International Journal of Pharmacology and Toxicology, 4 (1) (2016) 59-65

International Journal of Pharmacology and Toxicology

Website: www.sciencepubco.com/index.php/IJPT
doi: 10.14419/ijpt.v4i1.5944
Research paper

Tele-health: bridging the gap between the need for rapid toxicology consultation and shortage in poison control centers - a unique experience in Dammam poison control center

Maha Al Mazroua [1], Sahar Y Issa [2*], Essam M Hafez [3]

[1] *Poison Control Center, Dammam, KSA*
[2] *Poison Control Center, Dammam, KSA - Department of Forensic Medicine and clinical Toxicology. Faculty of Medicine - Alexandria University*
[3] *Poison Control Center, Dammam, KSA - Department of Forensic Medicine and clinical Toxicology. Faculty of Medicine - Minia University*
**Corresponding author E-mail:Sahar_issa71@yahoo.com*

Abstract

The development of poisons control centers (PCCs) has in general complied with the actual needs and conditions in the society. A single MOH toll-free telephone number (937) for all health services enables rapid transfer of the caller to a specialist in poison information and toxicology anywhere in the Saudi Kingdom at any time, day or night. A board-certified, qualified toxicologist can be reached within a few moments. This remarkable system is maintained by the voluntary cooperation of the 45 technical members of the Regional Dammam Poison Control Center (DPCC) since nearly three years, being the only PCC in the Kingdom offering this service till date.
Objectives: The objective of the current study is to empathize and promote services delivered by PCCs as poison control, chemical safety, prevention and treatment of toxicities within the Saudi Kingdom through the single MOH toll-free telephone number (937), being the only Saudi PCC responding to this service in toxicology. It promotes toxicovigilance in the hope of decreasing the overall morbidity and minimizing mortality from poisoning.
Methods: The calls received on the hotline telephone number of the DPCC directly conveying the calls from the free MOH line (937), were retrospectively studied and evaluated. Themes that emerged from the data obtained from telephone communication were statistically assessed.
Results: The study showed that the Unintentional exposures (N= 4353, 85%) greatly surpassed other types of exposure. Most of the callers were Saudi (N=4198, 82%) from Eastern region (N= 1654, 32.3%). The toxicological calls (N: 2389, 87.6%) were nearly 7 folds of the non-toxicological calls (N: 337, 12.4%) in the third year of the study. The number of calls were more during the summer season.

Keywords: *Poison Control Centers; Tele-Health; Toxicity; Consultation; Saudi Arabia; Dammam; DPCC.*

1. Introduction

DPCC was the first of its kind to be established in the kingdom of Saudi Arabia in 1984. It was the outcome of comprehensive plans made by the Ministry of Health, to ensure the best quality health care services made available to the people of the Saudi Kingdom. The availability of a national medical call center system offers fascinating potentials in public health. To operate in a satisfying way a poison control center is dependent on two cornerstones namely; a specifically trained, highly qualified and well educated staff on the one hand, and consistent, up to date, convenient information sources on the other. Great efforts had been expended in developing the poison control center call system and the software needed to meet the surveillance needs of national preparedness and security plans. Instant availability and readiness to provide information, via telephone, 24 hours/7 days is a minimum requirement to enable bridging the gaps between the need for toxicology consultation and shortage in poison control centers. In new centers this is not always possible in the beginning, but it should be their ultimate aim to introduce a 24 hours service as soon as possible. (Wolkin AF et al. 2015)

The actual value of health care savings attributable to poison control centers (PCCs) is difficult to quantify due to the preventive nature of their services. The efforts of PCCs have been shown to reduce unnecessary and costly health care utilization. A number of studies have demonstrated that poison centers reduce health care spending and that the amount of these savings far exceeds the cost of providing poison center services. (Bronstein A et al. 2012, Smith P et al. 2013) PCCs save great sum of money yearly in medical costs and productivity, the cost savings include all of the four most commonly referenced savings metrics namely; savings due to avoided medical utilization, reduced hospital length of stay, in-person outreach, and reduced work-loss days. (Wolkin AF et al. 2012) Other recognized benefits of PCCs, include but are not limited to the provision of surveillance data to governmental agencies, toxicology training of health care professionals, and involvement in local as well as national emergency preparedness and response. (Bronstein A et al. 2011) The provision of patient health care has been a fundamental part of PCCs services. Professionals in PCCs serve as primary health care providers for the home management of suspected poisonings and as toxicology consultants for health care providers and hospitals. In less than a few minutes, callers are connected to specially trained individuals

knowledgeable of the treatment, prevention and safety measures that should be taken to prevent injury from a number of hazardous materials. This rapid early intervention often limits morbidity and prevents mortality. (Cobaugh DJ et al. 2006) PCCs staff follow up on each case of suspected or known poisoning in order to assess the effects of treatment, to advice about continuing care, and to collect data on the occurrence of poisonings. In addition, PCCs have emerged as a useful asset in the response to local, national, and international emergencies by providing up-to-date information to the public and the media specifically targeting the communities they serve.(Spiller H and Griffith J, 2009)

