

# Determination of Cerebrospinal Fluid Sugar by Glucometer

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## Introduction

Early diagnosis and timely management of CNS infections has an implication on the prognosis and outcome. Thus bacterial meningitis should be dealt with as an emergency. Biochemical analysis of CSF plays an important role in the diagnosis of CNS infections<sup>1</sup>. Certain factors such as lack of laboratory facilities, time taken for the sample to reach the laboratory and the time consuming conventional laboratory methods may cause delay in specific treatment and cause unnecessary morbidity and mortality.

These delays can be avoided by determination of CSF sugar in the emergency room while the child is being examined. The early estimation of CF sugar will be helpful in deciding whether or not to use antibiotics in patients, suspected to have bacterial meningitis<sup>2</sup>.

The objective of this study was to determine the CSF sugar by Glucometer and compare the results with a conventional laboratory method.

## Material, Methods and Results

This study was done in Paediatric Unit I of Civil Hospital, Karachi from March to November 1999. A total number of 65 CSF samples were obtained during this period.

Children between ages of 2 months - 12 years, presenting with fever and convulsion were included, as well as those with a suspected diagnosis of meningitis. Diagnosed cases of febrile convulsions and those with diagnosed convulsive disorders without evidence of any acute event were excluded.

All CSF samples were collected in two separate tubes. One was checked for CSF glucose level using a glucometer and other was sent to a specified laboratory.

The glucostrip method used reagent containing hexokinase, G-6PDH, NAD, diaphorase, ATP and magnesium. Chemical principle used was that glucose in CSF reacts with components in the reagent layer to produce colour directly proportional to CSF glucose concentration level, being translated quantitatively by glucometer.

Laboratory method used two reagents, containing phosphate buffer and phenol in reagent 1 and glucose oxidase, peroxidase and 4-aminoantipyrine in reagent 2. They were dissolved at temp. 37°C and wavelength 500nm. Then CSF sample was mixed and optical density (OD) was obtained after incubation for 10 minutes. This final colour was translated quantitatively as CSF glucose level.

A total of 67 CSF samples were obtained using glucometer and laboratory test (gold standard). Low sugar (<40mg/dl) was found in 15 cases while 52 were normal. Comparison of glucometer results with laboratory method (gold standard) showed that out of 15 cases with low CSF sugar 13 (sensitivity 87%) were finally labelled as low sugar with laboratory method; while 50 out of 52 labelled by glucometer as normal were found normal using laboratory test (specificity 96%).

## Comments

Our results show that determination of CSF glucose by glucometer is of value in establishing the early diagnosis and management of bacterial meningitis, which may be life saving. In 1974 workers used urine dipstick and Benedicts method for determining CSF glucose. The result showed that combination of both tests was satisfactory in screening for low CSF glucose, with a high sensitivity but a low specificity<sup>3</sup>. Moosa in 1995 published a study using Combur 9 dipstick reagent strips and demonstrated a high specificity in determining low CSF sugar. Using this method he could distinguish normal from infected CSF<sup>1</sup>.

The advantages of using a glucometer include ease of performance, ready availability of glucostrips and no requirement of specially trained laboratory personnel. It is also cost effective. Thus, this method is suitable for use in government health facilities both in urban and rural areas of Pakistan. This method can be adopted by countries with lack of trained laboratory personnel and facilities.

We therefore conclude that the use of a glucometer to determine CSF glucose in the emergency unit is a valuable tool in arriving at a fast diagnosis. This is valuable, especially when quantitative determination of glucose may not be immediately available.

## **References**

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