DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

A STATISTICAL INFORMATION SYSTEM FOR POISON CONTROL CENTERS

by
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June, 2009
İZMİR

A STATISTICAL INFORMATION SYSTEM FOR POISON CONTROL CENTERS

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in Department of Statistics Program

by
Engin YILDIZTEPE

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Ph.D. THESIS EXAMINATION RESULT FORM

We have read the thesis entitled **"A STATISTICAL INFORMATION SYSTEM FOR POISON CONTROL CENTERS"** completed by **ENGİN YILDIZTEPE** under supervision of **PROF. DR. SERDAR KURT** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy.

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A STATISTICAL INFORMATION SYSTEM FOR POISON CONTROL CENTERS

ABSTRACT

A poison control center (PCC) is a modern health service unit that is able to provide immediate, free, and expert treatment advice and assistance over the telephone in case of exposure to poisonous or hazardous substances. The aims of PCC are to provide guidance for treatment strategies by giving right, current and comprehensive information rapidly in case of poisoning and to promote the safe, effective and proper use of medicines. Another major task of PCC is to disseminate and develop knowledge in these areas through teaching and research.

In this study, after giving general information about information systems and poison control centers, the statistical information system being developed for poison control centers (SISPCC) has been presented. Development stages and structure of the developed system have been explained. The modules of the information system have been presented. Consequent to the entry into the developed information system of the collected data by Dokuz Eylül University Drug and Poison Information Center (DPIC) since 1993, results of the 2007 annual report have been given. This report analyzed the etiological, demographical and clinical characteristics of exposures reported to the DPIC in 2007. And finally, conclusion and some suggestions for further research were given.

Keywords: Statistical information system, poison control center, poisoning

ZEHİR DANIŞMA MERKEZLERİ İÇİN BİR İSTATİSTİKSEL BİLGİ SİSTEMİ

ÖZ

Zehir danışma merkezleri (ZDM) zehirli veya tehlikeli maddelere maruz kalma durumlarında telefon ile acil ücretsiz uzman yardımı sağlayan modern sağlık birimleridir. ZDM'lerin amacı zehirlenme olgularında uygulanması gereken tedavi yöntemi hakkında ve ilaçların etkin ve güvenli kullanımı konularında doğru, güncel, kapsamlı ve hızlı bilgilendirme hizmeti sağlamaktır. ZDM'lerin bir başka önemli görevi de verdikleri eğitim ve yaptıkları araştırmalar ile hizmet verdikleri alanların gelişmesine katkıda bulunmaktır.

Bu çalışmada bilgi sistemleri ve zehir danışma merkezleri hakkında verilen bilgilerden sonra zehir danışma merkezleri için geliştirilen istatistiksel bilgi sistemi tanıtılmıştır. Geliştirilen sistemin yapısı, geliştirme süreçleri ve bilgi sistemini oluşturan bileşenler açıklanmıştır. Dokuz Eylül Üniversitesi İlaç ve Zehir Danışma Merkezi tarafından 1993 yılından bu yana toplanılan veriler geliştirilen bilgi sistemine aktarılmıştır. Dokuz Eylül Üniversitesi İlaç ve Zehir Danışma Merkezi'ne 2007 yılında bildirilen zehirlenme olgularının etyolojik, demografik ve klinik özelliklerinin araştırıldığı 2007 raporu da bu tez çalışması kapsamında sunulmuştur. Son olarak yapılan çalışma hakkında değerlendirmelerde bulunulmuş ileri çalışmalar konusunda öneriler yapılmıştır.

Anahtar sözcükler: İstatistiksel bilgi sistemi, zehir danışma merkezi, zehirlenme

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CHAPTER ONE
INTRODUCTION

In the contemporary, information systems (IS) have been increasingly important for the survivability of an organization. IS plays a greater role in the management and operation of all types organizations. Most organizations in all sectors of industry, commerce and government are dependent on their IS today. There are many different definitions about IS. United Kingdom Academy for Information Systems (UKAIS) suggests a broad definition, "Information systems are the means by which people and organizations, utilizing technologies, gather, process, store, use and disseminate information".

The domain of study of IS, as defined by the UKAIS, involves the study of theories and practices related to the social and technological phenomena. IS is a multidisciplinary subject and also IS has been used many different functional areas of industry, commerce and medical. There are many different information system applications in medical area. Because not only universities performing clinical trials but also health facilities, researchers and drug industry can use and get benefits from medical information directly or indirectly.

Medication related developments which especially came to the scene after World War II have presented plenty of new drugs and chemicals which have high harm potentials as well as being effective. For this reason, the medical community decided to develop a response to poisonings. In the late 1940s special toxicology wards were founded in Europe. In the United States (US), first poison information center was founded in 1953 (Burda, 1997).

Poison Control Center (PCC) is one of the health services which are necessary in various areas as well as medical information they have produced in addition to saving lives. The PCC's major task is to provide immediate, free, and expert treatment advice and assistance over the telephone in case of exposure to poisonous or hazardous substances. Furthermore, Poison Control Centers (PCCs) carry out the

clinical researches directed at medicine usage and the profile of being poisoned using patient and case information in the case of being poisoned.

First poison information center in Turkey, Refik Saydam Hıfzısıhha Poison Information Center, was founded in 1984. Dokuz Eylül University Drug and Poison Information Center (DPIC) started to serve in the constitution of School of Medicine, Pharmacology Department in 1993 (Tunçok, 2003). DPIC has been presenting all its accumulation and facilities to the health personal and public's service with the educated service staff. DPIC has been serving to the health personal and public by means of telephone about undesirable adverse effects of drug and being poisoned 24 hours a day with the help of experienced physicians and pharmacologists who are trained on Clinic Toxicology.

The main aim of these centers which gives the drug and toxic substances counseling service is to provide effective and safe medicine usage and to decrease morbidity, mortality and the cost of treatment in the case of being poisoned by giving right, current, comprehensive and rapid information. PCCs have to use information technologies and statistics for carrying out their tasks and researches properly and efficiently.

Epidemiological data on exposures in Turkey are extremely limited. Reports of this kind will give beneficial information to physicians, researchers and executives of health management for recent situation and characteristics of poisoning in Turkey. The data which have been used for previous studies from Turkey on this area usually gathered from the patients' records who were admitted to the emergency departments of the university hospitals (Hincal et al.,1987; Özköse & Ayoğlu, 1999; Ağın, Çalkavur, Olukman, Ural & Bak, 2002; Göksu, Yildirim, Koçoğlu, Tutak & Öner, 2002; Tufekci, Curgunlu & Sirin, 2004; Akkas, Coskun, Ulu & Sivri, 2004; Güloğlu & Kara, 2004; Satar & Seydaoglu, 2005; Seydaoglu & Satar, 2005; Akkose, Bulut, Armağan, Cebicci & Fedakar, 2005; Mert & Bilgin, 2006; Unverir et al., 2006; Akbaba, Nazlıcan, Demirhindi, Sütoluk & Gökel, 2007).

In this study, after giving general information about information systems and PCCs, development of an information system for PCCs is presented. In second chapter of this study, some general information about IS will be given. A brief history of PCC and the citation in the world and Turkey will be given in Chapter Three. Presentation of the statistical information system which has been developed for PCC will be given in Chapter Four. After collected data by Dokuz Eylül University Drug and Poison Information Center (DPIC) since 1993 have been entered into the developed information system, the results were obtained in the extent of the 2007 Annual Report are given in Chapter Five. Finally, last chapter consist of conclusion and some suggestions for further research.

CHAPTER TWO
BASIC IDEAS OF INFORMATION SYSTEM

2.1 System

Any basic discussion of information system rightfully begins with a description or a definition of the term “system”. The term “system” is a very common concept that almost all branches of science use. It is possible to find many definitions about system and its derivatives in literature. There are many versions of the definition. A generally accepted definition was made by Churchman (1968). According to Churchman’s book about the systems approach, a system is “a set of parts coordinated to accomplish a set of goals”. The fundamental concept of systems approach is defined by Churchman (1968). And there are five basic considerations to keep in mind when thinking about the meaning of a system:

1. The total system objectives, the performance measures of the whole system;
2. The system’s environment; the fixed constraints;
3. The resources of the system;
4. The components of the system, their activities, goals and measures of performance;
5. The management of the system.

System could also be a method or an algorithm in computer science or information science.

2.2 Work System

The concept of work system is a general case that encompasses many areas. A work system is a system in which human participants or machines perform business processes using information, technology, and other resources to produce products or services for customers (Alter, 2002a). The work system’s basic goals are produce the desired results and perform the work efficiently. Organizations have work systems

for obtaining material from suppliers, producing and delivering end products, finding customers, creating reports, coordinating work across departments, and many other functions. Figure 2.1 shows the work system framework.

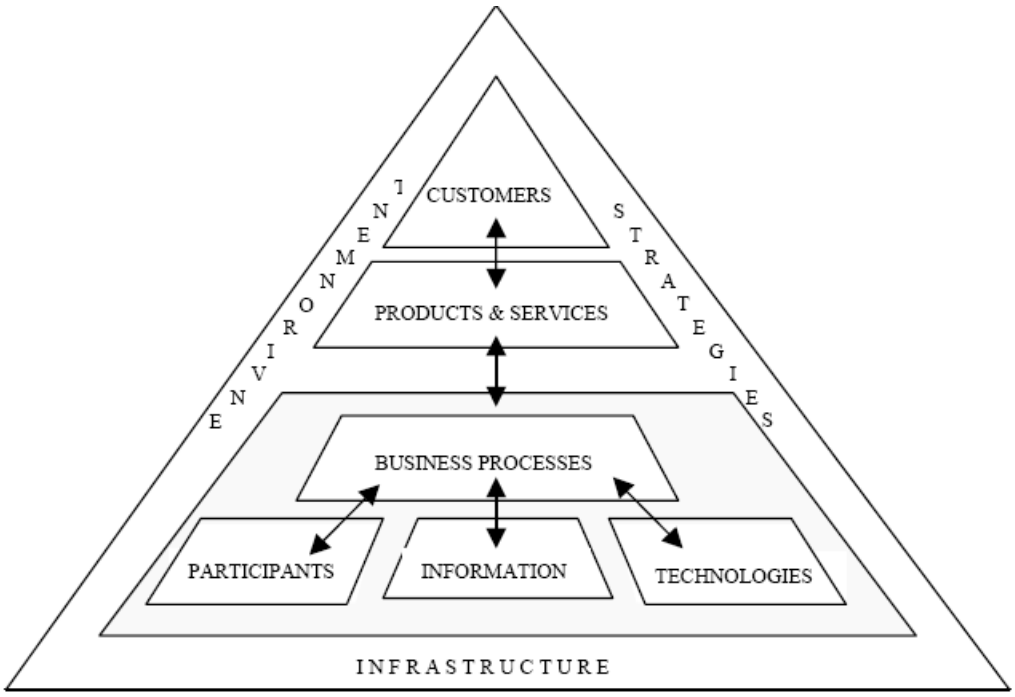


Figure 2.1 The work system framework (Alter, 2002a)

The definitions of the work system framework's elements as follows:

- Customers are the people who receive direct benefit from products or services.
- Products & Services are the things that the work system produces for customers.
- Business Process is the set of work steps.
- Participants are people who perform the work steps.
- Information is used by the participants to perform their work.
- Technology is the hardware, software and other equipments used by participants while doing their work.
- Environment is the organizational, cultural and technical environments that affect system performance.
- Strategies explain why the work system operates as it does.
- Infrastructure is the informational, technical and human resources.

2.3 Data and Information

We absorb data from everywhere in everyday. Anything that makes a sense can be treated as data. In a system data consists of basic facts that are the system's raw material. Raw data may be numbers, characters, images and sounds. The words, information and data are confused with each other. However, they are not synonyms. Information is the result of processing, manipulating and organizing data. Information is data that has been transformed into output that is valuable to users. Converting data into information is a key role of information systems. People need knowledge to use information. In general, knowledge is what is known. Knowledge is a combination of premonition, ideas, rules and procedures that guide actions and decisions. Figure 2.2 shows the relationship between data, information and knowledge.

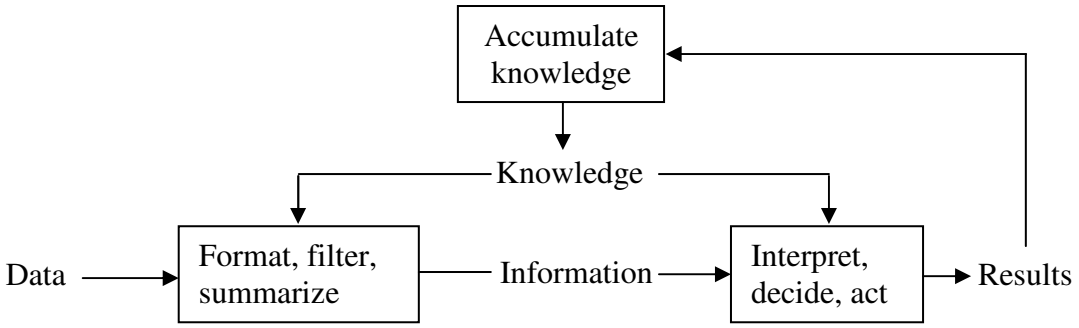


Figure 2.2 Relationship between data, information and knowledge (Alter, 2002b)

2.4 Database and Database Management System

Data is basically unstructured information such as a name, telephone number, or postal code. In information age the value of data is recognized by the organizations. As time goes by, organizations collect more and more data. Without the ability to manage this vast amount of data tends to become a problem, rather than an asset. The necessary solve is database for storing and managing data in a structured and systematic form.

A database is a structured collection of electronically stored data. Databases consist of files or tables that are linked. Each file or table contains data. Depending on how the system's files or tables are organized and linked system is called either a file system or a database management system. A file system stores and manages data in one or more files. File systems are out of fashion today. Today most systems are designed as relational databases with database management systems (DBMS). DBMS is a software tool used to define, maintain and manage databases. The use of a DBMS has several important advantages (Ramakrishnan & Gehrke, 2000);

- Data independence: DBMS can provide an abstract view of data so application programs should be as independent as possible from data storage.
- Efficient data access: A DBMS utilizes techniques to store and retrieve data efficiently.
- Data integrity and security: The DBMS can enforce integrity constraints and access controls on the data.
- Data administration: Experienced professionals can be responsible for organizing the database to minimize redundancy and for fine-tuning the storage of the data to make retrieval efficient.
- Concurrent access and crash recovery: A DBMS schedules concurrent accesses to the data. Furthermore, the DBMS protects users from the effects of system failures.
- Reduced application development time: The DBMS supports many important functions for accessing data stored in the DBMS. This facilitates quick development of applications. Many important tasks are handled by the DBMS instead of being implemented by the application.

2.5 Information System (IS)

In the contemporary, a huge number of books, articles, and research papers dedicated to different aspects of information systems (IS) research can be found. And there are many different definitions about IS. UK Academy for Information Systems (UKAIS) suggests a broad definition, "Information systems are the means by which

people and organizations, utilizing technologies, gather, process, store, use and disseminate information". Alter (2002b) suggests another definition; IS is a work system in which the business processes performed and products and services produced are devoted to information. The activities in their business processes are;

- capturing information,
- retrieving information,
- transmitting information,
- manipulating information,
- storing information,
- displaying information.

These activities can be computerized or manual (Alter, 2002b). There can be IS without computers. But in practice, information systems are now almost computerized. In information age, business success depends on information technology (IT).

The domain of study of IS, as defined by the UKAIS, involves the study of theories and practices related to the social and technological phenomena. IS is a multidisciplinary subject. IS researches impact on other disciplines. Figure 2.3 illustrates IS a reference discipline with other reference disciplines.

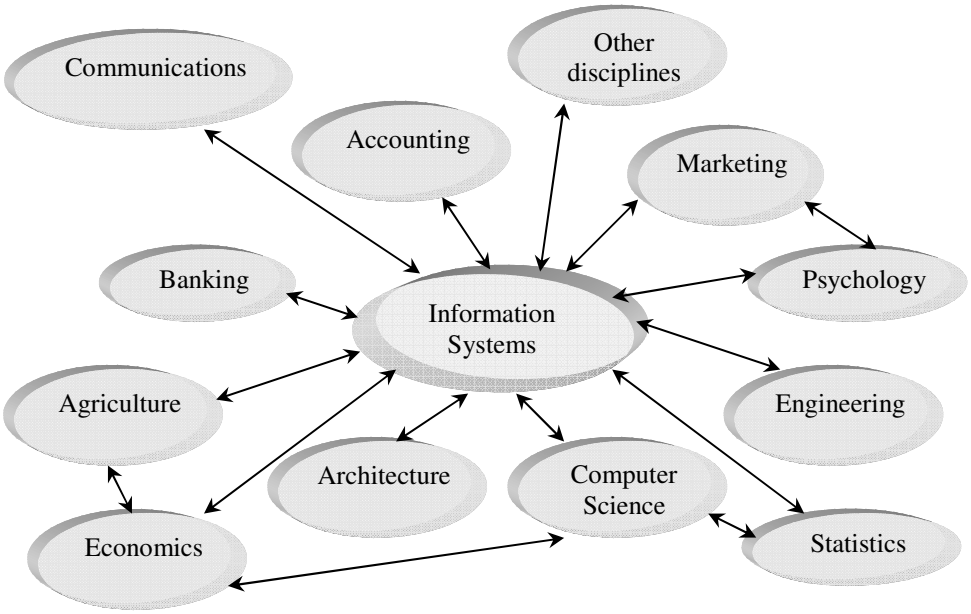


Figure 2.3 IS a reference discipline with other reference disciplines (adapted from Avison & Eliot, 2006)

2.6 Information System Categories

Most organizations in all sectors of industry, commerce and government are dependent on their IS today. In industries the existence of an organization depends on the effective application of their IS. Consequently, organizations are increasingly looking toward the application of technology to create new opportunities that provide them with a source of competitive advantages. IS has been used many different functional areas of industry;

- Product Design Systems use computer aided design (CAD) tools to design products.

- Supply Chain Systems use;
  - material requirement planning (MRP) systems integrate purchasing and product activities.
  - electronic data interchange (EDI) systems transmit electronically coded business data.

  - supply chain management (SCM) systems coordinate schedules between suppliers and their customers.

- Manufacturing systems use computer integrated manufacturing (CIM) systems to computerized data collection and integrated data flows between design, manufacturing, planning, accounting and other business functions.

- Sales and Marketing Systems use;
  - point of sale (POS) systems use bar codes to collect transaction data related to purchases.
  - sales force automation (SFA) systems automate data handling related to personal scheduling, contact management and providing revenue forecasts.
  - customer relationship management (CRM) systems address the somewhat broader topic of planning, controlling and scheduling pre-sales and post-sales activities for understanding the customers.

- Finance Systems handle transactions involving money, produce financial statements.

- Office Automation Systems provide tools that support general office works.

- Communication Systems link employees, customers and suppliers electronically to facilitate communication and coordination.

- Transaction Processing Systems collect and store data about process transactions.

- Statistical IS collect, process, store, retrieve, and analyze statistical data.

- Management IS provide managers the information they need for managing an organization.

- Executive IS provide executives with internal and competitive information.

- Decision Support Systems are interactive IS that provide information, models and analysis tools to help decision making.

- Enterprise Systems are firm-wide IS that coordinate major systems and permit access to any information needed for decision making.

- Medical IS accumulate enormous numbers of health records, which may contain personal disease histories, diagnosis, treatment processes, hospital administration information, billing and insurance.

CHAPTER THREE
POISON CONTROL CENTER

A poison control center (PCC) is a modern health service unit that is able to provide immediate, free, and expert treatment advice and assistance over the telephone in case of exposure to poisonous or hazardous substances. PCC assists in rational medicine usage and patient treatment by rapidly providing current information transfer about toxicity and its treatment. PCC answers questions about potential poisons in addition to providing treatment management advice about household products, medicines, pesticides, plants, bites, food poisoning, alcohol, gases, etc. Furthermore, PCC's another major task is to disseminate and develop knowledge in these areas through teaching and research.

3.1 A Brief History of PCC

The development in the field of medicine, particularly after World War II, had led to discovery of new drugs and chemicals which have had a high potential for causing harmful effects as well as being therapeutically effective. For this reason, the medical community decided to develop a response mechanism to deal with the poisoning incidents. In the late 1940s special toxicology wards were founded for this purpose in Europe. In the United States (US), first poison information center date back to 1953 (Burda & Burda, 1997). By 1957 there were 17 poison control centers in the US. PCC telephone numbers were promoted and poison information specialist and clinical toxicologists helped staff these centers. Poison control centers (PCCs) were encouraged and supported by the Emergency Medical Services Systems. American Association of Poison Control Centers (AAPCC) was founded in 1958. In the following years, the number of poison control centers had increased rapidly. There were more than 600 PCCs in US in the 1970s (Committee on Poison Prevention and Control, 2004). Therefore, AAPCC, American Academy of Clinical Toxicology (AACT) which was founded in 1968 in the US and European Association of Poison Control Centres (EAPCCT) which was founded in 1964 in Europe have brought standards to all existing PCCs. The vast majority of PCCs

closed or merged during the 1980s and 1990s. There were 52 centers which were certified as regional poison center by AAPCC in 2000 (Litovitz et al., 2001). According to 2007 Annual Report of the AAPCC, there were 61 certified centers in US in 2007 (Bronstein et al., 2008).

In 1980, World Health Organization (WHO) established The International Programme on Chemical Safety (IPCS). Main roles of IPCS are to establish the scientific basis for safe use of chemicals and to strengthen national capacities and capabilities for chemical safety.

Today, most countries have poison control centers. A worldwide directory of poison centers is available from the World Health Organization's website. WHO separates the World into the six regions; region of the Americas, European region, African region, Eastern Mediterranean region, South-East Asia region and Western Pacific region. WHO gives the countries' list in a region and their PCCs' addresses, telephone numbers, fax numbers and e-mail address if available.