2. Methods

The calls received on the hotline telephone number of DPCC directly conveying the calls from the free MOH line (937), were retrospectively studied and evaluated. Themes that emerged from the data obtained from telephone communication were statistically assessed with SPSS 22.0

3. Results

The calls received on the hotline telephone number of the DPCC directly conveying the calls from the free MOH line (937), were retrospectively studied and evaluated. Themes that emerged from the data obtained from telephone communication were tabulated and statistically assessed. Most of the exposures and caller sites were from own residence of caller (N= 4476, 87.4%) and (N= 3800, 74.2%) respectively, as demonstrated in table (1). Unintentional exposures (N= 4353, 85%) greatly surpassed other types of exposure as seen in table (2). Table (3) demonstrates that 73.2% (N= 3750) of exposures were managed on site. Most of the callers were Saudi (N=4198, 82%) from Eastern region (N= 1654, 32.3%), and most of them were from Dammam, as described in tables (4 and 5), and figure (8) simultaneously. Figure (1) shows the distribution of relevance of received calls (Toxicological & non toxicological) over three years period of the study since the start of the service with total number of calls reaching 725 calls in the first year, from all over the kingdom. Non toxicological calls (N: 528, 72.8%), greatly exceeded toxicological calls (N: 197, 27.2%). In the second year the ratio of non-toxicological calls (N: 590, 35.3%), were far less than toxicological calls (N: 1081, 64.7%). While the toxicological calls (N: 2389, 87.6%) were nearly 7 folds of the non-toxicological calls (N: 337, 12.4%) in the third year of the study. Figure (2) shows the classification of received calls over three years period of the study.

The monthly distribution of calls over three years period of the study was demonstrated in Figure (3), where a surge in the number of calls was noted during the summer season. Females (72%) greatly exceeded males (28%), and most of the toxic exposures was in the age group below 5 years (56%) as seen in Figures (4 and 5) respectively. In 91% of exposures, there was only single causative agent and, oral exposure route was the commonest (76%) as demonstrated in figures (6 and 7) simultaneously.

Table 1: Distribution of Exposure Calls Received by the DPCC Hotline during Study Period by Exposure Site and Caller Site

Site	Exposures site		Caller site	
	Number	%	Number	%
Own residence	4476	87.4	3800	74.2
Other residence	194	3.8	154	3
Workplace	108	2.1	93	1.8
Health care facility	31	0.6	732	14.3
School	56	1.1	36	0.7
Restaurant/food service	26	0.5	5	0.1
Public area	97	1.9	31	0.6
Other	37	0.7	256	5
Unknown	97	1.9	15	0.3
Total	5122	100%	5122	100%

Table 2: Distribution of Exposure Calls Received by DPCC Hotline during Study Period by Exposure Reason

Exposure reason	Number of calls	%
Unintentional	4353	85.0
General	3334	65.1
Environmental	87	1.7
Occupational	76	1.5
Therapeutic error	385	7.5
Misuse	143	2.8
Bite/sting	236	4.6
Food poisoning	82	1.6
Unknown	10	0.2
Intentional	642	12.5
Suspected suicide	462	9.1
Misuse	77	1.5
Abuse	77	1.5
Unknown	26	0.5
Adverse reaction	82	1.6
Drug	67	1.3
Food	5	0.1
Other	10	0.2
Other	25	0.5
Contamination/tampering	10	0.2
Malicious	10	0.2
Drug withdrawal	5	0.1
Unknown	20	0.4
Total	5122	100%

Table 3: Distribution of Human Exposure Calls Received by the DPCC by Management Site

Management site	Number of calls	%
Managed on site (non HCF)	3750	73.2
Patient already in (en route to) HCF when DPCC was called	789	15.4
Patient was referred by DPCC to a HCF	558	10.9
Other	20	0.4
Unknown	5	0.1
Total	5122	100%

HCF = health care facility
DPCC =Dammam poison control center

Table 4: Distribution of Human Exposure Calls Received by the DPCC by Nationality of Caller

