

Research Article**Assessment of the Need for Incorporation of Clinical Biochemistry Training during Internship****Dr Priti V Puppalwar^{1*}, Dr Arun K Tadas², Mahendra Pakhale³, Dr Prakash Kute⁴, Dr Trupti Ramteke⁵, Dr Harshal Pachpor⁶**¹Associate Professor, ²Prof and Head, ^{3,4,5}Assistant Professor, ⁶Postgraduate student Department of Biochemistry, SVNGMC, Yavatmal, Maharashtra***Corresponding author**

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Abstract: Clinical biochemistry is a clinical and diagnostics subject, which aims to put forward, improve and use standard diagnostic methods, to monitor disease development and treatment by biochemical methods. In order to avoid preanalytical and post analytical errors in the samples for analysis, proper training regarding sample collection, time of collection, management of sample reaching to the laboratory within time, proper data entry is essential for interns. Hence this study was carried out with the aim to assess the need for incorporation of clinical biochemistry training during internship. Study was carried out at, Shri Vasanttrao Naik Government Medical College (SVNGMC), Yavatmal in department of biochemistry after obtaining clearance from institutional ethical committee. Questionnaire was prepared and distributed to Clinicians and Interns chosen by systematic random sampling method. Most of the faculties suggested at least 15 days posting altogether in Biochemistry, Pathology and microbiology by rotation. Thus proper training before the beginning of internship training in various clinical departments will help in lowering of laboratory errors. Further studies in more institutions and on larger sample sizes are needed.**Keywords:** Clinical biochemistry, Internship.

INTRODUCTION

Medical Biochemistry is a paramedical course taught in first year MBBS. It is related to human health and disease. Its applicative arm is clinical biochemistry, a field that focuses on the methodology and interpretation of chemical tests performed to support diagnosis and treatment. In this course, MBBS students are taught about the chemistry of structures comprising human organisms, key chemical processes in the human body, nutrition and metabolism, integrative aspects of metabolism, water and electrolyte homeostasis, acid base balance, function tests of liver, kidney, thyroid, elements of molecular biology etc.

First MBBS duration is just of one year. Hence few topics in spite of their practical relevance are taught relatively superficial. Water and electrolyte homeostasis, acid base balance topics are relatively superficially treated in biochemistry inspite of their practical relevance and, their teaching in medicine in the final year MBBS mostly involves the management part, so basic biochemical knowledge of these topics remains obscure. Hence reorientation of such practical topics during internship is imperative.

An intern is posted in all the clinical departments of the hospital on a rotation basis. This gives him the basic clinical experience in all the disciplines of medicine so as to make him capable of working as a general physician. During this period intern is supposed to learn about sample collection, transportation of sample to the laboratory, procedure and interpretation of bed side tests, interpretation of results of laboratory tests, diagnosis and management of various diseases, under the guidance of Physician or Surgeon.

Clinical biochemistry is a clinical and diagnostics subject, which aims to put forward, improve and use standard diagnostic methods, to monitor disease development and treatment by biochemical methods. Clinical biochemistry helps to make diagnosis, choice of treatment and prophylactic methods easier. It is one of the most important parts of laboratory diagnostics together with laboratory haematology, immunology, clinical serology and microbiology, clinical toxicology. It possesses the largest number of diagnostic tests that help understand pathogenesis and aetiology of different pathological processes.

The commonest causes of errors in the total testing process as compiled by Plebani is as follows Pre-pre analytical (46%-68%), Preanalytical(3%-5%), Analytical(7%-13%), Post analytical (13-20%), Post-post analytical(25-46%) [1]. Thus the maximum errors occur in pre-pre analytical, preanalytical, post analytical and post-post analytical phases.

Following are the Pre-pre analytical and Pre-analytical laboratory errors

- 1. Inappropriateness of test request:** Only certain tests are necessary for emergency care and therefore knowledge of emergency and routine tests is must for the intern to limit the unnecessary load of routine tests during night to the laboratories.
- 2. Patient identification:** Correct identification of patient and specimens is a major concern for Laboratories. Proper labelling of request forms and specimens is must for proper identification of patients and specimens. Mislabeling leads to wrong results.
- 3. Patient preparation:** Laboratory tests are affected by many factors, such as recent intake of food, alcohol, or drugs, and smoking, exercise, stress, sleep, posture during specimen collection, and other variables. Proper patient preparation is essential for the test results to be meaningful.
- 4. Specimen collection:** The technique used to acquire specimen affect many laboratory tests. For example prolonged tourniquet application causes local anoxia to cells and excessive venous back pressure. The anoxia causes small solutes (potassium) to leak from cell.
- 5. Specimen transport:** Preanalytical errors like haemolysed sample, thawed specimen etc may occur during transport of specimens from ward to laboratory [1, 2]

Following are the Post analytical laboratory errors

Erroneous validation of analytical data, failure in reporting /addressing the report, excessive turn-around-time, improper data entry and manual transcription error, failure/delay in reporting critical values.