3.2 The Situation in the World

The AAPCC is nongovernmental, nationwide associations representing the US's 61 PCCs. PCCs in US have already possessed an efficient, real time surveillance mechanism, now known as the National Poison Data System (NPDS) since 2005. Another database system has been used before NPDS between 1983 and 2004 which was called Toxic Exposure Surveillance System (TESS). TESS was developed by AAPCC in 1983. NPDS is the only comprehensive poisoning surveillance database in the US today. NPDS database contains the experience of participating US's PCCs from 1983 to the present and contains detailed toxicological information on close to 46 million human exposure cases reported to PCCs (Bronstein et al., 2008). AAPCC compiles the data from PCCs in the US. AAPCC use these data to identify hazards early, focus prevention education, guide clinical research, direct training, and detect chemical bioterrorism incidents (Melisa et al., 2006).

The data are collected almost by telephone. The data collected for each poison exposure have six major categories. These categories are; case information, patient information, substance/exposure information, clinical effects, therapy and outcome. All data, except patient identifiers, is transmitted by the poison center to AAPCC database system (Watson et al., 2005). AAPCC publishes annual reports every year. Annual reports are summaries of NPDS data. These reports are available for all years from 1983 to 2007 at AAPCC's web site.

Another important association is European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) which was founded in 1964 by a group of physicians and scientists with the specific goal of advancing knowledge and understanding of the diagnosis and treatment of all forms of poisoning. According to EAPCCT's web site there are 40 poison centers in Europe. EAPCCT organize international congress every year.

3.3 The Situation in Turkey

First poison control center in Turkey, Refik Saydam Hıfzısıhha PCC (RSHPCC), started to serve in 1984. RSHPCC has been serving 24 hours a day and 7 days a week since 1988. The other PCCs in Turkey are Uludağ PCC which was founded in 1995 (Özyurt, 2003) and Hacettepe Drug and Poison Information Center which was founded in 1992. These centers have been serving in work hours. Another PCC which has been serving 24 hours a day and 7 days a week is Dokuz Eylül University Drug and Poison Information Center (DPIC) which was founded in 1993 (Tunçok, 2003). These centers have been in working condition in an independent way.

3.4 Dokuz Eylül University Drug and Poison Information Center (DPIC)

DPIC started to serve in the constitution of Faculty of Medicine, Pharmacology department in 1993. Since then, DPIC continue to present all of its experiences and facilities to the health professionals' and public's service with the help of experienced physicians and pharmacologists trained on Clinic Toxicology. DPIC has

been serving to the health professionals and public by means of telephone about undesirable adverse effects of drug and being poisoned nonstop 24 hours a day and 7 days a week with the help of experienced physicians and pharmacologists.

Poisoning incidents are public health problems that are much more common than they were appreciated before. The main aims of DPIC are to provide effective and safe usage of drugs besides to decrease morbidities, mortalities and the cost of treatments. More over, in case of poisoning, it also provides guidance for treatment strategies by giving right, current and comprehensive information rapidly.

Although the prior target mass is the health professionals in giving the service, the first aid suggestions are being given and it's aimed to encourage to appeal to the physicians with the health institutions.

Some DPIC functions are as follows;

- Answering the application of counseling about drug and toxic substances on phone,
- Replying the wishes for knowledge of drug, efficiency, toxicity and treatment,
- The education of medical students at undergraduate or Ph.D. level about drug and toxic substances,
- Preparing the educational programs in the short or long run,
- Carrying out the service of documentation about chemical substances and products such as drug and pesticides,
- Carrying out the epidemiological researches directed at drug usage and the profile of being poisoned.

DPIC has been serving in many different subjects. Some examples of information service given by DPIC are as follows;

- The knowledge of a possible toxicity relating to any substance which may be exposed to,

- Urgent diagnosis and treatment of being poisoned,
- Giving the information about overdose drug usage,
- Giving the information about toxicity of pesticides,
- General, specific and comprehensive information about drugs,
- Giving the information about adverse effects, contraindications, indications,
- The safe drug usage in the period of pregnancy and breast-feeding,
- Interactions of drug,
- The knowledge of toxicity to the exposure of professional and industrial substances and service of counseling.

DPIC has been presenting all its accumulation and facilities to the health professionals and public's service with the educated service staff. DPIC has been serving to the health professionals and public by means of telephone about undesirable adverse effects of drug and being poisoned 24 hours a day. The number of the cases reported to the DPIC from 1993 to the present is close to 50,000. The center receives phone calls from every city in the country but mainly serves in the Aegean region of Turkey with a population of over 9 million (2007 census).

CHAPTER FOUR
THE STATISTICAL INFORMATION SYSTEM FOR POISON CONTROL CENTERS

In this chapter, presentation of the statistical information system which has been developed for PCC (SISPCC) is given. Development stages and structure of the system are explained. The modules of the information system, user interfaces and a web based reporting service are presented. Structured analysis method was used as the development method. The project development stages are shown in Figure 4.1.

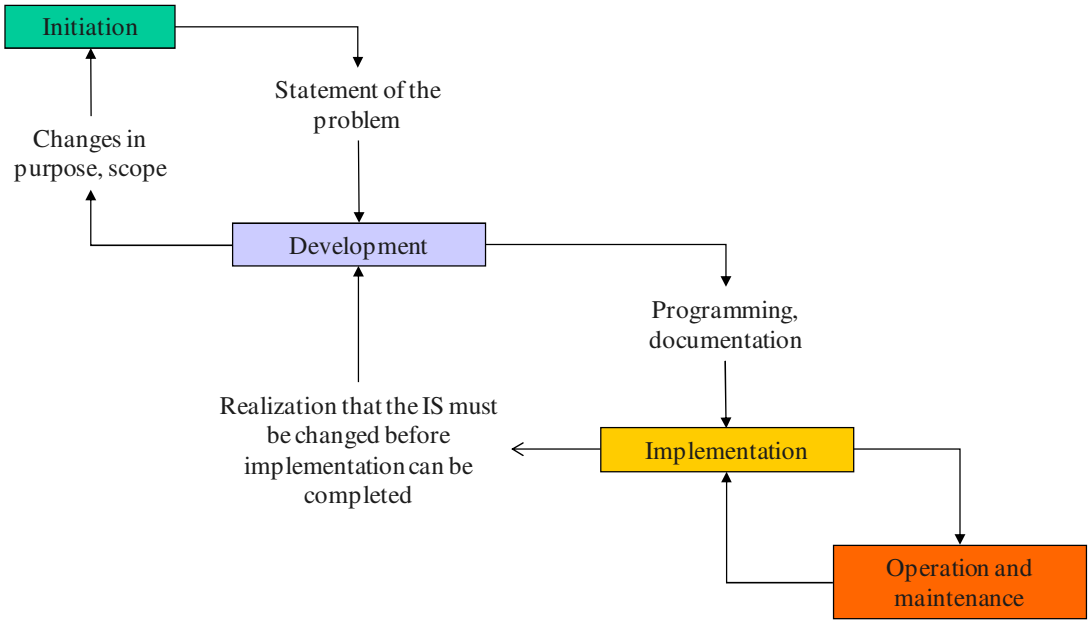


Figure 4.1 The four phases of an IS (Alter, 2002b)

4.1 Detailed Requirements Analysis

Detailed requirements analysis is the first step in the development phase of the traditional system development life cycle. System requirements specify what the information system must do or what property the system must have. Requirements determination is the most critical step of the entire system development life cycle. There are several widely used techniques, such as interviewing, questionnaires, observing decision makers behavior, study of documents, prototyping for determining system requirements. Data flow diagrams (DFD) can be used for the

visualization of the results of this investigation. DFD is a structured analysis technique that can be used to provide the end user with a physical idea of whole system.

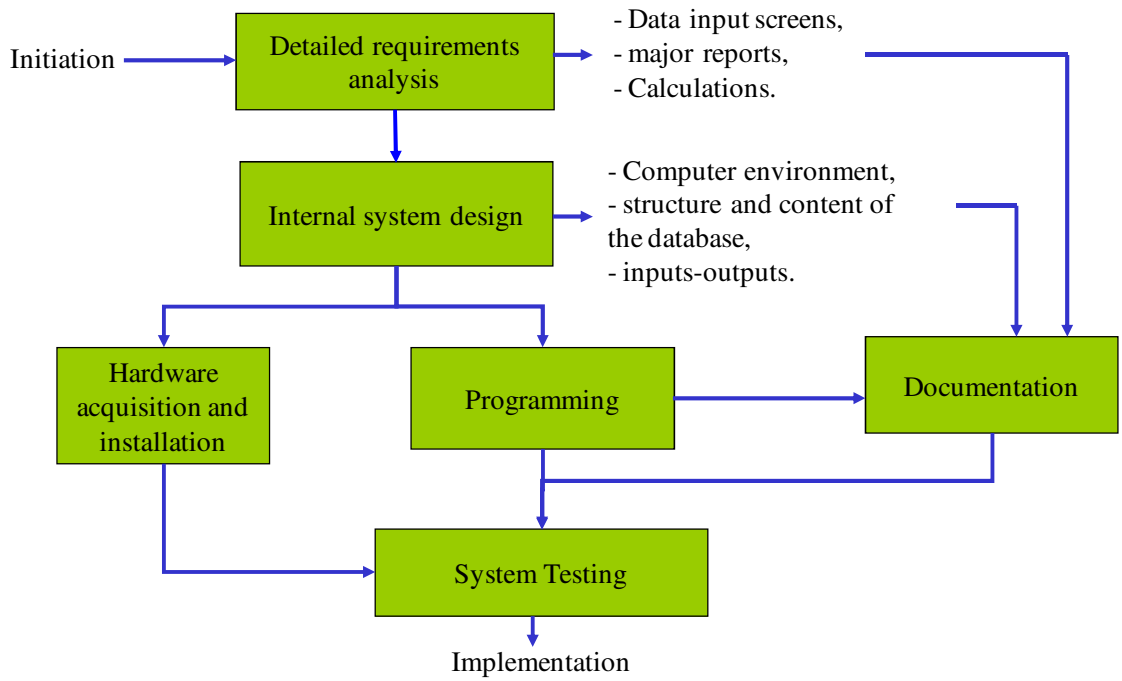


Figure 4.2 Project plan – development

4.1.1 Data Flow Diagrams

DFD starts with an overall picture of the system and continues by analyzing each of the functional areas of interest. The result is a series of diagrams that represent the system. A system model comprises more than one data flow diagrams. Initially a context diagram is drawn, which is a simple representation of the entire system under investigation. This is followed by first level diagram; which provides an overview of the major functional areas of the system. Using the context diagram together with additional information from the area of interest, the first level diagram can then be drawn. Each process on first level diagram may in turn be exploded to create a more detailed diagram. The first level diagram identifies the major system processes and any of these processes can then be analyzed further on second level process diagram. This process of more detailed analysis can then continue through level 3, 4 and so on. However, most investigations stop at second level.

The detailed requirements analysis has been performed with Dokuz Eylül University Drug and Poison Information Center. As a result of this study logical system design has been prepared. The context, first and second level logical data flow diagrams of the information system are as follows:

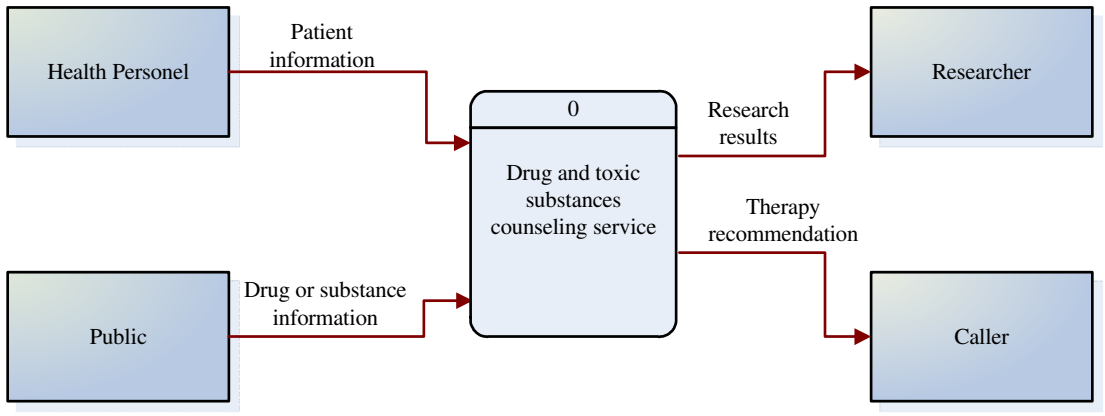


Figure 4.3 The context level data diagram for the Poison Control Center system

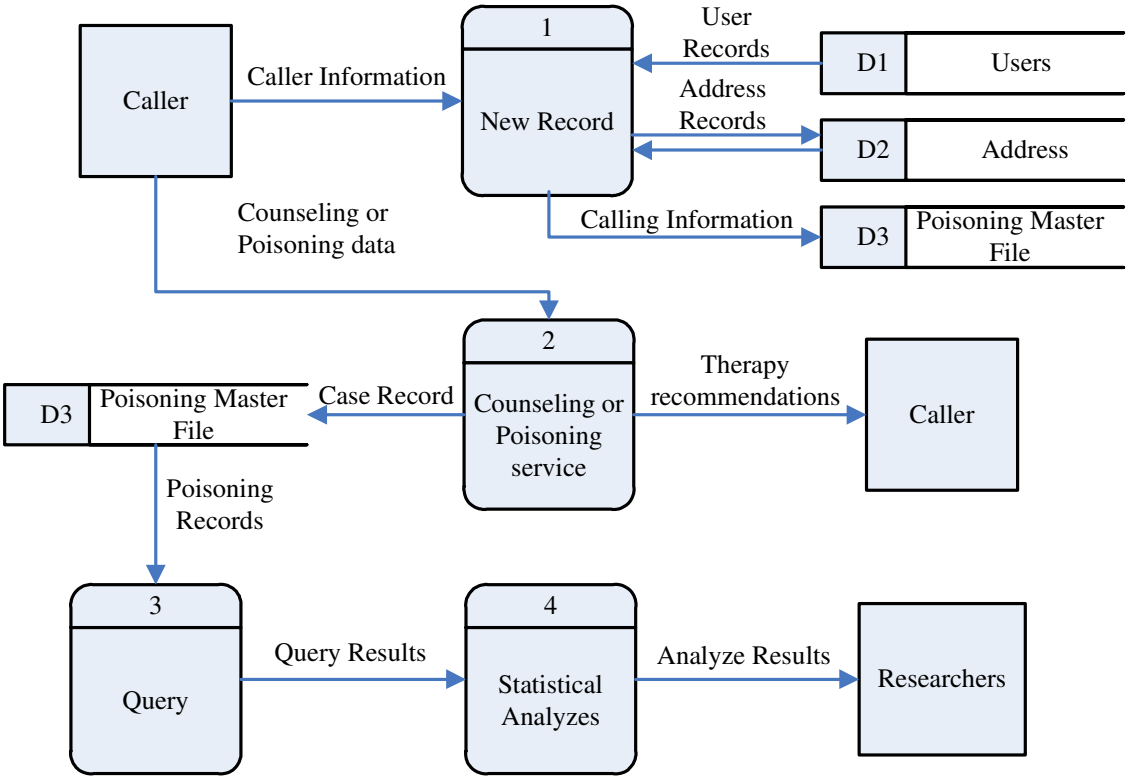


Figure 4.4 The first level data diagram for the Poison Control Center system

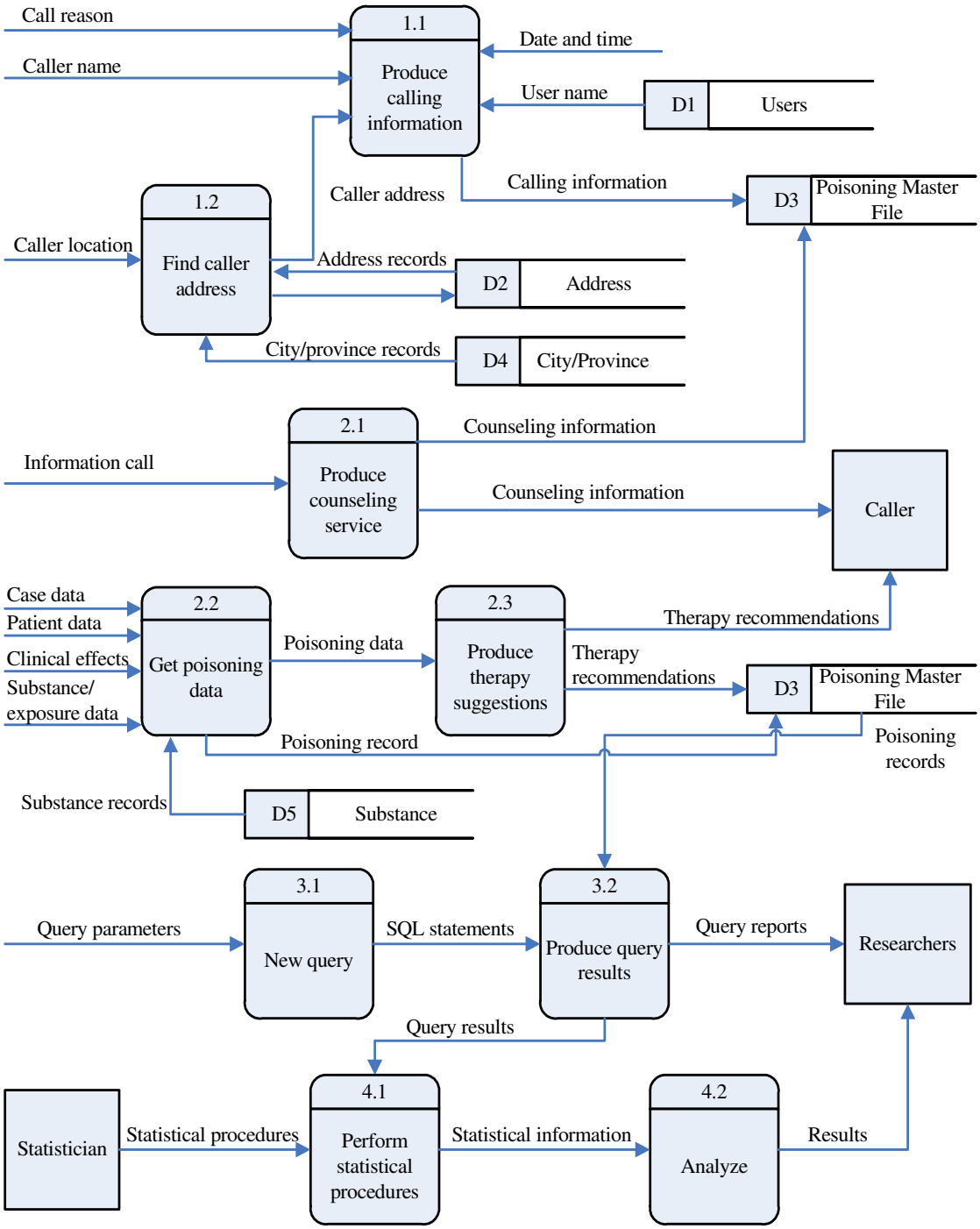


Figure 4.5 The second level data diagram for the Poison Control Center system

4.1.2 Data Dictionary

Data flow diagrams don't fully describe the subject of the investigation. The data dictionary provides additional information about the system. The data dictionary is compiled by system analyst to guide through analysis and design. The data dictionary stores details and descriptions of DFD elements. When developing programs, a data dictionary can be consulted to understand where a data item fits in the structure, what values it may contain, and basically what the data item means in real-world terms. Data flow diagrams have been used to help catalog the data processes, data flows, data stores, data structures and data elements in a data dictionary.

Table 4.1 Data flows description

Name	Description	Source	Destination	Data Structures
Call reason	Phone calling reason	Caller	Process 1.1	Call reason
Caller name	Caller name	Caller	Process 1.1	Caller name
Caller location	Contains caller location	Caller	Process 1.2	Caller location
Date and time	Current date and time	System	Process 1.3	Date and Time
Information call	Call for counseling service	Caller	Process 2.1	Caller name Patient information
Case data	Contains poisoning details	Caller	Process 2.2	Exposure information
Patient data	Data about patient	Caller	Process 2.2	Patient name Patient information
Clinical effects	Data about clinical effects	Caller	Process 2.2	Exposure information
Substance/exposure data		Caller	Process 2.2	Exposure information Substance information
Query parameters		Researchers	Process 3.1	
Statistical procedures	Choosing proper statistical method	Statisticians	Process 4.1	
Counseling information		Process 2.1	Caller	
Therapy recommendations	Contains suggested therapy information	Process 2.3	Caller	Therapy
Query reports		Process 3.2	Researcher	
Results	Statistical analyze results	Process 4.2	Researcher	
Caller address	Contains caller address data	Process 1.2	Process 1.3	Caller location
Poisoning data		Process 2.2	Process 2.3	Exposure information Substance information
SQL statements		Process 3.1	Process 3.2	
Query results		Process 3.2	Process 4.1	

Table 4.1 Data flows description (cont.)

