance (solid, liquid or gas), which if introduced in a living body or brought into contact with any part thereof would produce disease or even death by its constitutional or local effects or both. References to the poisons are found in the oldest Egyptian, Babylonian, Hebrew and Greek records. The ancient Indian Scriptures contain references to the poisoning of kings, the doings of professional poisoners and of widespread organized poisoning in prehistoric times. In those times, cases of poisoning the portions of stomach and heart were put on fire and the nature of flame and sound were noted to determine the nature of poison. [1]

Orfila, Professor of Chemistry and Legal Medicine at Paris is considered as the Father of Modern Toxicology. In the Nineteen Century, Orfila brought precise chemical method in

to toxicology. The first textbook on poison was written in 1814 by Matthew Joseph Orfila, a Spanish chemist. Orfila extracted arsenic from human tissues using a procedure for identification, developed several years before by James Marsh. This evidence was used in the court (1840) to convict Marie Lefarge of a homicidal poisoning. This was the first time that the toxicological data had been as evidence in the trial. [2]

Since the origin of the mankind in this world, poisoning always remained associated with it, though it was mostly accidental in nature in the earlier times. In spite of advanced medical treatment and awareness, the fatal outcome from exposure (inhalation, skin contacts and ingestion) to the chemicals of agricultural and domestic use is increasing day by day. [3] Easy availability, extensive use and low cost of the chemicals, all make the population more vulnerable for accidental as well

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as suicidal poisoning. [4]According to WHO reports, about 3 million people around the world are inflicted by poison every year, out of them 220000 died. About 99% of these deaths occur in the developing countries. In India, 50000 deaths occur due to poisoning every year.[5]Pattern of poisoning in a particular region depends on various factors like availability and access to the poison, socioeconomic status of an individual, educational status, knowledge on pesticides, their proper usage, etc. Rapid industrialization and massive use of pesticides in agriculture have increased the incidence of poisoning. The commonest cause of poisoning in India and other developing countries is pesticides; the reasons are agriculture based economics, poverty unsafe practices, illiteracy, ignorance, lack of protective clothing, and easy availability of highly toxic pesticides. Organophosphates poisoning constitute the largest bulk of poisoning in India.[6]In India, due to variations in geographical conditions and differences in religious and cultural practices, the incidence and pattern of poisoning vary from one place to another, hence it is desirable to perform regional studies periodically to recognize the extent and evolution of the problem. The present study is an attempt to find out pattern and other significant features of poisoning.

Aims and Objectives

The study was conducted to find out

1. Incidence and pattern of death due to poisoning in tertiary centre of Haryana
2. Different aspect of poisoning along with demographic pattern, socioeconomic status, Place of poisoning and other related parameters.
3. Different risk factors responsible for poisoning.

MATERIALS AND METHODS

The present study was conducted in the Department of Forensic Medicine, Pt. B. D. Sharma Post Graduate Medical Sciences (P.G.I.M.S), Rohtak, Haryana, from 1st January 2016 to 31stDecember 2016 to know the trends of poisoning in the tertiary care centre based on Medico-legal autopsy records conducted in the Departmental Mortuary. Total 292 cases in one year were studied retrospectively of which the medico-legal autopsies were conducted in the mortuary of the department. The study has been conducted under the following heads:

1. Month and season wise distribution of poisoning cases
2. Poison wise distribution
3. Area wise distribution
4. Sex and Age wise distribution of poisoning cases
5. Types of poison and the manner
6. Distribution of poisoning cases in terms of socioeconomic status
7. Distribution of poisoning cases in terms of occupation
8. Distribution of poisoning cases in terms Place of incidence and manner
9. Distribution of poisoning cases in Gender and manner

All the information of every case was gathered carefully from police papers, Post-mortem records, and chemical analysis report records. The information thus collected were presented on a format prepared for epidemiological data and the details of poisoning etc. for observation of the present study. Further, these data were analyzed and were presented in tables, bar and