Nationality	Frequency	Percent
Saudi	4198	82%
Filipino	36	0.7%
Indian	76	1.5%
Pakistani	72	1.4%
Egyptian	117	2.3%
Nepali	5	0.1%
Bangladeshi	4	0.1%
Sirilanki	67	1.3%
Jordanian	46	0.9%
Turkish	26	0.5%
Yemeni	51	1%
Syrian	128	2.5%
Indonesian	5	0.1%
Sudanese	72	1.4%
Omani	77	1.5%
Chinese	25	0.5%
American	5	0.1%
British	6	0.1%
Lebanese	101	2%
Unknown	5	0.1%
Total	5122	100%

Table 5: Distribution of Human Exposure Calls Received by the DPCC by Calling Region

Region	Frequency	Percent
Eastern Region	1654	32.3%
Riyadh	953	18.6%
Tabuk	814	15.9%
Jeddah	466	9.1%
Medina	118	2.3%
Mecca	256	5.0%
Quasim	184	3.6%
Abha	71	1.4%
Araar	328	6.4%
Jazan	71	1.4%
Najran	46	0.9%
Yanbu	26	0.5%
Al-Baha	92	1.8%
Khamis Mushayt	43	0.8%
Total	5122	100%

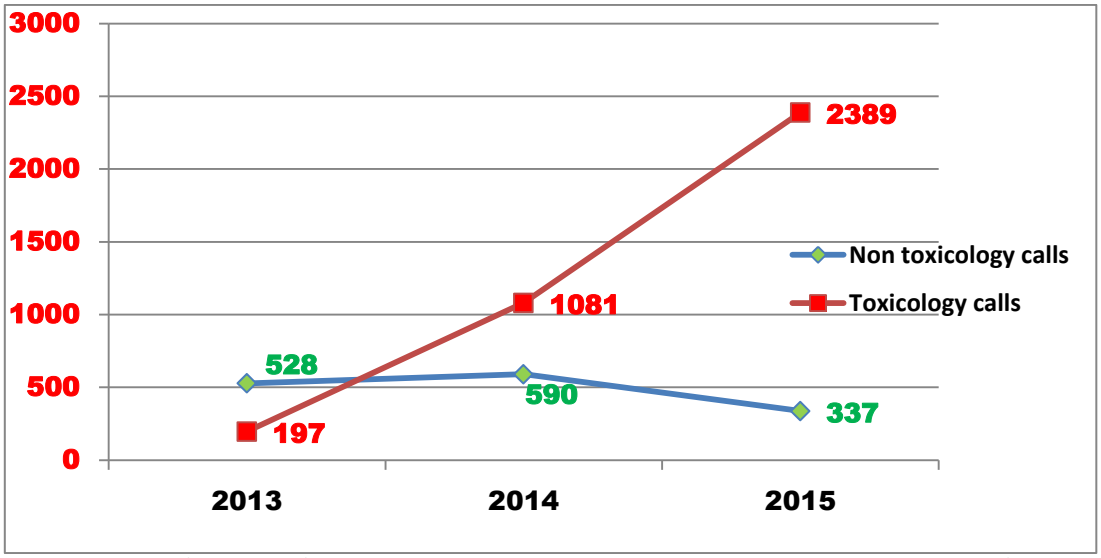

Fig. 1: Distribution of Relevance of Received Calls (Toxicological & Non Toxicological) Over Three Years Period of the Study.