In order to avoid preanalytical and post analytical errors in the samples for analysis, proper training regarding sample collection, time of collection, management of sample reaching to the laboratory within time, proper data entry is essential. All these above jobs are usually carried out by interns.

So this study was undertaken with the aim of finding the significance and need for incorporation of clinical biochemistry training during internship.

Aims and objectives

To assess the need for incorporation of clinical biochemistry training during internship

MATERIAL AND METHODS

Method of data collection- Questionnaire

Study design

Study was carried out at, Shri Vasantrao Naik Government Medical College (SVNGMC), Yavatmal in department of biochemistry after obtaining clearance from institutional ethical committee.

Questionnaire was prepared after discussion with faculties of Biochemistry and other preclinical and clinical departments and validated by senior faculties.

Study Group

Clinicians and Interns were chosen by systematic random sampling method. From each clinical department two clinicians were chosen randomly. Out of 80 interns every second intern was chosen for the study.

With prior consent feedback was obtained from Interns posted in various departments and faculties of Clinical departments at SVNGMC, Yavatmal using Likerts scale.

Inclusion Criteria

Medical faculties and interns at SVNGMC, Yavatmal.

RESULTS AND DISCUSSION

Biochemistry by definition is the chemistry of life and life is a system of cooperative enzyme catalyzed reactions. Understanding life in molecular terms is quite absorbing. The relevance and importance of the subject in Medicine should be clearly identified. Teaching of biochemistry presently followed in Medical Colleges deals, generally with the chemical and structural details of biomolecule and their metabolic fate with very little or no discussion on the physiological or pathological relevance. The beauty of the subject lies not in the fact that something occurs but in why it occurs. Understanding why? makes the subject lively [3].

Training of internship is aimed at correct practical application of the knowledge gained during MBBS course. It helps students in adjusting from college to full-time employment. Good working habits during internship will not only make a good doctor who understands the importance of ordering appropriate investigation, specimen/patient identification, proper techniques of specimen collection and transport in order to avoid preanalytical errors.

Investigations have relevance with disease process and outcome was strongly agreed and agreed by 96% of interns and 67% of faculties. 88% of interns strongly agreed and agreed that clinical biochemistry has relevance in clinical practice. These findings are in accordance with Independent Review of NHS Pathology Services [4] which describes the clinical

importance of biochemical tests being used for the investigation, diagnosis (eg. Diabetes mellitus), prognosis (eg. Measurement of plasma cholesterol concentration for determining risk of coronary artery disease, serial measurement of plasma creatinine concentration in renal disease can be used to indicate when dialysis may be required), monitoring (eg. Hypothyroid patients on thyroxine replacement therapy the need for measurement of thyroid function or measurement of drug level in patients taking potentially toxic treatment) and screening of patients(eg. Mass screening of all new borns for inherited metabolic disorders, such as phenylketonuria (PKU).

56 % of faculties agreed while 50 % of interns strongly agreed and agreed, 21% were neutral and 28% disagreed upon Clinical Biochemistry components taught in first MBBS were too early.

Regarding ability of interns to describe effect of various drugs on metabolic pathways and enzymes, 44% of faculties disagreed, 33% agreed and rest were neutral, while 38% of interns disagreed and strongly disagreed.

67% of faculties and 61% interns disagreed and strongly disagreed that interns are able to mention the time period within which the specimens should reach the laboratory from the ward.

On asking that whether the fundamentals of various metabolic processes, keeping an eye on investigation and diagnosis should be revised during internship, 78% of faculties and 68% of interns agreed and strongly agreed while 22% disagreed over it.

Whether interns are able to tell the normal range of common analytes, 78% of faculties and 40% interns agreed and strongly agreed, 18% interns gave neutral response while 42% disagreed and strongly disagreed. Ability to interpret common clinical and laboratory data being one of the specific learning objectives of Internship training, knowledge of normal range of common analytes is must for the interpretation of the test results [5].