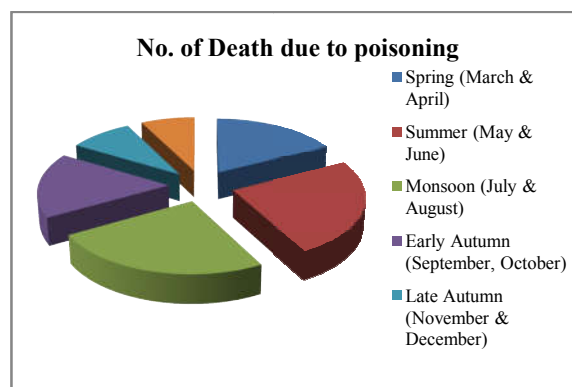
pie diagrams in result. In few cases, adequate information could not be obtained and such cases were put under "unknown." The skeletal remains, decomposed bodies and cases where the signs of poisoning were not present were excluded from this study.

OBSERVATION AND RESULTS

During the period of 12 months (one year) from 01.01.2016 to 31.12.2016, total of 292 cases of poisoning were documented out of total 2684 post-mortem cases.

Table 1 Month wise Distribution of Poisoning cases in Autopsy (01.01.2016 to 31.12.2016)

S No.	Month	No. of cases (%)
1.	January	9 (3.08)
2.	February	13 (4.45)
3.	March	21 (7.19)
4.	April	30 (10.27)
5.	May	38 (13.01)
6.	June	34 (11.64)
7.	July	31 (10.61)
8.	August	41 (14.04)
9.	September	26 (8.90)
10.	October	23 (7.87)
11.	November	16 (5.47)
12.	December	10 (3.42)
	Total	292 (100)



Graph 1 Seasonal variation of death due to poisoning

The present study shows, Maximum number of death due to poisoning occurred during August (14.04%) followed by May (13.01%) and June 11.64%) whereas minimum number of death due to poisoning occurred in January (3.08%) (Observation Table 1). Death due to poisoning occurred maximum in summer (May, June) (24.65%) and Monsoon (July, August) (24.65%) season, whereas minimum in winter season (January and February) (7.5%). (Graph 1)

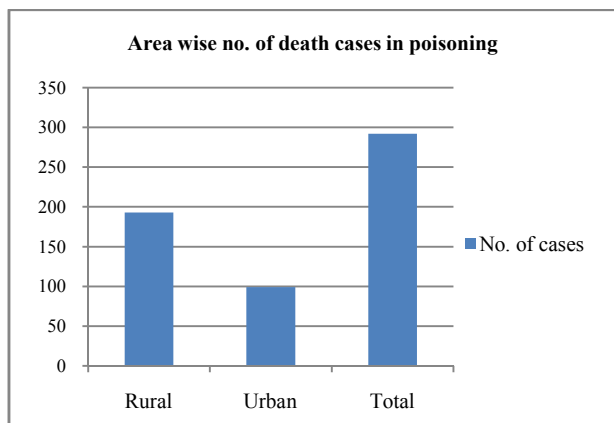
Table 2 Poison wise Distribution of death cases in Autopsy (01.01.2016 to 31.12.2016)

S No.	Name of poison	No. of cases (%)
1.	Aluminium Phosphide	103 (35.27)
2.	Organophosphorus Compound	94 (32.19)
3.	Snake bite	44 (15)
4.	Alcohol poisoning	11 (3.7)
5.	Benzodiazepines	6 (2)
6.	Food poisoning	6 (2)
7.	Rat poisoning	5 (1.71)
8.	Kerosene poisoning	3 (1)
9.	Drug overdose poisoning	2 (0.6)
10.	Unknown Poisoning	18 (6.16)
	Total	292 (100)