Name	Description	Source	Destination	Data Structures
Statistical information		Process 4.1	Process 4.2	
User name	Contains user information	D1	Process 1.3	User name
Address records	Stored address records	D2 Process 1.2	Process 1.2 D2	Caller location
City/province records		D4	Process 1.2	Caller location
Calling information		Process 1.1	D3	Call reason Caller location Caller type Caller name
Counseling information		Process 2.1	D3	
Therapy recommendations		Process 2.3	D3	Therapy
Poisoning record		Process 2.2	D3	Patient information Exposure information Substance information
Poisoning records		D3	Process 3.2	
Substance records		D5	Process 2.2	

Table 4.2 Data structures description

Name	Description	Contents
Date and Time	Current date and time	Date + Time
User name	User information	User first name + User last name
Record number	Record numbers	Record number + (Case number)
Call reason		[Poisoning ǀ Drug information ǀ Poison information ǀTeratogenicity information ǀ Other information]
Caller location	Caller address and phone number	Location + City + Province + Phone number + Extension + Address
Caller type		[Own ǀ Family/Friend ǀ Physician ǀ Other health staff Other ǀ Unknown]
Caller name		Caller first name + Caller last name
Patient name		Patient first name + Patient last name
Patient information	Some physical information about patient	Patient age + Patient gender + Weight + Pregnancy + Pregnancy Term + Patient chart no
Exposure information		Type of exposure + Route of exposure + Reason + The time elapsed + Clinical effects + Severity score
Substance information	The information about substance and blood level	Substance + Amount + Measuring blood level + Blood level + Blood level value
Therapy	Therapy information	Applied Therapy + Therapy recommendation
Outcome	Medical Outcome	Outcome

Table 4.3 Data elements description

Name	Alias	Description	Type	Length	Range	Default Value	List of Specific Values
Date		System date	smalldatetime	4	01.01.1900 – 06.06.2079	Current date	
Time		System time	smalldatetime	4	with an accuracy of one minute	Current time	
User name	Username	User nick name	varchar	30			
User first name	Userfirstname		varchar	25			
User last name	Userlastname		varchar	30			
Case number	Caseno	Autoincrement	integer	4			
Patient chart number	PatientChartNo	Patient chart number (If patient is under cure at the hospital)	integer	4			
Call reason	Callreason		tiny integer	1		Poisoning	1 – Poisoning 2 – Drug information 3 – Poison information 4 – Teratogenicity information 5 – Other information
Location	Location	Caller location code	varchar	8			
City	City	Caller city traffic code	varchar	4			
Province	Province	Caller province	varchar	4			
Phone number	Phoneno	Caller phone number	varchar	10			
Extension	Extline	Extension line	varchar	6			
Address	Address	Caller address	varchar	250			

Table 4.3 Data elements description (cont.)

Name	Alias	Description	Type	Length	Range	Default Value	List of Specific Values
Caller type	Callertype		small integer	2		Physician	1 – Own 2 – Family/Friend 3 – Physician 4 – Other Health staff 5 – Other 6 – Unknown
Caller first name	Cfirstname		varchar	25			
Caller last name	Clastname		varchar	30			
Patient first name	Pfirstname		varchar	25			
Patient last name	Plastname		varchar	30			
Patient Age	Age		real	4			
Patient gender	Gender		tiny integer	1		2	1 – Male 2 – Female 3 – Unknown
Patient weight	Weight	Patient body weight in kilogram	small integer	2	0 – 500		
Pregnancy	Pregnancy	Whether the patient is pregnant or not (if gender = 2)	tiny integer	1		2	0 – Not pregnant 1 – Pregnant 2 – Unknown
Pregnancy term	PregTerm	Pregnancy term in week	tiny integer	1	1-50		
Type of exposure	ExpType		tiny integer	1		1	1 – Acute 2 – Chronic 3 – Unknown 4 - Acute-on-chronic
The time elapsed	ExpTime	The time elapsed from exposure to call	real	4			

Table 4.3 Data elements description (cont.)

Name	Alias	Description	Type	Length	Range	Default Value	List of Specific Values
Severity score	SScore	Severity score of poisoning	tiny integer	1			0 – None 1 – Minor 2 – Moderate 3 – Severe 4 - Fatal
Route of exposure	ExpRoute	The route of exposure	small integer	2			1 – Per oral 2 – Inhalation/nasal 3 – Dermal 4 – Intramuscular 5 – Intravenous 6 – Bite/Sting 7 – Subcutaneous 8 – Ocular 19 – Unknown 20 – Other
Reason	Reason	The reason of the exposure	small integer	2			11 – General 12 – Occupational 13 – Environmental 14 – Unintentional misuse 15 – Bite/sting 16 – Food poisoning 21 – Suicidal 22 – Intentional Abuse 31 – Drug adverse effect 32 – Food adverse effect 33 – Unintentional unknown 40 – unknown
Amount	Amount	The amount of exposure	small integer	2			1 – Toxic 2 – Non-Toxic 3 – Unknown

Table 4.3 Data elements description (cont.)

Name	Alias	Description	Type	Length	Range	Default Value	List of Specific Values
Clinical effects	CEffects	The symptoms and clinical findings (Multi selection is available)	boolean	1			- Miosis; - Nausea/Vomiting; - Excess secretions; - Abdominal Pain; - Diarrhea; - Urinary incontinence; - Blurred vision; - Diaphoresis; - Hypotension; - Bradycardia; - Braonchospasm; - Fasciculation; - Tremor; - Mydriasis; - Tachycardia; - Hypertension; - Headache; - Dizziness/vertigo; - Hallucinations; - Convulsion; - Coma; - Fever; - Other
Substance	Substance	The code of the substance involved	varchar	10			
Measuring blood level	Measurement	Whether measuring blood level is necessary or not	tiny integer	1		2	1 – Required 2 – Not – required
Blood level	BloodLevel	Blood level of the substance	tiny integer	1			1 – Therapeutic 2 – Toxic 3 – Non-toxic 4 – Couldn't measure

Table 4.3 Data elements description (cont.)

Name	Alias	Description	Type	Length	Range	Default Value	List of Specific Values
Blood level value	BloodLevelValue	Blood level value of the substance	real	4			
Therapy recommendation	Therapy	The recommended therapy (Multi selection is available)	boolean	1			- Emetic; - Gastric Lavage,; - Activated charcoal; - Antidote; - Hemodialysis; - Supportive care,; - Hemoperfusion; - Skin decontamination; - Eye decontamination; - Cathartic; - Hospital Admission; - Observation without intervention; - Discharge; - Antidote; - Other therapy
Applied therapy	AppTherapy	The therapy that was applied before calling PCC (Multi selection is available)	bit	1			Same as above
Outcome	Outcome	Medical outcome if the patient was followed	tiny integer	1		4	1 – Recovered 2 – Ex 3 – Sequela 4 – Unknown 5 – Follow-up

Table 4.4 Processes description

ID	Name	Input	Output
1.1	Produce calling information	Call reason Caller name Caller address Date and time User name	Calling information
1.2	Find caller address	Address records City/province records	Caller address
2.1	Produce counseling service	Information call	Counseling information
2.2	Get poisoning data	Case data Patient data Clinical effects Substance/exposure data Agent records	Poisoning data Poisoning record
2.3	Produce therapy suggestions	Poisoning data	Therapy recommendations
3.1	New query	Query parameters	SQL statements
3.2	Produce query results	SQL statements	Query reports
4.1	Perform statistical procedures	Statistical procedures	Statistical information
4.2	Analyze	Statistical information	Results

Table 4.5 Data stores description

ID	Name	Alias	Description	Data Structures
D1	Users	Users	Contains user information	User name
D2	Address	Address	Contains hospital and health center address records	Caller location
D3	Poisoning Master File	PoisonCase	Contains poisoning records	Patient information + Exposure information + Substance information + Therapy + Outcome
D4	City/Province	City	Contains city and province records	Caller location
D5	Substance	Substance	Contains substance information	Substance information

4.2 The Database Design

After the logical design of information system the physical design of the database and hardware acquisition was completed. Entity relationship diagrams (ERD) were developed and the properties of the physical fields were described. The database was constituted with Microsoft SQL Server 2005. The database of the information system consists of thirty seven tables and twenty five views. The entity relationship diagrams of the database are shown at Figures 4.6, 4.7 and 4.8.

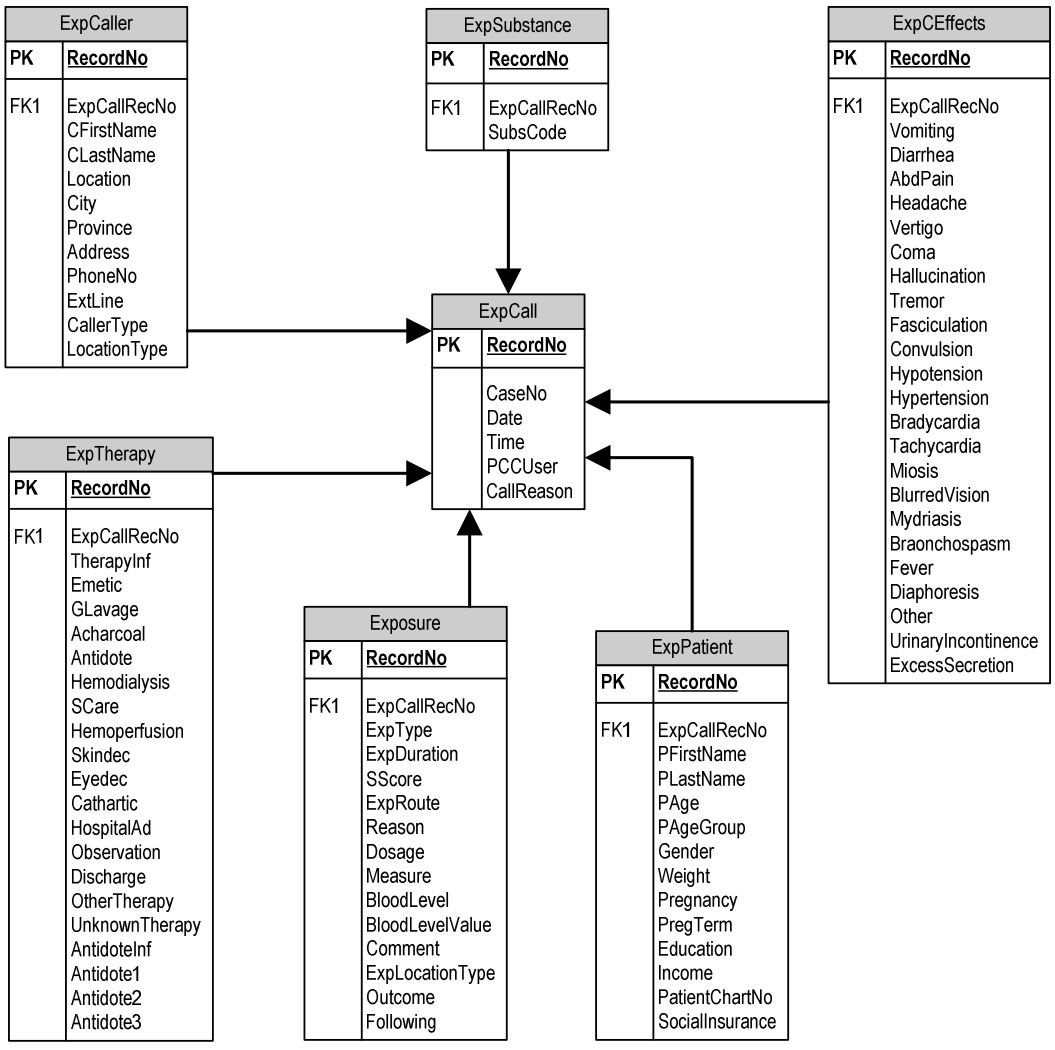


Figure 4.6 PCC Database ERD – 1

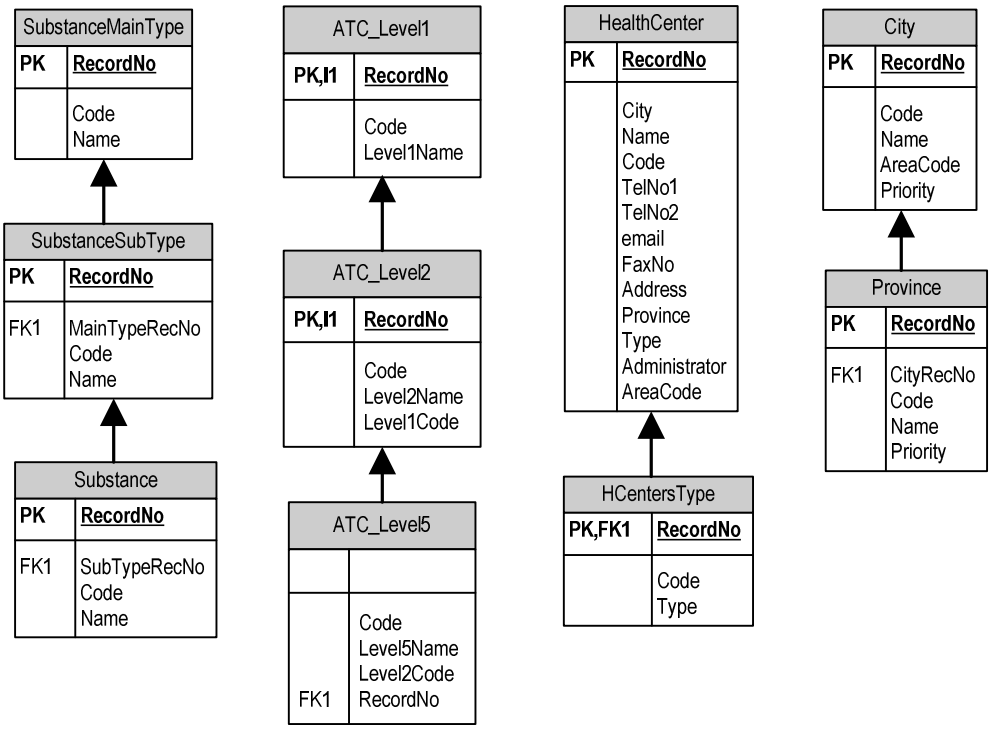


Figure 4.7 PCC Database ERD – 2

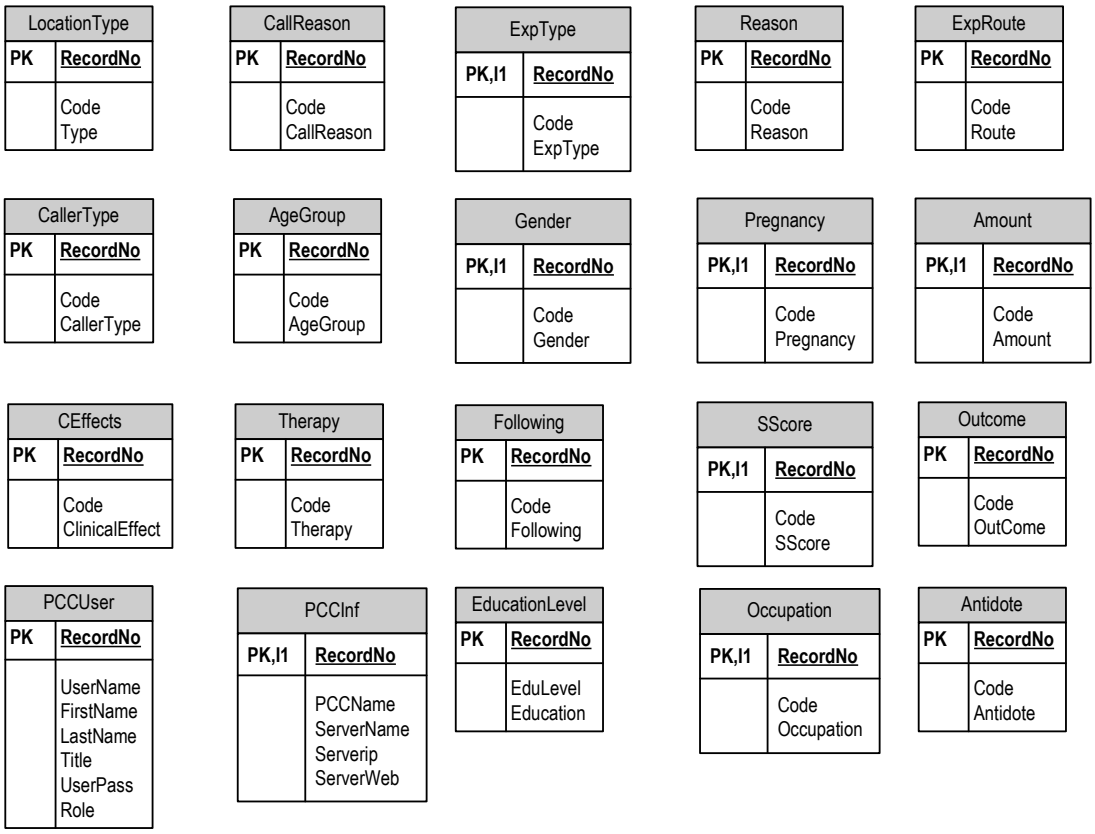


Figure 4.8 PCC Database ERD – 3

The data about caller, patient and incident is stored the tables which are shown in ERD – 1 in Figure 4.6. The tables which are shown in Figure 4.7 and Figure 4.8 are assistant tables for entering data about case.

4.3 User Interfaces

A comprehensive software has been developed for the purpose of recording the data concerning the callings received by PCC and consequently for related queries and descriptive statistics. This software has been implemented with the use of Delphi 2007 application development tool and it has been code-named “Ruber”. ActiveX Data Object (ADO) data connection method has been preferred so as to connect to the database being constituted with MS SQL Server 2005. The design of the reports which were gathered from the software has been designed by Report Builder 10.07 report development tool. Ruber’s user interfaces and their features have been explained in this part.

4.3.1 Database Login

Only authorized users can login to Ruber. Users are created by the database administrator. Permissions on a database table, view, or stored procedure are granted to a user by the database administrator. User can change password after logon.

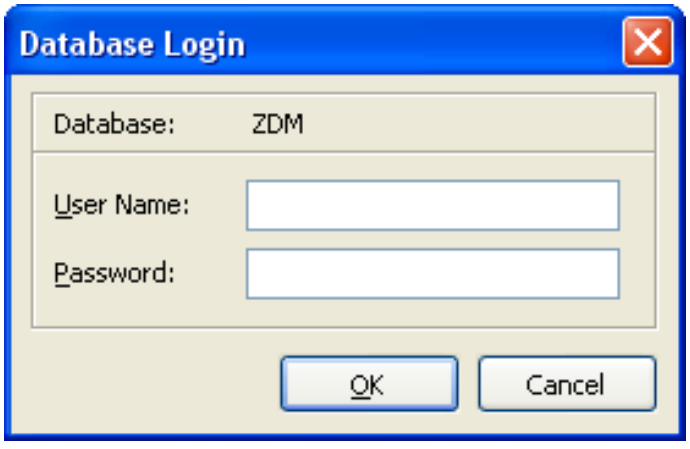


Figure 4.9 Database login form.

4.3.2 Main Form

Main form canvas has a web browser property. User can change URL from user information menu. The status bar goes across the bottom of the main form window. From left to right, the four boxes within it display the following information:

- User name
- Connected computer name
- The count of the follow-up patients
- Current date

Figure 4.10 The main form.

4.3.3 Case Input Form

The case input form is used for insert, update or delete data about case which was collected on phone. The data regarding demographic details of the cases and involving substance(s), route of and reason for the exposure, date, time, site and circumstances of poisonings are entered into the database tables via this form. Beside

these, clinical effects of the incidents, the recommendations by PCC and outcomes of the patients are also entered from the standard data forms.

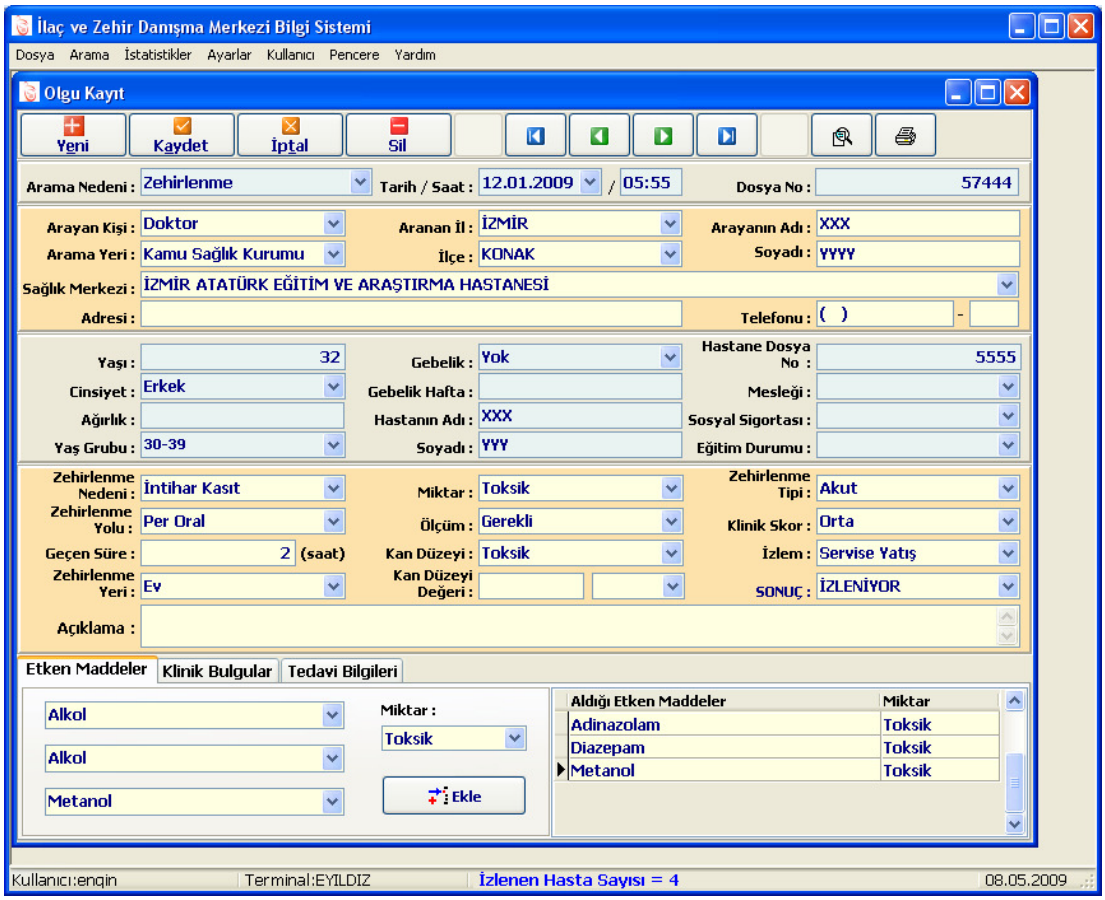


Figure 4.11 Case input form.

