EVALUATION OF POISON INFORMATION QUERIES RECEIVED BY A HOSPITAL BASED POISON INFORMATION CENTER: CURRENT SITUATION AND FUTURE DIRECTIONS

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ARTICLE INFO	ABSTRACT
Key Words Future directions; poison information center; poison information queries poisoning	Poison information center (PIC) is a specialized unit which provides immediate information on early diagnosis, treatment, prevention and risks management of poisoning. The aim of the study was to evaluate poison information queries received by a South Indian PIC which was established at JSS Medical Hospital, Mysuru and to draw future directions for improving the quality of the PIC's current services. A prospective interventional study was conducted for a period of 9 months at the Department of Emergency Medicine, JSS Hospital, Mysuru. A total of 402 poison information queries were received and answered during the study period, among which majority of queries were from the healthcare professionals (n=385) of JSS Hospital, Mysuru followed by general public. Most of the queries were for better patient care (n=292) and were majorly for the management of poisoning (n=217). Intentional poisoning due to pesticides was the major reason for poisoning. Most of the queries were received during ward rounds (n=295) and were mainly answered in the printed form (n=221). For majority of cases, Poisindex (n=218) and within 10- 20 minutes (n=157) was the major information source used and the time taken to provide the information respectively. The existing poison information service has been provided by the PIC in a skillful, efficient and evidence-based manner. However, further reduction in mortality and morbidity due to poisoning can be achieved if the future directions that were drawn from the study are taken into consideration

INTRODUCTION

Poisoning is a significant global public health problem and is one of the main causes of morbidity and mortality in developing countries such as India (Asawari *et al.*, 2017; Jesslin *et al.*, 2010). According to the World Health Organization (WHO), more than 3 million cases of poisoning occur worldwide annually with 2,51,881 deaths of which, 99% of the fatal cases occur in developing countries (Maheswari *et al.*, 2016). In India,

The National Poisons Information Centre (NPIC) in the Department of Pharmacology at the All India Institute of Medical Sciences (AIIMS), New Delhi provides round the clock telephone service on the management of various poisonings across the country with the goal of reducing the morbidity and mortality due to poisoning (Peshin *et al.*, 2014). Moreover, if the Poison information centers (PCIs) are established in each region, then it

can result in the reduction of poisoning treatment cost to the public by avoiding unnecessary emergency care visits and extended hospitalization (Blizzard *et al.*, 2008). PIC is a special information unit which provides immediate information on early diagnosis, effective treatment, prevention and risks management of poisoning (Churi *et al.*, 2012). The major objectives of PICs are: i) to provide immediate round the clock poison information; ii) to provide analytical services; iii) to assess the trend of the poisoning; iv) to assess and manage the risk of the poisoning; v) to provide programs to educate the public (Descotes and Testud, 2005; Flanagan, 2004). In a hospital setting, the clinical pharmacists who are trained to provide specific poison information services play a major role by answering patients oriented questions of the medical groups. This in turn helps the healthcare team to initiate more appropriate treatment to the poisoned patients at the earliest (Kaleemuddin *et al.*, 2001; Sutter *et al.*, 2010).

Mysuru is a South Indian district of Karnataka where agriculture is the major occupation in rural Mysuru and many rural patients get admitted to emergency department of JSS Medical hospital, Mysuru due to poisoning (Jesslin *et al.*, 2010). In order to fulfill the need of a PIC in Mysuru region, a PIC was established at JSS Hospital, Mysuru, This center has been constantly receiving inquiries and providing crucial information to the general public and medical professionals alike (Churi *et al.*, 2013). In order to ensure high quality services, it is important to assess the nature and quality of current services provided by the PIC in answering poison related queries of healthcare professionals and the general public. So, the objective of the study was to evaluate the patterns of poison information queries received by the PIC and to recognize the areas that need improvement. In addition, future directions were also drawn from this study which may help to enhance the overall quality of the current services offered by the PIC.