On toxicological analysis, Aluminium Phosphide was found most common poison responsible for death, (103 cases) (35.27%); followed by Organophosphorus compound, (94 cases) (32.19%); Snake bite (44 cases)(15%); Alcohol (11 cases) (3.7%); Benzodiazepines (6 cases) (2%); Food poisoning (6 cases) (2%); Rat Poisoning (5 cases) (1.71%); Kerosene poisoning (3cases) (1%) and drug overdose (2 cases),(0.6%) only.(Observation Table No.- 2)

Table 3 Area wise Distribution of death cases due to poisoning in Autopsy (01.01.2016 to 31.12.2016)

S.No	Area wise	No. of cases (%)
1.	Rural	193 (66.09)
2.	Urban	99 (33.90)
	Total	292 (100)

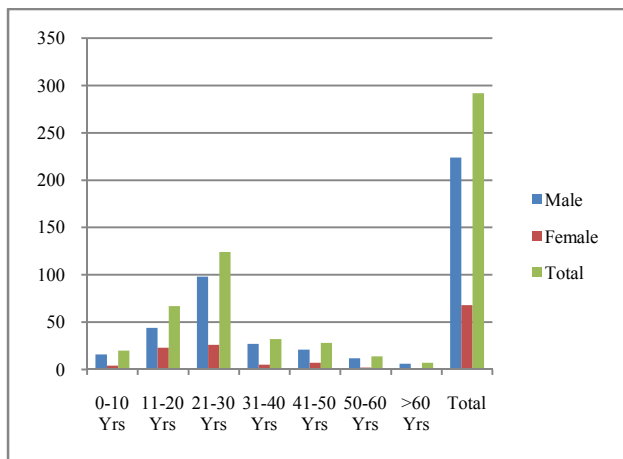


Graph 2 Area wise distribution of death cases in poisoning

The present study revealed that the victims of poisoning death cases were more in rural areas (66.09%) as compared to urban areas (33.90%). (Observation Table No.3) (Graph 2).

Table 4 Age and Sex wise Distribution of cases in Autopsy (01.01.2016 to 31.12.2016)

S. No	Age Group	Male	Female	Total	%
1.	0-10	16	4	20	6.8
2.	11-20	44	23	67	22.94
3.	21-30	98	26	124	42.46
4.	31-40	27	5	32	10.95
5.	41-50	21	7	28	9.58
6.	50-60	12	2	14	4.79
7.	>60	6	1	7	2.39
	Total	224 (77%)	68 (23%)	292	100



Graph 3 Age and Sex wise Distribution of Poisoning death cases

Gender wise males (77%) were more in comparison to female (27%). Preponderance of male over female was observed in almost all the age groups. The incidence of poisoning according to age and sex (Graph 3) revealed that there was an increasing trend of poisoning with increase in age up to 30 years and then declined with a peak incidence in the age group 21–30 years in compared to extremes of age. Maximum number of cases were from the age group 21-30 years (42.46%) followed by 11-20 years (22.94%). (Observation Table No. 4).

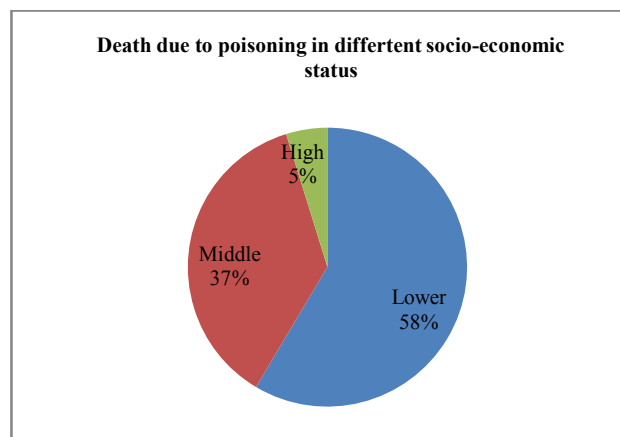
Table 5 Types of poison and the manner of cases (01.01.2016 to 31.12.2016)