User can insert, post, cancel or delete records with buttons on the top of the form. User can browse among records with arrow buttons. Furthermore, search (Figure 4.12) and print out the current case information (Figure 4.13) is available. Only the records that belong the current year are accessible to protect archive records. At the bottom of the form there are three tab sheets. First tab sheet is used for selecting the involving substances and amount of them. Clinical effects of the incident can checked from second tab sheet (Figure 4.14). Recommended treatments are entered from third tab sheet shown in Figure 4.15.

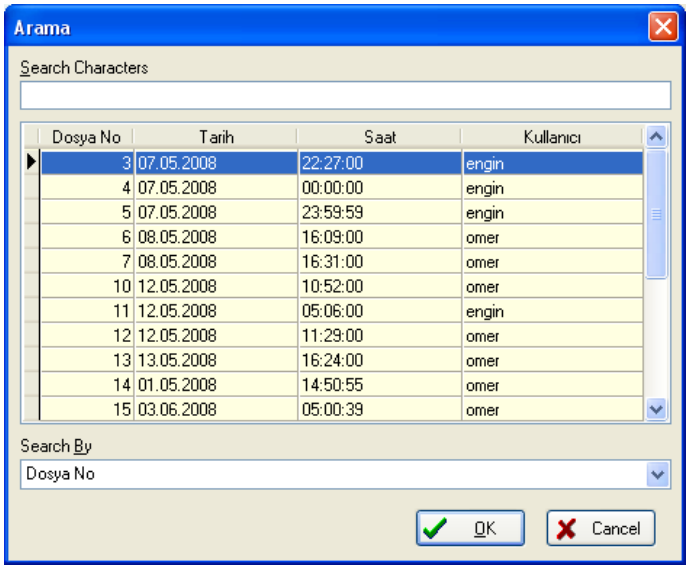


Figure 4.12 Search window.

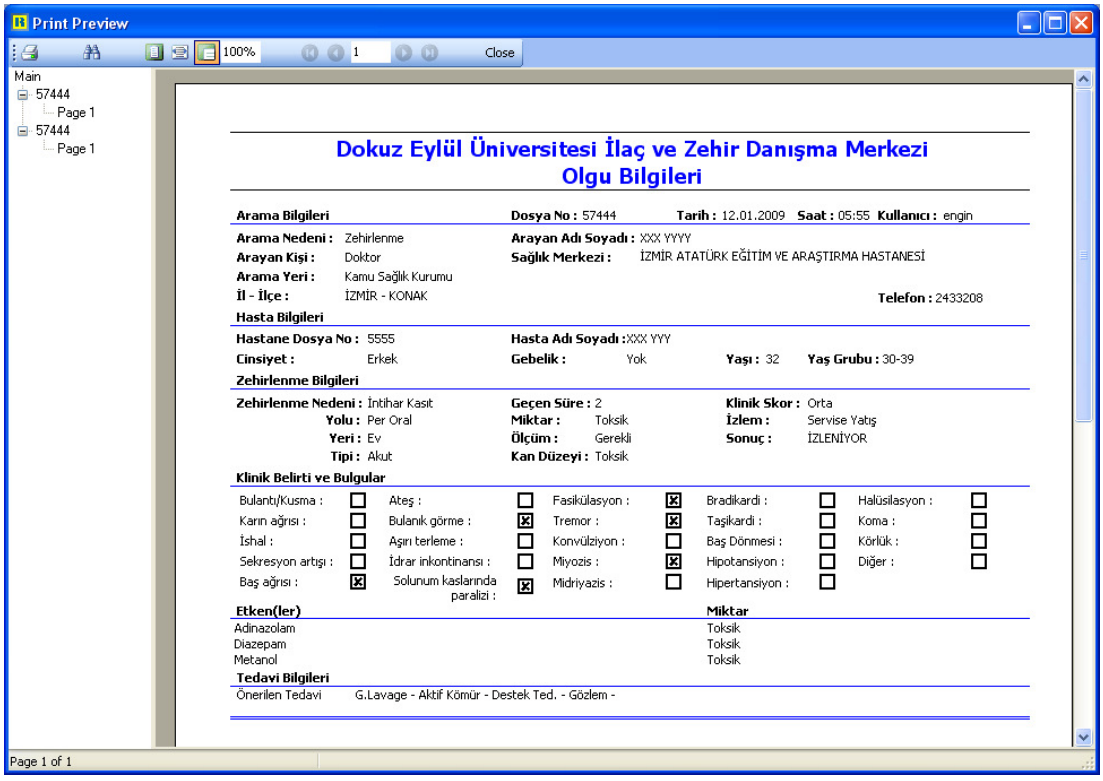


Figure 4.13 Print preview window for current case details

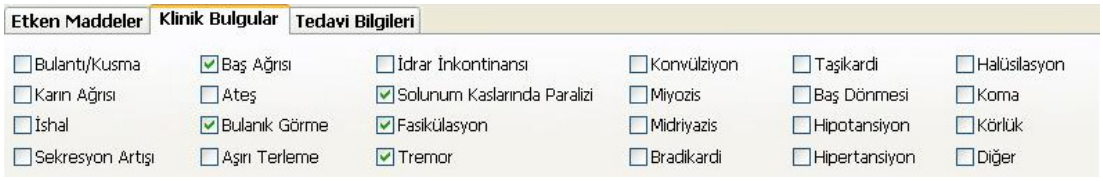


Figure 4.14 Clinical effects tab sheet

Figure 4.15 Treatment information tab sheet

The properties of the fields on the case input form are described below. These fields could be categorized into seven groups as follows;

- The data regarding phone call; reason of call, date, time and case number.
- Identification of the caller and location; caller type, site of the caller, city – province, location of the caller, name, address and telephone number of the caller.
- Demographic details of the patient; age, gender, weight, age group, pregnancy, pregnancy term, patient's name, patient chart number, occupation of the patient, social insurance status, education
- Details about incident and outcome of the patient; reason of the exposure, route of exposure, time elapsed between exposure and the call, site of poisoning, amount of exposed substance(s), necessitate of blood level measurement, blood level value, duration of the exposure, severity score, following options, outcome of the patient.
- Involving substance(s) and amount.
- Clinical effects of the incident.
- Treatment recommendations.

The detailed descriptions of the fields above and their options are as follows. The numbers in parenthesis express the code of the option in the database.

- Reason of call: The reason for calling to PCC is chosen in five options.
  (1) Poisoning: Actual or suspended exposures to toxic or non-toxic substances, includes adverse effects.
  (2) Drug Information: Information requests about drugs.
  (3) Poison Information: Questions about poisons, toxicity of a substance.

(4) Teratogenicity information: Questions about using drugs or chemicals in pregnancy unless an exposure has occurred.
(5) Other Information: The questions or information requests which are not named above.

- Date – time: The date and time of the initial call. The date format is "DD.MM.YYYY" for operating systems in Turkish. The time format is HH:MM. The default values of the date and time are current system date and time.

- Case number: A unique and auto increment number appends for every record inserted into the database.

- Caller type: This field is used for gathering data about the caller person.
  (1) Own: The patient or the person who asking for information is same person with caller.
  (2) Family/friend: The caller is a relative or a friend of the patient.
  (3) Physician: The caller is a physician.
  (4) Other Health Staff: The caller is any other health staff except physician.
  (5) Other: Any other person that is not listed above.
  (6) Unknown: The caller is unknown.

- Site of the caller: The location site of the caller that is most accurately described at the time of call. The location can be chosen in five options.
  (1) House: The call is made from residence of the caller or neighbor's or relative's home.
  (2) Workplace: The call is from office, factory, shop, any nonresidential place.
  (3) Public health facility: The call is from any public hospital, emergency or health center.
  (4) School: The call is from any school or dormitory.
  (5) Other: The call is from any location where is not listed.

(6) Unknown: The location of the caller couldn't be completely determined.
(7) Private health facility: Any private hospital, emergency or health center.

- City – province: The city and province where the call was made from.

- Location of the caller: If location type is (3) or (7) then the name of the health care facility can be chosen from health center combo box. This combo box lists the names of the health care facilities from selected city.

- Name, address and telephone number of the caller.

- Patient age: The patient's actual age. If the patient's age cannot be obtained, this field can be blank.

- Age group: If patient's actual age is unknown then the supposed age can be chosen in following age groups: 0 – 2; 3 – 5; 6 – 12; 13 – 19; 20's; 30's; 40's; 50's; 60's; 70's; 80's; ≥90; Unknown child (<18); Unknown adult (≥18); Unknown age.

- Gender: Patient's gender.

- Weight: Patient's weight.

- Pregnancy: Whether the patient is pregnant or not. The pregnant options can only be selected if gender field was selected as female.

- Pregnancy term: The number of weeks of pregnancy if pregnant is selected in previous field.

- Patient's name

- Patient chart number: Patient chart number if the patient is under cure at the hospital.

- Occupation of the patient

- Social insurance status: Whether the patient has a social insurance or not.

- Education: Patient's education level.

- Reason of the exposure: The category that describes the reason of the poisoning incident.
  (11) General accident: An unintentional poisoning incident usually happened by accidentally.
  (12) Occupational: Any exposure of an employee is being on duty.
  (13) Environmental: Any exposure that usually results from contamination of water, air, and environment.
  (14) Unintentional misuse: Unintentional use of a substance.
  (15) Bite/sting: Any animal bites or stings with or without envenomation.
  (16) Food poisoning
  (21) Suicidal: An exposure resulting from the intentional use of a substance for self destruction.
  (22) Intentional Abuse: Intentional improper use of a substance.
  (31) Drug adverse effect
  (32) Food adverse effect
  (33) Unintentional unknown: An exposure known to be unintentional but the reason is unknown.
  (40) Unknown: The reason for the exposure is unknown or other choices are not proper.

- Route of exposure: The route of the exposure.
  (1) Per oral: An exposure which the substance is ingested by the oral route.
  (2) Inhalation / nasal: An exposure by the inhalation route.

(3) Dermal: An exposure related to the skin.
(4) Intramuscular: An exposure by the intramuscular injection of a substance.
(5) Intravenous: An exposure by the intravenous injection of a substance.
(6) Bite / Sting: An exposure by an animal bite or sting.
(7) Subcutaneous: An exposure from the subcutaneous injection of a substance.
(8) Ocular: An exposure involving the eye.
(19) Unknown: The route of exposure is unknown.
(20) Other: Any other route of exposure which is not listed above.

- Time elapsed between exposure and the call: The time elapsed between the incident and call to the PCC in hours.

- Site of poisoning: The site of the poisoning incident. The location can be chosen in five options.
  (1) House: The residence of the patient or someone other than the patient.
  (2) Workplace: Any office, factory, shop or nonresidential place.
  (3) Public health facility: Any public hospital, emergency or health center.
  (4) School: Any school or dormitory.
  (5) Other: Any location where is not listed.
  (6) Unknown: The site of poisoning couldn't be completely determined.
  (7) Private health facility: Any private hospital, emergency or health center.

- Amount of exposed substance: The cases are graded according to amount of exposed substances as toxic, non-toxic and unknown.

- Necessitate of blood level measurement: Whether blood level measurement is necessary or not.

- Blood level: Blood level of the substance exposed.
  (1) Therapeutic

(2) Toxic
(3) Non-toxic
(4) Couldn't: Blood level couldn't be measured.

- Blood level value: Blood level value of the substance exposed if blood level could be measured.

- Duration of the exposure: The chronicity and duration of the exposure.
  (1) Acute
  (2) Chronic
  (3) Unknown
  (4) Acute-on-Chronic

- Severity score: The clinical severity of manifestations is assessed according to EAPCCT/IPCS Poisoning Severity Score (Persson et al., 1998) and then graded as follows.
  (1) None
  (2) Minor
  (3) Moderate
  (4) Severe
  (5) Fatal

- Following options: Following conditions of the patients.
  (1) Observation
  (2) Admitted to service
  (3) Referral
  (4) Intensive care
  (5) Unknown

- Outcome of the patient: The conclusion of the case made by the health professional in PCC. The follow-up option will be chosen, if the circumstance of the patient is being followed.

(1) Recovered
(2) Ex
(3) Sequela
(4) Unknown
(5) Follow-up: The case is being followed.

- Involving substance(s) and amount: The substances are classified in three level; substance main type, substance sub type, substance. The current total number of the substance records in the database is 4121.

- Clinical effects of the incident are checked among twenty three check boxes. Multi selection is available. The list of clinical effects are as follows; Vomiting, Diarrhea, Abdominal Pain, Headache, Vertigo, Coma, Hallucination, Tremor, Fasciculation, Convulsion, Hypotension, Hypertension, Bradycardia, Tachycardia, Miosis, Blurred Vision, Mydriasis, Braonchospasm, Urinary Incontinence, Fever, Excess Secretion, Diaphoresis, Blindness. If a clinical effect occurs that is not listed above, “other” check box can be checked. The other clinical effect can be entered in the edit box which becomes visible when other check box is checked.

- Treatment recommendations. Recommended therapies by PCC and if any therapy was provided before calling the PCC are selected via checked boxes in a grid. The therapy fields are as follows; Emetic, Gastric Lavage, Activated charcoal, Antidote, Hemodialysis, Supportive care, Hemoperfusion, Skin decontamination, Eye decontamination, Cathartic, Hospital Admission, Observation only, Discharge, Other, Unknown.

4.3.4 Case Query Form

The user specifies the query criteria for to retrieve information from PCC database. The query criteria are as follows:

- Date interval: A date interval may be specified with the from and to date.
- Time interval: A time interval may be specified with the from and to time.
- Case number: The number of the case.
- User name: User name who inserted the record.
- Call reason: User can type call reason or choose from the list.

Date and time interval criteria are required and have to be valid date and time value. User name and call reason criteria may contain initial letters of the words. The search button runs the query. As a result of the query a list of cases meeting the defined inquiry criteria is displayed. User can sort the results by clicking grid titles. Print button has a dropdown menu with two options; print the query result (Figure 4.17) and print the details of the cases. Also user can export the search result in text, html or excel file format with export the file button.

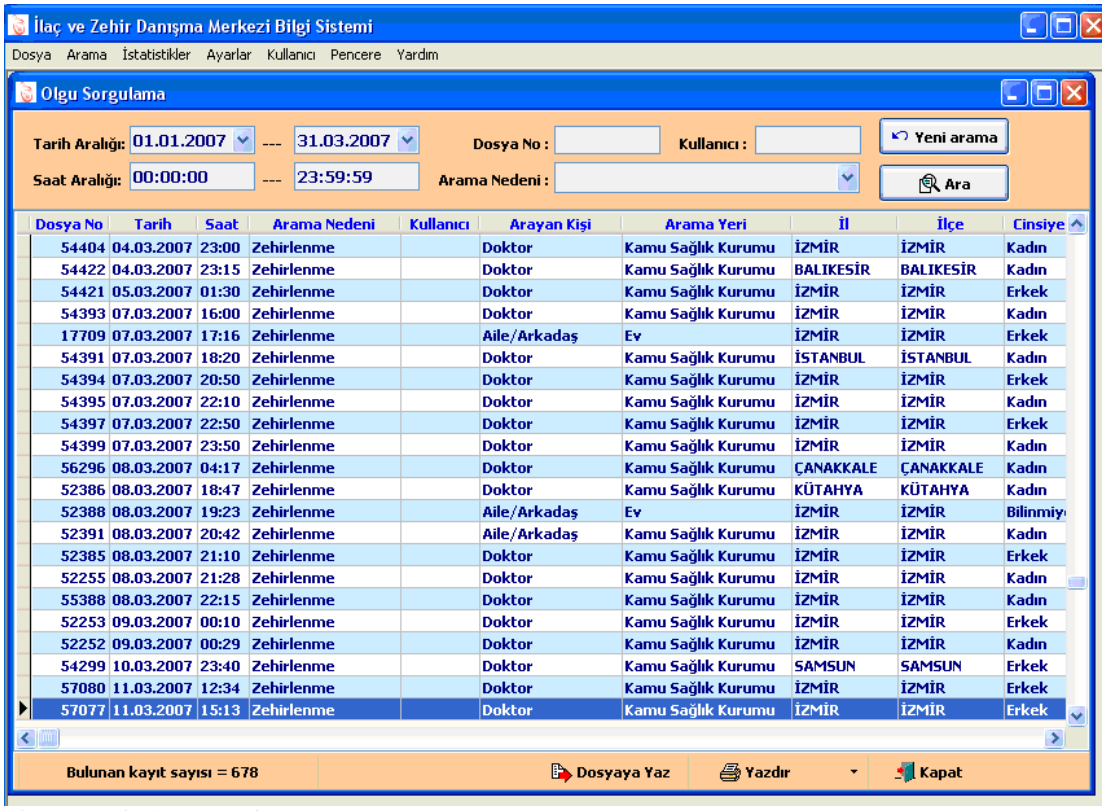
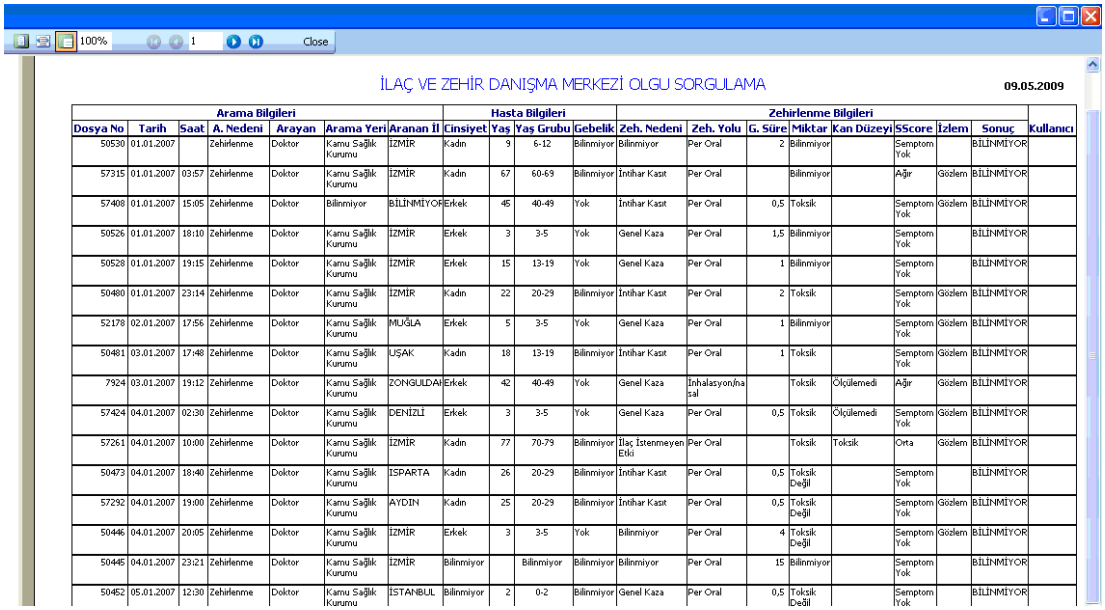


Figure 4.16 The query form



İLAÇ VE ZEHİR DANIŞMA MERKEZİ OLGU SORGULAMA

09.05.2009

Arama Bilgileri							Hasta Bilgileri				Zehirlenme Bilgileri								
Dosya No	Tarih	Saat	A. Nedeni	Arayan	Arama Yeri	Aranan İl	Cinsiyet	Yaş	Yaş Grubu	Gebelik	Zeh. Nedeni	Zeh. Yolu	G. Süre	Miktar	Kan Düzeyi	SScore	İzlem	Sonuç	Kullanıcı
50530	01.01.2007		Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Kadın	9	6-12	Bilinmiyor	Bilinmiyor	Per Oral	2	Bilinmiyor		Semptom Yok		BİLİNMİYOR	
57315	01.01.2007	03:57	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Kadın	67	60-69	Bilinmiyor	İntihar Kast	Per Oral		Bilinmiyor		Ağır	Gözlem	BİLİNMİYOR	
57408	01.01.2007	15:05	Zehirlenme	Doktor	Bilinmiyor	BİLİNMİYOR	Erkek	45	40-49	Yok	İntihar Kast	Per Oral	0,5	Toksik		Semptom Yok	Gözlem	BİLİNMİYOR	
50526	01.01.2007	18:10	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Erkek	3	3-5	Yok	Genel Kaza	Per Oral	1,5	Bilinmiyor		Semptom Yok		BİLİNMİYOR	
50528	01.01.2007	19:15	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Erkek	15	13-19	Yok	Genel Kaza	Per Oral	1	Bilinmiyor		Semptom Yok		BİLİNMİYOR	
50480	01.01.2007	23:14	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Kadın	22	20-29	Bilinmiyor	İntihar Kast	Per Oral	2	Toksik		Semptom Yok	Gözlem	BİLİNMİYOR	
52178	02.01.2007	17:56	Zehirlenme	Doktor	Kamu Sağlık Kurumu	MUĞLA	Erkek	5	3-5	Yok	Genel Kaza	Per Oral	1	Bilinmiyor		Semptom Yok	Gözlem	BİLİNMİYOR	
50481	03.01.2007	17:48	Zehirlenme	Doktor	Kamu Sağlık Kurumu	UŞAK	Kadın	18	13-19	Bilinmiyor	İntihar Kast	Per Oral	1	Toksik		Semptom Yok	Gözlem	BİLİNMİYOR	
7924	03.01.2007	19:12	Zehirlenme	Doktor	Kamu Sağlık Kurumu	ZONGULDAK	Erkek	42	40-49	Yok	Genel Kaza	İnhalasyon/Inhalasyonal		Toksik	Ölçülemedi	Ağır	Gözlem	BİLİNMİYOR	
57424	04.01.2007	02:30	Zehirlenme	Doktor	Kamu Sağlık Kurumu	DENİZLİ	Erkek	3	3-5	Yok	Genel Kaza	Per Oral	0,5	Toksik	Ölçülemedi	Semptom Yok	Gözlem	BİLİNMİYOR	
57261	04.01.2007	10:00	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Kadın	77	70-79	Bilinmiyor	İlaç İstenmeyen Etki	Per Oral		Toksik	Toksik	Orta	Gözlem	BİLİNMİYOR	
50473	04.01.2007	18:40	Zehirlenme	Doktor	Kamu Sağlık Kurumu	ISPARTA	Kadın	26	20-29	Bilinmiyor	İntihar Kast	Per Oral	0,5	Toksik Değil		Semptom Yok		BİLİNMİYOR	
57292	04.01.2007	19:00	Zehirlenme	Doktor	Kamu Sağlık Kurumu	AYDIN	Kadın	25	20-29	Bilinmiyor	İntihar Kast	Per Oral	0,5	Toksik Değil		Semptom Yok	Gözlem	BİLİNMİYOR	
50446	04.01.2007	20:05	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Erkek	3	3-5	Yok	Bilinmiyor	Per Oral	4	Toksik Değil		Semptom Yok	Gözlem	BİLİNMİYOR	
50445	04.01.2007	23:21	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İZMİR	Bilinmiyor		Bilinmiyor	Bilinmiyor	Bilinmiyor	Per Oral	15	Bilinmiyor		Semptom Yok		BİLİNMİYOR	
50452	05.01.2007	12:30	Zehirlenme	Doktor	Kamu Sağlık Kurumu	İSTANBUL	Bilinmiyor	2	0-2	Bilinmiyor	Genel Kaza	Per Oral	0,5	Toksik Değil		Semptom Yok		BİLİNMİYOR	

Figure 4.17 The print preview of the query results

4.3.5 Case Following Form

The cases which are being followed are listed with this form. User can sort the results by clicking grid titles. It is available that printing the query results and details of them. Also user can export the search result in text, html or excel file format with export the file button.

