

## EFFECT OF PRE OPERATIVE HEART RATE ON POST SPINAL HYPOTENSION IN OBSTETRIC PATIENTS

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### ABSTRACT

**Objective:** The purpose of the study was to determine the association between of pre operative heart rate and post spinal hypotension in women undergoing cesarean section.

**Study Design:** It was a quasi-experimental study.

**Place and Duration of Study:** It was conducted at Anaesthesia Department Combined Military Hospital Lahore and was of one year duration from June 2006 to May 2007.

**Patients and Methods:** Two hundred patients undergoing caesarean section were included in the study selected on non probability convenience sampling technique. The patients were divided into two groups depending upon their pre operative heart rate. Spinal anesthesia was administered and number of patients developing hypotension was noted.

**Results:** Among 200 patients, who were included in the study, 112 were placed in group A and 88 were placed in group B depending on mean heart rate of 90 beats per minute or less or 91 beats per minute or more respectively. In group A 14 (11.86%) patients developed hypotension where as in group B 28 (31.82%) patients developed hypotension.

**Conclusion:** Pre operative heart rate is significantly associated with post spinal hypotension in obstetric patients undergoing cesarean section.

**Keywords:** Pre operative heart rate, Spinal Anesthesia, Post spinal hypotension.

### INTRODUCTION

Morbidity and mortality directly related to anesthesia for cesarean delivery has decreased in past decades to 1.7 per million<sup>1</sup>. The higher risk of maternal complications associated with general anesthesia compared with regional anesthesia has led to an increased use of spinal and epidural anesthesia for both elective and emergency cesarean sections<sup>2</sup>. Although subarachnoid block (spinal anesthesia) is generally well tolerated, hypotension is a common adverse effect of subarachnoid block in some patients<sup>3,4</sup>. Hypotension during central neuraxial block is mainly a result of decreased systemic vascular resistance after blockade of preganglionic sympathetic fibers<sup>5</sup>. In pregnant women, it was demonstrated that sympathetic activity is increased as compared with that of nonpregnant women<sup>6-8</sup>. Differences of the regulation of the autonomic nervous system among healthy pregnant patients may explain hemodynamic differences in response to

subarachnoid block.

Vasovagal episodes in association with regional anesthesia are not rare<sup>9,10</sup>. Anesthesia-induced hypotension may have severe adverse effects for mother and child<sup>11</sup>. No strategy of preventing the hypotension caused by regional anesthesia, such as pre hydration with intravenous crystalloids or colloids<sup>12</sup>, as well as prophylactic intramuscular or intravenous vasopressors<sup>13-17</sup> has proved entirely satisfactory and applicable to all patients. Reactive hypertension<sup>18</sup> and cardiac arrhythmia<sup>19</sup> have been reported with use of ephedrine and pulmonary edema may result from excessive hydration<sup>20</sup>.

Systemic haemodynamic are modulated by the autonomic nervous system<sup>21</sup>. Preoperative determination of the autonomic nervous system control might provide an opportunity to detect patients at risk of severe hemodynamic impairment. A noninvasive method of measuring the activity of the autonomic nervous system is the analysis of heart rate<sup>5</sup>.

The preoperative heart rate may differ between patients in relation to the severity of hypotension after subarachnoid block.

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Therefore preoperatively analyzed heart rate may predict hypotension after subarachnoid block. This can prove beneficial in initiating measures to prevent this drop in blood pressure.

In the backdrop of this information, this study was conducted to determine the association of preoperative heart rate with post spinal hypotension in patients presenting for cesarean section. This study can help us in prevention of post spinal hypotension in patients with higher pre operative heart rate. Thus this study can be a step forward in developing new and beneficial treatment protocols best suited for our patients.

### **PATIENTS AND METHODS**

It was a quasi experimental study, which was carried out in Armed Forces tertiary care hospital (Combined Military Hospital Rawalpindi). A total of 200 patients fulfilling the inclusion/exclusion criteria were included in the study. Sampling technique used was non probability convenience sampling.

Patients with full term pregnancy presenting for caesarean section, aged between 20 to 35 yrs and having a physical status of American Society of Anesthesiology (ASA) I and II were included in the study. Patients suffering from hypertension(systemic or pregnancy induced), valvular heart diseases and renal disorders were excluded from the study.

Written informed consent was taken from all the patients who were included in the study. After placing the patients in supine position with a pelvic wedge for uterine tilt, baseline heart rate (HR) was determined with the pulse oximeter by taking average of three independent readings taken three minutes apart. Baseline mean arterial pressure (MAP) was recorded by taking the average of three independent mean MAP values, taken three minutes apart with the help of non invasive blood pressure monitor.