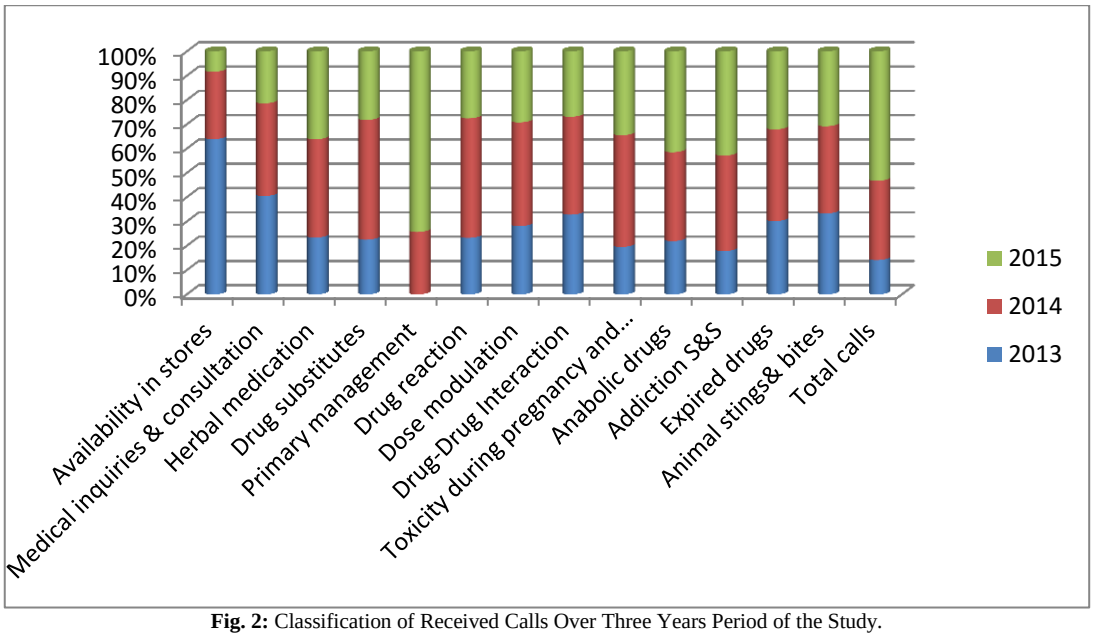

Fig. 2: Classification of Received Calls Over Three Years Period of the Study.

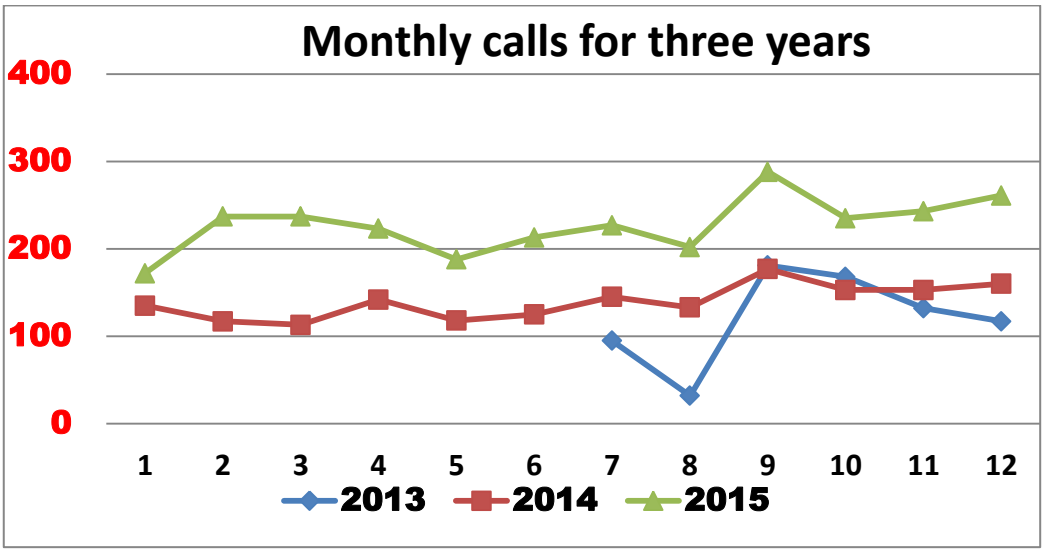

Fig. 3: Monthly Distribution of Calls Over Three Years Period of the Study.

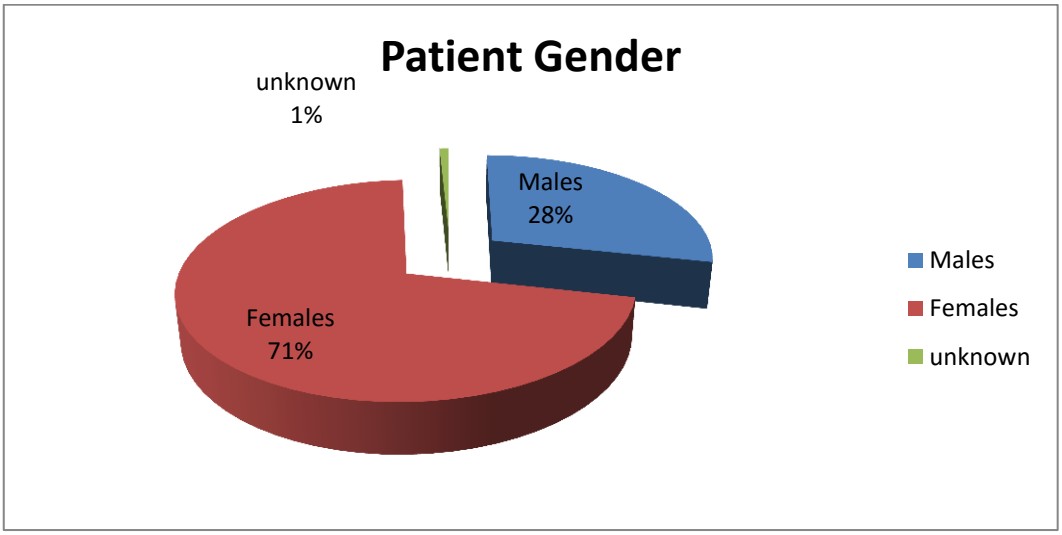

Fig. 4: Distribution of Calls by Patient's Gender.