4.3.6 Descriptive Statistics Form

The descriptive statistics regarding the PCC data can be generated by the form which is shown in Figure 4.19. The chart which shows the distribution of the call by date and some descriptive statistics of the call numbers received by PCC are acquired via this form. Users can set the time or date interval for query. The results can be filtered by the reason of the calls and any of two fields such as gender and age group. As a result of query total number and average number of the calls are calculated. The chart which shows the distribution of the phone calls in the selected date interval can be modified by double clicking on it (Figure 4.20). The chart can be copy to clipboard or save to a file. Also print out the chart is available.

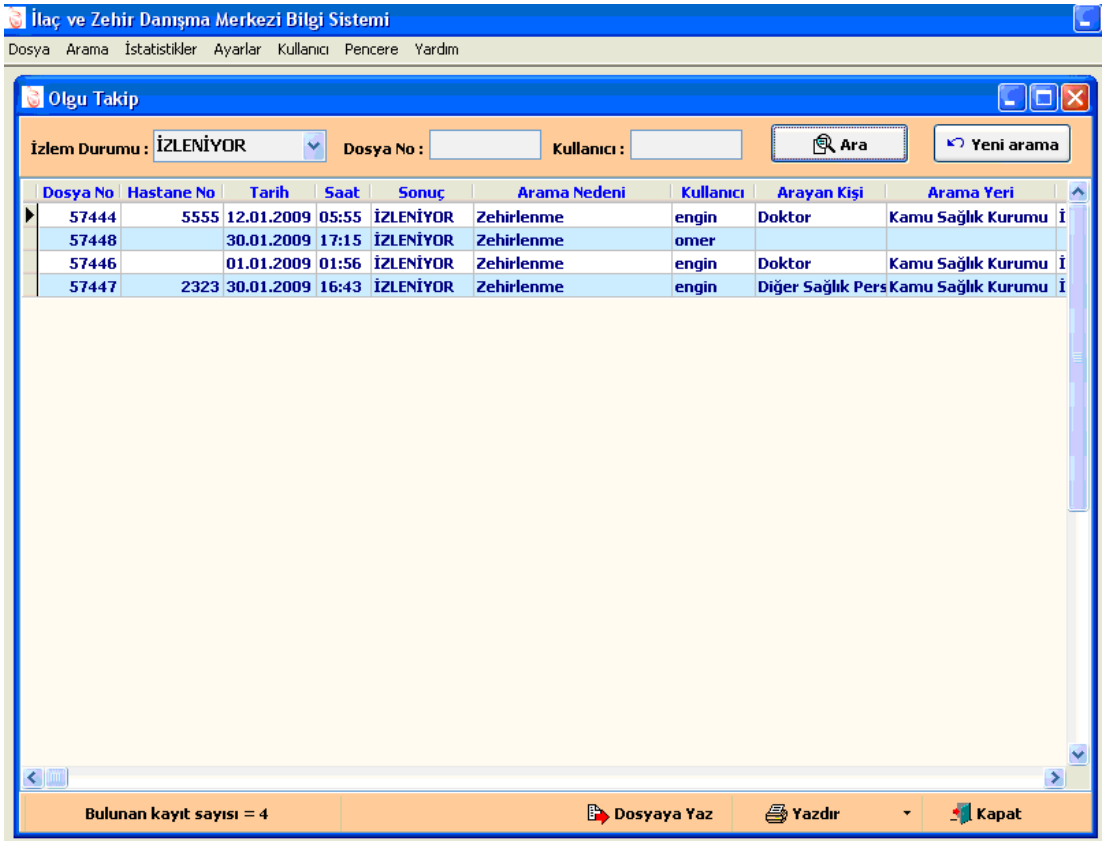


Figure 4.18 The query results of the following cases

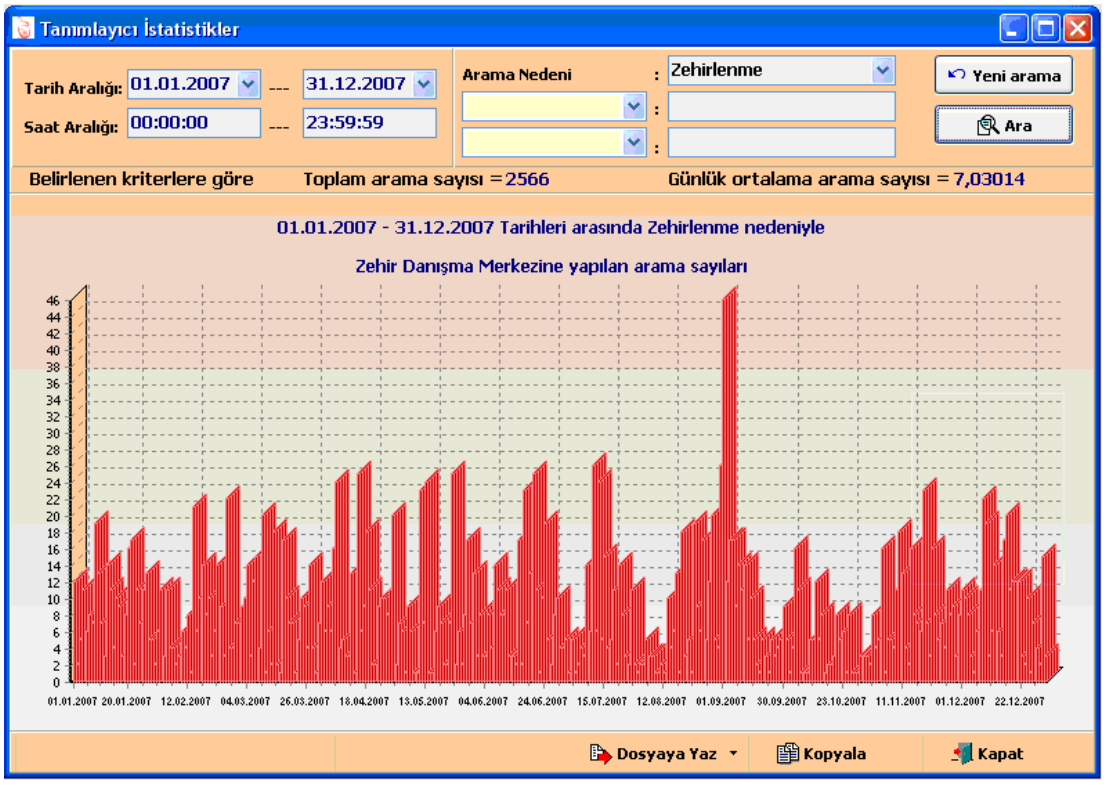


Figure 4.19 Descriptive statistics form

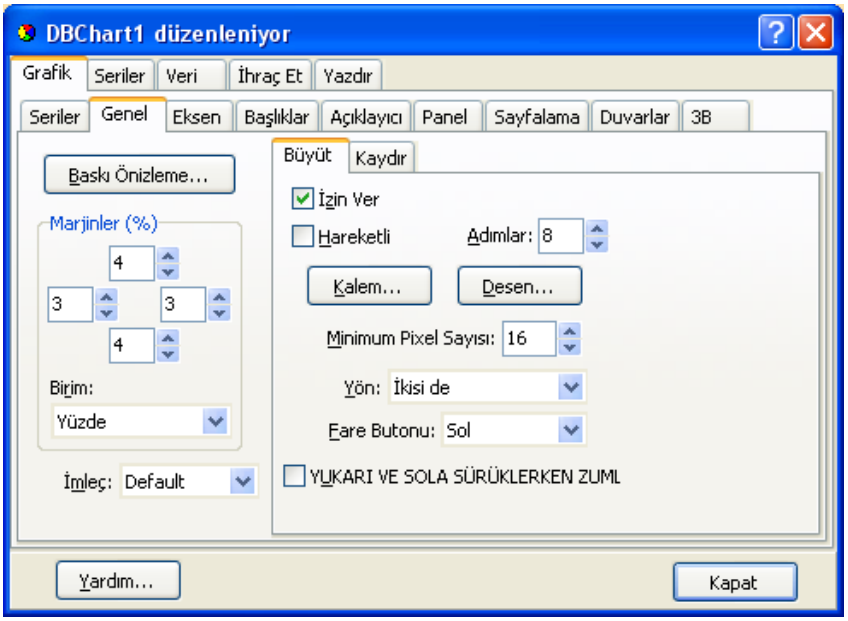


Figure 4.20 The properties of the chart window

4.3.7 Substance and Antidotes Settings

The tables which are used for data entry or query can be edited from settings menu. Only the authorized users and database administrators have insert, update and delete permissions on these tables.

The substances are hierarchically classified in three level; substance main type, substance sub type and substance. These records are stored in SubstanceMainType, SubstanceSubType and Substance tables. The current total number of the substance records in the database is 4121.

The first tab sheet has three grids which show substance main type, substance sub type and substance records respectively (Figure 4.21). The last grid which shows substances has sort property. User can sort the records in ascending or descending order, by clicking on the column heading. The second tab sheet has one grid which shows antidote names and codes.

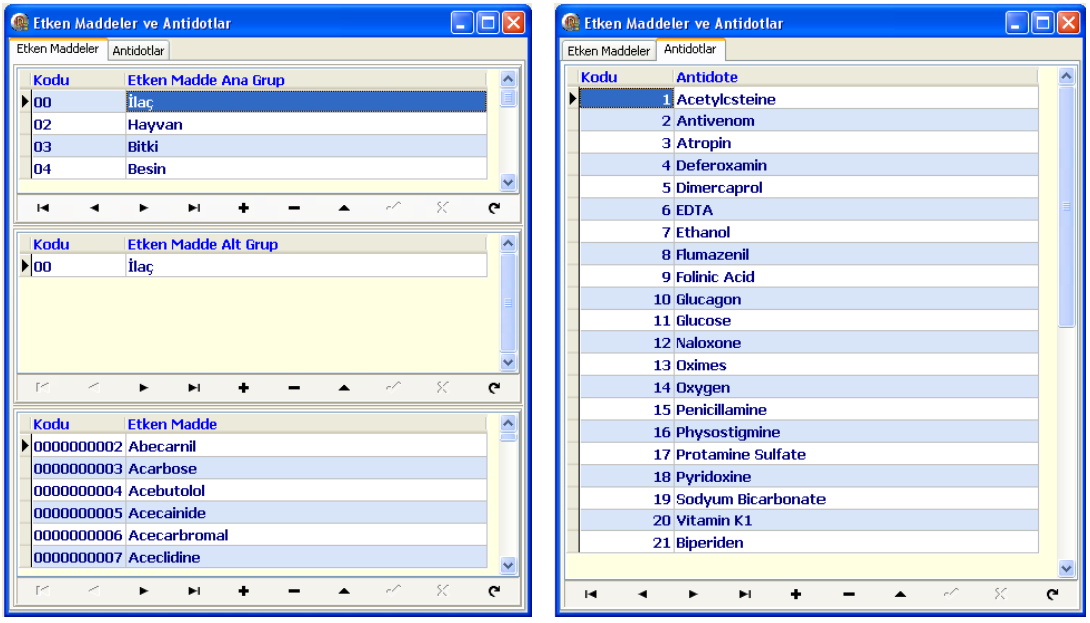


Figure 4.21 Substances and antidotes forms

4.3.8 City, Province and Health Centers Settings

All data about the cities, provinces and health centers of the country are stored in tables in the PCC database. The data in these tables provide entering case data quickly and preventing inconsistency. City, province and health centers window has three tab sheets. There are two data grids in the first tab sheet. First grid shows the cities and the second one shows the provinces (Figure 4.22). User can sort the city records in ascending or descending order, by clicking on the column heading. Both of the tables, city and province, have a field named priority. This field's value determines the appearance precedence in the list boxes.

The second tab sheet has a grid which shows the health centers information (Figure 4.23). The fields of the health center table are as follows; code, name, city, province, priority, phone area code, phone and fax numbers, address, e-mail, type and administrator name. All of the health care facilities in Turkey were entered into the database. User can sort the records by clicking on the column heading and when double clicked on the grid a quick search window is shown. The third tab sheet has a grid which shows the type of the health centers (Figure 4.24).

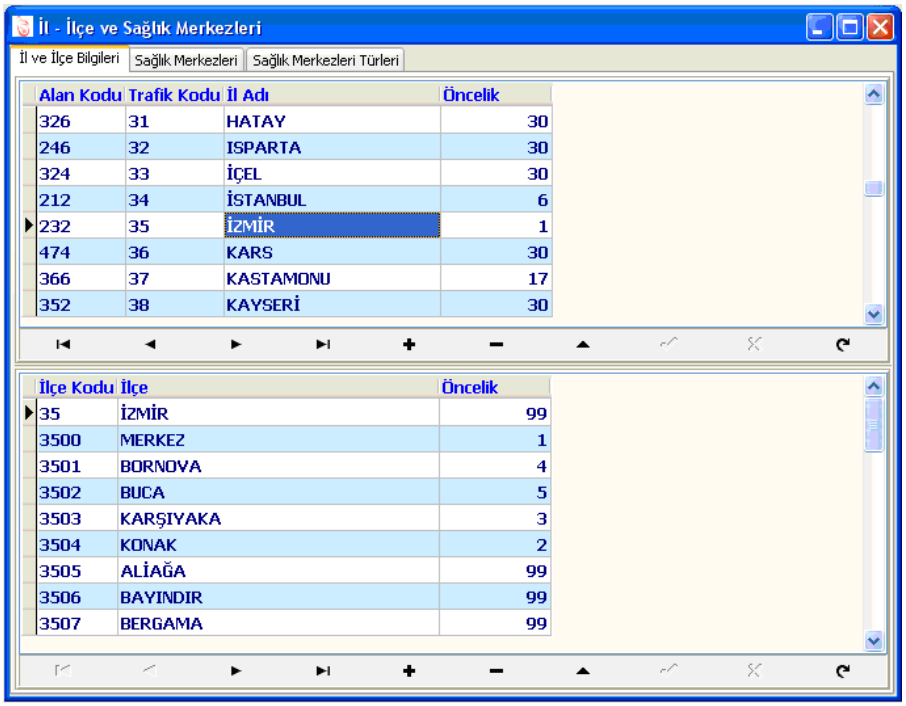


Figure 4.22 City and province tab sheet

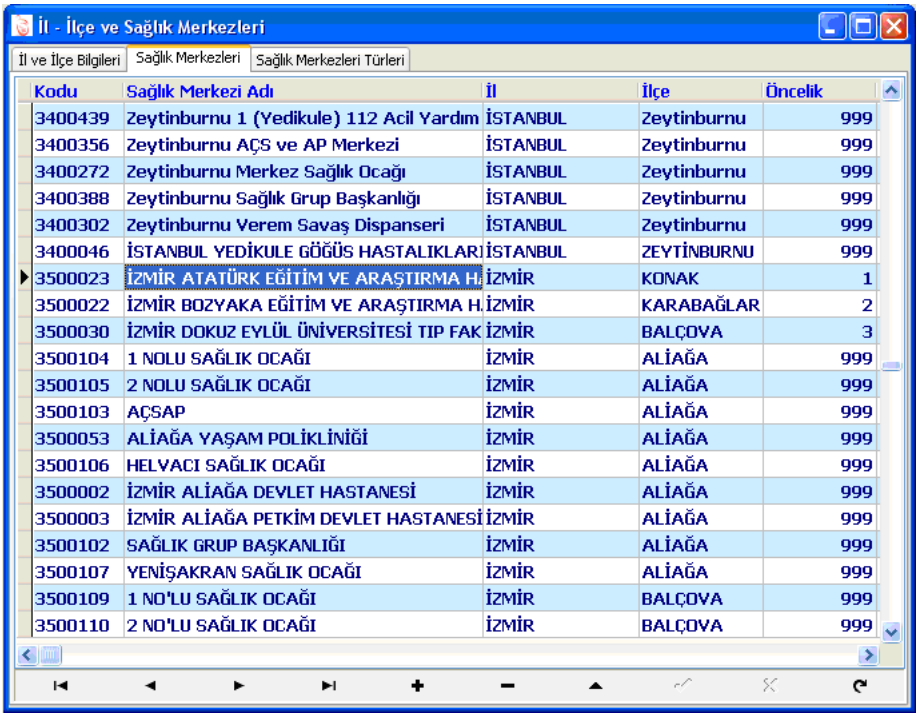


Figure 4.23 Health centers tab sheet

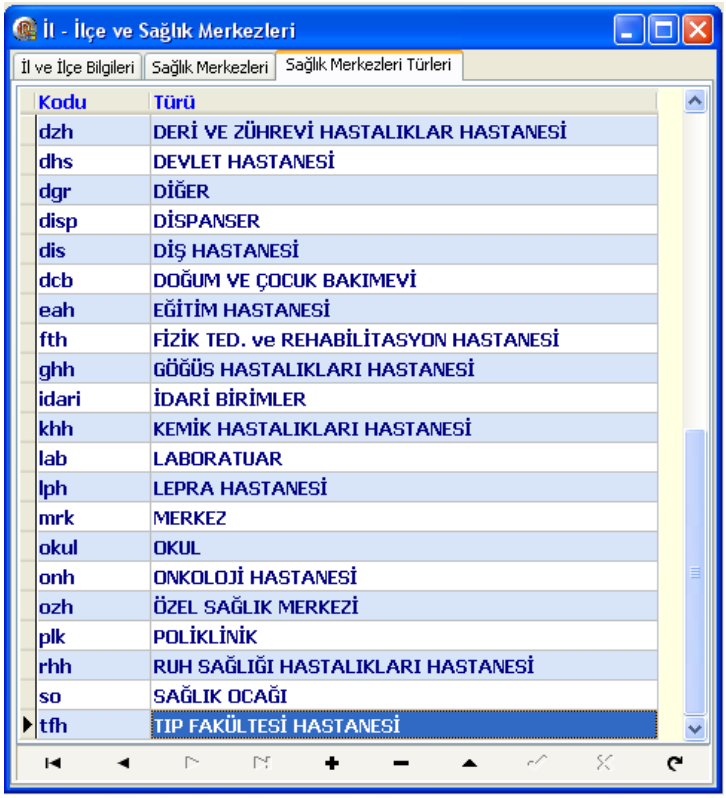


Figure 4.24 The types of the health centers tab sheet

4.3.9 Data Entry Options

Data entry options window which is displayed at Figure 4.25 has ten tab sheets and shows records which are related the following subjects:

- The reasons for the calling of the PCC.
- The descriptions of the caller type.
- Location types: The location of the caller or the location of the patient at the time the exposure occurred.
- The reasons of the poisoning incident.
- The routes of the exposure.
- Following conditions
- Outcomes
- Age Groups
- Education Levels
- Occupations

All users have select permission on these records but only the authorized users and database administrators can change, add and delete records.

