Orginal Article

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Identifying and Reporting of Unknown Pharmaceutical Drug Poisoning by Qualitative Analysis of Gastric Lavage Specimen of Patients - admitted to Department of Emergency Medicine, KIMS Hospital & Research Centre.

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ABSTRACT

Introduction: Poisoning is an important public health problem causing significant morbidity and mortality throughout the world. The number of poisoning cases increasing worldwide including India. Our study aimed in analyzing the type of pharmaceutical drug consumed as poison in a possibly within a short period of time.

Objectives: Validating the Indian Pharmacopeia and World Health Organization (WHO) standard methods of Analytical Toxicology.

Methodology: A Prospective, Analytical study was conducted on patients admitted to the Department of Emergency Medicine, Kempegowda Institute of Medical Sciences Hospital and Research Centre (KIMSH & RC). The collected gastric lavage was filtered using filter paper and the clear solution was taken for analysis. The colorimetry tests were performed and compared with standards and the results were documented and reported to the Department of Emergency Medicine, KIMS Hospital and Research Centre.

Results: Tests for samples like paracetamol, thyroxin, glibenclamide, metformin, aceclofenac, vitamind3, ferrous-gluconate, levocetirizine were carried out by using colorimetry method, the colour of the samples were compared with the colour of the standards. The methodology and comparison gave true positive result to confirm the unknown pharmaceutical drug present in gastric lavage. Conclusion: Our study used WHO standard methods of Analytical Toxicology and the Indian Pharmacopeia methods to identify the type of pharmaceutical drug consumed as poison. Colorimetry method plays a vital role in reporting the result in short time period by analyzing the type of pharmaceutical drug consumed as intentional poison, using gastric lavage and toxindromes so that the therapy can be started as soon as possible to reduce the percentage of mortality.

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INTRODUCTION

Poison is a substance (solid/ liquid or gaseous), which if introduced in the living body, or brought into contact with any part thereof, will produce ill health or death, by its constitutional or local effects or both. Advances in technology and social development have resulted in the availability of most drugs and chemical substances in the community. These chemical substances pose a significant threat due to their poisonous effect and their extensive use in medicine.[1, 2] Various agents such as pesticides, drugs, house hold products have been used intentionally or accidentally as a poisoning in different countries. Intentional poisoning is increasing worldwide due to change in the life style and social behaviour resulting in mortality and morbidity. The various reasons responsible for Intentional poisoning are distress due to loss in the business, failure in romance or differences with the intimate partner, examination, emotional disturbances, and chronic diseases.[3] Unintentional poisoning involve a young child, adult, old-age people accidentally poisoning themselves without wanting to cause harm to their body. The various bites and stings are also responsible for accidental poisoning.[4] Acute poisoning is exposure to a poison on one occasion or during a short period of time. Chronic poisoning is long term repeated or continuous exposure to a poison where symptoms do not occur immediately or after each exposure. The list of types of poisoning includes: Drug poisoning has become a major health problem worldwide, following lakhs of deaths a year. It is one of the second most common poisoning in India and other countries. It may be intentional or unintentional.[6,10] Colorimetry: Color tests are usually the simplest and quickest chemical test that an analyst can apply to a sample. Most color tests are quite sensitive thus, only minute quantities of sample are necessary to complete a successful test, and often the best results are obtained with the smallest of sample quantities, frequently less than one mg. They are designed to provide an indication of the presence or absence of drug classes in the test sample and quickly eliminate negative samples.

Fig. 1: Violet colour.

Fig. 2a: Glibenclamide.

Fig. 2b: Brownish tinge.

Fig. 2c: Orange red.

Fig. 5a: Blue color

Fig. 3: Royal-blue.

Fig. 4a: Royal blue.

Fig. 4b: Bluish- green.

Fig. 4c: Yellowish-Orange.

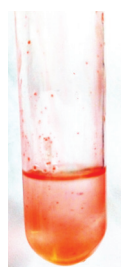
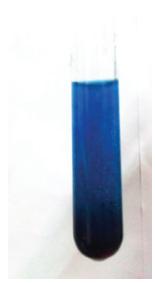


Fig. 5b: Royal Blue colour.