S No.	Poison	Accidental	Suicidal	Homicidal	Total (%)
1.	Organophosphorus Compound	2	101	0	103 (35.27)
2.	Aluminium Phosphide	56	38	0	94 (32.19)
3.	Snake bite	44	0	0	44 (15)
4.	Alcohol poisoning	11	0	0	11 (3.7)
5.	Benzodiazepines	2	4	0	6 (2)
6.	Food poisoning	6	0	0	6 (2)
7.	Rat poisoning	1	4	0	5 (1.71)
8.	Kerosene poisoning	2	1	0	3(1)
9.	Drug overdose poisoning	1	1	0	2 (0.6)
10.	Unknown Poisoning	2	16	0	18 (6.16)
	Total	127	165	0	292 (100)

In our study, maximum suicide (101 cases, 61.21%) was associated with aluminium phosphide and accidental poisoning with organophosphorus compounds (56 cases, 44.09%). (Observation Table No- 5)

Table 6 Distribution of poisoning cases in terms of socioeconomic status (01.01.2016 to 31.12.2016)

S No.	Socioeconomic status	Cases (%)
1.	Lower	171 (58.56)
2.	Middle	107 (36.64)
3.	High	14 (4.79)
	Total	292 (100)



Graph 4 Death due to poisoning in different socio-economic status

It was observed that most of the victims of death due to poisoning, Lower class tops the list with 171(58.56%) cases followed by middle class with 107(36.64%) cases and rest 14 (4.79%) case belongs to upper class. (Observation Table No- 6) (Graph 4)

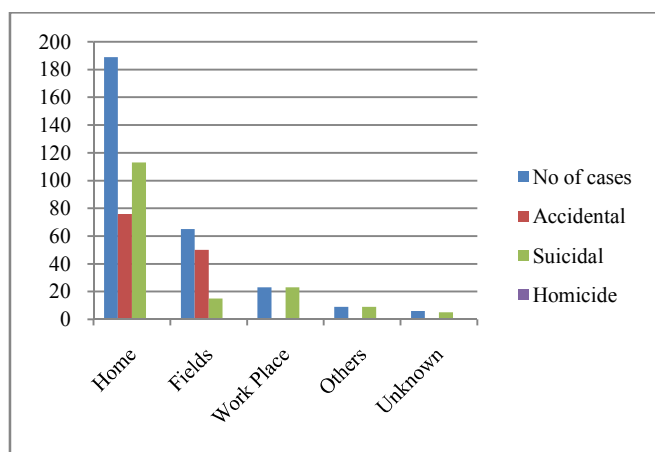
Table 7 Distribution of poisoning cases in terms of occupation (01.01.2016 to 31.12.2016)

S No.	Occupation status	No. of Cases (%)
1.	Agriculture (farmer)	82 (28.08)
2.	Businessman	13 (4.45)
3.	Housewife	34 (11.64)
4.	Labour	60 (20.54)
5.	School/college going	20 (6.84)
6.	Service (government/private)	11 (3.76)
7.	Unemployed	58 (19.86)
8.	Professionals	1 (0.34)
9.	Any other	12 (4.10)
	Total	292 (100)

In our study, most of deaths due to poisoning were noticed in agriculture associated (Farmer) person (28.08%), followed by Labour (20.54%), Unemployed persons (19.86%), Housewife (11.64%), school/college going (6.84%), Businessman (4.45%), Service person (3.76%) and professionals (0.34%). (Observation Table No- 7)

Table 8 Distribution of poisoning cases in terms Place of incidence and manner (01.01.2016 to 31.12.2016)

S No.	Place of poisoning	No of cases	Accidental	Suicidal	Homicide
1.	Home	189	76	113	0
2.	Fields	65	50	15	0
3.	Work Place	23	0	23	0
4.	Others	9	0	9	0
5.	Unknown	6	1	5	0
	Total	292	127	165	0

