# THE EFFECT OF PRE-ANAESTHETLC FASTING ON BLOOD GLUCOSE LEVEL IN CHILDREN UNDERGOING SURGERY

Pages with reference to book, From 243 To 245

Mussarat Shah ( Department of Anaesthesia, Khyber Medical College, Peshawar. )
Zahoorullah, Tasleem ul Haq, Tasleem Akhtar ( PMRC Research Centre, Khyber Medical College, Peshawar. )

## ABSTRACT

Blood glucose concentrations were measured in 104 children aged 6 months- 10 years (mean 3.1 years) undergoing inpatient anaesthesia. The mean fasting period was 10.87 ± 2.68 hours. Mean preanaesthetic and 1/2 hour post-anaesthetic blood glucose levels were 4.8 ± 0.8 and 6.1 ± 1.9 mmoles/L respectively. Pre- anaesthetic low blood glucose level (2.7- 3.3 mmoles/L) could only be detected in 3.8% cases. Post-anaesthetic increase in blood glucose level was the same as reported in adults (JPMA 40 : 243, 1990).

## INTRODUCTION

Pediatricians and anaesthesiologists are concerned about the long period of pre-operative starvation in children. Prolonged fasting is expected to result in significant hypoglycaemia with resultant deleterious effects on the still maturing brain. However studies conducted so far have given variable results from nil to 28%[1-4]. Blood sugar hômeostasis is controlled by a complex interaction of factors. Stress causes an increase in blood sugar through the action of adrenal glucocorticoides. An increase in post-anaesthetic blood sugar level owing to the stress of anaesthesia and surgery is well documented[5,6]. Pre-anaesthetic fasting blood glucose level is also expected to vary according to age of patient, period of fasting, time to operation and the premedication given. However, the role of these factors is still controversial. In Pakistan prolonged pre-anaesthetic fasting of children is common, owing mainly to the long operation lists of surgeons. No data is available on the prevalence of hypoglycaemia in our children whose response to fasting may be modified by the additional factors of chronic malnutrition and recurrent gastrointestinal and respiratory infections.

## PATIENTS AND METHODS

Children undergoing elective surgery for hernia repair, strabismus and tonsillectomy were included in the study. The routine schedule of pre-operative fasting starting from the midnight before the operation was followed. For children one year of age or less only atropine (0.1 mg/kg) was given as premedication. Anaesthesia was induced with thiopentone (0.4 mg/kg) and succinyl chloride (1mg/kg) and maintained with halothane (1.5-2%), oxygen and nitrous oxide (50%). Blood samples for glucose level were taken before and 30 minutes after induction of anaesthesia. Samples were sent to the laboratory in fluoride oxalate. Blood glucose level was estimated by the method of Cooper and McDaniell7, in which orthotoluidine reacts quantitatively with the aldehyde group of the aldohcxoses to form a glycosylamine and schiff base.

## RESULTS

A total of 104 children were studied. Their ages ranged from 6 months to 10 years with a mean ± S.D.

of 3.14 ± 2.04 years. The mean fasting period was 10.87 ± 2.68 hours while mean pre-anaesthetic and post-anaesthetic blood glucose levels were 4.78 ± 0.85 mmoles/L (68.14 ± 15.23 mg/dl) and 6.12 ± 1.94 mmoles/L (110 ± 34.93 mg/dl) respectively (Table I).

**TABLE I. Frequency of preanaesthetic hypoglycaemia in different studies.**

| Source | Total No. of subjects | Upper age limit (years) | No. of hypoglycaemia subjects according to different criteria of hypoglycaemia. | | | |
|---|---|---|---|---|---|---|
| | | | Criterion | I* | II** | III*** |
| This study | 104 | 10 | 0 | | 2 (1.9%) | 2 (1.9%) |
| Thomas, 1974[1] | 18 | 4 | 5 (28%) | | 0 | 0 |
| Watson, 1972[2] | 80 | 15 | 8 (10%) | | 0 | 0 |
| Graham, 1979[3] | 31 | 5 | 0 | | 0 | 4 (13%) |
| Jensen & Wernberg, 1982[4] | 134 | 9 | 1 (0.57%) | | 0 | 0 |

*Blood glucose level of 2.2 mmoles/L (40 mg/dl) and less[8]
**Blood glucose level of 2.8 mmoles/L (50 mg/dl) and less[9]
***Blood glucose level of 3.3 mmoles/L (60 mg/dl) and less[10]

Preoperative blood glucose level of 2.67 — 3.33 mmoles/ L (48-60 mg/dl) were found in 4 children (Table II).

