

Effect of Surgery on Post Operative Blood Sugar Level among Non Diabetic Patients with Fractures in Relation to Gender Difference

N P Singh¹, Binny Sarai², G S Aulakh³

¹Professor, Deptt of Surgical Conditions, Jammu College of Physiotherapy.

²Lecturer, Deptt of Biochemistry, Jammu College of Physiotherapy.

³Director and Chief Orthopedic Surgeon, Aulakh Bone and Joint Hospital, Tarantaran

Corresponding Author: N P Singh

ABSTRACT

Background: Risk of increased blood sugar level in patients with traumatic fractures at time of admission is common complication among the spectrum of complications associated with orthopedic trauma. Acute hyperglycemia following traumatic injury has received significant attention in various studies, however there has been little discussion regarding the relationship of blood glucose level in cases of fractures at time of admission and few days after surgery and also rare data is available with respect to gender difference in blood sugar level pre and post operatively in cases of orthopedic trauma.

Methodology: Samples of blood for estimation of Random blood sugar were taken from the patients with traumatic fracture at time of admission to the hospital. The samples of Random blood sugar were grouped into two Group A (Male) and Group B (Female). Total 20 samples that is 10 males and 10 females were collected. Each sample was then tested for Random blood sugar level by O-Toluidine method. The same procedure of collection of blood samples from same patients and estimation of Random blood sugar level was done ten days after surgical treatment of fracture and the estimation of blood sugar level was done by means of O-Toluidine method.

Results: Comparison of blood sugar level of all 20 patients for Random blood sugar level at time of admission and 10 days after surgery showed significant change with $p < 0.001$. Whereas comparison of Group A (Male) and Group B (Female) for Random blood sugar level at time of admission and 10 days after surgery showed insignificant difference between both the groups with $p > .05$.

Conclusion: Blood sugar level increases in cases of fractures among non diabetic patients at time of admission due to hyper metabolic response to stress and decreases to normal levels few days after surgery due to multiple factors such as effect of anesthesia, relieve in pain, good sleep and reduced fatigue with no significant difference in blood sugar levels among male and female patients at time of admission and 10 days after surgery.

Key Words: Fracture, Blood Sugar level, Non Diabetic, Stress, Hyperglycemia.

INTRODUCTION

Fractures present a major part of orthopedic practice and are usually associated with number of complications which may include neurological changes, cardiovascular, renal and gastrointestinal

complications and can even present with metabolic and electrolytic complications. Risk of increased blood sugar level in patients with traumatic fractures at time of admission is common complication among the spectrum of complications associated

with orthopedic trauma. Up to 30% of patients can have blood glucose levels greater than 200mg/dl after trauma and higher than normal values in majority of these patients can be seen. [1] Jeremitsky, et.al; studied that early hyperglycemia in severe trauma patients is associated with poor out come and glucose control is needed to achieve better out comes and prognosis. [2] Various studies have reported hyperglycemia at time of admission in trauma patients to be a significant problem with increased morbidity and mortality. [3-5] Most of the trauma patients (with different level of hyperglycemia) are in urgent need of immediate surgery which requires exact blood sugar level control. Disregarding this intervention causes early outcome, including diabetic ketoacidosis, hyperosmolar coma, increased risk of infection and wound healing disorders. Therefore there is significant relationship between admission blood sugar level and severity of trauma. [6] Acute hyperglycemia following traumatic injury has received significant attention in various studies, however there has been little discussion regarding the relationship of blood glucose level in cases of fractures at time of admission and few days after surgery and also rare data is available with respect to gender difference in blood sugar level pre and post operatively in cases of orthopedic trauma. The purpose of this study was to evaluate the blood sugar level at time of admission and after 10 days postoperatively in non diabetic orthopedic trauma patients and to compare blood sugar level in male and female patients at time of admission and after 10 days postoperatively.

METHODOLOGY

Objective of study: To evaluate the Random blood sugar level at time of admission and after 10 days postoperatively in non diabetic orthopedic trauma patients and to compare Random blood sugar level in male and female patients at time of admission and after 10 days postoperatively.