MATERIALS AND METHODS

Study design and setting: The study was a prospective interventional study conducted for

a period of 9 months from July, 2019 to March, 2020 at the Department of Emergency Medicine of JSS Hospital, Mysuru. JSS Hospital is an 1800 bedded, tertiary care teaching hospital which provides healthcare services to the residents in and around Mysuru region and this study was carried out in the PIC, which was established by Department of Pharmacy Practice, JSS College of Pharmacy, Mysuru, at the hospital. The PIC has started to work effectively since September 2010 and it has trained clinical pharmacists who are available 24 hours a day to provide telephone service. They receive and answer poison information queries from toll free telephone (1800 425 0207) and local phone number. The PIC also has basic and essential infrastructure facilities like good number of computers, printers, high speed internet access, subscription from Micromedex database and standard text books to provide poison information services. E-mail ID of the PIC is pic.jsscp@jssuni.edu.in and website is www.picjsscp.jssuni.edu.in. The mobile application of the PIC for android phones was developed recently and is available at free of cost in Google Play Store. Well developed standard operating procedure (SOP) is followed to answer poison related queries and quality documenting services (softcopy and hardcopy) are ensured in the PIC. All the above mentioned facilities were utilized during the study period to provide necessary poison information services to healthcare professionals and general public.

Sources of data: All the appropriate and required data were gathered from patient case records, lab investigation records, diagnostic tests, poison phone calls and interviews with doctors, nurses, patient and patient care taker.

Ethical Approval: The study was approved in the month of June 2019 by the Institutional Ethical Committee of JSS College of Pharmacy, Mysuru.

Study Criteria:

1) Inclusion criteria: All poisoning cases admitted to the emergency care unit of JSS Hospital, Mysuru

2) Exclusion criteria: Patients who were treated on an outpatient basis

Study procedure: Patients who got admitted to Department of Emergency Medicine of the hospital were reviewed regularly and the patients who met the inclusion criteria were followed up. The poison information queries were received from health care professionals and general public. During the study, poison information queries were answered to the healthcare practitioners with the aim of better patient care and updating the knowledge whereas poison information queries were answered to the general public with the aim of rectifying their doubts, avoiding the unnecessary visits to hospital and educating them. The responses to the queries related to the management of the poisoning cases were provided in the form of standard treatment guidelines and attached to the patient's case sheet, while the queries related with updating knowledge were mainly answered by verbally. The poison information was analyzed for the parameters like enquirer's status, professional status of the enquirers from JSS Hospital (Mysuru), purpose of the query, category of the query, type of poisoning, reason for exposure, mode of receiving queries, mode of provision, reference consulted and time taken to provide information. Furthermore, the details of all the poison information services provided to the people in need were documented in electronic database and in hard copy for easy retrieval of the information.

RESULTS AND DISCUSSION

During the study period, a total of 402 poison information queries were received and answered and the following evaluations were made.

Enquirer's status: Out of the 402 queries received, the majority were from health care professionals of JSS Hospital, Mysuru (n= 385) followed by the general public (n = 17) as depicted in Figure 1. The findings showed that the healthcare professionals of JSS Hospital were more aware of poison information services and used the services more than the general public. It means that there is a need to conduct more awareness

programs for the public to use the poison information services. As this was a hospital based study and majority of the queries were from healthcare professionals, the following evaluations were obtained from the poison information queries that were received from the healthcare professionals of JSS Hospital, Mysuru.

Professional status of the enquirers: Assessment of the professional status of the enquirers showed that (n= 219) of the queries were obtained from the clinicians, (n = 158) of the queries were from the post graduates (PGs) students of the department of general medicine, emergency medicine, pediatrics and so on and (n=8) of the queries from the nursing staff. As the clinicians and the PGs were involved in diagnosis and treatment of the poisoned patients, they were having more queries regarding the management of poisoned patients compared to nurses. The professional status of the enquirers is depicted in the Figure 2.

Purpose of the query: As depicted in Figure 3, (n= 292) queries were intended for better patient care while (n= 93) queries were for updating the knowledge. The primary objective of PIC is to improvise the patient care as well as to prevent poisoning. This showed that the healthcare professionals were effectively utilizing the services of PIC for providing better patient care.

Category of queries: All the poison information queries were categorized into various domains such as management of poisonings, choice of antidotes (availability/ administration/ cost category), identification of the poison, analysis of poison, range of toxicity, toxic effects, toxicokinetics, toxicodynamics and monitoring parameters. Queries were asked for more than one category also. However, majority of the queries were concerned with the management of the poisoned victims (n= 217) followed by analysis of poison (n=66), toxic effects of the poison (n=25), monitoring parameters (n= 23), information on antidotes (n= 19) and identification of the poison (n=17). The other queries included queries regarding range of toxicity (n= 13), toxicodynamics (n= 3) and toxicokinetics (n= 2). The poison information

queries related to thermodynamics were associated with need of information regarding the mechanism of toxicity, possible harm, onset of action, teratogenicity and maximum tolerated dose for a poison ingested while queries related to absorption and concentration in blood were classified under toxicokinetics. The categories of queries are depicted in Table 1. A few specific instances of queries that were asked during the study period are mentioned below:

- **Query related to analysis of poison:** A patient was admitted in the hospital due to suspected Dichlorvos (an organophosphate poisoning) and the blood samples were sent to the PIC to carry out the analysis. The quantitative analysis of the poisoning in the human serum of poisoned patient was carried out using reversed phase high performance liquid chromatography (RP- HPLC) from which Dichlorvos poisoning was confirmed and the results were communicated to clinician within a short period of time.
- **Query related to identification of poison:** A patient was admitted in the hospital due to poisoning of an unknown substance. It was labeled as 'Nuclear Biospray' on the bottle; but the details regarding the formulation of the product or any other relevant information was not specific. After hours of online search, we could get connected to the manufacturer ansd found that the offending substance was Emamectin benzoate, a newer broad spectrum insecticide for vegetables.
- **Query related to range of toxicity:** In a case, a patient had consumed yellow cow dung powder and clinicians needed to know the range of toxicity. As the yellow cow dung powder contained Auramine (a florescent yellow, tasteless, odourless, water soluble highly lethal, easily available household poison), the information regarding range of toxicity due to Auramine poisoning was provided.

The above mentioned examples of queries that were answered during the study period showed that the clinical pharmacists who were a part of the PIC were well trained to answer different categories of the queries. By providing the necessary information to the enquirer, proper management strategies were initiated by the clinician as early as possible whereby a significant reduction in mortality and morbidity among the poisoning cases were achieved. But, the analytical services that were provided to assist the healthcare practitioners in the treatment of victims admitted due to unknown or suspected poisoning were limited to the quantitative analysis of specific organophosphate compounds like Dichlorvos and Dimethoate poisoning only. All the requested tests contributed to the detection, confirmation and quantification of poisonous substance were requested for better patient care. Thus, it was found that a proper framework consisting of analytical toxicology laboratory services, proper communication with the clinicians and availability of antidotes can act as a corner stone in improving the standard of the PIC's existing services.

Type of poisoning: As depicted in Table 2, pesticide poisoning queries (n=185) were major in number followed by medicines (n= 98), bites and stings (n= 53) and unknown/others (n= 49). As agriculture is the major occupation in rural Mysuru, use of pesticides paved the way for accidental (due to its improper handling, storage and disposal) and intentional (due to its easy availability) poisoning. The victims also preferred ingestion of medicines as it is a common method for a painless suicide. Recommendations that were drawn to reduce the number of pesticide poisonings are: i) ban and control on import, distribution and sale of highly and moderately toxic pesticides ii) implementation of appropriate legal action against those who violate regulatory measures of the government iii) storage areas of pesticides should be lockable and away from homes of the farmers. Moreover, community-based suicide intervention programs must be organized.
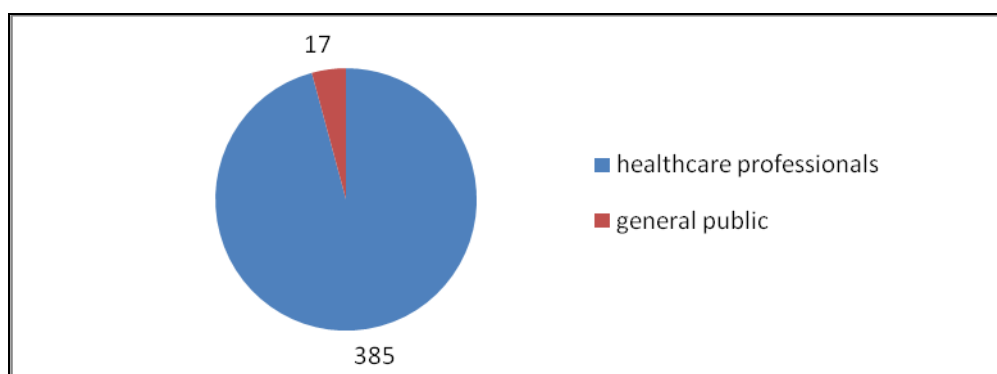
Figure 1: Distribution of poison information queries based on enquirer's status
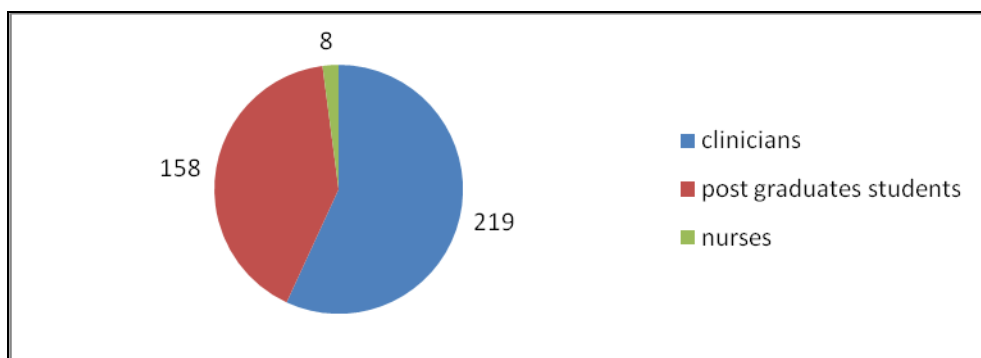

