Original Research Paper

Biochemistry

A STUDY ON BIOCHEMICAL PROFILE OF PATIENTS AT A RURAL TEACHING HOSPITAL.

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ABSTRACT

Background: Laboratory investigations are an important and reliable tool for proper diagnosis and treatment, carried out to confirm the findings or to estimate the aetiology. It is only an aid and has to be interpreted in its true essence for the medication to be effective to the fullest.

Objectives: To study the biochemical profile of patients admitted in a tertiary health care centre.

Study Design: A Retrospective Study.

Setting: Central Clinical Laboratory of MIMER Medical College, Talegaon Dabhade, Pune and Department of Biochemistry, MIMER Medical College, Talegaon Dabhade, Pune.

Data Sources and Analysis: Biochemical laboratory investigation results of 1525 IPD patients were obtained and analysed for abnormal findings.

Results: The diagnostic yield of various tests were calculated. About 76.52 % of the patients were detected with deranged values. The biochemical parameters with highest diagnostic indices were Fasting Blood Glucose, Serum Direct Bilirubin, Serum Chloride and Serum Aspartate Transaminase (SGOT). To the contrary, Serum Proteins showed the least diagnostic index.

Conclusion: Laboratory investigations do assist a clinician in proper diagnosis, treatment and prevention of any illness or complications arising out of it. But unnecessary investigations must be ruled out in order to reduce the expenditure, man power and machinery damage due to overload.

KEYWORDS : Routine Laboratory investigations, Diagnostic Yield.

INTRODUCTION

The aim of this study was to determine the diagnostic yield of various biochemical laboratory investigations conducted in a tertiary health care centre. A retrospective study-cum-analysis was done to determine the abnormal findings from the investigations carried out. A Laboratory Test/Investigation is a procedure in which a body fluid or tissue sample is examined to get information about a person's health. [1]. Advances in science and technology have spawned a bewildering array of very useful and sophisticated tests that help us to confirm our diagnostic suspicions. [2].

Laboratory investigations are recommended for the following purposes:-

1) Diagnosis: The test has to be positive in a population with the disease and negative in those who are not affected by it.
2) Monitoring: The test is carried out in order to assess the therapeutic effect of the drug/s administered.
3) Screening: The test is done to detect a disease in its presymptomatic stage to avoid the ill-effects arising out of it. [3]

Specificity and sensitivity are two vital elements of a laboratory test. Sensitivity is the ability of a test to identify the particular disease whereas, specificity is the ability to identify the patients affected with the disease. [4]

Most commonly, blood sample is analysed to detect the biochemical profile of patients. The serum, separated from the blood, is the most important constituent for various enzymes, electrolytes and other parameters.

METHOD AND MATERIAL

The Central Clinical Laboratory (CCL) of MIMER Medical College, Talegaon Dabhade, Pune, carries out approximately 6 lakh investigations in a year. About 55% of these are of the in-house patients of the hospital. This study was conducted in this laboratory and the department of Biochemistry amongst patients admitted in the hospital during a period of two months in the beginning of the year 2017.

The CCL has an electronic database 'HMS' to maintain the records of all investigations that are conducted here and is also supported by a Clinical Decision Support System to assist in patient's automated data entry and retrieval of assessed criteria. Each in-house patient is allotted a unique nine (9) digit IPD number that is used to maintain the records of medical treatment, lab investigations and bills. The diagnosis of all the patients are also recorded and stored.

For this study, we pre-selected one suitable day of a week (Wednesday) so as to obtain samples without any bias. A list of biochemical parameters with their reference range was prepared and the results of selected patients were recorded. The abnormal findings were then found and the diagnostic yield of each parameter was calculated according to the given formula.

Diagnostic Yield = Number of abnormal findings / Total number of individuals x 100

RESULTS

The most common illnesses for which a laboratory investigation was ordered and carried out were hypertension, upper respiratory tract infection, carcinomas, fractures, gastritis, trauma, viral fever, bronchitis, urinary tract infection, calculi, preterm labour, dengue, lipoma, anaemia, spondylitis, CHF, hernias, COPD, Koch's Disease, diabetic foot, etc. The commonly tested biochemical parameters and reasons to detect their values were obtained. A total of 1525 IPD patients (Males -792 and Females – 733) were chosen to conduct this survey. Their biochemical parameter values were recorded in a tabular format for easy analysis. The reference range for the parameters selected for this study are listed below. (Table 1).

Table 1: Biochemical Investigations, their reference ranges and type of investigation along with common indications.

INVESTIGATION	REFERENCE RANGE	TYPE OF INVESTIGATION AND COMMON INDICATIONS
Blood Sugar (Fasting)	70 – 100 mg / Dl	Screening, Diagnosis and Monitoring
Blood Sugar (Random)	Upto 200 mg / dL	(Diabetes Mellitus, Stroke, Hypertension,
Blood Sugar (Post – Prandial)	Upto 140 mg / dL	Hypoglycaemia, Malnutrition)

| Blood Urea	15 – 40 mg /dL	Diagnosis and Monitoring (Renal failure, Sepsis, Uraemia, Shock)
Serum Creatinine	0.6 – 1.2 mg /dL	Diagnosis (Poisoning, Hematemesis)
Serum Proteins	6 -8 g / dL	Diagnosis (Malnutrition, Multiple myeloma)
Serum Total Bilirubin	Upto 1 mg / dL	Diagnosis and Monitoring (Hepatic
Serum Direct Bilirubin	Upto 0.3 mg / dL	disorders, Jaundice, Gall bladder diseases)
Serum ALT	0 - 40 IU / L	Diagnosis and Monitoring (Hepatic Dysfunction)
Serum AST	5 – 35 IU / L	Diagnosis and Monitoring (Cardiac Disorders)
Serum Alk. PO4	15 – 112 IU / L	Diagnosis (Hepatic and Bone Disorders)
Serum Sodium	135 – 145 mmol / L	Screening and Diagnosis (Drug monitoring Dehydration, Oedema, Diuresis)
Serum Potassium	3.5 – 5 mmol / L	Screening and Diagnosis (Drug monitoring, Dehydration, Diabetic Ketoacidosis)
Serum Chloride	95 – 105 mmol / L	Screening and Diagnosis (Drug monitoring, Fluid imbalance, Oedema)