Materials and Methods

Study Design and Duration: A prospective, analytical study for 6 months was conducted on patients admitted to the Department of Emergency Medicine, KIMSH& RC

Source of Data

1. History of consumption of Drugs
2. Prescription & H/O patient by patient attenders.

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Inclusion Criteria

1. Patients admitted to the Department of Emergency Medicine with the consumption of pharmaceutical drug by oral route.

2. Gastric lavage done in KIMS Hospital & Research Centre.

Exclusion Criteria

Patients admitted with other routes of Pharmaceutical Drug poisoning and gastric lavage done in other Hospital and then referred to KIMS Hospital & Research Centre.

Methodology

WHO Standard of Analytical Toxicology methods & Indian pharmacopeia methods were used for carrying out the colorimetry test. Common drugs used for chronic disease, multivitamins and OTC drugs were listed out. The qualitative tests for listed pharmaceutical drugs were carried out and kept as standards for reference. As the patient comes with the history of pharmaceutical drug consumed as poison, data was recorded in a well-designed data collection form, which include relevant data such as, demographic details, type of pharmaceutical drug consumed as poison, time of consumption, if any empty containers or sachets or pills cover and prescription list, first aid done, and its complication. The gastric lavage collected during the stomach wash was sent to the analytical toxicology laboratory. The collected gastric aspirate was filtered using filter paper and the clear solution was used for analysis. The color tests were performed to identify the unknown pharmaceutical drug compound based on toxindromes, and history of patient's data and physician's interpretation. The results were documented and reported to the Department of Emergency Medicine.

Standard Test

1. Aceclofenac

Procedure: Dissolve 10 mg of Aceclofenac in 10 ml of ethanol (95%), and to 1 ml of this solution, add 0.2 ml of a mixture of equal volume of a solution of potassium ferricyanide and a solution of ferric chloride Allow to stand in the dark for 5 minutes, add 3 ml of a solution of hydrochloric acid, and allow to stand in the dark for 15 minutes. A blue color develops and a precipitate is formed.

2. Ferrous Gluconate

Procedure: Shake a quantity of the powdered tablets containing 0.5g of ferrous gluconate with 10ml-of-dilute hydrochloric acid. Filter and add to the filtrate 1ml of barium chloride solution, an opalescence may be produced but no precipitate is formed

Inference: Ferrous gluconate is confirmed.

3. Glibenclamide

Procedure: Dissolve 20mg of sample in 2ml of sulphuric acid (96% w/w), the solution is colourless and exhibits a blue fluorescence in UV light at 365 nm. Dissolve about 0.1g of chloral hydrate in the solution, within 5 minutes the color changes to deep yellow and after about 20 minutes a brownish tinge is produced.

Inference: Glibenclamide is confirmed.

4. Levocetirizine

Procedure: To 20mg of a drug add the mixture of 80% v/v solution of sulphuric acid and 1% v/v of nitric acid, the solution turns in to a bluish greenish color.

Inference: Levocetirizine is confirmed.

5. Levothyroxine

Procedure: To about 50mg of sample in a porcelain dish add a few drops of sulphuric acid (96 per cent w/w), violet vapours are evolved.

Inference: Levothyroxine is confirmed.

6. Metformin

Procedure: Dissolve 25mg of sample in 5ml of water, add 1.5ml of 5M sodium hydroxide, 1ml of 1-naphthol solution and, drop wise with shaking, 0.5ml of sodium hypochlorite solution (3 %) an orange red colour is produced which darkens on keeping.

Inference: Metformin is confirmed.

*7. Paracetamo***l**

Procedure: Add 0.5ml of HCL to 0.5ml of sample, boil for 10 min & cool. Add 1ml of O-cresol solution to 0.2mlof the hydrolysate. Add 2ml of ammonium hydroxide solution, & mix for 5secs, a strong royal blue color develops.

Inference: Paracetamol is confirmed.

