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Use of Point of Care Testing in Ambulance on Hypoglycemic Patients during an Ambulance Call in Relation to Diagnostic Efficiency: An Observational Study

Sudheendra Rao T[1], Anil S Nelivigi[2]

Author's Affiliation:
Assistant Professor, Professor,, Department of Emergency Medicine, Basaveshwara Medical College & Hospital, Chitradurga, Karnataka, 577502, India.

Corresponding Author:
Anil S Nelivigi, Professor, Department of Emergency Medicine, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, 577502, India.

E-mail: anilnelivigi@yahoo.co.in

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Abstract

Background: Ambulance services are important part of health system in dealing with the emergencies and preventing mortality. The point of care testing of hypoglycaemia helps physicians with rapid results by using commonly ordered tests. This study was mainly taken up to study the role of POCT in diagnosis and providing immediate treatment for hypoglycaemia. *Materials and Methods:* A prospective study was undertaken in Ambulance services of the emergency department of Basaveshwara Medical College and Hospital, Chitradurga between March 2015 to July, 2019. The patients were subjected for a diagnostic work up by using point of care testing using GRBS. *Results:* Majority of the patients belonged to 51–60 years of age group, males sex and had diabetes since 11–15 years. The sensitivity of the point of care testing of hypoglycaemia was 78.03% and specificity was 90.21%. The inter test agreement as indicated by Kappa statistics was 0.69 which is deemed to be good. *Conclusion:* The point of care testing provides the diagnosis at an earliest point of time and thus helps in early treatment and prevention of mortality.

Keywords: Point of care testing; Laboratory test; Mortality; Prevention; Diagnosis.

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Introduction

Response and patient transfer are important services provided by the ambulance services on behalf of health sector. The demand for the immediate emergency ambulance care is increasing across the globe.[1] The research had shown that most of the deaths in diabetic patients is mainly due to hypoglycaemia within first hour of its occurrence.[2] Many available studies have envisaged that the pre hospital care is unquestionable in preventing the deaths due to hypoglycaemia. Paramedics and doctors can play a key role in provision of the pre hospital care in ambulances which mainly influence the outcome of patient in emergency departments.[3,4] The emergency departments nowadays facing challenges including decreasing hospital resources and growing public demand, long waiting times and extended periods of overcrowding. Hence minimizing the delay between onset of symptoms and initiation of treatment is critical for improving the patient outcome for the critically ill patients.[5]

The point of care testing (POCT) provides the physicians with rapid results for many commonly ordered tests Including GRBS. It has become increasingly possible to perform the common clinical investigations outside of the laboratory at the point of care with a reasonable level of accuracy

with the advances in the laboratory technology. The primary advantage provided by the POCT devices is increased portability and speed. Using POCT, caregivers can perform, analyze, obtain and act on test results at the bedside in a matter of minutes, significantly faster that if samples were sent out to a central laboratory. If POCT is used effectively it potentially decreases delays to treatment initiation, increase ED efficiency, influence patient care positively and alleviate the negative effects of overcrowding.[6]

Hence, it was decided to take up this study to assess the importance point of care testing in relation to patient outcome in patients with hypoglycemia.

Materials and Methods

A prospective study was undertaken among the patients using ALS ambulance services in the emergency department of Apollo hospital, Bangalore between March 2015 to July, 2019. The estimated sample size was based on kappa statistics was 487 which were rounded to 500. The cases with hypoglycaemia who had blood glucose levels of less than 70 mg/dl choosing ambulance service from the emergency department of Basaveshwara medical college and Hospital constituted the sample. Clearance from the institutional ethical committee was taken before the study was started. An informed, bilingual, written consent was obtained from either patients or their attenders. All the emergency patients using ALS ambulance services with Point of Care testing and who gives consent to participate in the study were included in to the study. Those patients using the ambulance service and in whom Point of Care testing was not done and Ambulance service used for Out Patient Transfer were excluded from the study.

Methodology

The information about the purpose and importance of the study was explained to all the subjects before they were included as study samples. The patients were subjected for a diagnostic work up by using point of care testing using GRBS. A Provisional Diagnosis was made on the basis of Point of Care test interpretation and were compared with the In- Hospital diagnosis. The data thus obtained was compiled and analyzed for comparison and Agreement between Provisional diagnosis and Discharge diagnosis.

The data thus collected was entered in excel and analyzed using Statistical Package for Social Services (vs 20). Only dual diagnosis performed on the same day were included in the analyses. Kappa statistics were calculated to measure the agreement between two diagnoses. The Kappa statistic value is a metric that compares Point of Care diagnosis with in Hospital Diagnosis. The Kappa value of < 0.20 was considered as Poor agreement, 0.20 to 0.40 as Fair agreement, 0.40 to 0.60 as Moderate agreement, 0.60 to 0.80 as Good agreement and 0.80 to 1.00 as Very good agreement. P values < 0.05 were considered statistically significant.

Results

Table 1: Socio demographic characteristics of study group.