**TABLE II. Age/sex distribution, fasting period and blood glucose levels of cases with low blood glucose.**

| Age | Sex | Fasting period | Blood glucose level pre-anaesthetic mmoles/L | Blood glucose level post-anaesthetic mmoles/L |
|---|---|---|---|---|
| 1 year | F | 9Hrs | 3.3 | 3.72 |
| 2 years | M | 13 Hrs | 3.3 | 10.0 |
| 3 years | M | 10 Hrs | 3.2 | 2.9 |
| 4 years | M | 15 Hrs | 2.7 | 3.4 |

Out of these four children, one was aged 1 year, two were two years of age and one of 4 years. None had a blood glucose level of less than 2.67 mmoles/L (48mg/dI). No correlation of blood glucose level with age of the patient and period of fasting was observed (r = 0.177 and 0.161 respectively). Post-anaesthetic increase in blood glucose level was seen in all except one, children. A positive correlation was found between pre and post- anaesthetic blood glucose levels (r = 0.466) while no correlation was found between post-anaesthetic blood glucose level and age (r = 0.068).

## DISCUSSION

Hypoglycaemia has been defined by various workers as a blood glucose level varying between less than 2.2 to 3.3 mmoles/L (40 — 60mg/dl) [8-10]. None of children in our study had hypoglycaemia according to the less than 2.2 mmoles to 2.8 mmolesfL criteria while only one child had a blood glucose level of 2.7 mmoles which can be labelled as hypoglycaemia on the basis of the 3.3. mmoles criterion while the one with a level of 3.2 and two with levels of 3.3 mmoles each had borderline hypoglycaemia according to this definition. Our results are therefore different from the prevalence of 28% hypoglycaemia in less than 2 years old reported by Thomas[1] and 10% in less than 15 years old[2].

There are several possible explanations for this difference. Our children are continually stressed by recurrent episodes Of illness especially in the first two years of life. A child has on an average 6-7 episodes of diarrhoea and about the same number of respiratory infections in this period. In future it would be appropriate to look at the nutritional status, disease history and cortisol levels of children as well. Our subjects were not given effective preoperative sedation which would also contribute to the stress of hospital admission, stay in an unfamiliar environment and the fear of injections and operation. One interesting reason given for differences in prevalence of hypoglycaemia in different studies is the diurnal variation in blood glucose level. The studies of Thomas[1] and Graham[3] which were carried out in the same hospital had different prevalence. The reported reason was the different timings of the operations; one study was in the morning and the other in the afternoon. It was suggested that overnight fasting is not as deleterious as day time fasting with regard to blood sugar level. The lack of correlation between period offastingand blood glucose level and age and blood glucose level in our study is similar to that of others[2-4]. The study of a larger number of subjects is needed however before any conclusions can be reached. The increase in blood glucose level during surgery seen in our subjects and reported in adults by others[5,6] is attributed to a state of glucose intolerance and insulin suppression. The increase in our subjects varied from 0.3-7.7 mmoles/L with 50% having increase of above 6 mmoles/L. Since our study was on a limited number of children and hormonal levels could not be done we can only tentatively conclude that hypoglycaemia is not a real problem of our children subjected to prolonged preoperative fasting. We suggest more comprehensive studies with larger number of subjects on this interesting and important subject.

**ACKNOWLEDGEMENT**

We thank PMRC for the grant to conduct this study. The help of statistician Mr. Mumtaz Akhtar, Mohammad Zaid Lab. technician and Typist Miss. Mubaraka Naseer of PMRC Research Centre for the statistical analysis, laboratory work and secretarial assistance respectively is acknowledged with appreciation.

**REFERENCES**

1. Thomas, D.K. Hypoglycaemia in children before operation; its incidence and prevention. Br. J. Anaesth., 1974; 46: 66.
2. Watson, B.G. Blood glucose level in children during surgery. Br. J. Anaesth., 1972; 44: 712.
3. Graham, I.F. Preoperative starvation and plasma glucose concentration, in children undergoing outpatient anaesthesia. Br. J. Anaesth., 1979; 51: 161.
4. Jensen, B.H., Wernberg, M. and Andersen, M. Preoperative starvation and blood glucose concentration, in children undergoing inpatient and out-patient anaesthesia. Br. J. Anaesth., 1982; 54:107.
5. Allison, S.P., Tomlin, PJ. and Cnamberlain, MJ. Some effects of anaesthesia and surgery on carbohydrate and fat metabolism. Br. J. Anaesth., 1969; 41: 588.
6. Houghton, A., Hickey, J.B., Ross, S.A. and Dupre, J. Glucose tolerance during anaesthesia and surgery. Comparison of general and extradural anaesthesia. Br. J. Anaesth., 1978; 50:495.
7. Cooper, G.R. and McDaniell, V. Standard methods of clinical chemistry, edited by H.P. MacDonald. New York, Academic Press, 1970, p. 159.
8. Cornblath, M. and Schwarts, R. Disorders of carbohydrate metabolism in infancy, 2nd ed. Philadelphia, Saunders, 1976, p. 345.
9. Ehrlich, R. M. Hypoglycaemia in infancy and childhood. Arch. Dis. Child., 1971; 46: 716.
10. Bowie, M.D., Mulligan, P.B. and Schwartz, R. Intravenous glucose tolerance in the normal

newborn infant; the effect of a double dose of glucose and insulin. Paediatrics, 1963; 31: 590.