Regarding ability of intern to pinpoint the diagnostic tests for specific disease 44% of faculty agreed and 44% disagreed while 89% of interns agreed and strongly agreed. As interns are future practitioners, they should be able to advice specific tests for diagnosis of diseases and if not it will unnecessarily increase the load on patients pocket.

67% of faculty disagreed and strongly disagreed whereas 40% of interns agreed and strongly agreed, 25% gave neutral response while 36% disagreed and strongly disagreed on the ability of interns to describe the metabolic and molecular level of disease process and accordingly advice the diagnostic tests

(Table1, 2). Biochemistry possesses the largest number of diagnostic tests that help understand pathogenesis and aetiology of different pathological processes. Information, obtained by biochemical tests help to evaluate the development of pathological process on molecular, cellular and organ level. It is essential for early diagnosis of a disease and also assessment of its therapy efficacy.

Opinion about ability of intern to describe the effect of circadian rhythm on certain parameters and hence affect of time of collection of specimens on those parameters 56% of faculties gave neutral opinion while 33% disagreed, while 50% of interns disagreed and strongly disagreed. Certain biochemical parameters for example hormones show diurnal variations, hence time of collection of specimen for hormonal analysis should be meticulously followed.

On asking whether Interns can perform and interpret common bed side tests of clinical biochemistry, 78% of faculties agreed and 67% of interns agreed and strongly agreed. Performing few bed side tests like Benedict's test in urine of patients with diabetes mellitus or in stool for detection of lactose intolerance in infants, benzidine tests for presence of occult blood in stool helps in quick diagnosis of these conditions even in absence of full fledged laboratories.

67% of faculties agreed and 60% of interns agreed and strongly agreed that Interns are able to carry out patient preparation before specimen collection.

66% of faculties and 76 % of interns agreed and strongly agreed that Interns can take adequate precautions during sample collection.

Regarding ability of interns to take necessary precautions during handling and transport of specimens to the laboratory 44% faculties agreed and strongly agreed and 23% disagreed while remaining gave neutral response while 64% of interns agreed and strongly agreed over it. Improper specimen handling leads to hemolysis, lipemia, evaporation, unlabeled specimens which in turn leads to unnecessary pricks to the patient.

66% of faculties and 86% of interns agreed and strongly agreed that Interns are able to choose appropriate bulbs for specimen collection.

90% of Interns agreed and strongly agreed that Interns are able to perform urine specimen collection properly whereas 55% of faculties had the same opinion and 33% of faculties responded neutral to it.

44% of faculties agreed while 23% disagreed upon ability of interns to take precautions to avoid Preanalytical errors whereas 53 % of interns agreed for it.

45% of faculties disagreed, 33% agreed and rest gave neutral opinion regarding avoidance of post analytical errors by interns whereas 46% of interns disagreed, 35% agreed and rest were neutral for it.

34% of faculties disagreed, 44% were neutral and 22% agreed and strongly agreed regarding capability of Interns to interpret Biochemical investigations whereas 49% of interns agreed over it.

33% of faculties disagreed while 56% gave neutral response to competency of interns to interpret the difference between diagnostic, screening and prognostic tests whereas 53% of interns agreed, 32% were neutral and 15% disagreed over it.

Regarding views on open ended questions most of the Faculties and Interns both agreed that Clinical Biochemistry training should be introduced during internship and it should be at least for 7 to 15 days (Table 3, 4).

