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Original Research Article

Pre-operative Hypoglycemia in Patients Presenting for Surgery: A Hospital Based Cross-sectional Study

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ABSTRACT:

Introduction: Peri-operative glycemic control is an important factor for post-operative recovery and is well protocoled for diabetic patients in every setup. It is not always so with non-diabetic patients. This study aimed to observe the pre-operative glucose level and prevalence of hypoglycemia in patients presenting for surgery and its association with the duration of nil per oral period (NPO), age and intravenous fluids used in the pre-operative period. **Methods**: A cross-sectional study was conducted in the Department of Anesthesiology in a Nepalese medical college including all the patients posted for elective surgery over a period of three months. Socio-demographic and clinical details of the participants were collected in the operating theatre. Duration of NPO period and intravenous fluid prescribed in the pre-operative fasting period were recorded. A glucose strip test was performed in all the participants. **Results:** Participants were found to have fasted for an unnecessarily longer duration (12.84±2.27 hours). The incidence of hypoglycemia in patients posted for elective surgery was very high (43.3%). Ringer lactate and normal saline were equally prescribed (38.4%) and dextrose-normal saline was prescribed in the rest of the participants. Gender and type of intravenous fluids were positively correlated. NPO period was negatively correlated in overall participants. In hypoglycemic participants, we observed that lower glucose was influenced by pre-operative fluids, age and NPO duration. **Conclusion:** Pre-operative use of glucose containing fluids during NPO period is an important step to prevent hypoglycemia and related consequences.

Keywords: Hypoglycemia; Intravenous fluids; Pre-operative

INTRODUCTION:

Peri-operative glucose level is known to have a significant impact on the morbidity and outcome of patients after surgical procedure. Hyperglycemia increases the chance of infection and wound healing time.[1] On the other hand, hypoglycemia results in increased sympathetic activities confounding the peri-operative complications.[2] Peri-operative glucose level primarily depends on the period of fasting, age of the patients, amount and type of intravenous fluids used and the use of peri-operative medications such as steroids and certain antibiotics known to cause hyperglycemia.[3,4]

Peri-operative glucose metabolism is essential for complication free recovery from anesthesia and surgery. Pre-operative hyperglycemia is known to increase peri-operative morbidity and prolong hospital stay. Similarly, pre-operative hypoglycemia is known to induce catabolic response and adversely

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affect the recovery from surgery. Recently, enhanced recovery from surgery program is advocating for peri-operative glucose containing fluids to avoid development of catabolic state and insulin resistance and thus reducing overall hospital stay.[5] This study aimed to find the peri-operative glucose level and prevalence of hypoglycemia in patients presenting for surgery and its association with the duration of nil per oral (NPO) period, age and intravenous fluids used in the pre-operative period.

METHODS:

This cross-sectional observational study was conducted in the Department of Anesthesiology, College of Medical Sciences, Bharatpur, Chitwan, Nepal. Ethical approval was obtained from the Institutional Review Committee prior to enrollment of the participants.

Since calculated minimum sample size was 272.13, we included 302 participants over a period of three months. All the patients posted for elective surgery during the study period were included in the study. Patients who were diabetic were excluded. All the personal details were recorded. After shifting to the operating table, all the participants were questioned regarding the NPO period and the duration was noted. Intravenous fluid transfused during the pre-operative fasting period and prescription of pre-operative steroids, if any, were also noted. Blood glucose level was checked with glucose strip test in all the participants and noted. Hypoglycemia was defined as blood glucose level less than 70 mg/dl and managed with intravenous dextrose.

All the data were compiled in the excel spreadsheet and later statistical analysis was done using Statistical Package for Social Sciences (SPSS^{TM}) software version 20. Patient demography was analyzed using frequency and mean (±SD). Pearson correlation test was used to find the correlation between age, duration of NPO and glucose level whereas Eta test was used to find the correlation between gender, types of fluids used preoperatively and glucose level. A p value <0.05 was considered statistically significant.

RESULTS:

A total of 302 participants were included in the study out of which 58.6% were male and 41.4% were female. The average age of the participants was 40.74±19.26 years. The average NPO duration was 12.84±2.27 hours and the average glucose level observed was 89.09±41.38 mg/dl. The association between gender and pre-operative glucose level was not significant (Table 1). Three types of intravenous fluids were used out of which normal saline (NS) and ringer lactate (RL) were common. Both the fluids were equally used in 38.4%, where as 23.2% received 5% dextrose in normal saline (DNS).

It was observed that there was positive correlation between age and pre-operative glucose level (r=0.63). The type of intravenous fluids pre-operative was found to have moderate association with the pre-operative blood glucose level (Table 2).