The patients were divided into two groups depending on their pre-operative heart rate. The patients having a heart rate of 90 beats per minute or less were included into group A,

while those having heart rate of 91 beats per minute or more were included in group B. The patients were preloaded with 1000ml of lactated Ringers solution. Spinal anaesthesia was administered at L3-L4 disc space, 3mL of 0.5% bupivacaine was given after aseptic spinal tap. The patients were again placed in the supine position with right pelvic wedge and oxygen was administered at 5 liters/minute via face mask. Six readings of Mean Blood Pressure with the help of non invasive blood pressure monitor were recorded every three minutes apart. The lowest mean arterial pressure reading was noted. All the data was entered into the patient proforma. The number of patients developing more than 20% drop in their mean arterial pressure in each group was noted.

### **Data Analysis**

Data had been analyzed using SPSS version 15 Descriptive statistics were used to describe the data. Chi-square test was used to defer nine the association of pre-operative heart rate with post spinal hypotension  $P$ -value $<0.05$  was considered significant.

### **RESULTS**

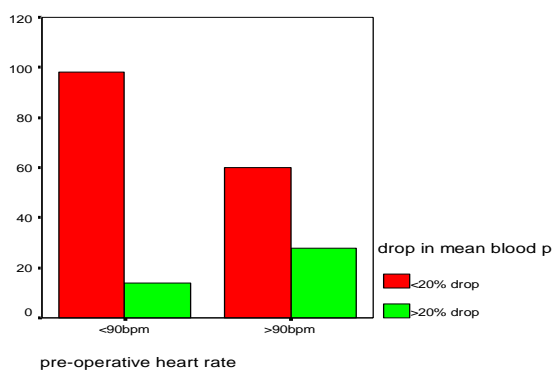
Of the 200 patients included in the study aged between 20 to 35 years fifty from (27%) were primigravida, 78 (39%) patients had one previous cesarean section, 67 (33.5%) patients had two previous cesarean sections and only 1 (0.5%) had three previous Cesarean sections.

Depending on the heart rate 112 patients were included in group A and 88 were included in group B.

The number of patients developing more than 20% drop in their mean blood pressure compared to their pre operative values in each group was noted. Out of the 112 patients in group A, 14 (12.5%) patients developed hypotension. Out of the 88 patients in group B, 28 (31.82%) patients developed hypotension. Chi square was applied to relevant data and  $P$ -value  $<0.001$  which was statistically significant. (Figure)

### **DISCUSSION**

Spinal anesthesia is the preferred technique for caesarean section in obstetric patients<sup>2</sup>. It



**Figure: Comparison of Patients developing hypotension in both groups**

has certain advantages over general anesthesia<sup>22</sup> as well as over epidural anesthesia<sup>23</sup> for obstetric cases. However it has certain disadvantages as well. The most common and most dreaded disadvantage is development of post spinal hypotension<sup>3,4</sup>.

Although there are techniques which can be employed to prevent hypotension like pre loading with crystalloid or colloid<sup>24</sup> solution and use of vasopressor agents<sup>14-18</sup>, but these strategies can not be employed indiscriminately to all the patients. Therefore there is a need for a predictor which can predict patients at risk of developing post spinal hypotension.

Pre operative heart rate is a guide of the sympathetic activity of the patient<sup>5</sup>. It can be employed to predict the patients at risk of developing hypotension after injection of spinal anesthesia.

The aim of this study was to determine whether pre operative heart rate is associated with post spinal hypotension in obstetric patients.

Michael et al. in their study found that patients with a pre operative heart rate of greater than 90 beats per minute had an 83% chance (positive predictive value) of developing marked hypotension after spinal anesthesia and patients with a HR less than 90 bpm had a 75% chance (negative predictive value) of not developing marked hypotension. The results of our study are comparable with their study, in that the frequency of hypotension in the group with pre operative heart rate of more than 90 bpm was 31.82% where as in the group with pre

operative heart rate of less than 90 bpm the incidence was 12.5%.

Dmitri C et al published their study using heart rate variability to stratify risk of obstetric patients undergoing spinal anesthesia<sup>26</sup>. They divided the patients into LO and HI groups. The mean pre operative heart rate in the HI group was 81 bpm and in the LO group it was 95 bpm. In their study none of the patients in HI group developed hypotension whereas all 11 patients in the LO group developed hypotension. The results of our study differ in regards that 12.5% of the patients with heart rate of less than 90 bpm developed hypotension, whereas in the above mentioned study none of the patients in the HI group developed hypotension.

Hanns et al<sup>5</sup> found that an LF/HF ratio greater than 2.5 may indicate a high risk of hypotension after spinal anesthesia. An LF/HF ratio of less than 2.5 may indicate a low risk of hypotension after spinal anesthesia. The LF/HF ratio is ratio of heart rate variability. The higher ratio indicates greater pre operative heart rate and hence greater sympathetic discharge. The results of this study are comparable to ours.

This study can be used as a stepping stone for future research to determine the relationship of pre operative heart rate and post spinal hypotension.

## CONCLUSIONS

There is a significant association between operative heart rate and post spinal hypotension in obstetric women undergoing cesarean section.

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