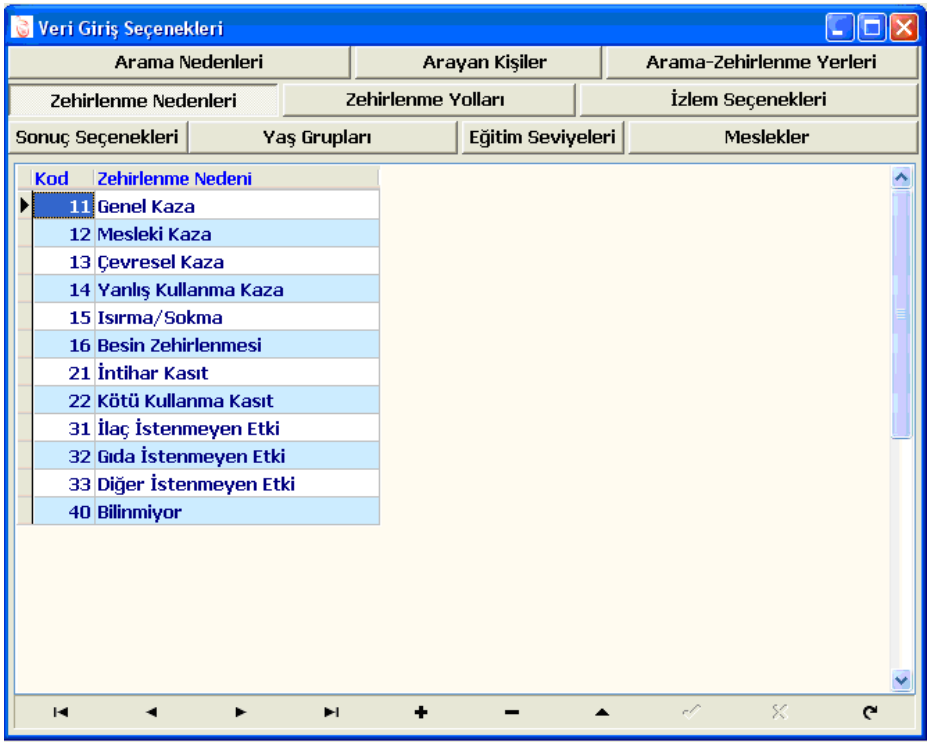


Figure 4.25 The data entry options

4.3.10 User Operations

The system users are created by the database administrator. Permissions on a database table, view, or stored procedure are granted to a user by the database administrator. But some personal data can be changed by the user. User can not change the user name which is used for login to the database. But the user can change first name, last name, title and main form canvas URL fields from user information window which is displayed at Figure 4.26. Users can change their passwords with "New Password Form" (Figure 4.27). User's new password is entered in the 'new password' edit box. New password is reentered in the 'confirm new password' field and then the change button is clicked. User password can be also changed by the database administrator. Database administrator can reset the user password but can not view users' passwords.

Figure 4.26 The user information form

Figure 4.27 The new password form

4.3.11 Window Menu

Ruber is a multiple document interface (MDI) application. The foundation of a multiple document interface (MDI) application is the MDI parent form. This is the form that contains the MDI child windows, which are the sub windows wherein the MDI application. The window menu commands allows the user to tile, cascade, minimize or close the MDI child windows.

4.3.12 Help Menu

4.3.12.1 Poisoning Diagnosis and Therapy Guide

This command opens the poisoning diagnosis and therapy guide document (Tunçok & Kalyoncu (Eds.), 2007), shown in Figure 4.28, in pdf file format. This

guide was published by Republic of Turkey Ministry of Health Refik Saydam Hygiene Center Presidency School of Public Health.

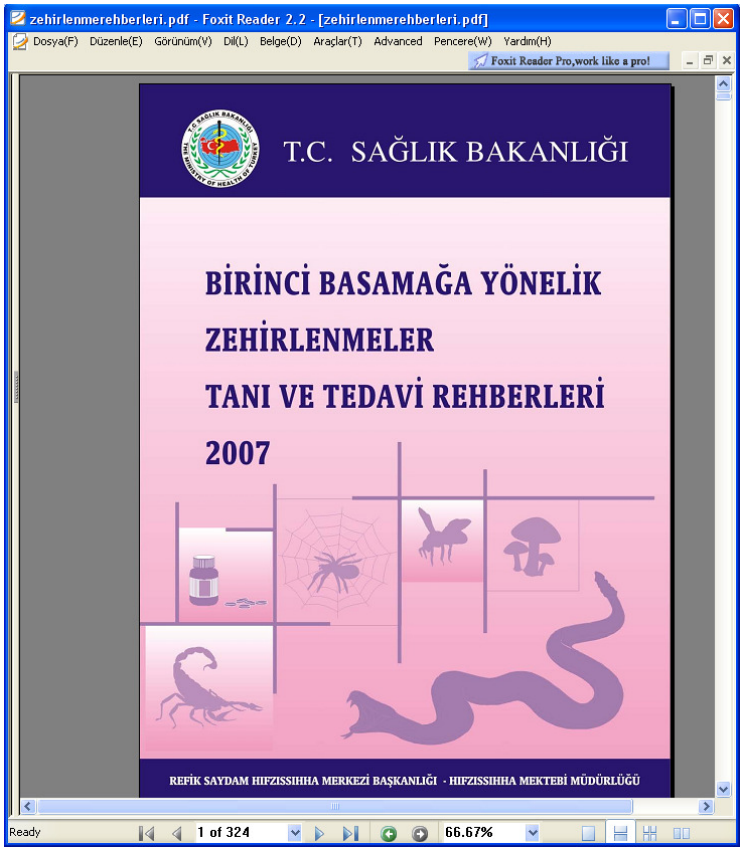


Figure 4.28 The poisoning diagnosis and therapy guide document.

4.3.12.2 Help

This command displays the help contents in a help window.

4.3.12.3 About

This command displays the about box window. About box displays the credits of the Ruber and includes information about product name and installed version and copyright information.

4.4 Reporting Service

A web-based reporting application has been developed for PCC users. Microsoft SQL Server 2005 Reporting Service was used for implementing the reports. Reporting service is a comprehensive, server based solution that provides an environment for creating a number of different types of reports and enables management interactive web based reports. This web-based reporting application allows authorized PCC users to perform queries and drill-down reports. The content and layout of the reports can change as the user selects parameter values or clicks on different items. A sign like a plus (+), may be used to expand and collapse detail sections, giving users the ability to drill down to more specific information. The implemented reports have an interactive feature called drilldown. The high level summary information is initially presented with this feature. The users can click a plus (+) sign to reveal part of the detail information.

Report parameters are used within a report for setting criteria for datasets. A parameter is used to limit the record set returned to the report, typically in the where clause of a query. If the user selects or enters a specific value, only the records that match that parameter value are returned otherwise all records are returned. All of the implemented reports have parameters to specify some criteria that can help to determine the record set returned to the report. The record set returned to the report also can be exported to the various file formats. For example in the reports regarding telephone calls data the PCC users may select the reason of the call and then export the records that match that parameter value.

Most of the reports in the PCC Report Server are matrix reports. Unlike a table report, a matrix report displays aggregated values two-dimensionally with column groups and row groups. The sums, averages, or counts intersect at the grouping levels for columns and rows. This enables a cross-tab report similar to a pivot table in Microsoft Excel.

Thirty four reports were implemented and deployed to Report Server of the PCC. The reports can be previewed by authorized PCC users. The implemented reports are categorized into five groups in different directories. Figure 4.29 shows the directories in the home directory of the PCC Report Server. These directories are as follows.

- Call Statistics directory contains cross tables and descriptive statistics regarding data related to telephone calls reported to the PCC.
- Case Statistics directory contains the reports about cases which are built in cross tabulation form.
- Outcome Statistics directory contains the reports related to medical outcome of the patients.
- Substances Statistics directory contains reports which are concerned with the substances in the exposure cases.
- Therapy Statistics directory contains cross tables related to recommended or applied therapy information.

The detailed descriptions of the reports in Call Statistics directories are given below. The reports in other folders have the same features, that's why they are mentioned only with their names in the following parts. It is inconvenient to show the screen shots of the entire thirty four reports aforementioned above so only a few screen shots of them are given in the following pages.

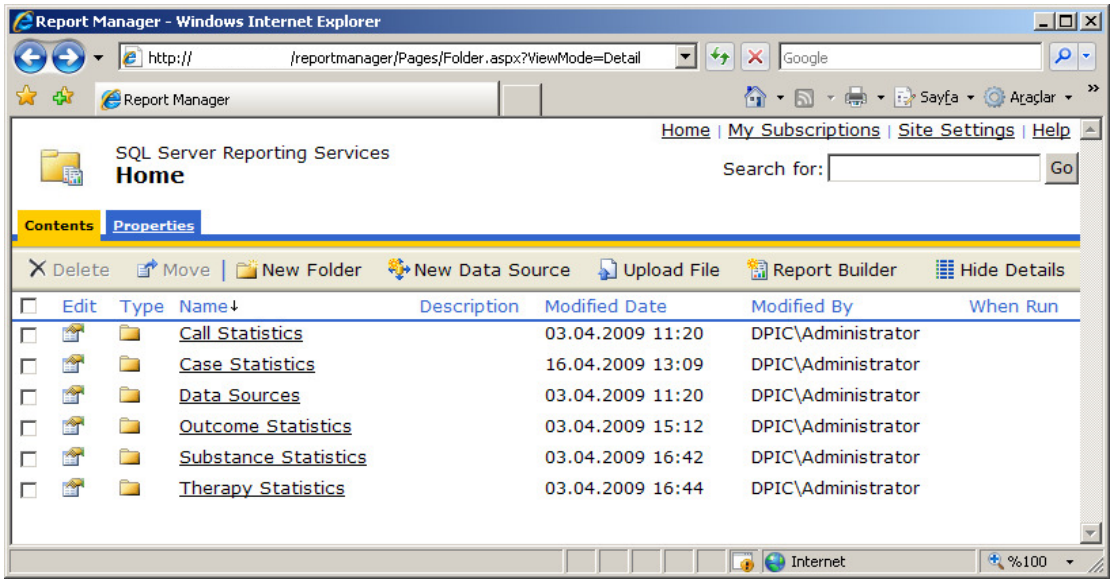


Figure 4.29 Reporting Service home directory

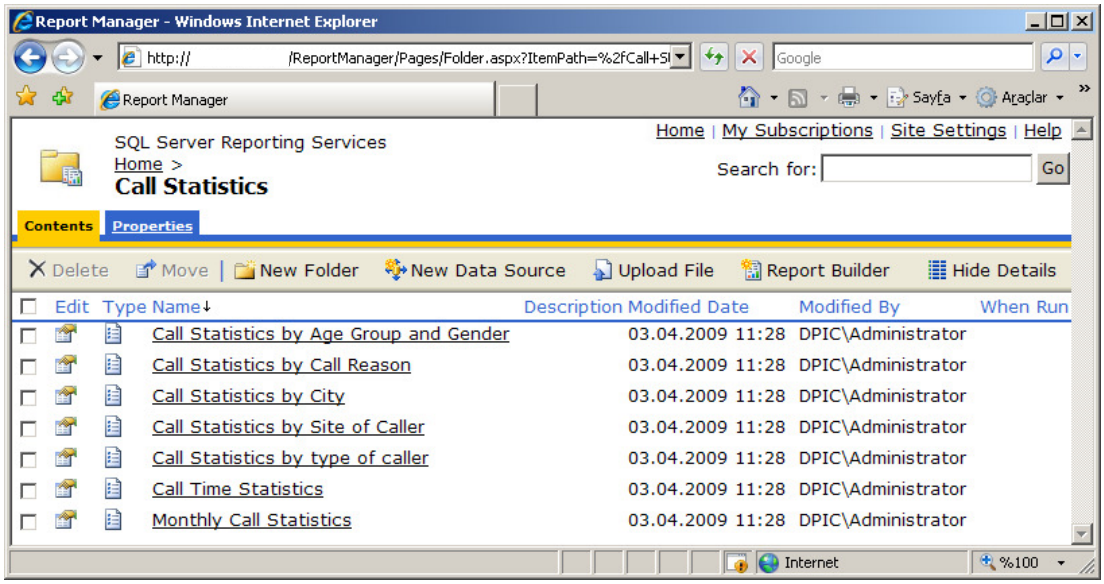
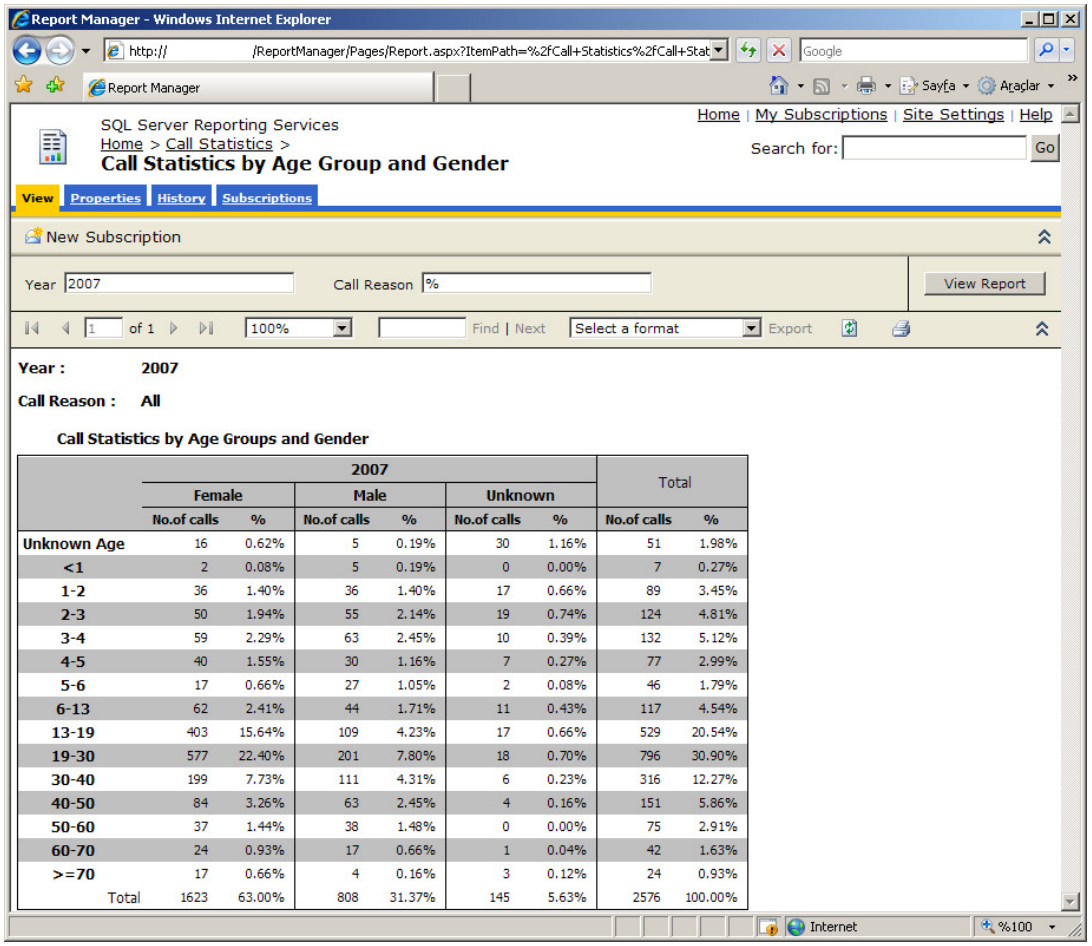


Figure 4.30 The content of the Call Statistics Directory

The content of the first directory is displayed in Figure 4.30. The first directory includes seven reports regarding the cases received by PCC. Descriptions of these reports are given in the following.

- Call Statistics by Age Group and Gender: This report, shown in Figure 4.31, shows the distribution of the cases which were reported to PCC by age and gender. The report has two parameters. One of these parameters is the year with the default value of the previous year value and the other one is reason of call which default value is the percent (%) sign. The percent sign is a structured query language (SQL) wildcard. SQL wildcards can substitute for one or more characters when searching for data in a database. The percent sign is used to stand for zero or more arbitrary characters. These parameters can't be left blank.
- Call Statistics by Call Reason: This report shows the distribution of the cases by reason of the call. The report has one parameter which filters the records according to year.
- Call Statistics by City: The distribution of the received calls by PCC is shown by cities. Year and reason of call fields are the parameters of this report.



	2007						Total	
	Female		Male		Unknown			
	No.of calls	%	No.of calls	%	No.of calls	%	No.of calls	%
Unknown Age	16	0.62%	5	0.19%	30	1.16%	51	1.98%
<1	2	0.08%	5	0.19%	0	0.00%	7	0.27%
1-2	36	1.40%	36	1.40%	17	0.66%	89	3.45%
2-3	50	1.94%	55	2.14%	19	0.74%	124	4.81%
3-4	59	2.29%	63	2.45%	10	0.39%	132	5.12%
4-5	40	1.55%	30	1.16%	7	0.27%	77	2.99%
5-6	17	0.66%	27	1.05%	2	0.08%	46	1.79%
6-13	62	2.41%	44	1.71%	11	0.43%	117	4.54%
13-19	403	15.64%	109	4.23%	17	0.66%	529	20.54%
19-30	577	22.40%	201	7.80%	18	0.70%	796	30.90%
30-40	199	7.73%	111	4.31%	6	0.23%	316	12.27%
40-50	84	3.26%	63	2.45%	4	0.16%	151	5.86%
50-60	37	1.44%	38	1.48%	0	0.00%	75	2.91%
60-70	24	0.93%	17	0.66%	1	0.04%	42	1.63%
>=70	17	0.66%	4	0.16%	3	0.12%	24	0.93%
Total	1623	63.00%	808	31.37%	145	5.63%	2576	100.00%

Figure 4.31 The distribution of the calls by age and gender

- Call Statistics by Site of Caller: It is the report that shows the distribution of call numbers according to the location of the callers. The report has two parameters which filter the records according to year and reason of call.
- Call Statistics by Type of Caller: It discloses the distribution of received call numbers according to the callers. The report has same parameters with previously mentioned report.
- Call Time Statistics: It shows the telephone call frequencies of received calls by time intervals. The report has two parameters which filter the records according to year and gender of patient.
- Monthly Call Statistics: It gives the monthly call numbers in order to analyze if there is a trend according to months or seasons in the cases which have been reported to PCC. The result record set can be filtered according to year of call time and reason of call.

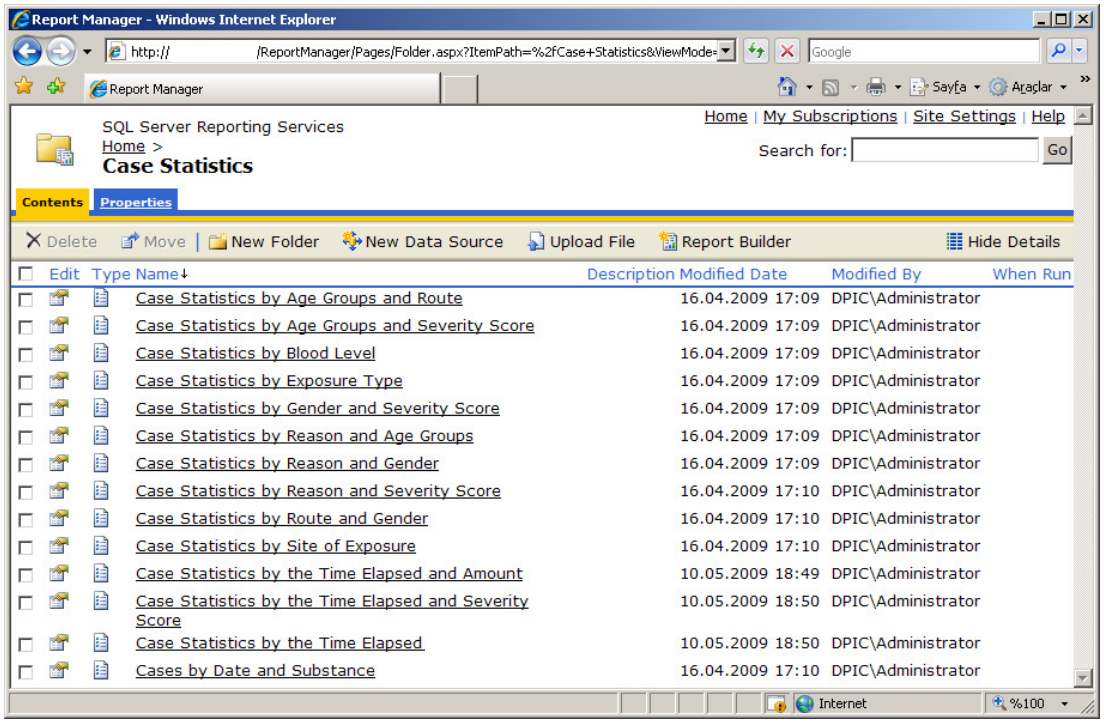


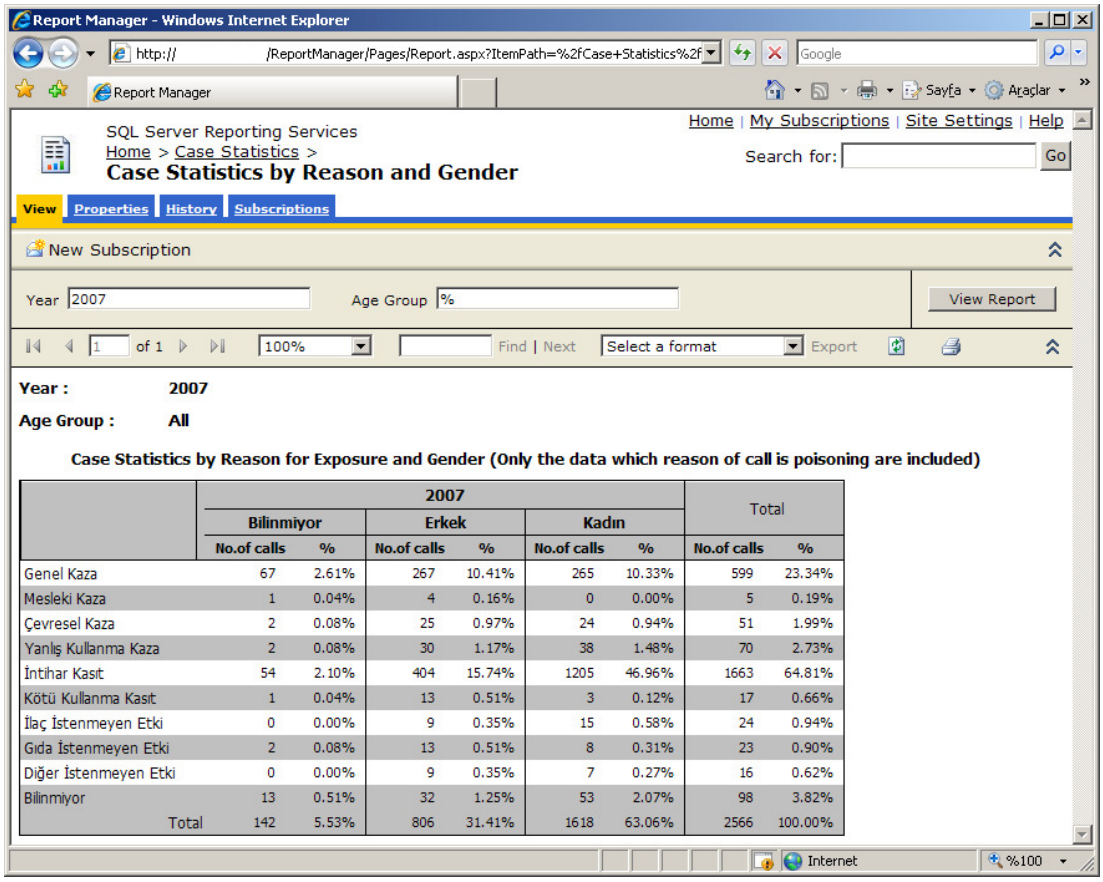
Figure 4.32 The content of the Case Statistics Directory

The Case Statistics Directory, shown in Figure 4.32, contains fourteen reports regarding demographic details of the cases, route of and reason for the exposure and circumstances of poisonings. These reports indicate the distribution of facts according to the fields specifying in their titles.