Figure 2: Distribution of poison information queries based on the professional status of the enquirers
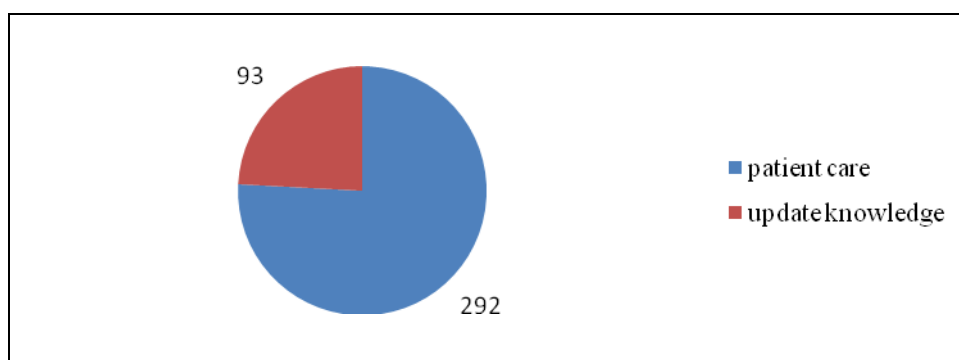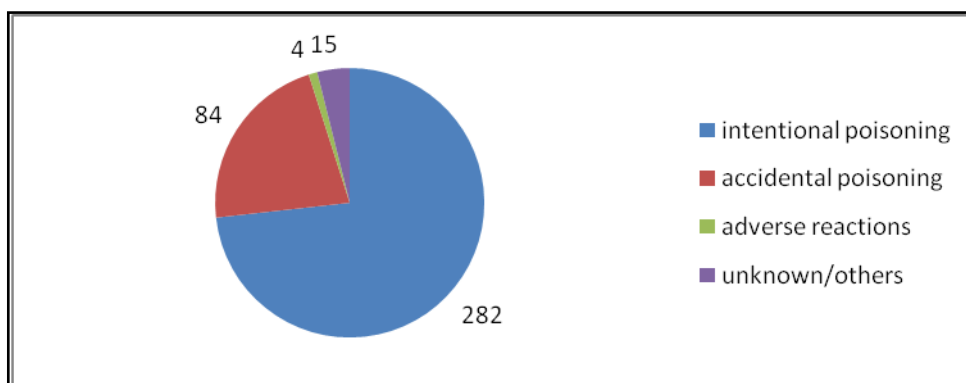

Figure 3: Distribution of poison information queries based on purpose of the query

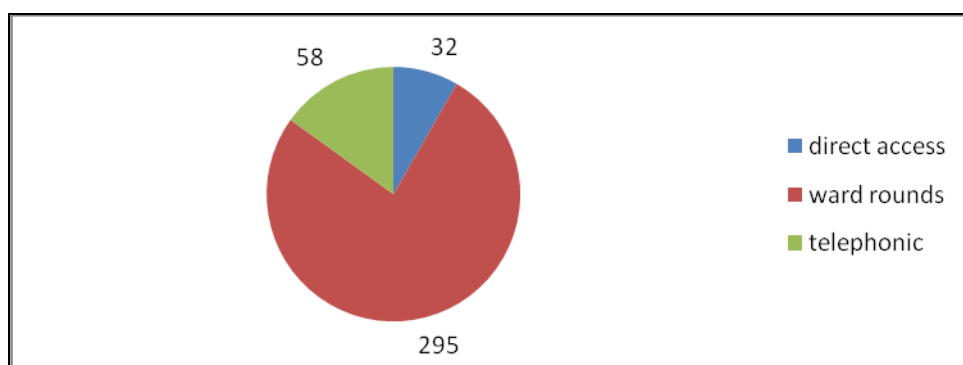**Table 1: Distribution of poison information queries as per the categories of queries**

