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Study of Correlation of Anthropometric Measurements with the Level of Subarachnoid Block and Haemodynamics in Parturients Undergoing Caesarean Section

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ABSTRACT

Maternal obesity is a significant public health issue that impacts anesthetic management during cesarean sections. This study aims to investigate the correlation between various anthropometric measurements and the level of subarachnoid block and hemodynamic changes in parturients undergoing cesarean section. This prospective observational study was conducted at a tertiary care hospital from November 2018-August 2020. A total of 100 parturients of ASA I and II status scheduled for elective cesarean sections under spinal anesthesia were included. Anthropometric measurements such as height, weight, BMI, BSA, waist-to-hip ratio (WHR) and abdominal circumference (AC) were recorded. The level of the subarachnoid block, time to achieve maximum block and hemodynamic parameters (systolic blood pressure, diastolic blood pressure, mean arterial pressure and heart rate) were monitored and correlated with the anthropometric data. Among the 100 parturients, 33 achieved a maximum block level of T4, while 67 reached T6. Significant differences were observed in the anthropometric measurements between the two groups. Parturients with a short height, high BMI, BSA, WHR and AC achieved a higher block level (T4) more rapidly. A strong negative correlation was found between increasing weight, BMI and AC with the time to achieve maximum block ($r=-0.822$, -0.871 and -0.725 respectively, $p<0.001$). Hemodynamic instability was more prevalent in parturients with higher BMI, BSA, WHR and AC, with 44% experiencing hypotension. Ephedrine was required in 41 parturients, primarily those with high BMI and AC. Anthropometric measurements significantly impact the spread and speed of spinal anesthesia and subsequent hemodynamic responses in parturients undergoing cesarean sections. Proper assessment of these measurements can help in planning the mode of anesthesia and taking necessary precautions to mitigate intraoperative complications.

INTRODUCTION

When selecting anesthesia for cesarean sections, attention must be paid to the urgency of the operation, pre-existing maternal systemic problems, the general status of the fetus and the surgeon's and patient's preferences. Although both general and regional anesthesia can be used, regional anesthesia is the most widely preferred mode for cesarean sections due to its many advantages. These include the mother being awake during the procedure, minimal or no requirement for airway intervention, preservation of airway reflexes, reduced blood loss, reduced probability of drug-related fetal depression and continued postoperative analgesia[1-3]. Spinal anesthesia is widely used in parturients for cesarean sections and while considered safe, is frequently associated with nausea, vomiting and hypotension despite preoperative hydration and left uterine displacement[4].

Maternal obesity, a significant public health problem, is associated with increased rates of pregnancy complications, including stillbirth, childhood obesity, and diabetes[5-6]. Obesity can affect the epidural space due to the greater amount of epidural fat tissue, widened epidural veins and increased intra-abdominal pressure, potentially leading to higher levels of anesthesia and respiratory depression. Abdominal circumference (AC) correlates with intra-abdominal volume, which increases during pregnancy due to fetal size, amniotic fluid and uterus and can compress the inferior vena cava (IVC)[7].

Hypotension after neuraxial anesthesia is a common complication, with an approximate prevalence of 15-33% in the general population and is closely associated with morbidity and mortality[8]. Despite various treatment methods, including crystalloid and colloid administration and avoidance of aortocaval compression, 40-60% of patients still require vasopressor agents such as phenylephrine or ephedrine to maintain blood pressure during the initial minutes after spinal anesthesia[9-10].

The aim of this study is to observe the effects of anthropometric measurements, such as body mass index (BMI), body surface area (BSA), abdominal circumference (AC) and waist-to-hip ratio (WHR), on the level of subarachnoid block and hemodynamics in parturients undergoing cesarean section.

MATERIALS AND METHODS

Study Design: This study was a single-center, prospective observational study conducted at the Obstetrics OT of a tertiary care hospital.

Study Duration: The study was conducted from November 2018-August 2020 after obtaining clearance from the Institutional Ethics Committee.

Sample Size: The study included 100 parturients undergoing lower segment cesarean section (LSCS).

Inclusion Criteria:

- Term parturients undergoing cesarean section.
- American Society of Anesthesiologists (ASA) physical status I-II.

Exclusion Criteria:

- Patients who refused subarachnoid block (SAB) or participation in the study.
- Patients with ASA physical status III or higher.
- Patients with antepartum hemorrhage such as placenta previa or abruptio placentae.
- Patients with preeclampsia/eclampsia.
- Patients with cardiac disease, chronic hypertension, renal disease, diabetes mellitus, coagulopathy, or any other significant medical comorbidity.

Methodology: Upon obtaining IEC permission, parturients scheduled for elective cesarean section under spinal anesthesia and meeting the inclusion criteria were enrolled in the study. Each patient was briefed about the study and written informed consent was obtained.

A routine pre-anesthetic evaluation was performed by the attending anesthesiologist. Preoperative measurements included weight, height, and gestational weeks. The Body Surface Area (BSA) is calculated using the DuBois formula: $BSA = 0.007184 \times (weight^{0.425}) \times (height^{0.725})$. The Body Mass Index (BMI) is calculated using the formula: $BMI = body\ weight / height^2$.

Abdominal circumference (AC) was measured at the midpoint between the upper part of the iliac bone and the 12th costal margin with the patient standing upright. Hip circumference was measured at the most prominent part of the gluteal muscles. The waist-to-hip ratio (WHR) was calculated as the ratio of abdominal circumference to hip circumference.