- Case Statistics by Age Group and Route: This report shows the distribution of the poisoning cases by age groups and route of exposure. The report has three parameters which filter the records according to year, reason for exposure and gender of patient.
- Case Statistics by Age Groups and Severity Score: The distribution of the poisoning incidents is shown by age groups and clinical severity score. The report has same parameters with previously mentioned report.
- Case Statistics by Blood Level: It shows the distribution of cases by substance blood level. The report has two parameters which filter the records according to year and gender of patient.

- Case Statistics by Exposure Type: This report denotes the poisoning case statistics by chronicty of the exposure. Year and gender of patient fields are the parameters of this report.
- Case Statistics by Gender and Severity Score: The distribution of the poisoning incidents is shown by gender and clinical severity score. The report has two parameters which filter the records according to year and reason for exposure.
- Case Statistics by Reason and Age Groups: This report gives the distribution of the poisoning cases by reason for exposure and age groups. Year of the call time and gender of patient fields are the parameters for filtering.
- Case Statistics by Reason and Gender: This report, shown in Figure 4.33, shows the distribution of the poisoning cases by reason for exposure and gender. The report has two parameters which filter the records according to year and age groups of patients.
- Case Statistics by Reason and Severity Score: It is the report that shows the distribution of the poisoning incidents by reason for exposure and clinical severity score. The report has two parameters which filter the records according to year and gender.
- Case Statistics by Route and Gender: This report denotes the poisoning case statistics by route of the exposure and gender of patient.
- Case Statistics by Site of Exposure: This report gives the poisoning case statistics by site of the exposure. The report has two parameters which filter the records according to year and gender.
- Case Statistics by Time Elapsed and Amount: The distribution of the poisoning incidents is shown according to the time elapsed between the incidents and calls to the PCC and amount of exposed substance. Year of the call time and gender of patient fields are the parameters for filtering.
- Case Statistics by Time Elapsed and Severity Score: The distribution of the poisoning incidents is shown according to the time elapsed between the incidents and calls to the PCC and clinical severity score. The report has two parameters which filter the records according to year and gender.

- Case Statistics by Time Elapsed: This report shows the distribution of the cases by the time elapsed between the incidents and calls to the PCC. The report has two parameters which filter the records according to year and reason of call.
- Cases by Date and Substance: This report is different from the reports mentioned above. The detailed information regarding the poison exposure cases can be list with this form. A date interval and substance(s) can be used to filter result record set.



	2007						Total	
	Bilinmiyor		Erkek		Kadın			
	No.of calls	%	No.of calls	%	No.of calls	%	No.of calls	%
Genel Kaza	67	2.61%	267	10.41%	265	10.33%	599	23.34%
Mesleki Kaza	1	0.04%	4	0.16%	0	0.00%	5	0.19%
Çevresel Kaza	2	0.08%	25	0.97%	24	0.94%	51	1.99%
Yanlış Kullanma Kaza	2	0.08%	30	1.17%	38	1.48%	70	2.73%
İntihar Kasıt	54	2.10%	404	15.74%	1205	46.96%	1663	64.81%
Kötü Kullanma Kasıt	1	0.04%	13	0.51%	3	0.12%	17	0.66%
İlaç İstenmeyen Etki	0	0.00%	9	0.35%	15	0.58%	24	0.94%
Gıda İstenmeyen Etki	2	0.08%	13	0.51%	8	0.31%	23	0.90%
Diğer İstenmeyen Etki	0	0.00%	9	0.35%	7	0.27%	16	0.62%
Bilinmiyor	13	0.51%	32	1.25%	53	2.07%	98	3.82%
Total	142	5.53%	806	31.41%	1618	63.06%	2566	100.00%

Figure 4.33 Distribution of the cases by reason and gender

The Outcome Statistics directory contains three reports regarding outcome and severity score of the cases.

- Cases by Following and Severity Score: The distribution of the poisoning incidents is shown according to the following options and clinical severity score. Year of the call time and gender of patient fields are the parameters for filtering.

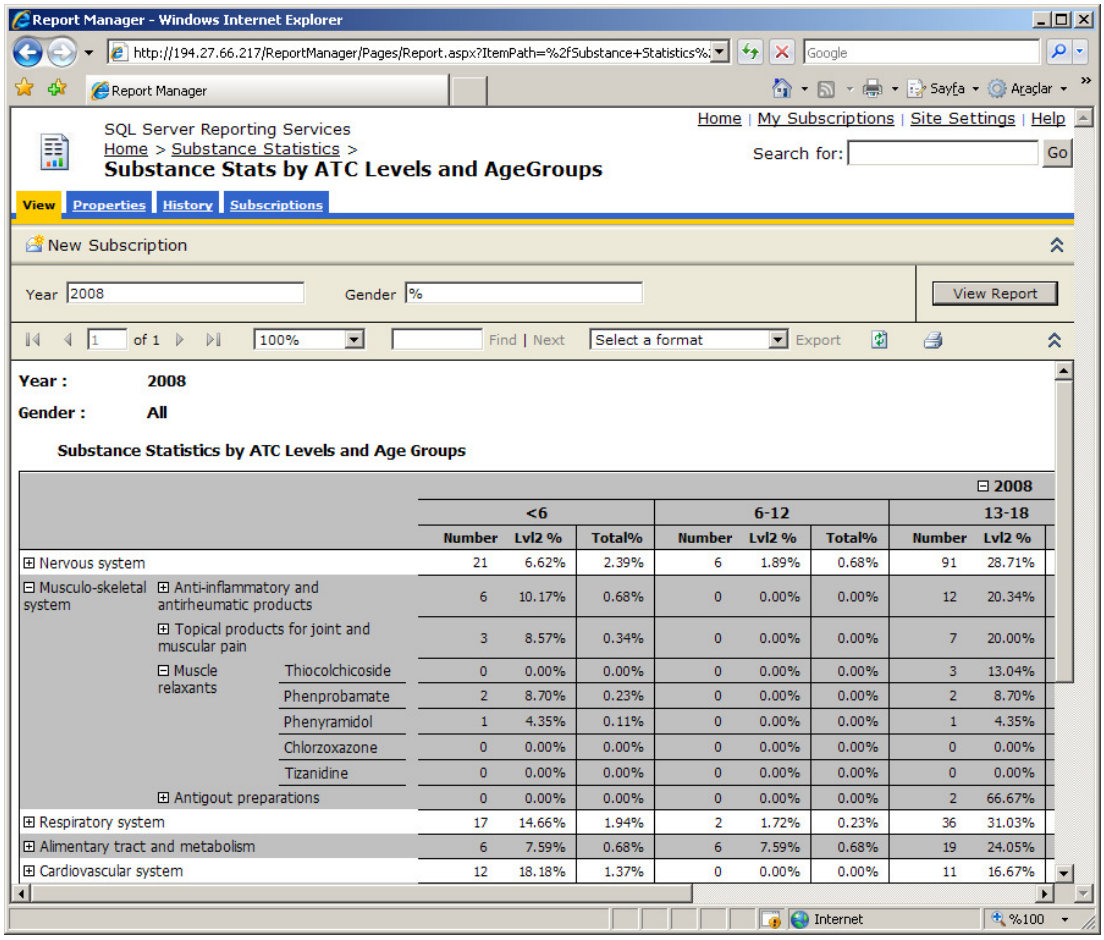
- Cases by Outcome: The detailed information regarding the poison exposure cases can be list with this form. A date interval, gender of patient and outcome can be used to filter result record set.
- Cases by Outcome and Severity Score: This report gives the distribution of the poisoning cases by outcome of the patient and clinical severity score. The report has two parameters which filter the records according to year and gender.

The Substance Statistics directory contains six reports regarding substances involving in the exposures. The medications were categorized into nine main groups and twenty subgroups according to the World Health Organization (WHO) Anatomical Therapeutic Chemical (ATC) classification index. Thus, it is possible to arrange reports according to ATC level.

- Poison Exposure Cases by Substance and Age Groups: This report denotes the distribution of poison exposure cases by substance categories and age groups. Year of the call time and gender of patient can be used to filter result record set.
- Poison Exposure Cases by Substance and Gender: This report denotes the distribution of poison exposure cases by substance categories and gender. The report has two parameters which filter the records according to year and age groups.
- Substance Stats by ATC Levels and Age Groups: This report shows the distribution of the medications involved in poisoning incidents according to ATC levels. Also year and gender fields can be used to filter the result record set. This report is displayed in Figure 4.34.
- Substance Stats by Main Substance Level and Age Groups: This report gives the distribution of the poisoning incidents by main substance categories and age groups. The report has two parameters which filter the records according to year and gender.
- Substance Stats by Main Substance Level and Gender: This report gives the distribution of the poisoning incidents by main substance categories and

gender. The report has two parameters which filter the records according to year and age groups.

- Substance Stats by Main Substance Level and Outcome: It is the report that shows the distribution of the poisoning incidents by main substance categories and outcome. The report has two parameters which filter the records according to year and gender.



			2008					
			<6			6-12		
			Number	Lvl2 %	Total%	Number	Lvl2 %	Total%
Nervous system			21	6.62%	2.39%	6	1.89%	0.68%
Musculo-skeletal system	Anti-inflammatory and antirheumatic products		6	10.17%	0.68%	0	0.00%	0.00%
	Topical products for joint and muscular pain		3	8.57%	0.34%	0	0.00%	0.00%
	Muscle relaxants	Thiocolchicoside	0	0.00%	0.00%	0	0.00%	0.00%
		Phenprobamate	2	8.70%	0.23%	0	0.00%	0.00%
		Phenyramidol	1	4.35%	0.11%	0	0.00%	0.00%
		Chlorzoxazone	0	0.00%	0.00%	0	0.00%	0.00%
		Tizanidine	0	0.00%	0.00%	0	0.00%	0.00%
	Antigout preparations		0	0.00%	0.00%	0	0.00%	0.00%
Respiratory system			17	14.66%	1.94%	2	1.72%	0.23%
Alimentary tract and metabolism			6	7.59%	0.68%	6	7.59%	0.68%
Cardiovascular system			12	18.18%	1.37%	0	0.00%	0.00%

13-18		
Number	Lvl2 %	Total%
91	28.71%	
12	20.34%	
7	20.00%	
3	13.04%	
2	8.70%	
1	4.35%	
0	0.00%	
0	0.00%	
2	66.67%	
36	31.03%	
19	24.05%	
11	16.67%	

Figure 4.34 Summary of medications involved in exposures by ATC Levels and age groups

The Therapy Statistics directory contains four reports regarding therapy information. All reports in this directory have two parameters which filter the result record set by year and gender.

- Therapy Statistics by Age Groups: This report shows the distribution of the poisoning cases by recommended therapy method.

- Therapy Statistics by Amount: This report gives the distribution of the poisoning cases by recommended therapy method and amount of exposed substance.
- Therapy Statistics by Gender: The distribution of the poisoning incidents is shown according to the recommended therapy method and gender.
- Therapy Statistics by Therapy Information: This report generates a cross table to compare applied and recommended therapy methods.

Reporting Service, being an essential component of statistical data system which has been developed for PCC, assists the researchers especially in the retrospective studies. In addition, it facilitates PCC to get detailed or brief information about the cases. Annual Report of the DPIC, 2007 which has been prepared with the efficient use of the Reporting Service has been presented in the following Chapter 5.

CHAPTER FIVE
ANNUAL REPORT OF THE DOKUZ EYLÜL UNIVERSITY DRUG AND POISON INFORMATION CENTER, 2007

Dokuz Eylül University Drug and Poison Information Center (DPIC) started to serve in the constitution of School of Medicine, Pharmacology Department in 1993 (Tunçok, 2003). Since then, DPIC continue to present all of its experiences and facilities to the health professionals' and public's service with the help of experienced physicians and pharmacologists trained on Clinic Toxicology. DPIC provides consultation about toxic substances and undesirable adverse effects of drugs by telephone 24 hours a day. DPIC receives phone calls from every city in the country but mainly serves in the Aegean region of Turkey with a population of over 9 million (2007 census).

The data which has been gathered since 1993 transferred into the developed database system and then the etiological, demographical and clinical characteristics of exposures reported to the DPIC in 2007 were investigated. The results of this annual report are presented in this chapter.

5.1 Material and Methods

This study was approved by the Institutional Ethics Committee of the Dokuz Eylül University, School of Medicine. A cross-sectional, descriptive review was conducted in all cases of poisonings reported to the DPIC in 2007.

All data (including demographic details like identification of the caller and health care facility, involving substance(s), route and reason for the incident, date, time, site and circumstances of poisoning (unintentional, intentional and unknown), clinical effects, time elapsing until consultation, methods of management, treatment recommendations and outcomes of the patients) were acquired by telephone consultations and recorded on standard data forms. Clinical outcome was based on the assessment of health professionals handling the call. The clinical severity of

manifestations was assessed according to EAPCCT/IPCS Poisoning Severity Score and then graded into asymptomatic, mild, moderate or severe (Persson et al., 1998). The patients was categorized into age groups as <6 years, 6 to 12, 13 to 18 for children; 19 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69 and >69 years for adults. The medications were also classified by nine major groups and twenty subgroups according to the World Health Organization (WHO) Anatomical Therapeutic Chemical (ATC) classification index.

All the data were then entered into the Ruber that was developed for poison information centers with guidance from the DPIC. All of the DPIC data between 1993 and 2008 were transferred.

Statistical analyses were performed by using the statistical packages SPSS 15 for Windows and MINITAB 14. Descriptive statistics were calculated for numerical variables, mean and standard error were expressed as mean ± SE. Pearson Chi-square test was performed for testing the independence and association between variables in contingency tables. A p value < 0.05 was considered statistically significant. Spearman's correlation coefficient (Spearman's rho) was used to measure the strength of association of the ordinal variables. Data in this paper are provided as tables and charts using Microsoft® Office Excel 2003.

5.2 Results

In 2007, DPIC received 2,576 total phone calls concerning poisoning and information calls, 2,566 (99.6%) of them related to cases of poison exposures. Calls for drug information constituted 0.4 % (10) of all calls.

Ninety-seven percent (2,503) of the calls came from the health care facilities, 73.3 % (1,889) of total calls came from İzmir and 26.7 % (687) came from other cities (6.3% Manisa, 2.4% Aydin, 1.8% Usak, 16.2% other cities). Ninety-nine percent of total calls were made by physicians. Residences (1,999, 78.0%) were the most common site for poisoning incidents.

The number of reported incidents was higher in December and November (9.9% and 9.5%, respectively). The overwhelming majority of cases (2,542, 99.0%) were acute at the time of the calls, followed in frequency by chronic (22, 0.9%) and unknown durations (2, 0.1%). Among all of the cases, the most common route of exposure was ingestion (2,379, 92.7%) followed by inhalation/nasal route (88, 3.4%), insects bites/stings (54, 2.1%) and dermal route (22, 0.9%).

The time elapsed between the incidents and calls to the DPIC was as follows: 1,309 cases (51.0%) within two hours, 600 (23.4%) between 2 and 4 hours, 350 (13.6%) between 4 and 8 hours, 162 (6.3%) between 8 and 24 hours, 31 (1.2%) more than one day. In 114 (4.4%) of the cases, the exposure time was unknown. Median time elapsed from exposures to the calls was 1.5 h. Mean value of the elapsing time was 3.1 ± 0.1 h (2.6 ± 0.1 and 3.5 ± 0.2 for children and adults, respectively). The majority of phone calls (1,408, 54.7%) were received between 18:00 and 23:59 (Table 5.1). When the age groups were compared in respect to elapsed time period, a significant association was found between the patients aged 0-5 years and those aged 6-18 years (χ^2=53.38, p<0.001). According to this association younger the patient was, earlier the calls for information were made, indicating a positive linear correlation between the elapsing time (≤2 and >2 hour) and the age groups (0-5, 6-18) (Spearman's rho=0.223).

Table 5.1 Phone call frequencies by time intervals.

Time	No. of calls	% of total
00:00-05:59	405	15.7
06:00-11:59	189	7.3
12:00-17:59	485	18.8
18:00-23:59	1,408	54.7
Unknown Time	89	3.5
Total	2,576	100.0

Most of the poisoning exposures that were reported to DPIC were in adults (1,398, 54.5%, Table 5.2). The mean age of the patients was 21.5 ± 0.3 (9.7 ± 0.2 for children and 30.9 ± 0.3 for adults, respectively), most being between 13 and 39 years-old group (1,636, 63.8%, Table 5.2). In 2007, a female predominance was

found among the cases except for patients in the age group of 0 – 5 years. The female-to-male ratio was 2:1.

Table 5.2 Age and gender distribution of exposures

	Gender						Total	
	Female		Male		Unknown			
Age	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Unknown Age	15	0.9	5	0.6	28	19.7	48	1.9
0-5 years	204	12.6	216	26.8	55	38.7	475	18.5
6-12 years	62	3.8	43	5.3	11	7.7	116	4.5
13-18 years	403	24.9	109	13.5	17	12.0	529	20.6
19-29 years	574	35.5	201	24.9	17	12.0	792	30.9
30-39 years	198	12.2	111	13.8	6	4.2	315	12.3
40-49 years	84	5.2	63	7.8	4	2.8	151	5.9
50-59 years	37	2.3	37	4.6	0	0.0	74	2.9
≥60 years	41	2.5	21	2.6	4	2.8	66	2.6
Total	1,618	100.0	806	100.0	142	100.0	2,566	100.0

Most of these incidents were intentionally performed (1,680, 65.5%, Table 5.3). The predominance of these intentional exposures (suicide attempt, misuse or abuse) was found in all age groups, except in 0-12 years-old children. Unintentional exposures constituted majority of the cases in 0-12 years old children (497, 84.1%) and they were significantly higher in this age group compared to the 13-18 year-old teenagers (χ^2=374.59, p<0.001). In accordance with this finding, number of intentional exposures were significantly higher in adults than in patients aged 0-18 years (χ^2=202.48, p<0.001, Table 5.3). Incidence of intentional exposures were significantly higher in females compared to males (χ^2=385.03, p<0.001, Table 5.4).

Table 5.3 Distribution of motivations for exposure by age

Reasons	Age Groups										Total	
	<6 years		6 - 12 years		13 - 18 years		>18 years		Unknown			
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Unintentional	421	88.6	76	65.5	46	8.7	235	16.8	10	20.8	788	30.7
Intentional	43	9.1	28	24.1	465	87.9	1,114	79.7	30	62.5	1,680	65.5
Unknown	11	2.3	12	10.3	18	3.4	49	3.5	8	16.7	98	3.8
Total	475	100.0	116	100.0	529	100.0	1,398	100.0	48	100.0	2,566	100.0

Table 5.4 Distribution of motivations for exposure by gender

Motivations	Gender						Total	
	Female		Male		Unknown			
	No.	%	No.	%	No.	%	No.	%
Unintentional	357	22.1	357	44.3	74	52.1	788	30.7
Intentional	1,208	74.7	417	51.7	55	38.7	1,680	65.5
Unknown	53	3.3	32	4.0	13	9.2	98	3.8
Total	1,618	100.0	806	100.0	142	100.0	2,566	100.0

Exposure to multiple substances occurred in 121 cases. Medications were the most frequent substance of exposures (1,949, 72.5%) followed by chemicals, metals, cosmetics (126, 4.7%) and alcohol (126, 4.7%, Table 5.5). When the gender and substance categories were analyzed, a significant association was found between them (χ^2=135.78, p<0.001). The incidents involving medications were significantly more common in women than in men (χ^2=378.95, p<0.001, Table 5.5). Unlike this, when the substance type (medications etc.) and the age groups (0-18 years, >18 years) were compared, no significant association could be found (χ^2=0.39, p=0.53). The medication related events were significantly higher in teenagers (13-18 years) than in children (0-12 years) (χ^2=20.27, p<0.001, Table 5.6).