	Characteristics	Frequency	Percent
Age group	21 – 30 years	16	3.2
	31 – 40 years	133	26.6
	41 – 50 years	175	35.0
	51 – 60 years	128	25.6
	More than 60 years	48	9.6
Sex	Male	286	57.2
	Female	214	42.8
Duration of diabetes mellitus	Less than 1 year	26	5.2
	1 – 5 year	117	23.4
	6 – 10 years	181	36.2
	11 – 15 years	132	26.4
	More than 15 years	44	8.8
	Total	500	100

Table 1 displays the socio demographic variables of the study group. Majority of the patients belonged to 51–60 years of age group followed by 31–40 years. Majority of the patients were males and had diabetes mellitus for 11–15 years in this study.

Table 2: Comparison of point of testing hypoglycemia with in hospital hypoglycemia.

Point of testing hypoglycemia	In hospital hypoglycemia	
	Positive n (%)	Negative n (%)
Positive	167 (78.0)	28 (9.8)
Negative	47 (22.0)	258 (90.2)
χ^2 value=239.654 df=1 p value=0.000, Sig		
Kappa value=0.69		
Sensitivity		78.03%
Specificity		90.21%
Positive predictive value		85.64%
Negative predictive value		84.59%

Table no 2 shows the comparison of point of testing and in hospital testing for hypoglycaemia. The sensitivity of the point of care testing of hypoglycaemia was 78.03%, specificity was 90.21%, positive predictive value was 85.64% and negative predictive value was 84.59%. The inter test agreement as indicated by Kappa statistics was 0.69 which is deemed to be good.

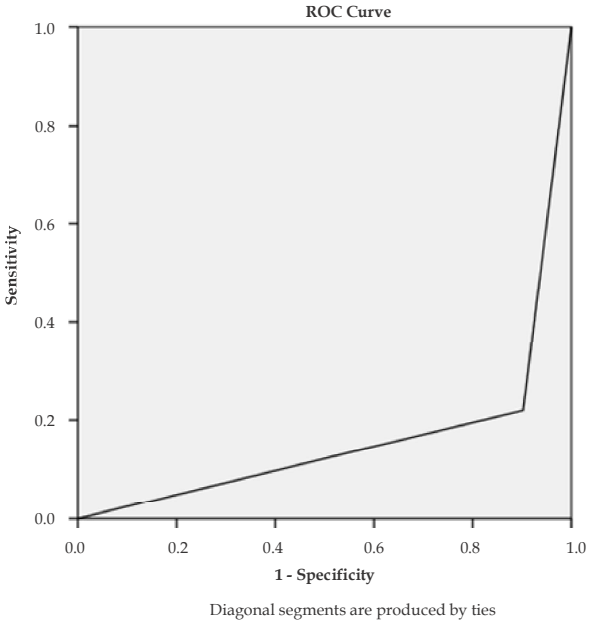

Fig. 1: ROC curve of point of testing and in hospital testing of hypoglycemia.

The receiver operator curve had shown that, the area under curve was around 16% as indicated in this study.

Discussion

Ambulance services play an important role in saving people from death. The intervention during transit of the patients is thus important n reduction such mortality.[7] The literature available had established the role of pre hospital care in saving the life of the people.[6]

The literature available had also shown that many investigations can be performed outside the laboratory at the point of care with a reasonable level of accuracy with the advances in the laboratory technology. It mainly decreases the potential delays to the treatment initiation, increase in ED efficiency, influences the patient care positively and alleviate the effects of overcrowding in the emergency department.

The mean age of the patients in this study was 61 years. In a study by Singer et al., the mean age of the patients was 63 years.[9] About 50% of the cases were males and same number of cases were females. In a study by Singer et al., about 44% of the patients were females.[9]

This study had shown that, sensitivity of the point of care testing of hypoglycaemia was 78.03%, specificity was 90.21%, positive predictive value was 85.64% and negative predictive value was 84.59%. The inter test agreement as indicated by Kappa statistics was 0.69 which is deemed to be good. In a study by Tortella et al., a high correlation values was found for glucose between the ambulance and emergency department values.[10] A study by Burrit et al. had shown that patient specimens between the PCA in the helicopter and the clinical laboratories showed no significant differences, with the exception of glucose. Lower glucose values were obtained in the laboratory due to the time lag between specimen collection in the helicopter and analysis in the laboratory.[11] In a study, Smith et al. had noted that the results of flight samples agreed well with the traditional laboratory methods. Lower glucose values were obtained in the laboratory due to the time lag between specimen collection in the helicopter and analysis in the laboratory.[12]

Conclusion

This study was mainly undertaken to study the effect of POCT in life saving situation during transfer of patient in ambulance. The study had shown that the point of care testing is helpful in diagnosis of the diseases for many diseases. However, this study is not without limitations. The sampling method was not followed in this study hence study results cannot be generalized. But this study was able to bring about many facts. A future study with sound research methodology can bring out the actual facts of POCT.

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