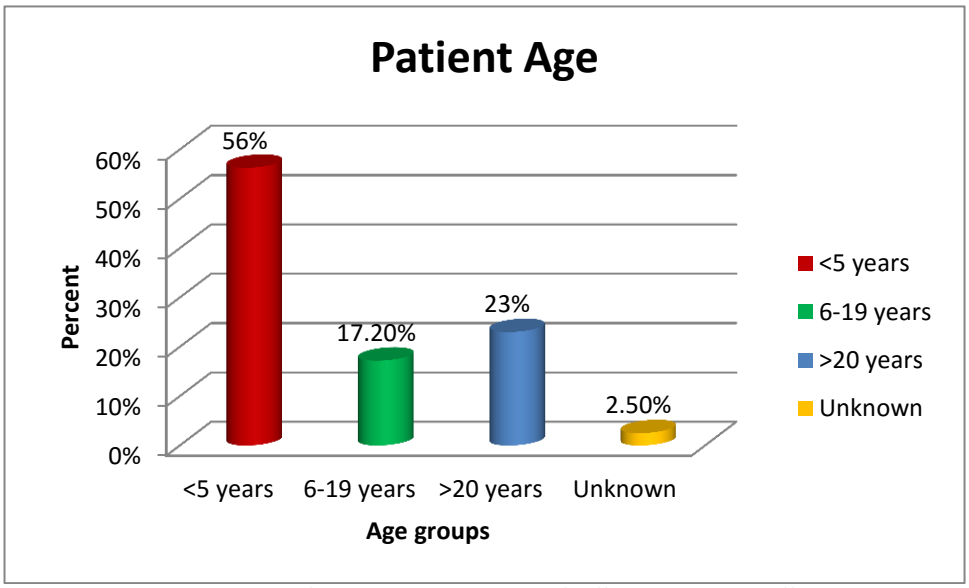

Fig. 5: Distribution of Exposure Calls by Percent of Different Age Groups Affected.

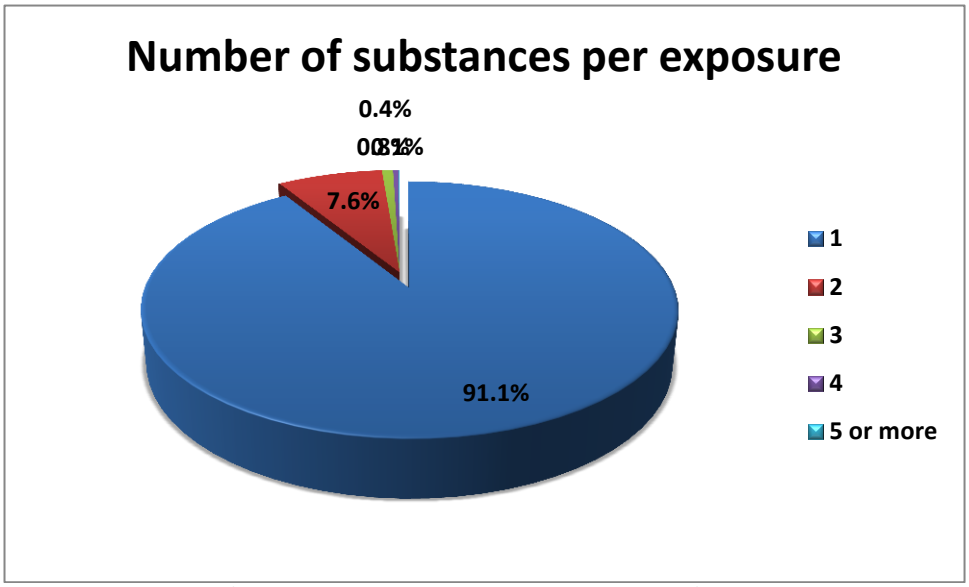

Fig. 6: Distribution of Exposure Calls Received by the DPCC by Number of Substances per Exposure.

