

## VALIDITY OF FASTING BLOOD SUGAR ON THE DAY OF SURGERY COMPARED WITH THE PREINDUCTION BLOOD GLUCOSE LEVEL IN TYPE II DIABETIC PATIENTS

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### ABSTRACT

**Objective:** It is necessary that the diabetic patients who are scheduled for elective surgery, be operated as the first cases, but usually it is not possible due to large number of surgeries. The aim of this study was to compare the fasting blood sugar (FBS) on the morning of operation day with pre-operative blood glucose level.

**Methodology:** Prospective, hospital based study conducted during September 2004-July 2005. Nikookary Hospital, Tabriz Medical Science University, Iran. One hundred patients scheduled for ophthalmic surgery, were enrolled in this study. The levels of fasting and preoperative blood sugar (by lab and glucometry) were measured and compared with the FBS and with each other, as well.

**Results:** There was a significant difference between FBS and pre-operative Blood Sugar glucometry and the laboratory ( $P < 0.001$  &  $P = 0.001$ , respectively), and also between the mean preoperative BS by the glucometry and the laboratory procedures ( $P < 0.001$ ).

**Conclusion:** It is not possible to use FBS on the morning of operation day instead of the pre-operative BS level in diabetic patients.

**KEY WORDS:** Fasting blood sugar, Preoperative blood sugar, Glucometry, Diabetes, Surgery.

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### INTRODUCTION

Diabetes Mellitus is a complicated metabolic disorder which usually involves small vessels and leads to tissue injuries including ophthalmic injury. Ophthalmic involvement usually appears between 10-20 year after the onset of disease. Retinopathy, Cataract, extra-ocular muscles paralysis and optic neuropathy

are some of these injuries. Diabetes by itself is not an important factor in pre-operative prognosis but its effect on end organs (heart, nervous system, kidney & vascular system) which is associated with increased physiologic age, is related with preoperative prognosis.<sup>1</sup> Mortality of diabetic patients from surgery is five times more than non-diabetics. Major risk factors of diabetic patients who undergo surgery are: Cardiovascular disorders, renal insufficiency, joint and connective tissue disorders (limited neck extension, poor wound healing), inadequate granulocyte production and neuropathy. In diabetic patients healing of deep ulcers is impaired because of collagen disorders. Thus a major focus of anesthesiologists should be the preoperative evaluation and treatment of these diseases to ensure optimal preoperative conditions.<sup>1</sup>

In patients with type II diabetes who are treated with oral medication, these drugs should be stopped before surgery, according to their short half-lives. Metformin should be

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stopped 24 hours before surgery because of its potency in causing severe metabolic acidosis. Chlorpropamide should be stopped 24-48 hours before surgery. There is controversy about the maximum blood glucose level for elective surgeries, but in different studies it has been reported between 200-250 which looks quite high.<sup>1</sup> Also there are different ways to control the blood glucose levels in preoperative period and during operation. The prime objective is to maintain the patient's blood sugar level in the range of 80 upto 120 mg/dl (Tight control).<sup>1</sup> Diabetic patients must be operated as the first cases because of the pathology of diseases. In the regional resource centers they are not operated as the first cases due to large number of surgeries on the list. According to the metabolic conditions of these patients, controlling of blood glucose level is important. FBS is routinely measured at 7 to 8 o'clock in surgery wards but the time of induction of anesthesia is not obvious. According to time gap, patient's stress (which impairs blood glucose level) and being on NPO, FBS on the morning of operation day may not indicate the blood glucose level during operation and anesthesia. In fact the major aim of this study is to determine the validity of FBS on the morning of surgery during induction of anesthesia.

#### PATIENTS AND METHODS

In this prospective study, 100 patients with type II diabetes mellitus who were scheduled for ophthalmic surgery and aged 40 to 80 years old with ASA class II, were enrolled. All of them were treated with oral medications. Patients with chronic and serious complications such as progressive CNS disease, cardiovascular disease and renal failure were excluded. From all of these patients blood samples were taken for checking of FBS on the morning of operation day. After coming to operating room and before induction of anesthesia, blood samples were again taken from all patients while one sample was sent to laboratory to check blood sugar (BS) and the other sample was used for checking BS by glucometry. The

person who used with glucometer and the glucometer in all patients were the same. (Glucomen Menarini- 2658131).

The parameters which were measured for all patients included Sex, patient's mean age, mean duration of DM Type-2, mean FBS, mean preoperative blood glucose (measures by both laboratory and glucometer), mean time of taking fasting and preoperative blood samples, mean time gap between taking FBS sample and taking preoperative sample, mean difference between FBS and preoperative blood glucose level (measure by both laboratory and glucometer) and blood glucose level measured by laboratory<sup>2</sup> (BSL) & glucometry (BSG).<sup>3</sup> Statistical analysis was performed between FBS and preoperative BS (BSG, BSL) and also between BSG and BSL.

Correlation coefficient between difference of FBS and preoperative BS with time gap of taking the samples was evaluated. Data were analyzed by SPSS 12 Statistical package. Data were shown by the form of number, percentage and mean±standard deviation. We used ANOVA and pearson's correlation to evaluate correlation of data.  $p < 0.05$  being statistically meaningful.

#### RESULTS

There wasn't any statistical difference between patient's sex (F/M:49/51). Mean age of patients was  $63.95 \pm 10.53$ . Mean years of having DM II was  $7.75 \pm 5.41$ . Means FBS was  $186.4 \pm 71.95$  mg/dl. Mean BSG was  $242.96 \pm 324.5$  mg/dl. Mean BSL was  $177.45 \pm 67.63$  mg/dl. Mean time gap between taking samples to check FBS and pre-operative BS was  $146.92 \pm 94.5$  minutes.

