ejpmr, 2015,2[5], 1123-1129

SJIF Impact Factor 2.026

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 3294-3211

EJPMR

DIAGNOSTIC YIELD OF BIOCHEMICAL INVESTIGATIONS: IMPLICATIONS

Ashima Badyal*

Demonstrator, Department of Biochemistry, Government Medical College, Jammu, J&K State, India- 180001.

Article Received on 17/07/2015 **Article Revised on 08/08/2015** **Article Accepted on 01/09/2015**

***Correspondence for Author**

Ashima Badyal

Demonstrator, Department of Biochemistry, Government Medical College, Jammu, J&K State, India- 180001.

ABSTRACT

Laboratory tests are important elements of medical practice. Overuse of clinical chemistry investigations has implications for the patients, physicians and also to the laboratory. Effective use of clinicians and the clinical laboratory has great implications on the cost and operational efficiency of the hospital. This study aimed at determining the yield of simple clinical biochemistry investigation across different test-ordering categories.The study was conducted in the main lab of the Department of Biochemistry, Government Medical College and Hospital, Jammu. A total of more than one lakh investigations are performed in a single month, out of which, an average of thirty thousand investigations are performed in the Main Lab itself. Out of the 12 types of clinical chemistry investigations ordered, serum sodium, serum potassium, serum creatinine, serum bilirubin, total protein had low diagnostic yield, while serum uric acid, serum alp, serum alt, serum urea had intermediate diagnostic yield ranging from 36.1% to 44.7% . Serum AST with the diagnostic yield of 64.3% was the highest. Amongst all,serum uric acid with a total of 2370 investigations (3.9% of total investigations) had a relatively high diagnostic yield of 36.1 %. The overall/average diagnostic yield of all popular tests taken together came out to be 31.9%.This study has conclusively proven that the diagnostic yield of major investigations in a hospital lab are invariably low. There is a need to develop protocols for ordering specific clinical chemistry results.

KEYWORDS: Clinical chemistry, diagnosis, yield, biochemical.

INTRODUCTION

Large amount of knowledge generated by clinical biochemistry is now being accepted by clinical practice across medical and surgical discipline.[1] Multiple factors contribute to the inappropriate utilization of laboratory services by patient care physicians, even at teaching hospital. Laboratory tests accounts for an estimated 10% of total cost of health care.[2] The volume of tests performed by clinical laboratories has been rising by 10% to 15% or more each year for the past 20 years.[3]

Laboratory test can be broadly classified as screening test, diagnostic tests and tests required for disease monitoring. Screening tests are used in the population who donot necessarily perceive they are at risk and where identification of a disease condition much earlier than its clinical manifestation could possibly alter the natural history of the disease. On the other hand, symptomatic individuals with some pre-test probability of the disease, undergo diagnostic tests in amanner that the tests significantly rule-in or rule-out the condition. Disease monitoring investigations are usually done at periodic intervals to determine the effectiveness of the treatment, or progression of disease, thus each test is ordered for a particular individual to answer a specific question. Virtually junior medical staff in teaching hospital orders maximum diagnostic tests and their test ordering behaviour is largely determined by protocols or routines that they have developed without consideration of efficient use of laboratory tests. These protocols then are passed on to successive batches of residents and serve as major source of education for the house staff in laboratory testing.[4]

The idea evolved out of the study of the pattern of the test ordering by the treating physicians and their residents and the continuous complaint of our senior laboratory staff. Even our personal lookover the data registered in our laboratory was not up to the mark. The idea then took the form of a study to determine why a particular test was ordered and the proportion of test results which yielded an abnormal value.

MATERIALS AND METHODS

There are four running Biochemical Clinical laboratories under our hospital, namely: Main lab (in the Biochemistry Department), Emergency lab, labs in Super Speciality Hospital and SMGS Hospital, both associated with our medical college, Jammu, India. A total of more than one lakh investigations are performed in these labs in a single month, out of which, an average of thirty thousand investigations are performed in the Main lab itself, hence the study was conducted in main clinical lab Department of Biochemistry, GMC, Jammu for a period

of 2 months,with the consent of Hospital Administration and laboratory in-charge, producing a big sample size for this study.

Source of Data

In-patients of the various departments of the hospital constituted the major source of data for the present study. A 'Daily Investigations Record Register' (DIR) was maintained in the Department to record the results (all the investigations being conducted in the Main Lab of the Department every working day).