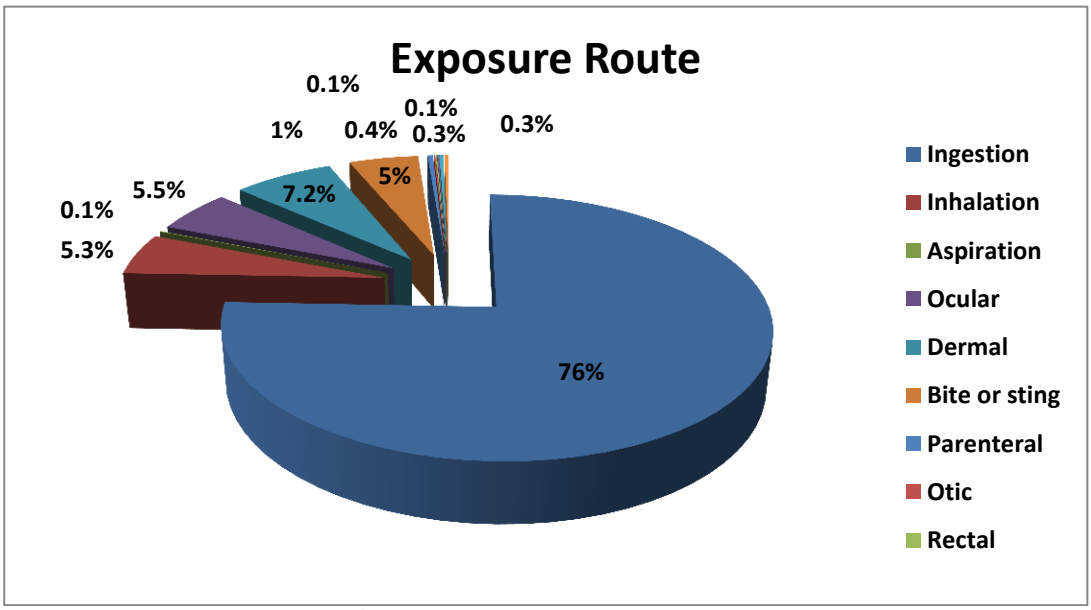

Fig. 7: Distribution of Human Exposure Calls Received by DPCC by Exposure Route.