Sample: Total sample size 20 patients randomly selected divided into two groups of 10 males and 10 females with Mean age of 58.8 and Standard deviation of 12.322.

Males Mean age: 58.9 Standard Deviation: 12.314

Females Mean age: 58.7 Standard Deviation: 12.996

Inclusion criteria: Non Diabetic patients, Patients with any traumatic fracture, Patient above 40 years, No history of hypertension.

Exclusion Criteria: Prior history of diabetes or any endocrinal disorder, Age below 40 years, Patient with any psychological problem.

Procedure

Socio Demographic details of each patient were collected. Patients were then instructed to remain calm and relaxed during collection of blood sample followed by written consent from the patient and their relatives and then blood samples were collected by venipuncture, 2 ml of blood sample was collected in EDTA tubes. These samples of blood for estimation of Random blood sugar were taken from the patients with traumatic fracture at time of admission to the hospital. The samples of Random blood sugar were grouped into two Group A (Male) and Group B (Female). Total 20 samples that is 10 males and 10 females were collected. Each sample was then tested for Random blood sugar level by O-Toluidine method. The same procedure of collection of blood samples from same patients and estimation of Random blood sugar level was done ten days after surgical treatment of fracture and the estimation of Random blood sugar level was done by means of O-Toluidine method.

RESULTS

Comparison of blood sugar level of all 20 patients for blood sugar level at time of admission and 10 days after surgery with related t test showed significant change with $p < 0.001$ (Table 1) with increased blood sugar level at time of admission with Mean sugar level of 174.7mg/dl and decreased

blood sugar level 10 days after surgery with Mean sugar level of 127.2mg/dl. Similar significance with $p < 0.001$ (Table 2 and Table 3) for Group A (Male) and Group B (Female) for comparison of blood sugar level at time of admission and 10 days after surgery were obtained using related T test. The results clearly indicated increase in blood sugar level at admission for Males with Mean blood sugar level of 170.7mg/dl and decrease in the level 10 days after surgery with Mean sugar level of 125.6mg/dl. Similar findings were obtained for females with increased blood sugar level at admission with Mean sugar level of 178.7mg/dl and decreased blood sugar level 10 days after surgery with Mean blood sugar level of 128.8mg/dl.

Table 1. Comparison of blood sugar level.

	Blood Sugar level At Time Of Admission	Blood Sugar level 10 Days After Surgery
Mean	174.7mg/dl	127.2mg/dl
Standard Deviation	14.7045	7.2591
t	24.0934	

$n = 20, p < 0.001$

Table 2.(Group A Males)

	Blood Sugar level At Time Of Admission	Blood Sugar level 10 Days After Surgery
Mean	170.7mg/dl	125.6mg/dl
Standard Deviation	11.0257	7.3666
t	21.3687	

$n = 10, p < 0.00$

Table 3. (Group B Females)

	Blood Sugar level At Time Of Admission	Blood Sugar level 10 Days After Surgery
Mean	178.7mg/dl	128.8mg/dl
Standard Deviation	17.3016	7.1616
t	14.8419	

$n = 10, p < 0.001$

Whereas comparison of Group A (Male) and Group B (Female) for blood sugar level at time of admission and 10 days after surgery with unrelated T test as represented by Table 4 and 5 showed insignificant difference between both the groups with $p > .05$ with Mean blood sugar level at time of admission was 170.7 and 178.7 for males and females respectively and insignificant results of comparison of Blood sugar level for male and female 10 days after surgery with mean values of 125.6 and 128.8 were obtained.