Category of queries	Number of queries answered
Management of poisonings	217
Analysis of poison	66
Toxic effects of the poison	25
monitoring parameters	23
Information on antidotes	19
Identification of poison	17
Range of toxicity	13
Toxicodynamics	3
toxicokinetics	2

Table 2: Distribution of poison information queries based on the type of poisoning

Type of poisoning	Number of poison queries
pesticides	185
medicines	98
bites and stings	53
unknown/others	49

Figure 4: Distribution of poison information queries based on the reason for exposure
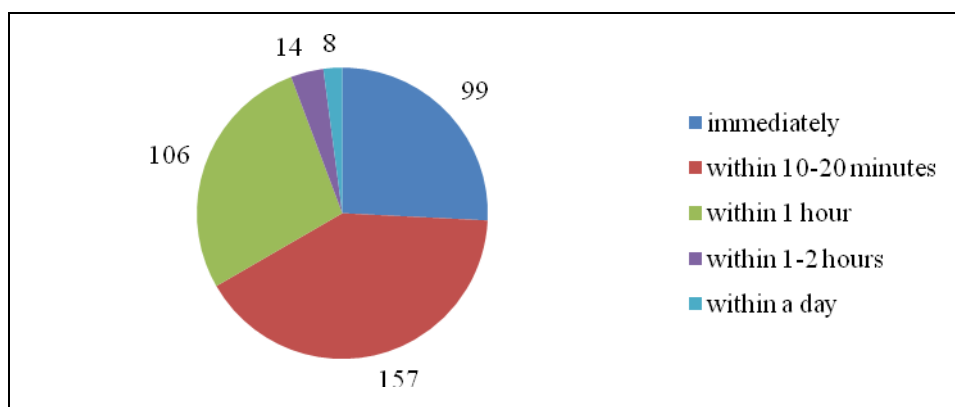

Figure 5: Distribution of poison information queries based on mode of receiving queries

Table 3: Answering the poison information queries based on references consulted

References consulted	Number of poison queries
Poisindex	218
standard treatment protocols	103
textbooks	46
others	18

Table 4: Answering the poison information queries on the basis of mode of provision

Mode of provision	Number of poison queries
Printed form	221
Verbally	139
WhatsApp/mail	13
Poison information mobile application	9
Written	3

Figure 6: Classification of poison information queries based on time taken to provide information

Reason for exposure: Intentional poisoning (n= 282) was the major reason for exposure followed by accidental (n= 84), unknown/others (n= 15) and adverse reaction (n= 4) as depicted in Figure 4. The intentional poisoning was with a purpose of self harm/suicide, misuse and abuse of substances. Among the victims implicating poison with the ideation of suicide, the poisoning due to pesticides was the most common method of poisoning. This information was assessed by interacting and taking history from the victim relatives/ caretakers or the victim itself. On the other hand, the accidental poisoning included bites/stings (like snake and insect bites), occupational hazards as well as toxicity due to consumption of therapeutic drugs. Among the majority of victims, the reason for attempting suicide by poisoning was found as family/ marital discords, financial problems like debt, failure of crops, medical conditions, premarital affairs/ love failure, and unemployment were the reasons for the intentional poisoning. In some cases, the reason behind the poisoning remained unknown because of non cooperative behavior of the relatives as well as the victims.

Mode of receiving queries: Poison information queries were mostly asked during the ward rounds (n= 295) due to proactive participation of clinical pharmacists during ward rounds and easy accessibility and better interaction. It was followed by telephonically (n= 58) and direct access (n= 32). The direct access and telephonic queries were mainly obtained from the post graduates students who were visiting poison information center for the purpose of updating the knowledge on the poisonous substances and who were posted in various departments (medicine, psychiatry, pediatrics and so on) in the hospital. This also suggests that more awareness with respect to the telephonic services of the PIC must be provided to the healthcare professionals. The various modes of receiving the queries are depicted in Figure 5.