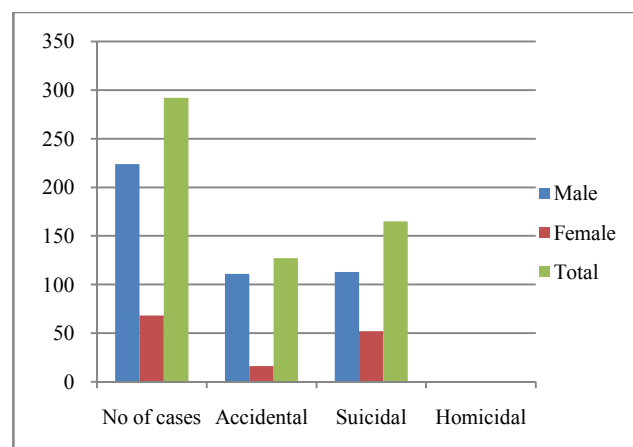


Graph 5 Distribution of poisoning cases in terms place of incidence and manner

In our study, most ill-fated place was home (residence) as it was recorded highest number of cases i.e. 189 (64.47%) cases. 165 (56.5%) cases of death due to poisoning were suicidal in nature and 127(43.49%) cases were accidental in nature (Observation Table No- 8). No case of homicidal poisoning was reported.

Table 9 Distribution of poisoning cases in Gender and manner of poisoning (01.01.2016 to 31.12.2016)

S No.	Gender	No of cases	Accidental	Suicidal	Homicidal
1.	Male	224	111	113	0
2.	Female	68	16	52	0
	Total	292	127	165	0



Graph 6 Distribution of poisoning cases in Gender and manner of poisoning

In the current study, manner of death in females due to suicidal poisoning was noticed in 52 cases (76.47 %) and Accidental poisoning in 16 cases (23.52%). In males, death due to Suicidal poisoning was noticed in 113 cases (50.44%) and Accidental poisoning was noticed in 111 cases (49.52%).

DISCUSSION

With the green revolution, advancement in agricultural technologies, pesticides, grain preservatives and fumigates in the State of Haryana, insecticides and grain preservatives gained the number one in poisoning status.[7]

The commonest mode of committing suicide in India is by the ingestion of poison. Pesticides were the main source of poisoning in majority (67%) of the cases because these are easily available, cheap and highly toxic. Aluminium phosphide and organophosphate are the two commonest pesticides whose poisonings are prevalent throughout the country. In some regions Aluminium phosphide is the commonest [8] while organophosphate in other places.[9] [10] In the present study, deaths due to aluminium phosphide poisoning were more prevalent constituting 35.27% among all poisoning deaths. It is due the reason that aluminium phosphide is most easily available and common fatal poisoning as per classification of poison by WHO. It has been observed that the Aluminium phosphide poisoning was commonly used for suicide.

A wide range of age groups of both genders were found exposed and victims to poisoning, with male predominance. A similar trends were reported by studies conducted in Northern, [11] [12] [13] Southern,[14] [15] Western[16] and Eastern[17] regions of India. This trend may be due to increased occupational hazard and exposure of men to stress as they are the only earning members of a large family.[18] Maximum numbers of suicide cases (42.46%) were in the age group 21-30 years due to the fact that at this period they are by nature more emotional, aggressive, intolerant and irrational. The high incidence of poisoning in age group 21-30 years may also be due to domestic, educational and employment related stress. That means, the persons of this young age group are suffering from stress of the modern life style, failure or less percentage in the exams, scolding from parents or teachers, failure in love, family problems etc. Change over from the concept of joint family to nuclear family has forced modern youth to face the problem of day to day living, both at home and outside, on their own without the much needed advice from the elders. When

these problems and tensions become unbearable, ending one's life seems to be the only solution of them. [19] Domestic violence, emotional status of young girls and their vulnerability to stress during puberty is the reason for increased female cases in age category 11-20 and 21-30 years age group. Sharma *et al* [20] said that people in the extremes of the age groups i.e. below 15 years and above 60 years, were least prone to poisoning and the higher incidence of poisoning found in the age group of 15-30 years. Singh *et al* [21] have also studied that younger age group is most susceptible to the lure of riches, the modern society's hard stick of success and frustrations caused by the inability to cope with the highly competitive, indifferent and materialistic society have resulted in increased poisoning in younger generations.