Table 4. (Comparison of Male and Female Blood Sugar level at time of Admission)

	Male	Female
Mean	170.7mg/dl	178.7mg/dl
Standard Deviation	11.0257	17.3016
t	1.2331	

$n = 10, p > .05$

Table 5. (Comparison of Male and Female Blood Sugar level 10 days after surgery)

	Male	Female
Mean	125.6mg/dl	128.8mg/dl
Standard Deviation	7.3666	7.1616
t	0.9849	

$n = 10, p > .05$

DISCUSSION

Based on the findings of the study the blood sugar level is found to be increased among the patients with traumatic fractures at the time of admission in table. 1, 2 and 3. Richard.et.al; Studied 790 patients with orthopedic injuries who required operative intervention. They found that hyperglycemia with blood sugar level ≥ 200 mg/dl and HGI ≥ 1.76 was an independent risk factor for 30 days surgical site in orthopedic trauma patients without history of diabetes. [7] Olsen et.al; studied various risk factors related to spinal surgical site infection. They reported serum glucose levels, preoperatively and within five days after the operation, to be significantly higher in patients in whom surgical site infection developed than in uninfected control patients. [8] Karunakar et.al; did a study to analyze the effect of stress hyperglycemia on infectious complications in orthopedic trauma patients. They divided them into two subgroups based on mean serum glucose greater than 220 mg/dl (hyperglycemic index(HGI) 3.0 or greater) and concluded that mean perioperative glucose levels greater than 220 mg/dl (HGI > 3.0) were associated with a seven times higher risk of infection in orthopedic trauma patients with no known history of diabetes mellitus. [9] This increase in blood sugar level in patients with orthopedic trauma at the time of admission can be attributed to the hyper metabolic response to stress that leads to hyperglycemia in critically ill patients with trauma. [10] The immediate physiological response to traumatic injury is thought to result in certain autonomic and endocrine

adaptations, such as increased catecholamine and glycogen levels. [11,12] Acute fractures induce stress hormone secretion of glucocorticoids, glucagon, adrenaline, thyroxine, somatotropin and others which is called "Stress response". During stress response the activation of several hormones induce insulin resistance, resulting in hyperglycemia and associated risk factors present then in patients with acute trauma. [13] This hyperglycemia was felt to be a compensatory mechanism of body to cope with stress. [14] Results of the study revealed decrease in blood sugar level 10 days after surgery in table. 1, 2 and 3. This decrease in blood sugar level can be multi factorial, various factors can be attributed to have resulted in decrease blood sugar level post operatively. These factors may include the effect of anesthesia provided to patient at the time of surgery which decreases the level of hormones increased due to stress at time of admission. Enquist A et. al; reported that extensive epidural analgesia with local anesthetic agents will prevent the endocrine and metabolic responses to surgery in the pelvis and lower limb. Epidural blockade from dermatomal segment T₄ to T₅ establish before start of surgery, prevent increase in cortisol and glucose concentration. [15] Thus the adrenocortical and glycemic responses to the surgery are abolished. The anesthetic induction agent etomidate interferes with the production of steroids in the adrenal cortex and synthesis of both aldosterone and cortisol is blocked. [16] McDonald and colleagues reported suppressant effect of therapeutic doses of morphine on hypothalamic-pituitary-adrenal axis in humans. [17] Thus morphine decreases the cortisol in normal and stress conditions, thereby reducing the presurgical stress in these patients. The other factor which can contribute to fall in blood sugar level days after surgery is multimodal approach to accelerate post operative recovery. [18] Which include decrease in postoperative fatigue and pain, good sleep and personal care. Further the results of the study as per

table 4. show no significant difference between males and females blood sugar level at time of admission this can be attributed to the fact that in our study we have taken in to consideration non diabetic patients and not much study is available with regard to gender difference .Amini et.al; in their study assessed the impact of special factors including age, gender and accident mechanism on admission hyperglycemia occurrence in multi trauma patients and found no significant relation [19] which supports the result of our study. Similar findings were noticed 10 days postoperatively in table.5 were in no significant results were found when blood sugar level between male and female were compared 10 days after surgery due to scant data available with respect to gender differences. The results of this study are in accordance with the study of Saeung Yeol Lee et.al; that sex, age at time of surgery, type of ankle fracture and BMI did not affect postoperative changes in FBG level. [20]

CONCLUSION

We have demonstrated that blood sugar level increases in cases of fractures among non diabetic patients at time of admission due to hyper metabolic response to stress and decreases to normal levels few days after surgery due to multiple factors such as effect of anesthesia, relieve in pain, good sleep and reduced fatigue with no significant difference in blood sugar levels among male and female patients at time of admission and 10 days after surgery.

