

Study of impact of manual biochemistry practicals vs practicals using automation techniques in first-year MBBS students

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Abstract

Background: Biochemistry being considered as one of the fundamental science subjects taught during the first year of medical course, is proposed to be taught in the right perspective to medical students; since it forms the basic for General Medicine. Innovative curriculum with case-based learning is proven to develop the academic performance of biochemistry in medical students.

Objective: To study the impact of manual and automated technique practicals on students' knowledge, skills, and attitude and its perception by the students.

Materials and Methods: The 150 voluntary participants were first-year MBBS students who consented to undergo study. They were asked to perform practical of estimation of urinary sugar using Uristik and using Benedict's test (manual method). Knowledge was tested by questionnaire.

Result: Statistically significant difference was found between automated method when compared with manual method.

Conclusion: From this study, we found early clinical exposure to automated method was better than traditional manual method for medical students in Indian scenario. However, it was also noted that automated method requires extra efforts by the students to learn the accurate interpretation of the results. But, students were satisfied more by automated method.

KEY WORDS: Early clinical exposure, medical education, Uristix, manual, automated method

Introduction

Biochemical investigations are most important for assessment of clinical condition of patients. Hence, results of these investigations should be precise and accurate.^[1] Basis of these investigations is taught in the first year of MBBS. Advances in the field of medical science are overwhelming with biochemistry occupying the central place. Traditional medical education systems in India have been based on the model of teaching that engage medical students in classrooms and

laboratory settings for the first year of their education, with an introduction to clinical subjects coming in their second year.^[2,3] But as we still are following manual techniques for the estimation, students are unaware of advantages of automated techniques over manual methods.^[4] So the aim of our study was to introduce few of these automated techniques in their practical curriculum and make them aware of their advantages such as accuracy, precision, easy interpretation, and less time-consuming.

Objective

To study the impact of manual and automated technique practicals on students' knowledge, skills, and attitude and its perception by the students.

Materials and Methods

One hundred and fifty students of first-year MBBS were included in our study, and they were asked to perform practical

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of estimation of urinary sugar using Uristik and using Benedict's test (manual method). Ethical committee clearance was obtained from the institutional ethical committee. This study was conducted in the Department of Biochemistry in our college. After completion of both the tests, students were given a questionnaire to assess by which technique they understood the practical better. Questionnaire was assessed by giving score.

1. Determination of Urinary Glucose by Benedict's Test

Principle

When Benedict's qualitative reagent is heated with eight drops of urine, glucose present in urine reduces cupric ions present in reagent to cuprous ions. Alkaline medium is provided to the reaction by sodium carbonate present in reagent. The color changes to green, yellow, orange, or red according to concentration of glucose present in urine [Fig 1].^[1]

Interpretation

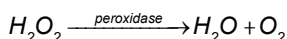
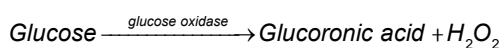
- No change in color (i.e., blue: absence of sugar)
- Pale green with slightly cloudy: trace
- Definite cloudy green: 1+
- Yellow to orange precipitate with supernatant fluid pale blue: 2+
- Orange to red precipitate supernatant fluid pale blue: 3+
- Brick red precipitate supernatant decolorized: 4+.^[2]

2. Determination of Urinary Glucose by Uristix Method

Principle

The test is based on a specific glucose oxidase peroxidase method, a double sequential enzyme reaction. The reagent strips contain chromogen KI also along with glucose oxidase and peroxidase enzymes. The method is specific for glucose.

Reaction



$\text{O}_2 + \text{K}$ color changes from sky blue to blue to green to chocolate brown depending on concentration of glucose [Fig 2].

Questionnaire for Comparison Between Both the Methods

1. Which method they understood better?
2. Which method was simple to perform?
3. By which method they could interpret result better?
4. Which method was more accurate?
5. Which method is less time-consuming?

Scale: 1- Poor, 2- Average, 3- Good, 4- Better, 5- Best (total score of 25).

Result

Average score given by student is represented graphically in Figure 3. When we compared scores given to each method, they showed statistical significant difference ($p < 0.001$).