Data Abstraction

The most common investigations being performed by the lab were identified and enlisted. The possible reasons for ordering the tests were also identified from the information available from the case-sheet and the treating physicians' comments (Table 1). A data chart was prepared for the whole sample of patients for the two months, i.e. May and June 2015, and fed on an Excel Sheet to derive all the relevant statistical results for the study.

Table 1: List of investigations with possible reasons for their ordering.

Investigations	Reference Range	Reasons	Types
Serum Glucose	70 to 160 mg/dl	Screening for diabetesmellitus (age>35 years) Known diabetic patients Preoperative assessment	Screening , Diagnosis, Monitoring
Serum Urea	15 to 40 mg/dl	Renal Failure	Screening
Serum Creatinine	0.6 to 1.4 mg/dl	Sepsis, Metabolic Cause, Renal failure	Screening, Diagnosis, Monitoring
Serum Uric Acid	2.5 to 7.0 mg/dl	Cardiac Patients, Gouts, Arthritis	Screening, Diagnosis, Monitoring
SerumSGPT/ALT	30 to 65 IU/L	Hepatitis, Alcoholic liver disease	Screening
SerumSGOT/AST	15 to 35 IU/L	Cardiac Diseases, Jaundice	Screening, Diagnosis, Monitoring
Serum Total Protein	6.4 to 8.2 g/dl	Renal Failure, Malnutrition	Screening, Diagnosis, Monitoring
Serum Albumin	3.4 to5 g/dl	Renal Cause, Intoxication, Burn	Screening, Monitoring
Serum ALP	50 to 135 IU/L	Liver Diseases	Screening, Diagnosis, Monitoring
Serum Na^+	130 to 150 meq/l	Acid base balance	Screening, Diagnosis, Monitoring
Serum K^+	3.5 to 5.5 meq/l	Acid base balance	Screening, Diagnosis, Monitoring
Serum Bilirubin total	0.2 to 1.0 mg/dl	Jaundice	Screening, Diagnosis, Monitoring

RESULTS AND DISCUSSION

We performed a descriptive statistical analysis of the collected data. Diagnostic yield of a test was defined as the proportion of abnormal test results among all the tests ordered, and was expressed in percentage. Based on the yield of the test (Table 2), investigations were classified as low yield (0 to 33%), intermediate yield (34 to 66%), and high yield (67% and above).[5] The specific reasons for ordering the test were also described and the reasons were further sub- classified into screening, diagnostic and treating monitoring categories. The classifications were performed as a part of post – hoc analysis.

Table 2: Yield of individual investigations.

Sr No	Investigation	Total No of Investigations	Abnormal Results	Yield %
1	Serum Glucose	6070	1866	30.7
2	Serum Urea	6392	2854	44.7
3	Serum Creatinine	6448	1248	19.4
4	Serum Uric Acid	2370	856	36.1
5	SGPT/ALT	5736	2482	43.3
6	SGOT/AST	5776	3712	64.3
7	Serum Total Protein	3782	866	22.9
8	Serum Albumin	3616	1128	31.2
9	Serum ALP	5536	2242	40.5
10	Serum Na^+	5226	724	13.9
11	Serum K^+	5214	508	9.7
12	Serum Bilirubin total	5034	1008	20
	Total:	**61200**	**19494**	**31.9**

A total of 61200 tests were evaluated. Serum glucose, serum urea and serum creatinine were the most common tests ordered in 6070 (10%), 6392 (11%), 6448 (11%) cases respectively.Out of the 12 types of clinical chemistry investigations ordered, serum sodium, serum potassium, serum creatinine, serum bilirubin, total protein had low diagnostic yield ranging from 9.7% to 22.9%. Most of these investigations are used for screening purposes. Other important tests in the low yield group were serum glucose and albumin having diagnostic yield of 30.7% and 31.2% respectively.

The investigations of serum uric acid, serum alp, serum alt, serum urea had intermediate diagnostic yield ranging from 36.1% to 44.7%, while serum AST with the diagnostic yield of 64.3% was higher among the intermediates. The proportion of tests ordered without specific reason was quite high for the above all types of investigations. Amongst all,serum uric acid with a total of 2370 investigations (3.9% of total investigations) had a relatively high

diagnostic yield of 36.1 %. The overall/average diagnostic yield of all popular tests taken together came out to be 31.9% (Table 3).