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8. Vitamin D

Procedure: Dissolve a quantity containing about 1000 units of vitamin D in 1ml of chloroform and add 10 ml of antimony trichloride solution, a pinkish red colour appears at once.

Inference: Vitamin D is present.

RESULTS AND DISCUSSION

The colorimetry test for sample was carried out and compared with the standard, and the results were documented.

I. Sample 1: Patient A

A female patient (1635745/16) came with a history of oral consumption of 20 tablets, the

before day of admission to the hospital. The patient was given stomach and gastric lavage was collected. Based on history given by patient care taker, toxindromes and physician's interpretation we tested for drugs like paracetamol, glibenclamide, aceclofenac and thyroxin.

Result: The test was shown to be positive for Thyroxin.

Inference: Thyroxin: Violet colour (a.)

II. Sample 2: Patient B

A female patient (55643) came with a history of oral consumption of 35 tablets early morning, on the day of admission to the hospital. The patient was given stomach wash and gastric lavage collected. Based on history we tested for drugs like paracetamol, glibenclamide, aceclofenac, metformin and levocetirizine.

Result: The test was shown to be positive for aceclofenac, glibenclamide and metformin**.**

Inference: **Aceclofenac:** Blue color (a.)

Glibenclamide: Brownish tinge (b.)

Metformin: Orange red(c.)

III. Sample 3: Patient C

A male patient (1651204/16) came with a history of oral consumption of 10 tablets. The gastric lavage collected was collected. Based on history we tested for drugs like paracetamol and cetirizine.

Result: The test was shown to be positive for paracetamol

Inference**: Paracetamol:** Royal-blue(a.)

IV. Sample 4: Patient D

A female patient (69719) came with a history of oral consumption of 38 tablets last night. The gastric lavage collected. Based on history test was carried out on paracetamol, glibenclamide, aceclofenac, metformin, levocetirizine, ferrous citrate or gluconate, vitamin A and vitamin D/D3.

Result: The test was positive for paracetamol, levocetirizine, Vitamin-D3, ferrous Gluconate

Inference**: Paracetamol:** Royal blue (a.) **Levocetirizine:** Bluish- green (b.)

Vitamin D3: Yellowish-Orange (c.) **Ferrous Gluconate**: Red brown colour (d.)

V. Sample 5: Patient E

A male patient (87059) admitted with a history of oral consumption of 10 tablets. The gastric lavage collected, and analysis was done

for paracetamol, aceclofenac & levocetirizine.

Result: The test was positive for aceclofenac and paracetamol.

Inference: Aceclofenac: Blue color (a.) Paracetamol: Royal Blue colour (b.)

The positive results and the negative results are documented and reported to the physician and department of emergency medicine. This technique or process of analyzing the unknown pharmaceutical drugs present in gastric lavage of patient, helps in starting of therapy soon, thereby helping in reducing mortality and morbidity. The method which we followed in our laboratory was very simple, easy to determine, or easy to carry out, with less time consuming, easy to differentiate, with few lab technicians.

CONCLUSION

Though there is an improvement in the therapeutic patterns, health care professionals are not able to reduce morbidity and mortality caused due to poisoning, because it is difficult to identify the type of poison consumed by the patient. Hence, there is a greater need to find the

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ways to identify the type of poison. Our study used, Indian Pharmacopeia and WHO standard methods of Analytical Toxicology to identify the type of pharmaceutical drug consumed intentionally or unintentionally as poison, analysis of the type of poison consumed, with the help of gastric lavage possibly with a short time period, helps in starting the therapy as soon as possible to reduce the percentage of mortality.

LIMITATIONS

1.The study period was very short to carry out sample analysis. 2.The gastric aspiration taken during stomach wash was very less, due to which multiple pharmaceutical drug analysis was unable to carry out. 3.Few patients admitted with history of pharmaceutical drug poisoning were already done stomach wash in other hospital. 4.This method is just a preliminary analysis, which helps in eliminating large number of drugs and for confirmation other methodology must be adopted.

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