Discussion

Executing the test cases manually without any tool support is known as manual testing, while taking tool support and executing the test cases by using automation tool is known as automation testing.^[6] According to the students, the automated method was simpler and easy to perform and understand when compared with the manual method. They were able to interpret the result accurately in the automated technique. Students were happy to perform the automated technique rather than manual method^[6] as it was much time-consuming, nonprogrammable, and less reliable with huge investment in human resources.

The rapid pace of change in health care and medicine is giving rise to corresponding rapid changes in the content and process of medical education.^[7] Studies have stated that fundamental sciences should be integrated with clinical sciences as both are essential to progress in each. Our study findings are supported by the study conducted by Fuks and others, who strongly recommend that critical thinking should be introduced as early as the first year to medical students when they are learning basic sciences because it helps in creating a natural bridge to pathophysiology and clinical medicine taught later in the curriculum.^[8,9] They also state teaching clinical inference in the classroom and small group setting permits students to learn specific subject with the appropriate level of attention and intensity.^[10]

Automated technique can help students adapt ideas and produce novel hypotheses which can be used for later testing. It provides quick screening of urine chemistry which may be used for semiquantitative results by reporting as approximately g/dL. It is more reliable, specific, and sensitive than the manual method. However, it was also noted that automated method requires extra efforts by the students to learn the accurate interpretation of the results.

From this study, we found early exposure to automated techniques in biochemistry practical was better learning methodology than traditional manual method of practical for medical students in Indian scenario. Students were satisfied to perform the automated practical and were happy enough to take extra efforts on their part to learn the automated technique.

Conclusion

Level of understanding, involvement, and acceptability of the students for Uristik method is more than manual Benedict's



Figure 1: Benedict's test (negative, 1+, 2+, and 3+ from left to right).

URS-8SG MULTIPLE URINE TEST STRIPS

IMPORTANT :

READ PACKAGE INSERT BEFORE USE. DO NOT touch test areas. Store at temperature between 15°C -30°C. DO NOT remove desiccants. Be sure to replace cap immediately and tightly.

LOT.

EXP.

100 STRIPS
FOR IN VITRO DIAGNOSTIC USE

<p>GLUCOSE 30sec.</p>	
<p>BILIRUBIN 30sec.</p>	
<p>KETONE 40sec.</p>	
<p>SPECIFIC GRAVITY 45sec.</p>	
<p>BLOOD ca CELLS/ μ l 60sec.</p>	
<p>pH 60sec.</p>	
<p>PROTEIN 60sec.</p>	
<p>UROBILINOGEN 60sec.</p>	

Figure 2: Interpretation for multiple Uristix strip chart showing color coding for concentration of sugar.

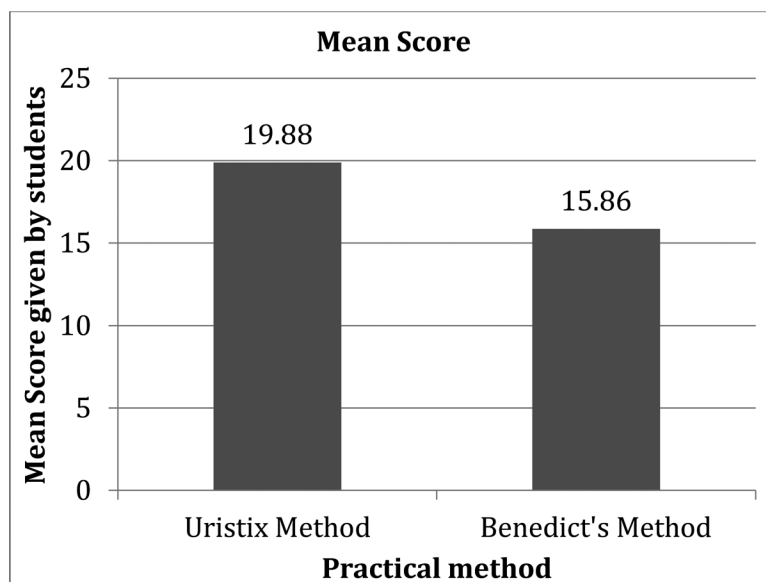


Figure 3: Mean score of practical by manual and automated methods.

method. Hence, automated methods should be introduced in first-year MBBS practical curriculum to assure first-year medical students that biochemistry is helpful in patient diagnosis and care. However, it was also noted that automated method requires extra efforts by the students to learn the accurate interpretation of the results. But, students were satisfied more by automated method than manual method.

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