The frequency of hypoglycemia (blood glucose level less than 70 mg/dl) was 131 (43.3%). Among the hypoglycemic participants, 54.2% were males and the rest were females. The mean pre-operative glucose level in hypoglycemic participants was 57.02±9.97 mg/dl. The average age of the patients with hypoglycemia was 40.72±19.18 years and had positive correlation with the pre-operative glucose level. This means, among the hypoglycemics the blood glucose level was higher in older participants (Table 3). We observed insignificant association between gender and pre-operative glucose level in non diabetic participants. The NPO duration

Table 1. Association between gender and glucose level in overall participants (N=302).

			Value
Nominal by interval	Eta	Gender dependent	0.632 (eta square = 0.39)
		Glucose level dependent	0.047

Table 2. Association between IVF and glucose level in overall participants (N=302).

			Value
Nominal by Interval	Eta	IVF dependent	0.578 (eta square= 0.32)
		Glucose level dependent	0.056

Table 3. Correlation between age, NPO duration and pre-operative blood glucose level in hypoglycemic population (N=131).

	Age (years)	NPO duration (hours)	Glucose level (mg/dl)
Mean ± SD	40.72±19.18	13.37±2.40	57.02±9.98
Pearson correlation (r)	1		0.334
Pearson correlation (r)		1	0.059

Table 4. Association between intravenous fluids and glucose in hypoglycemic participants.

			Value
Nominal by Interval	Eta	IVF Dependent	0.580 (eta square =0.33)
		Glucose Dependent	0.218

was13.37±2.39 hours in the hypoglycemic group and was positively correlated with glucose level which means though hypoglycemic, blood glucose level was higher in patients with longer duration of nil per oral duration which may be due to metabolic compensation. Among the hypoglycemic patients 37.4%, 41.2% and 21.4%t had received NS, RL and DNS respectively in the pre-operative fasting period. It was observed that there was moderate association between IVF and pre-operative glucose level (Table 4).

DISCUSSION:

Pre-operative fasting induced hypoglycemia is very common. It is regarded as high as 23.3% of the population posted for surgery.[6] Depending on the presence or absence of symptoms and glucose monitoring results, hypoglycemia may be classified as biochemical, symptomatic or both.[7] The severity of hypoglycemia is taken as one of the predictors of mortality in patients and it is more significant with diabetic patients.[8,9,10] Symptoms of hypoglycemia are often masked during surgical procedures due to blunting by anesthetic agents while under general anesthesia.[11] The anesthesiologists often delay or infrequently monitor blood glucose levels due to added responsibilities or concurrent multiple tasks during surgical procedures.[12] Poor communication during patient hand-over from ward and intensive care unit to operation theatre is the prime vulnerable periods for occurrence of hypoglycemia.

Hong M et al. observed that glucose level decreases with increase in fasting period in elderly patients posted for surgery.[13] Similarly, Shah M et al. observed that blood glucose level decreases with prolonged fasting period in pediatric patients. [14] In our study, we observed that glucose level increases with age though it was not statistically significant. According to Roberts et al. male gender is an independent predictor for elevated fasting blood glucose level.[15] We observed insignificant association between gender and pre-operative glucose level in non- diabetic participants.

Unnecessary prolongation of pre-operative fasting was observed by Pattajoshi et al.[5] We had almost similar observation. We observed that pre-operative fasting was unnecessary increased to 12.84±2.27 hours. We observed that NPO period was negatively correlated with pre-operative glucose level in overall population i.e. blood glucose level decreases with increase in NPO duration whereas in hypoglycemic participants it had positive correlation i.e. though hypoglycemic blood glucose was higher in patients with longer NPO duration which may be due to metabolic compensation such as decrease in insulin secretion and hepatic and renal gluconeogenesis.[16] Blood glucose level is higher in patients receiving hydroxyethyl starch (HES), blood transfusion and dextrose containing fluids as compared to non dextrose fluids.[5] In our study, we observed that three types of fluids were used. The commonly prescribed pre-operative fluids in the pre-operative period were DNS (21.4%), NS (37.4%) and RL (41.2%) in increasing order. We observed that pre-operative glucose level had moderate association with types of fluids prescribed during the fasting period. Pattajoshi claimed that incidence of hypoglycemia is as 23.3%.[5] We observed the incidence to be 43.3% which was found to be influenced by pre-operative IVF, age and NPO duration.

CONCLUSION:

Though the result of our study in overall participants was different from the usual understanding that prolonged fasting increases the incidence of pre-operative hypoglycemia which could be due to metabolic compensation, we conclude that use of pre-operative glucose containing fluids during the fasting period decreases the incidence of pre-operative hypoglycemia to some extent, if not overall elimination.Thus we suggest using pre-operative glucose containing fluids in non- diabetic patients during the fasting period.

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