Table 1: Feedback from Faculties of Clinical department based on Likerts scale

Sl. No.	Question	SA %	A %	N %	D %	SD %
1	Investigations have relevance with disease process and outcome.	22	67	11	0	0
2	The clinical biochemistry has relevance in clinical practice.	33	56	11	0	0
3	Clinical Biochemistry components taught in first MBBS were too early.	11	56	22	11	0
4	Interns are able to describe effect of various drugs on metabolic pathways and enzymes.	0	33	22	45	0
5	Interns are able to mention the time period within which the specimens should reach the laboratory from the ward.	0	11	22	67	0
6	Fundamentals of various metabolic processes, keeping an eye on investigation and diagnosis should be revised during internship.	11	67	22	0	0
7	At the end of MBBS curriculum, interns are not able to tell the normal range of common analytes.	11	67	11	11	0
8	Intern is able to pinpoint the diagnostic tests for specific disease.	0	44	12	44	0
9	Interns are able to describe the metabolic and molecular level of disease process and accordingly can advice the diagnostic tests.	0	11	22	56	11
10	Interns are able to describe the effect of circadian rhythm on certain parameters and hence effect of time of collection of specimens on those parameters.	0	11	56	33	0
11	Interns can perform and interpret common bed side tests of clinical biochemistry.	0	78	11	11	0
12	Interns are able to carry out patient preparation before specimen collection.	0	67	33	0	0
13	Interns can take adequate precautions during sample collection.	22	44	34	0	0
14	Interns are able to take necessary precautions during handling and transport of specimens to the laboratory.	22	22	33	23	0
15	Interns are able to choose appropriate bulbs for specimen collection.	22	44	22	12	0
16	Interns are able to perform urine specimen collection properly.	11	44	33	12	0
17	Interns can take precautions to avoid Preanalytical errors.	11	33	33	23	0
18	Interns are able to avoid post analytical errors	11	22	22	45	0
19	Interns can interpret the results of biochemical investigations.	11	11	44	34	0
20	Interns are able to interpret the difference between diagnostic, screening and prognostic tests	11	0	56	33	0

Table2: Feedback from Interns based on Likerts scale

Sl. No.	Question	SA %	A %	N %	D %	SD %
1	Investigations have relevance with disease process and outcome.	68	28	0	4	0
2	The clinical biochemistry has relevance in clinical practise.	46	42	8	0	4
3	Clinical Biochemistry components taught in first MBBS were too early.	21	29	21	28	1
4	Interns are able to describe effect of various drugs on metabolic pathways and enzymes.	0	22	40	30	8
5	Interns are able to mention the time period within which the specimens should reach the laboratory from the ward.	4	32	3	57	4
6	Fundamentals of various metabolic processes, keeping an eye on investigation and diagnosis should be revised during internship.	18	50	10	22	0
7	At the end of MBBS curriculum, interns are not able to tell the normal range of common analytes.	6	34	18	22	20
8	Intern is able to pinpoint the diagnostic tests for specific disease.	25	64	4	4	4
9	Interns are able to describe the metabolic and molecular level of disease process and accordingly can advice the diagnostic tests.	4	36	25	32	4
10	Interns are able to describe the effect of circadian rhythm on certain parameters and hence effect of time of collection of specimens on those parameters.	0	39	11	36	14
11	Interns can perform and interpret common bed side tests of clinical biochemistry.	21	46	7	22	4
12	Interns are able to carry out patient preparation before specimen collection.	21	39	8	21	11
13	Interns can take adequate precautions during sample collection.	26	50	4	10	10
14	Interns are able to take necessary precautions during handling and transport of specimens to the laboratory.	25	39	14	11	11
15	Interns are able to choose appropriate bulbs for specimen collection.	43	43	0	11	5
16	Interns are able to perform urine specimen collection properly.	30	60	0	10	0
17	Interns can take precautions to avoid Preanalytical errors.	0	53	22	25	0
18	Interns are able to avoid post analytical errors	0	35	18	39	7
19	Interns can interpret the results of biochemical investigations.	14	35	39	12	0
20	Interns are able to interpret the difference between diagnostic, screening and prognostic tests	14	39	32	10	5

Table 3: Feedback by faculty on open ended questions

Sl. No.	Question	Answer
1	Do you think clinical biochemistry training should be incorporated in internship	All the faculties responded yes for it.
2	If Yes, then how much period and which topics should be included	Most of the faculties suggested at least 15 days posting altogether in Biochemistry, Pathology and microbiology by rotation .

Table-4: Feedback by students on open ended questions

Sl. No.	Question	Answer
1	Do you think clinical biochemistry training should be incorporated in internship	Most of the students responded yes to this question.
2	If Yes, then how much period and which topics should be included	Students suggested at least 15 days posting altogether in Biochemistry, Pathology and microbiology by rotation.

CONCLUSION

Biochemical investigations have relevance with disease process and outcome. Much of pre and post analytical errors contribute to the laboratory errors. Interns in hospitals play a major role in sample collection, handling, transportation and also in keeping notes of investigations. Also they are future practitioners hence proper training in these processes before the beginning of internship training in various clinical departments will help in lowering of laboratory errors. Further studies in more institutions and on larger sample sizes are needed.

Draw backs of study- Small sample size

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