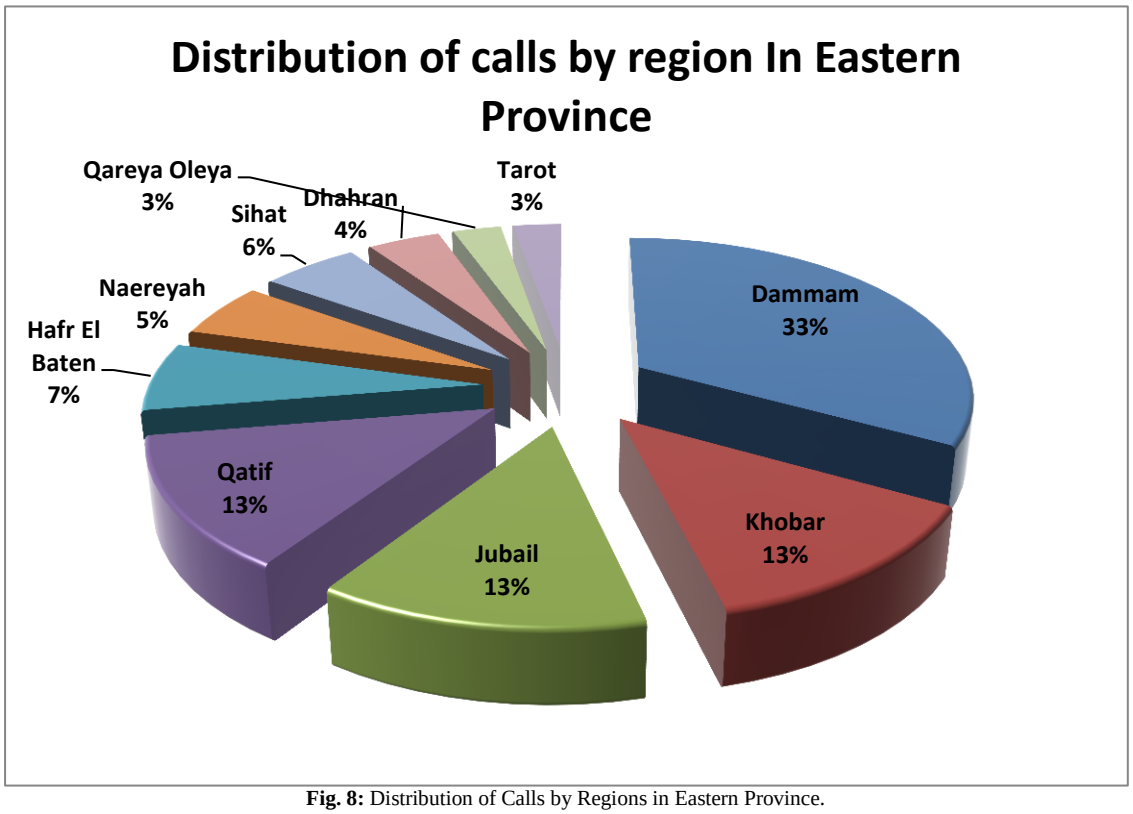

Fig. 8: Distribution of Calls by Regions in Eastern Province.

4. Discussion

Poisoning is the third leading cause of unintentional injury and death worldwide. Each year 3,000 young children aged 0 to 14 die of acute poisoning. (Vassilev ZP and Marcus SM, 2007) In accordance with our results children 5 years and under, account for the majority of all poison exposures with children up to two years old especially vulnerable. Single oral causative agent in own residence are the commonest types of exposures as seen in our results (Wolkin AF et al. 2006) The initial evaluation of alleged poisonings may be performed in a physician's office or the emergency department after contacting PCC if available. If the physician in the PCC receives a phone call about a suspected poisoning, the first step is to ascertain whether the patient is symptomatic (i.e., respiratory, circulatory, or neurologic symptoms). Symptomatic patients should receive ambulance transport to the emergency department. If there is no hospital nearby, the patient should be transported to the nearest physician's office. (Zaloshnja E et al. 2006, Wu AH et al. 2008, Blizzard JC et al. 2008) If the ingestion was witnessed, a nontoxic substance was involved, and the patient appears asymptomatic, a prompt case assessment is advised for either in the physician's office or a period of observation at home may be appropriate. (Waston WA et al. 2005, Galvaol TF et al. 2011).

Patients calling PCCs should be stabilized, if needed and once the patient is stable, a history should be obtained, including patient age and sex, the time of probable or witnessed toxin exposure, the type of substance involved, and the method of exposure (i.e., skin contact, inhalation, or ingestion). (Hoffman R and Osterhoudt KC 2002) The possible method of exposure is vital to help detecting substance abuse or suicidal intents, which is especially relevant in adolescents. The physician should ask for the original containers of the possibly ingested substances, and the names of any prescription or over-the-counter medications in the home to which the patient had access. (Barry JD 2005) Medications brought into the home by visitors should also be considered. The ingestion of medications brought into the home, such as in a visitor's purse or pillbox, accounts for a significant number of accidental childhood poisonings each year. (Liebelt E and De-Angelis C 1999) In accordance with our results, most toxic ingestions occur among females mainly toddlers and children younger than five years with access to unsecured substances. (Bryant S and Singer J 2003)

For many years, all poisonings were treated with the same protocol of aggressive decontamination and standard antidote regimens. There is still controversy as to which patients are likely to benefit from decontamination. Gastric decontamination, such as activated charcoal and gastric lavage, are no longer routinely recommended and should be reserved for the most severe cases, as advised by poison control center. (Bryant S and Singer J 2003).

Most of poisonings require supportive treatment, including monitoring and continued observation. Low risk patients with minimal symptoms, nontoxic ingestions, and no expected sequelae may be discharged to caregivers after a short observation period, after contacting PCC, thus reducing costs by savings due to avoided medical utilization, reduced hospital length of stay. (Bronstein AC et al. 2010, Wolkin AF et al. 2012) High risk patients (e.g., intentional ingestions, patients who exhibit continued toxidromes or prolonged symptoms) should be admitted to the hospital for ongoing treatment and extended observation. (Bryant S and Singer J 2003, Smith P et al. 2013) As in accordance with our study, the majority of the toxic events and calls were recorded during the summer months. (Law R et al. 2011).

5. Conclusions

In conclusion, tele-health services should be encouraged and, the staff responding to enquiries should be trained and dedicated to this task for the entire period of operation, which means around the clock. Each poison control center should have its own, dedicated telephone number that is cheap to use and ideally it should be free of charge. A single national organization should be organized to collect and aggregate data from poison centers into a National Poison Data System, and maintain a detailed, up-to-date information on poisonings to be used by governmental agencies.

References

[1] Blizzard JC, Michels JE, Richardson WH, *et al.* (2008): Cost-benefit analysis of a regional poison center. Clinical Toxicology; 46(5):450-6. http://dx.doi.org/10.1080/15563650701616145.