Table 3: Overall yield of investigations by test ordering category

Number of tests ordered (% of total)	Number of abnormal tests	Percent yield
61200	19494	31.9%

Physicians order laboratory tests primarily to screen for unsuspected disease, to establish or to exclude a diagnosis, to indicate aprognosis to select the most appropriate therapy and to monitor therapy.[6] Often the tests are ordered to confirm previous results and for medico-legal purposes. However, the cognitive process involved in the ordering of the clinical chemistry tests is complicated.[7] Firstly, behaviour may exist in different physicians and their residents. Overall, when tests were ordered for unspecified reasons or for 'just in case' scenario, they had the lowest yield. Secondly, most clinical chemistry test are ordered unsupervised by medical residents and senior consultants orthe tests ordering behaviour is passed from one generation of residents to another, and itbecomes more of a mechanical process rather than a thoughtful one.[8] Overuse of clinical chemistry investigations has implications for the patients, physicians, and also to the laboratory. A recent study on the use of laboratory in the teaching hospital points to the clinical laboratory as a major contributor to today's hospital costs. Furthermore, follow up laboratory studies are often excessive.[9]

Most of the investigations constitute an out-of-pocket expense for the patients and tend to increase the overall cost of medical treatment. Sometimes patients may demand test performance regardless of price as a result of broad insurance coverage and the need for reassurance.[10] Sometimes, physicians believe that patients are impressed by the performance of numerous tests of order of test ordering to allay patient concerns or to completely work as a patient to satisfy or impress supervisors or peers.[11] Overuse of tests may be defensive practice behaviour on the part of a physician but a higher number of asymptomatic abnormal test result make the patient management more confusing as well as challenging. Screening profile test can produce unexplained, abnormal results that generate additional work even though the data may represent only extreme values in healthy individuals. Additional test request can be justified if results enhance diagnostic accuracy or improve patient management. Overutilization or misutilization of laboratory data occurs when irrelevant or repeat laboratory testing is ordered or when tests results are ignored. Laboratory often get

overburdened with clinical chemistry tests and this could have a bearing on overall quality of functioning.[12]

CONCLUSION AND FUTURE PERSPECTIVES

This study has conclusively proven that the diagnostic yields of major investigations in a hospital lab are invariably low. The problem is real and common to all such labs, requiring an urgent consideration. There is a need to develop protocols for ordering specific clinical chemistry results, so as to optimally use the resources especially in resource poor countries. Such an effort not only requires effective communications between the laboratory and clinicians but also requires efforts to educate the treating physicians, especially in the formative training areas.

REFERENCES

1. Devlin TM, ed (2010). Textbookof biochemistry with clinical correlations. 7th edition, New York: John Wiley. A Studenttextbook that focuses on medical biochemistry and its link into a clinical issues, p. 1240.
2. Fineberg HV. The high cost of low cost diagnostic tests. In:AltermanSH ,Blendon R (eds). Medical Technology: The culprit behind health care costs?,Publication (PHS) 79-3216. US Dept of Health, Education and welfare.1979, p. 144-165.
3. Benson ES. The responsible use of the clinical laboratory. ClinBiochem., 1986; 19(5): 262-70.
4. Wong ET, Margaret M, Seth T, Shaw Jr. Ordering of laboratory tests in a teaching hospital. JAMA., 1983; 249: 3076-80.
5. Pal PS, Joshi R, Reddy MVR, Jain AP. Diagnostic Yield of Simple Biochemical Investigations amongst Medical Inpatients in Teaching Hospital. JMGIMS., 2009; 14: 42-6.
6. Murphy J, Henry B. Effective utilization of clinical laboratories. Hum Pathol., 1978; 9: 625-33.
7. Psycher T, Daly J. The pediatric office laboratory.A look at recent trends. PediatrClin North Am., 1989; 36: 1-28.
8. Conelly D, Steele B. Laboratory utilization problems and solutions: Arch Pathol Lab Med., 1980; 104: 59-62.
9. Eisenberg J. Doctors Decision and the cost of medical care. Ann Arbor, MI: Health Administration Press, 1986.

10. Eisenberg JM, Myers LP,Pauly MV. How will changes in physician payment by medicare influence laboratory testing. JAMA., 1987; 258: 803-8.
11. Angell M. Cost containment and the physician. JAMA., 1985; 254: 1203-7.
12. Benson ES. Initiatives towards effective decision making and laboratory use. HUM Pathol., 1980; 11: 440-48.