Table 5.5 The distribution of the cases by substance categories and gender*

Substances	Gender						Total	
	Female		Male		Unknown			
	No.	%	No.	%	No.	%	No.	%
Medication	1,351	80.7	511	59.1	87	59.2	1,949	72.5
Chemicals, Metals, Cosmetics	41	2.4	71	8.2	14	9.5	126	4.7
Alcohol	52	3.1	65	7.5	9	6.1	126	4.7
Pesticides, Rodenticides, Herbicides	57	3.4	55	6.4	6	4.1	118	4.4
Cleaning Products	49	2.9	57	6.6	11	7.5	117	4.4
Mushroom, Plants, Food	28	1.7	32	3.7	6	4.1	66	2.5
Bites/Stings	33	2.0	29	3.4	2	1.4	64	2.4
Other / Unknown	35	2.1	19	2.2	7	4.8	61	2.3
Gases	29	1.7	26	3.0	5	3.4	60	2.2
Total	1,675	100.0	865	100.0	147	100.0	2,687	100.0

Table 5.6 The distribution of cases of poison exposure by substance categories and age*

Substances	Age Groups								Total	
	0-12 years		13-18 years		>18 years		Unknown			
	No.	%	No.	%	No.	%	No.	%	No.	%
Medication	346	58.3	475	87.6	1,100	73.4	28	51.9	1,949	72.5
Chemicals, Metals, Cosmetics	69	11.6	8	1.5	46	3.1	3	5.6	126	4.7
Alcohol	10	1.7	15	2.8	94	6.3	7	13.0	126	4.7
Pesticides, Rodenticides, Herbicides	32	5.4	16	3.0	69	4.6	1	1.9	118	4.4
Cleaning Products	61	10.3	8	1.5	48	3.2	0	0.0	117	4.4
Mushroom, Plants, Food	21	3.5	3	0.6	37	2.5	5	9.3	66	2.5
Bites/Stings	19	3.2	4	0.7	40	2.7	1	1.9	64	2.4
Other / Unknown	25	4.2	8	1.5	23	1.5	5	9.3	61	2.3
Gases	10	1.7	5	0.9	41	2.7	4	7.4	60	2.2
Total	593	100.0	542	100.0	1,498	100.0	54	100.0	2,687	100.0

* Actual number of the cases in each substance categories might be lower than total number of exposures because of the fact that there are some cases with multiple exposures to various substances.

The frequency distributions showed that nervous system medications were the most frequent offending agents. Among these, analgesics and antidepressants were responsible for most of the cases, accounting for 15.5 % and 13.5 % of all medication exposures, respectively. Paracetamol was the most commonly ingested medication both among nervous system agents and all medications (445, 22.4 % and 11.8%, respectively). Amitriptyline was the most ingested medication among antidepressants (146, 28.6 % of the antidepressants and 3.9 % of all medications). Musculo-skeletal system medications (470, 12.4 % of all medications, Table 5.7) were the second leading cause of drug exposures, followed by drugs affecting alimentary tract and metabolism (408, 10.8 %, Table 5.7) as well as anti-infectives/ antimicrobials (273, 7.2 %, Table 5.7).

Table 5.7 Summary of medications involved in exposures by categories**

Medications		**No**	**%**
Nervous system	Analgesics	587	15.5
	Antidepressants	511	13.5
	Sedative/hypnotics/antipsychotics/anxiolytics	408	10.8
	Antihistamines	209	5.5
	Psychostimulants	125	3.3
	Anticonvulsants	85	2.2
	Others	59	1.6
	Subtotal	***1,984***	***52.4***
Musculo-skeletal system	Anti-inflammatory and antirheumatic products	373	9.9
	Muscle relaxants	95	2.5
	Others	2	0.1
	Subtotal	***470***	***12.4***
Alimentary tract and metabolism	Drugs for functional gastrointestinal disorders	133	3.5
	Vitamins and minerals	116	3.1
	Others	159	4.2
	Subtotal	***408***	***10.8***
Anti-infectives / antimicrobials		***273***	***7.2***
Respiratory system	Nasal preparations	130	3.4
	Cough and cold preparations	53	1.4
	Asthma therapies	41	1.1
	Subtotal	***224***	***5.9***
Cardiovascular system	Antihypertensives	118	3.1
	Other cardiac therapy	46	1.2
	Subtotal	***164***	***4.3***
Hematopoietic system	Antianemic preparations	80	2.1
	Others	14	0.4
	Subtotal	***94***	***2.5***
Hormones and hormone antagonists		***39***	***1.0***
Others		***127***	***3.4***
	Total	**3,783**	**100.0**

**Percentages are based on the total number of medications (3,783).

The cases were graded according to amount of exposed substances as toxic (1,262, 49.2%), non-toxic (886, 34.5%) and unknown (418, 16.3%). The majority (777, 87.7%) of cases with non-toxic amounts of exposure and 915 (72.5%) of cases with toxic amounts of exposure were clinically asymptomatic. A significant linear correlation was found between grades of exposures and presence of clinical symptoms (χ^2=69.96, p<0.001).

Most of the cases (1,998, 77.9%) reported to DPIC had no symptoms. However minor and moderate symptoms are reported in 16.3% (417) and 3.3 % (84) of the cases, respectively; whereas only a minority of the cases (62, 2.4%) had clinically serious symptoms. The number of asymptomatic cases were significantly higher in females than in males (χ^2=264.84, p<0.001). Most of the intentional exposures (1,351, 80.6%) were asymptomatic, just 19.4 % of them having clinical symptoms. A significant association was found between motivations for exposure and the clinical severity of clinical manifestations (χ^2=22.63, p<0.001).

The recommended treatment methods included activated charcoal (799, 24.5%), supportive care or observation (1456, 44.7%), gastric lavage (490, 15.0%), antidotes (73, 2.2%), skin decontamination (10, 0.3%), mechanical emesis (1, 0.03%) and others (266, 8.2%). No treatment modality was recommended in 5.0 % (164) of the cases. Decontamination methods (activated charcoal, gastric lavage, skin decontamination) were frequently recommended for patients exposed to toxic amounts of substances (1,033, 56.4%) but less for patients exposing non-toxic amounts (131, 13.8%). Besides these, among the recommendations given by DPIC for non toxic exposures, observation of the patients was recommended significantly more than gastrointestinal decontamination (χ^2=356.43 p<0.001, Table 5.8).

Table 5.8 Summary of recommended treatments by amount of exposure. ***
(AC: Activated charcoal, GL: Gastric lavage, SD: Skin decontamination, E: Mechanical emesis)

Recommended treatments	**Amount of Exposure**					
	Toxic		**Nontoxic**		**Unknown**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Decontamination Methods (AC+GL+SD+E)	1,033	56.4	131	13.8	136	28.4
Supportive Care or Observation	586	32.0	663	69.9	207	43.2
Other treatment	212	11.6	155	16.3	136	28.4
Total	1831	100.0	949	100.0	479	100.0

*** More than one treatment might be recommended.

In the series of 2007, there were two fatal cases (0.08 % of all exposures) both of them being from unintentional poisonings. One of these cases was 3 years old girl

who was stung by a scorpion. The other case was 35 years old female who was poisoned by carbon monoxide inhalation (Table 5.9).

Table 5.9 Fatal exposures

Date	Gender	Age	Amount	Severity Score	Outcome	Reason	Substance
09.01.2007	Female	35	Toxic	Major	EX	Accident	Carbon monoxide
17.07.2007	Female	3	Toxic	No symptom	EX	Bite/sting	Scorpion bite

5.3 Discussion

This study analyzed the cases exposed to poisons and medications reported to the Dokuz Eylül University Drug and Poison Information Center (DPIC) in 2007. In Turkey, the data used for previous studies on this subject have been usually obtained from the records of admitted patients in the emergency departments of the hospitals (Hincal et al.,1987; Özköse & Ayoğlu, 1999; Ağın et al., 2002; Göksu et al., 2002; Tufekci, Curgunlu & Sirin, 2004; Akkas et al., 2004; Güloğlu & Kara, 2004; Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005; Akkose et al., 2005; Mert & Bilgin, 2006; Unverir et al., 2006; Akbaba et al., 2007). Although DPIC mainly serves in the Aegean region of Turkey, it also receives phone calls from every city in the country. Therefore, unlike many previous studies, the data has been collected from several sources and was more likely to be representative of the situation across the country.

The vast majority of telephone calls (99.6%) to our DPIC were related to poisonous exposures, followed by the calls for receiving information about some drugs (0.4 %). According to AAPCC report, informative calls about drugs was more frequent in United States (11.1%) compared to that of our report (Bronstein et al., 2008). In the following report, the calls primarily originated from health care facilities, particularly for poisoning incidents constituting 99.6 % of all consultations. More over, most of the calls (99.1 %) were made by physicians. Although residence was the most common site for poisoning incidents in our DPIC, the calls from health

care facilities (97 %) was much more common in this report compared to that of poison centers in United States and Israel (15.6 % and 0.8 %, respectively) (Bronstein et al., 2008; Bentur et al., 2008). The reason for ineffective use of our DPIC by public may be because of the various factors like close localization of the health care facilities to residence area and/or unawareness of DPIC by the public. Although our DPIC serves all Aegean region, most of the calls came from İzmir (73.3 %).

Unlike some of the previous studies (Tufekci, Curgunlu & Sirin, 2004; Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005), in the following report, a seasonal trend was not found although slightly higher numbers of cases were reported in November and December. In our study, the most common route of exposure was ingestion (92.7%) similar to the findings of some other studies from Turkey (Göksu et al., 2002; Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005; Hocaoğlu, Kalkan, Akgün, Çapar & Tunçok, 2007). Similar result has also been reported in other countries (Bronstein et al., 2008; Bentur et al., 2008; Afshari, Majdzadeh & Balali-Mood, 2004; Tran, Thi & Jonas, 2008) .

In a study by Bentur et al. (2008), in 57.1 % of the cases, the time elapsed between exposures and the calls was less than two hours. Similarly, elapsing time was also found to be less than two hours in 51.0 % of the cases in our study. The shorter time periods were detected in children younger than six years-old (2.3 ± 0.2 h). We suggested that accidental exposures were recognized earlier by the parents of children aged less than 6 years unlike that of the intentional exposures in adults. The average number of calls per a day was 7 and most of the calls (54.7 % of all cases) were made in evening hours which would be corresponding to the meetings of family members. Similar findings have already been reported in previous case series from Turkey (Hocaoğlu et al., 2007; Oray et al., 2008).

A female predominance was found among the cases of poison exposure in 2007. Many of the previous studies from Turkey also reported that females constituted the majority of poisonings cases (Tufekci, Curgunlu & Sirin, 2004; Güloğlu & Kara,

2004; Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005; Mert & Bilgin, 2006; Unverir et al., 2006; Akbaba et al., 2007; Hocaoğlu et al., 2007). Although the female-to-male ratio (2:1) in our study was in concordance with the previous studies from our country, this ratio was reported approximately 1:1 in other countries (Bronstein et al., 2008; Bentur et al., 2008; Afshari, Majdzadeh & Balali-Mood, 2004; Tran, Thi & Jonas, 2008). Most of the reported cases in DPIC were adults (54.5%). Similarly, in Iran, Afshari, Majdzadeh & Balali-Mood (2004) reported that poisoning were more common in adults, too. In contrast to these, majority of the poisoned patients was younger than 18 years in United States (Bronstein et al., 2008) and Israel (Bentur et al., 2008).

In our study, intention (suicide attempt, misuse or abuse) was the predominant motivation for the exposures, especially in female cases, in all age groups (65.5%) but not in 0-12 year-old children group. Similar results have been reported in many of the previous studies from Turkey and Iran (Tufekci, Curgunlu & Sirin, 2004; Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005; Akbaba et al., 2007; Hocaoğlu et al., 2007; Afshari, Majdzadeh & Balali-Mood, 2004). However, there are divergent reports from other countries. In the 2007 report of American Association of Poison Control Centers (AAPCC) and in a study from Israel, most of the poisoning exposures (83.2% and 74.4%, respectively) were unintentional in nature (Bronstein et al., 2008; Bentur et al., 2008). In a study from Vietnam, the rate of unintentional exposures was 49.3 % (Tran, Thi & Jonas, 2008). In our study, the rate of unintentional exposures was higher than intentional exposures in 0-12 year-old children. The predominance of intentional cases in Turkey may be explained by the fact that there were fewer calls coming from public in case of unintentional exposures compared to calls from health care facilities which deals with serious poisoning cases, probably exposed to these substances intentionally.

Medications were the most frequent causes of poisoning exposures and accounted for 72.5 % of all cases. This finding is in concordance with the previous studies from Turkey and other countries(Özköse & Ayoğlu, 1999; Ağın et al., 2002; Göksu et al., 2002; Tufekci, Curgunlu & Sirin, 2004; Akkas et al., 2004; Güloğlu & Kara, 2004;

Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005; Akkose et al., 2005; Mert & Bilgin, 2006; Akbaba et al., 2007; Bronstein et al., 2008; Bentur et al., 2008; Afshari, Majdzadeh & Balali-Mood, 2004). Chemicals, metals, cosmetics (4.7 %) and alcohol (4.7 %) were also common causes of exposures, followed by pesticides / rodenticides / herbicides (4.4 %), cleaning products (4.4 %) and mushroom, plants, food (2.5 %). In a previous report from our DPIC, the rate of pesticide exposures were higher than recent findings (8.8 %) (Kalkan, Erdogan, Aygoren, Capar, Tuncok, 2003). This ratio might have been decreased in recent years due to the restriction brought on some pesticides by the Ministry of Agriculture and Rural Affairs. However, in some recent studies from Turkey, still, the rate of pesticide poisoning (18.9 between 34.7 %) was higher than this report (Güloğlu & Kara, 2004; Satar & Seydaoglu, 2005; Seydaoglu, Satar & Alparslan, 2005; Akbaba et al., 2007). The aforementioned studies were done in the hospitals generally located in the southern and the south-eastern regions of Turkey. These regions have vast rural and agricultural areas. In studies by Satar & Seydaoglu (2005) and Seydaoglu, Satar & Alparslan (2005), high rate of pesticide poisoning was explained by the socioeconomic status in these regions and rather easy access to these poisonous substances. Therefore, it was suggested that in Turkey, the type of substances responsible for poisonings may differ from one region to another.

Analgesics were found to be the most common agents in DPIC records, similar to annual AAPCC report in 2007 (Bronstein et al., 2008). In particular, paracetamol was the mostly ingested drug among all other medications similar to results from different countries (Göksu et al., 2002; Hocaoğlu et al., 2007). The high incidence of paracetamol exposures may be due to extensive availability of this over-the-counter medication. In the following report, it was found that antidepressants, especially amitriptyline, were the second leading cause of medication related poisonings. Contrary to this finding, in the studies from different countries, antidepressants were reported to be the 3rd to 12th cause of poisonings with drugs (Bronstein et al., 2008; Bentur et al., 2008; Afshari, Majdzadeh & Balali-Mood, 2004). The higher rate of amitriptyline related poisonings in this report may be the result of the fact that these

medications are widely available and inexpensive as well as being easily obtained from pharmacies without prescription.

Majority of the poisonings cases (77.9 %) had no symptoms at all, indicating similar findings with other studies from Turkey (Hocaoğlu et al., 2007; Oray et al., 2008). However minor and moderate symptoms are reported in 16.3% (417) and 3.3 % (84) of the cases, respectively; whereas only a minority of the cases (62, 2.4%) had clinically serious symptoms. Similarly, in a study from Israel (Bentur et al., 2008), 50.4 % of cases were without any complaint, while 30.9 % minor, 2.8 % moderate and 0.7 % of the cases had major symptoms. In that report, mortality rate was 0.03%. In the following report, the number of asymptomatic exposures in female patients was found to be significantly higher than that of males. Based on this results, it can be speculated that female patients would have been exposed to least toxic substance or amount of toxic substance was less in these patients compared to the male patients in case of intentional poisonings.

In a study by Özköse & Ayoğlu (1999), 69.3 % of their cases were reported to receive activated charcoal. Besides this, gastric lavage and application of specific antidotes were performed as the management methods in 57.0 % and 5.3 % of the cases; respectively. In another study from Turkey by Satar & Seydaoglu (2005), 68.1 % of the patients had not received any treatment at all. While gastric lavage was performed in 24.6 % of patients, 4.8 % received antidotes and 2.5 % used activated charcoal. The AAPCC reported that decontamination procedures were provided in 44.7 % of their cases (Bronstein et al., 2008). In the following report, similar to AAPCC's findings, decontamination procedures were recommended for almost 40 % of the cases (activated charcoal (24.5 %), gastric lavage (15.0 %), skin decontamination (0.3 %), and mechanical emesis (0.03 %)). No treatment methods were recommended in 5.0 % of the cases. More over, non-toxic exposures constituted 34.5 % of all exposures. Our findings demonstrate that high percent of supportive care or observation were recommended for non-toxic exposures (69.9 %). The gastrointestinal decontamination procedures were recommended by DPIC for 13.8 % of non-toxic exposures. Gastrointestinal decontaminations were

recommended for toxic exposures more compared to that for non-toxic exposures. Therefore, DPIC have played an important role for selection of patients undergoing gastrointestinal decontamination procedures following poisoning events, preventing unnecessary gastrointestinal decontaminations.

In this report, there were two mortalities (0.08 %); one of these patients was an adult who died of carbon monoxide inhalation, where as the other case was a child exposed to a scorpion sting. In a study from AAPCC (Bronstein et al., 2008), mortality rate was reported to be 0.05 % of all cases. Our mortality rate must be interpreted as minimum frequency because of the spontaneous reports to DPIC and limited telephone follow up.

Epidemiological data on the poisoning incidents are extremely limited in Turkey. The reports of this kind will give beneficial information to physicians, researchers and executives of health management by enlighting recent situation and characteristics of poisonings events in Turkey. The medications, especially, analgesics and antidepressants were found to be the main causes of poisonings in 2007 DPIC report. Although analgesics and antidepressants are not over the counter medications in Turkey, their easy availability even without prescription, can cause high rate of poisonings. There is a need for a central poisoning data system in order to make extensive studies.

CHAPTER SIX
CONCLUSION AND FURTHER RESEARCH

A statistical information system which was developed for Poison Control Centers (SISPCC) has been presented in this study. At first, basic ideas of information systems and general information about poison control centers have been given. Then, development stages and structure of the developed system have been explained. The software module of the statistical information system and PCC reporting service have been presented in detail. And, the first annual report of the DPIC which has been realized with the use of SISPCC and also researches the etiological, demographical and clinical characteristics of exposures to drugs and poisons reported to the DPIC in 2007 has been finally presented.

The SISPCC consists of two main modules. A database system and software are the first module and they have been developed to store and retrieval data. The database was constituted with Microsoft SQL Server 2005 and the software has been implemented with the use of Delphi 2007 application development tool and it has been code-named “Ruber”. The second module is the Reporting Service of the SISPCC which is a web-based reporting application and has been developed for PCC users. Microsoft SQL Server 2005 Reporting Service was used for implementing the reports. Reporting service is a comprehensive, server based solution that provides an environment for creating a number of different types of reports and enables management interactive web based reports. This web-based reporting application allows authorized PCC users to perform queries and drill-down reports.

Thirty four reports were implemented and deployed to Report Server of the PCC. The reports can be previewed by authorized PCC users. The implemented reports are categorized into five groups in different directories. All of the implemented reports have parameters to specify some criteria that can help to determine the record set returned to the report. The record set returned to the report also can be exported to the various file formats. Most of the reports in the PCC reporting server are matrix reports. Reporting Service, being an essential component of statistical data system

which has been developed for PCC, assists the researchers especially in the retrospective studies. In addition, it facilitates PCC to get detailed or brief information about the cases. Annual Report of the DPIC, 2007 was prepared with the efficient use of the Reporting Service.

Universities performing clinical trials, other health facilities and drug industry can also use and get benefits from the "Statistical Information System for Poison Control Centers". SISPCC can be a reference for promoting health politics on the prevention and management of poisonings. Additionally, health facilities, universities performing clinical trials and drug companies may use SISPCC both as a surveillance reference and an information product. The information will be useful for researchers and statistical analyses. Collected data on epidemiology, treatment and outcomes of poisonings reported to PCC will be used for promoting Health Politics of Turkey on the prevention and treatment of poisonings.

Poisoning incidents are public health problems that are much more common than they were recognized before. The main aim of PCCs which gives the drug and toxic substances counseling service together is to provide effective and safe drug usage and to decrease the morbidity, mortality and cost of treatment in the case of being poisoned by giving right, current, comprehensive and rapid information. According to a study in the USA in 1997 (Miller & Lestina, 1997), each $1 spending on poison information center prevents almost $6.50 medical care expense. It is essentially necessary to increase the awareness and importance given to PCCs in Turkey; thereby it will be lucrative not only for public health and physicians but also for economical benefits.

After transferring the data which has been gathered by DPIC since 1993 into the developed database system, the results were obtained in the extent of the Annual Report of DPIC, 2007. This report analyzed the poison and medication exposure cases reported to the DPIC in 2007. Epidemiological data on exposures in Turkey are extremely limited. The data which have been used for the other previous studies on this area are usually gathered from the patients' records which were admitted to the

emergency departments of the university hospitals. Although DPIC mainly serves in the Aegean region of Turkey, it also receives phone calls from every city in the country. Therefore, unlike many previous studies, the data has been collected from several sources and was more likely to be representative of the situation across the country. Reports of this kind will give beneficial information to physicians, researchers and executives of health management for recent situation and characteristics of poisoning in Turkey. But there is a need for a central poisoning data system in order to make extensive studies, to determine preventive measures and regulations related to poisoning incidents in Turkey.

In addition to the urgent and preventive help which PCCs provide in the case of poisoning, the data which they provide can also be used in many various areas. The researches on epidemiology and outcomes of poisonings reported to PCCs can be used to promote Health Politics of Turkey on the prevention of poisoning incidents. The poisoning profile of Turkey can be constituted. Thus, there is a need for a central poisoning data system in order to make extensive studies, to determine preventive measures and regulations related to poisoning incidents in Turkey. Poison control centers should be constructed and supported by the Ministry of Health to be able to accumulate all poisoning data in one hand and in this way the detailed research studies can be accomplished in poisoning in Turkey with the assistance of national poisoning database system which compiles the information gained from all poison information centers across the country. SISPCC can highly be a reference to develop a national poisoning information system.

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