REFERENCES

1. Laird AM et.al. Relationship of early hyperglycemia to mortality in trauma patients. *The Journal of Trauma*.2004; 56(5):1058-62.
2. Jeremitsky E, et.al. The impact of hyperglycemia on patients with severe brain injury. *J Trauma* 2005; 58(1):47-50.
3. Sung J, et.al. Admission hyperglycemia is predictive of outcome in critically ill trauma patients. *J Trauma* 2005; 59(1):80-3.

4. Bochicchio GV, Joshi M, et.al; Admission preoperative glucose is predictive of morbidity and mortality in trauma patients who require immediate operative intervention. *Am Surg* 2005; 71(2):171-4.
5. Bochicchio GV, Sung J, Joshi M, et.al; Persistent hyperglycemia is predictive of outcome in critically ill trauma patients. *J Trauma* 2005; 58(5):921-4.
6. Jabalameli M, Naghibi KH, Sheibani SH. Comparison of glucose level among traumatic patients in causality and emergency department Qazvin Univ Med Sci 2010;14(2):42-6.
7. Richards JE, Kauffmann RM, et.al; Relationship of hyperglycemia and surgical site infection in orthopedic surgery. *The Journal of Bone and Joint Surgery. American Volume.*2012; 94(13):1181-86.
8. Olsen MA, Nepple JJ, et.al; Risk factors for surgical site infection following orthopedic spinal operations. *The Journal of Bone and Joint Surgery. American Volume.*2008; 90(1):62-69 [Pub MED].
9. Karunakar MA, Staples KS. Does Stress induce hyperglycemia increase the risk of perioperative infectious complications in orthopedic trauma patients? *Journal of Orthopedic Trauma* 2010; 24(12):752-56.
10. Sperry JL, Frankel HL, et.al; Early hyperglycemia predicts multiple organ failure and mortality but not infection. *J Trauma.*2007; 63(3):487-94.
11. Mc Cowen KC, Malhotra A, Bistrrian BR. Stress induced hyperglycemia. *Crit Care Clin.*2001;17:107-124 [Pub Med: 11219223].
12. Smiley DD, Umpierrez GE. Perioperative Glucose control in diabetic or non diabetic patient. *South Med J.*2006; 99:580-589.Quiz 90-1 [Pub Med: 16800413].
13. Loser MR, Damoisal C, Payen D. Bench-to-Bedside review glucose and stress conditions in intensive care unit. *Crit Care* 2010; 14:231.
14. Bochicchio GV, Scalaa TM. Glycemic control in the ICU. *Adv Surg.*2008; 42:261-75.
15. Enquist A, Brandt MR, et.al; The blocking effect of epidural analgesia on adrenocortical and hyperglycemic response to surgery. *Acta Anaesthesiol Scand* 1977; 21: 330-35.
16. Loagner RL, White PF. Etomidate inhibits adrenocortical function in surgical patient. *Anesthesiology* 1984; 61:647-51.
17. Mc Donald RK, Evans FT, Weise VK et.al; Effect of morphine and nalorphine on plasma hydrocortisone levels in men. *J Pharmacol Exp Ther* 1959; 125:241-7.
18. Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. *Br J Anaesth* 1997; 78:606-17.
19. Amini A, Derakhshanfar H, Hamid Kariman et.al; Hyperglycemia and related factors in multiple trauma patients in Imam Hossein Hospital.2010.*J Mazandaran Univ Med Sci* 2013;23(98):328-32.
20. Seung Yeol Lee , Moon Seok Park, Soon-Sun Kwon, Ki Hyuk Sung et.al; Influence of ankle fracture surgery on glycemic control in patients with diabetes. *BMC Musculoskeletal Disorders* (2016) 17:137.

How to cite this article: Singh NP, Sarai B, Aulakh GS. Effect of surgery on post operative blood sugar level among non diabetic patients with fractures in relation to gender difference. *Int J Health Sci Res.* 2018; 8(1):129-133.