There was a significant difference between mean FBS and mean BSG ( $P = 0.001$ ). This was also true about the comparison of the FBS and

Table-I: Difference of FBS,BSG, BSL and their P-Value

	Mean±SD	P-Value
FBS-BSG	-24.26±41.05	0.001
FBS-BSL	12.65±35.02	<0.001
BSG-BSL	35.61±38.50	0.001

mean BSL ( $P < 0.001$ ) and also the comparison of mean BSG and means BSL ( $P = 0.001$ ). This means we can't use any of these parameters. In evaluation of correlation between difference of FBS and pre-operative BS (Glucometry and lab) with time gap of sample taking, there was a significant positive relation between difference of FBS and BSL with time gap of taking samples ( $p = 0.001$ ,  $r = 0.327$ ).

It means decreasing or increasing the time difference between taking blood samples may decrease or increase the difference of two samples (respectively) but, this is not true about the sample of glucometry ( $P = 0.014$ ,  $r = 0.888$ ) (Figure 1, 2).

### DISCUSSION

*Glucometry or lab?* A lot of studies have been performed to evaluate results of glucometry. Glasmacher et al and Johnson et al have compared the results of glucometry with routine lab methods and have found significant difference between them.<sup>4</sup> Chen et al have studied glucometer accuracy in high blood sugar (hyperglycemia), Normal blood sugar and low blood sugar (hypoglycemia) levels. The results have shown high accuracy just in cases of hypoglycemia, but there was a significant difference between results of glucometry and standard lab methods in other two conditions.<sup>2</sup>

Halimi et al have evaluated glucometry results with lab methods in type II diabetic

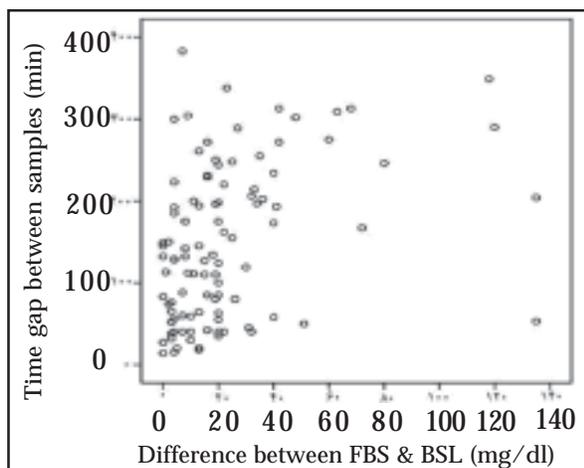


Figure-1: Correlation between FBS & BSL with blood samples' time gap

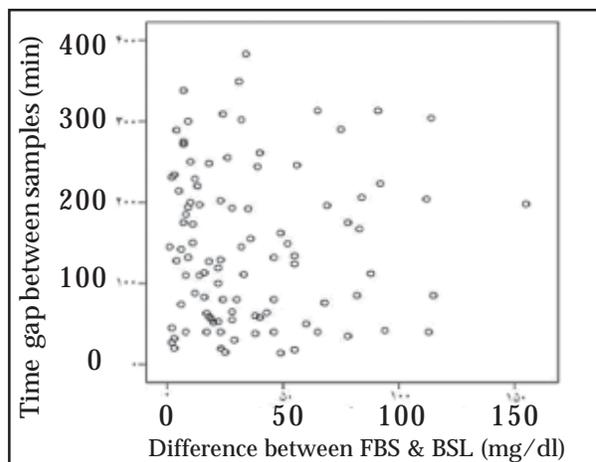


Figure-2: Correlation between FBS & BSG whit blood samples' time gap

patients which showed there was a statistical difference between them. They concluded that, validity of this method in measuring blood glucose level in type II diabetes is unclear.<sup>3</sup> In contrast, Keith and Pieper have shown that it is possible to use glucometry results for therapeutic aims instead of lab results in diabetic patients.<sup>5</sup> In our study there was a significant difference between preoperative BSG and BSL. This means using laboratory is recommended and the result is similar like the previous studies.

*FBS or pre-operative BS?* In studies performed by Anderson et al<sup>6</sup> Penell<sup>7</sup> Kollaeitis et al<sup>8</sup> Muhlestein<sup>9</sup> Eaton<sup>10</sup> Schepereel et al<sup>11</sup>, importance of FBS and its effect on decreasing post operative complications was shown. Diabetic patients who are scheduled for elective surgery, must be operated as the first cases. But because of large number of these patients, there is often a long period between the time of taking sample for FBS and start of surgery and because of metabolic characteristic of this disease, a lot of changes in this period can be seen. The main objective of this study was to find out whether to use FBS instead of preoperative BS or not, since no such study has been performed so far. Although some studies have shown the effect of FBS in prognosis of these patients and all of them have shown that increase in preoperative Blood Sugar (BS) increases complications but none of them has evaluated the rela-

tion of FBS and preoperative blood sugar. In our study there was a statistical difference between FBS on the morning of operation day and preoperative blood sugar. So it is not possible to use FBS instead of preoperative BS. It is necessary to control FBS in these patients and in all diabetic patients. FBS should be measured preoperatively but if the surgery is going to be performed later in the afternoon, FBS can't be an accurate parameter to evaluate patients blood glucose level. As such it is better to take a preoperative sample for checking Blood Sugar.

Using FBS on the morning of operation day instead of preoperative BS is not recommended for evaluating patient's glucose level and also preoperative blood sugar measured by glucometry is not reliable. We suggest that it should be measured by laboratory investigation which is more reliable.

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