[2] Barry JD (2005): Diagnosis and management of the poisoned child. Pediatric Annals; 34(12):937-946. http://dx.doi.org/10.3928/0090-4481-20051201-09.

[3] Bronstein A, Spyker D, Cantilena L, *et al.* (2011): Annual Report of the American Association of Poison Control Centers' National Poison Data System: Clinical Toxicology; 49(10):910– 41.

[4] Bronstein A, Spyker D, Cantilena L, *et al.* (2012): Annual Report of the American Association of Poison Control Centers' National Poison Data System: Clinical Toxicology; 50(10):911–1164.

[5] Bronstein AC, Spyker DA, Cantilena LR, *et al*. (2010): Annual Report of the American Association of Poison Control Centers' National Poison Data System: Clinical Toxicology; 49(10):910–41.

[6] Bryant S and Singer J (2003): Management of toxic exposure in children. Emergency Medicine Clinics of North America; 21(1):101-19. http://dx.doi.org/10.1016/S0733-8627(02)00083-4.

[7] Cobaugh DJ, Krenzelok EP (2006): Adverse drug reactions and therapeutic errors in older adults: a hazard factor analysis of poison center data. American Journal of Health-System Pharmacy; 63:2228–34 http://dx.doi.org/10.2146/ajhp050280.

[8] GalvaoI TF, Silva MT, Silva CD, *et al.* (2011): The impact of a poison control center on the length of hospital stay of poisoned patients-Cohort study. Sao Paulo Medical Journal; 129(1):23-9 http://dx.doi.org/10.1590/S1516-31802011000100005.

[9] Hoffman R and Osterhoudt KC (2002): Evaluation and management of pediatric poisonings. Pediatric Case Review; 2(1):51-63. http://dx.doi.org/10.1097/00132584-200201000-00007.

[10] Law R, Martin C, Wolkin A, *et al.* (2011): Use of the National Poison Data System for surveillance of human health effects from the Deepwater Horizon oil spill. Journal of Emerging Health Threats; 4(s37):27.

[11] Liebelt E and De-Angelis C (1999): Evolving trends and treatment advances in pediatric poisoning. Journal of the American Medical Association; 282(12):1113-5. http://dx.doi.org/10.1001/jama.282.12.1113.

[12] Smith P, Hadler J, Stanbury M, *et al.* (2013): Updating public health surveillance for the 21st century. Journal of Public Health Management and Practice; 19(3):231– 9. http://dx.doi.org/10.1097/PHH.0b013e318262906e.

[13] Spiller H and Griffith J (2009): The Value and Evolving Role of the U.S. Poison Control Center System. National Center for Biotechnology Information. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2663870/.

[14] Vassilev ZP, Marcus SM (2007): The impact of a poison control center on the length of hospital stay for patients with poisoning. Journal of Toxicology and Environmental Health; 70(2):107-10. http://dx.doi.org/10.1080/15287390600755042.

[15] Watson WA, Litovitz TL, Rodgers GC Jr, *et al.* (2005): Annual report of the American Association of Poison Control Centers Toxic Exposure Surveillance System. American Journal of Emergency Medicine; 23(5):589-666. http://dx.doi.org/10.1016/j.ajem.2005.05.001.

[16] Wolkin AF, Amy H, Schnall M, *et al.* (2015): Using Poison Center Data for Post disaster Surveillance. Pre-hospital and Disaster Medicine; 29(5): 521–4. http://dx.doi.org/10.1017/S1049023X14000983.

[17] Wolkin AF, Martin C, Law R, *et al*. (2012): Using poison center data for national public health surveillance for chemical and poison exposure and associated illness. Annals Emergency Medicine; 59(1):56–61. http://dx.doi.org/10.1016/j.annemergmed.2011.08.004.

[18] Wolkin AF, Patel M, Watson W (2006): Early detection of illness associated with poisonings of public health significance. Annals of emergency medicine; 47:170–6. http://dx.doi.org/10.1016/j.annemergmed.2005.09.016.

[19] Wu AH, Smith A, Mc-Comb R (2008): State-wide hospital clinical laboratory plan for measuring cholinesterase activity for individuals suspected of exposure to nerve agent chemical weapons. Clinical Toxicology; 46:110–6. http://dx.doi.org/10.1080/15563650701664830.

[20] Zaloshnja E, Miller T, Jones P, *et al.* (2006): The potential impact of poison control centers on rural hospitalization rates for poisoning. Pediatrics; 118(5):2094-100. http://dx.doi.org/10.1542/peds.2006-1585.