This study shows that poisoning is the commonest cause of agricultural Suicidal poisoning/ accidental poisoning in the region of Haryana and rural population is more prone to poisoning due to occupational hazards.

Rapid increase of indebtedness by farmers and failure to reimburse due to natural calamities like draught is the reason behind the increase in poisoning during summer and monsoon season. It is also due to probably due to socio-economic reasons like monsoon-dependent cultivation practice, agriculture-based economy, crop failures, exorbitant rates of interest and indebtedness to private usuries, financial crisis, hunger, denied minimum wages and increased work and labour pressure in rainy season which lead to constant anxiety coupled with an easy availability of insecticidal poisons, as it is purchased and kept at farms and houses for use when the agricultural activities are at its peak. India being an agriculture nation, handling of pesticides and fumigates are a routine practice by farmers and their family members. Household and agricultural agents (67.46%) were associated with most poisoning due to easy availability of these agents and inadequate knowledge to support their safe residential use. Studies have shown that pesticide is the most common toxic agent involved in poisoning. [22][23]

Most of the incidents of poisoning (64.72%) took place in the home, because agricultural pesticides and insecticides used for suicidal act were available at their residence. The same was also consistent with the study done by Haloi M *et al*. [24]

Poisoning cases were observed more in rural areas as compared to urban areas due to people's illiteracy or less education, as well as shortage of immediate treatment of poisoning which was consistent with Varma *et al*. findings [25], while Chaudhary *et al*. [26] showed that 64.90% of poisoning cases were observed in urban areas as compared to rural areas (35.10%). Also, the present scenario is due to bulk of population live in rural areas and agricultural activities are prevalent in these areas.

Highest numbers of poisoning cases (58.81%) were seen in lower socioeconomic class followed by middleclass and very few in high class. These findings were consistent with Kulshrestha *et al*. and KailashUZ [27] [28] studies. The reason for the above said findings may be due to economic instability, unemployment, and stress.

Economic status was found to be lower in 58.56% of cases. This is because of poverty which may be a motive behind

suicide and because of deficiency of funds they cannot afford the standard of treatment after exposure.

CONCLUSION

Pattern of poisoning cases in present study is almost similar to that of many other studies. In our study majority of the cases of poisoning (42.46%) were young adults between 21-30 years of age and males (76.71%) predominated over females (23.29%). Male female ratio was 3.29:1. Most of the patients belonged to lower socioeconomic status and lived in a rural areas. Pesticides were the main source of poisoning (67.46%) of which Aluminium Phosphide and Organophosphates are the commonest. Easy availability of deadly chemicals, lack of knowledge how to handle them, delay in hospitalization and deficient emergency facilities in hospital setups in rural area; all contribute to maximum fatalities. Most of the poisoning cases are suicidal (56.50%). Agricultural failure (28.08%), family quarrel & unhappiness (20.54%), unemployment (19.86%), unsatisfactory exam results (6.84%) or loss in business (4.45%) were the main motives of suicide.

It is clearly evident from the above figures that the agriculture and related profession that plays pivotal role in these cases of poisoning. So it is the duty of general public, N.G.O's, Government and Doctors to educate this venerable portion of society. Organophosphorus compounds, Aluminium Phosphide and other spray poisonings can be restricted by having a control on their sale and distribution. The preventive and educational measures can be more effectively designed and implemented if epidemiological data derived from the poison information centres are utilized. [29] Psychological counselling of young adults, by talking their problems sympathetically and on humanitarian grounds, may be helpful to guide them in properly and motivate the young to use their power and enthusiasm for development of nation.

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