About 1167 patients, i.e. 76.52 % of the total sample size showed deviations from the normal values. Males were found to have more deranged values than females by a great extent. (Figure 1).

Figure 1: Gender – based analysis of the sample size.
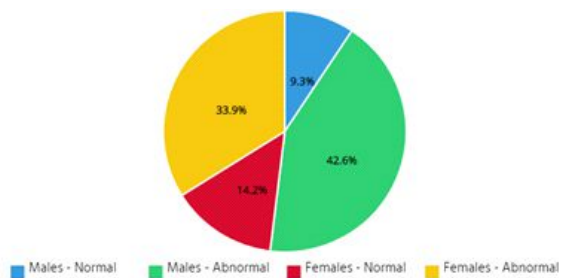
Amongst the 14 different biochemical parameters tested, only a few turned out to give better diagnostic yield. (Figure 2). This points out the need to improve the knowledge to select only the required parameters for diagnosis and to avoid unnecessary wastage of time, efforts, man power, machinery and socioeconomic implications.

Figure 2: Investigations and their values reflecting the Diagnostic Yield.
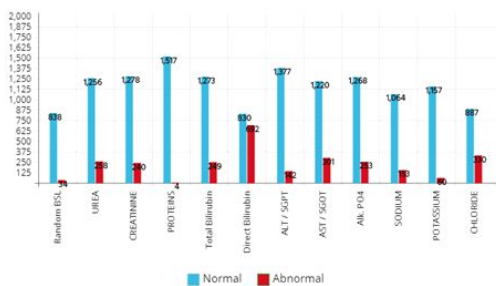
Moreover, certain biochemical indices showed a significant diagnostic yield – Fasting Blood Sugar (54.28%), Serum Direct Bilirubin (45.46%), Serum Chloride (27.11%) and Post-Prandial Blood Sugar (26.53%). To the contrary, Serum Proteins (0.26%), Random Blood Sugar (3.90%) and Serum Potassium (4.93%) had the least values of diagnostic yield. All the biochemical parameters recorded with their diagnostic yield are shown below. (Table 2).

Table 2: Biochemical parameters and their diagnostic yield.

INVESTIGATION	TOTAL DIAGNOSTIC YIELD (%)
Blood Sugar (Random)	3.90
Blood Sugar (Fasting)	**54.28**
Blood Sugar (Post-Prandial)	26.53
Blood Urea	17.04
Serum Proteins	**0.26**
Serum Creatinine	15.81
Serum Total Bilirubin	16.36
Serum Direct Bilirubin	**45.46**
Serum ALT	9.35
Serum AST	19.79
Serum Alk. PO4	16.63
Serum Sodium	12.57
Serum Potassium	**4.93**
Serum Chloride	27.11

DISCUSSION

Laboratory investigations are very much essential in the diagnosis and management of many conditions. However, they may not provide clinical value in every scenario. [5] Through this study, we have confirmed that laboratory investigations are an inseparable part of a complete medical treatment. Sometimes, it do occur that some tests fail to indicate any abnormalities in spite of promising complaints of the patient. The efficiency of the tests are devaluated by such minute occurrences. However, the laboratory investigations are an unavoidable tool in monitoring the therapeutic effect in patients undergoing specific medication and indicate the progress or the need to change to alternative treatment.

It is a point of grave concern that inappropriate and unnecessary laboratory investigations cause a burden and increase in the expenses which pose a trouble to the patient.

Population worldwide are getting older with a growing need for more sophisticated healthcare techniques. Innovations in technology are leading to new and expensive diagnostic and therapeutic methods and options which will lead eventually to a greater rise in healthcare costs. [6]. According to a study conducted in 2005 by three authors, it was found that laboratory investigations contribute to about 10 % of the cost of treatment. This can be made effective by ordering for only the appropriate tests in order to make sustainable utilization of all resources. [7].

CONCLUSION

This study has revealed that Fasting BSL and Serum Direct Bilirubin had the highest probability of being detected abnormal thus pointing towards to its high prevalence in common disorders. To the contrary, Serum Proteins and Serum Potassium indicated least deviation from normal levels rendering it less efficient towards diagnosis. Moreover, about 23% of the total tests conducted fail to detect even any of the slightest variations. The major reason behind this is the irrational way of ordering tests by junior medical staff without considering the proper protocol and relevance of the underlying condition. It has a serious impact of passing down this practice amongst newly joined staff and technicians and thereby, cause a decline in the diagnostic yield.

Laboratory investigations have thus been proved to be an inseparable part of medication. The prompt use of these can lead to easy diagnosis and efficient treatment of any illness. The clinicians must improve their knowledge and practical skills to order only for the relevant tests and extract its true essence. Moreover, this would lead to a decreased loss of valuable resources. Thus, a sense of appropriate laboratory tests should be inculcated in all the medical personnel.

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