References consulted: As depicted in Table 3, Poisindex (n= 218) was used as the main information source followed by standard treatment protocols (n= 103), textbooks (n= 46) and others (n= 18). Other references that were consulted include published articles and online websites. Multiple references were consulted to answer few queries.

Mode of provision: The information was provided in printed form (n= 221) majorly followed by verbally (n= 139) and by WhatsApp/mail (n= 13). Some queries were provided by poison information mobile application (n= 9) and by written (n= 3) also. However, the information was provided in more than one mode too. The mode of provision of poison information is depicted in Table 4. The printed form was documented in the patient's case whereby all those who had an access to the patient's case sheet could ensure better patient care and update their knowledge. In situations where information was to be provided at the earliest, it was sent through WhatsApp/mail or through telephone calls. Though answers for some of the queries were already available in the poison information app, due to lack of awareness about this mobile application, it was not much used by the healthcare professionals.

Time taken to provide information: Most of the poisoning queries were provided within 10-20 minutes (n= 157) as that was the time taken to get it in printed form. It was followed by within 1 hour (n= 106), immediately (n= 99), within 2-4 hours (n= 14) and within a day (n= 8) as depicted in Figure 6. The information for the queries which required the preparation of standard management guidelines were given either within 1 hour or within 2-4 hours. However, not even a single provision of information was delayed more than a day suggesting that the PIC is well established with trained clinical pharmacists, basic resources and infrastructure facilities like computerized information systems, printers, necessary books and telephonic management services.

From the above results and discussion, the future directions that were drawn for improving the quality of the current services provided by the PIC are as follows:

- Presently, though the PIC provides poison information services telephonically, this service is minimally used by the general public. By overcoming this limitation to an extent, the unnecessary visits to emergency department of the hospital can be reduced. In addition, information regarding the poison information app developed by the PIC must be circulated to many so that people can make best use of the mobile application.
- Though there is an analytical laboratory available at JSS College of Pharmacy (Mysuru), the necessary procedures to carry out analysis of poisoning substances and a specialized clinical toxicologist who is in charge of performing qualitative and quantitative analysis of poisonous substances are not available. So, more focus should be given to rectify this limitation. In order to save the time during transportation of samples, it is also suggested to establish an analytical laboratory within the vicinity of the department of emergency medicine whereby qualitative and quantitative analytical

services can be provided. However, from a practical point of view, huge amount of financial support is required.

- Training programs on poison information can improve the expertise of the healthcare providers whereby better patient care can be achieved. As the majority of the poisonings are observed in the rural and semi rural areas of the district, the healthcare practitioners working in primary and secondary care hospitals should be trained by regular refreshers and continuous education for updating their knowledge on the current epidemiological scenario in toxicological emergencies. Therefore, more training programs are needed to be organized to strengthen existing services offered by the PIC.
- One of the most important aspects in poison control services is the preventive aspect of accidental ingestion. Public awareness programs on poison prevention should be conducted at a larger scale, covering various population groups who may be at a greater risk for occupational and intentional poisoning. This can be done by placing banners in the strategic areas, distributing leaflets and so on. Moreover, suicide intervention programs must be organized.
- More community based researches must be carried out with respect to poisoning in order to find great breakthroughs to reduce current scenario of poisoning.
- Steps must be taken to improve the toxicovigilance role of the PIC like identification of high risks for poisoning and changes and/or prevalence in the incidence of poisoning, monitoring of toxic effects and toxicity of various substances, reporting to health and other authorities about situations requiring preventive or corrective actions, and where appropriate calling an alert and monitoring of effectiveness of preventive strategies.

- Furthermore, an online database should be established, connecting all the government as well as private hospitals for determining the actual epidemiological data of poisoning in the district. The data from this database can be a major milestone to influence the regulatory authorities in taking appropriate measures for the prevention of poisoning especially due to pesticides.

CONCLUSION

PICs are aimed to improve the patient care among the victims of poisoning. The evaluation of poison information queries received by the PIC established at JSS Hospital, Mysuru concludes that queries were majorly received from healthcare professionals of the hospital than the general public. The category of queries answered, time taken to, references consulted and mode chosen to answer the queries suggests that the PIC is well established with trained clinical pharmacists and basic resources and infrastructure facilities like computerized information systems, printers, necessary books and telephonic management services. However, the quality of the existing services provided by the PIC can be improved if the future directions that were drawn from the study are taken into consideration. Thus, the mortalities and morbidities associated with poisoning can be prevented to a greater extend.

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