Standard protocol for spinal anesthesia was followed. An intravenous line was established with a 20G catheter and the patient was started on Ringer Lactate solution. In the operating room, all patients were monitored using 3-lead electrocardiography (ECG), non-invasive blood pressure (NIBP) and peripheral oxygen saturation (SpO2) measurements.

With the patient in a sitting position, spinal anesthesia was administered using a 25G Quincke spinal needle at the L3-L4 interspace, with 10 mg of hyperbaric bupivacaine. Sensory block level was evaluated at one-minute intervals using the pinprick test. The operation commenced once the sensory block reached the T6 level. The time taken to reach the maximum sensory block level was recorded for each patient.

Hemodynamic parameters, including heart rate (bpm), mean arterial pressure (MAP), systolic arterial pressure (SAP) and diastolic arterial pressure (DAP), were measured and recorded every two minutes for the first 30 minutes and then every five minutes until the end of the procedure. Instances of hypotension and bradycardia following spinal anesthesia were documented.

RESULTS AND DISCUSSIONS

Demographic Data and Anthropometric Measurements: The demographic data and anthropometric measurements of the 100 parturients included in the study are summarized in Table 1. The mean age was 26.79 years (SD=3.70) and the mean gestational age was 38.30 weeks (SD=0.63). The average weight was 78.57 kg (SD=9.46) and the mean height was 155.87 cm (SD=4.57). The mean BMI was 32.50 kg/m² (SD=4.95) and the mean BSA was 1.78 m² (SD=0.09). The mean abdominal circumference was 95.13 cm (SD=2.53) and the mean waist-to-hip ratio was 0.97 (SD=0.06).

Distribution of Maximum Block Level: The maximum block level achieved in each parturient was noted. Among the 100 parturients, 33 achieved a maximum block level of T4, while 67 reached T6. The distribution of maximum block levels based on anthropometric measurements is presented in Tables 2-7.

Correlation of Anthropometric Measurements with Maximum Block Level:

- **Height:** A shorter stature was associated with a higher block level (T4). There was a significant difference in the heights of parturients achieving a maximum block of T4 and T6 (χ^2=15.88, p=0.003). Among the 33 parturients who achieved T4, 19 had a height <155 cm (Table 2).
- **Weight:** The maximum block level achieved was higher (T4) in parturients with a weight above 85 kg (χ^2=64.6, p<0.001). Among the 33 parturients who achieved T4, 32 had a weight above 80 kg (Table 3).
- **BMI:** The maximum block level achieved was higher (T4) in parturients with a BMI $\geq$35 (χ^2=67.59, p<0.001). Among the 33 parturients who achieved T4, 31 had a BMI $\geq$35 (Table 4).
- **BSA:** The maximum block level achieved was higher (T4) in parturients with a BSA $\geq$1.8 (χ^2=28.92, p<0.001). Among the 33 parturients who achieved T4, 31 had a BSA $\geq$1.8 (Table 5).
- **Abdominal Circumference (AC):** The maximum block level achieved was higher (T4) in parturients with an AC $\geq$96 cm (χ^2=60.31, p<0.001). Among the 33 parturients who achieved T4, 31 had an AC $\geq$96 cm (Table 6).
- **Waist-to-Hip Ratio (WHR):** The maximum block level achieved was higher (T4) in parturients with a WHR $\geq$1 (χ^2=24.07, p<0.001). Among the 33 parturients who achieved T4, 33 had a WHR $\geq$1 (Table 7).

Correlation of Anthropometric Measurements with Time to Achieve Maximum Block Level: There was a strong negative correlation between increasing weight, BMI, BSA, AC and WHR with the time to achieve the maximum block level. Conversely, height had a strong positive correlation with the time to achieve the maximum block level (Table 7).

- **Weight:** r=-0.822, p<0.001
- **Height:** r=0.561, p<0.001
- **BMI:** r=-0.871, p<0.001
- **BSA:** r=-0.627, p<0.001
- **AC:** r=-0.725, p<0.001
- **WHR:** r=-0.477, p<0.001

Correlation of Anthropometric Measurements with Hemodynamic Parameters: There was a significant correlation between anthropometric measurements and systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) post-induction of spinal anesthesia.

- **SBP:** Strong negative correlation with weight (r=-0.696, p<0.001), BMI (r=-0.766, p<0.001), BSA (r=-0.508, p<0.001) and AC (r=-0.663, p<0.001). Moderate negative correlation with WHR (r=-0.444, p<0.001). Strong positive correlation with height (r=0.524, p<0.001).
- **DBP:** Strong negative correlation with weight (r=-0.594, p<0.001), BMI (r=-0.628, p<0.001) and AC (r=-0.576, p<0.001). Moderate negative correlation with BSA (r=-0.463, p<0.001) and WHR (r=-0.430, p<0.001). Moderate positive correlation with height (r=0.383, p<0.001).
- **MAP:** Strong negative correlation with weight (r=-0.564, p<0.001), BMI (r=-0.600, p<0.001) and AC (r=-0.522, p<0.001). Moderate negative correlation with BSA (r=-0.437, p<0.001) and WHR (r=-0.431, p<0.001). Moderate positive correlation with height (r=0.370, p<0.001).

Incidence of Hypotension and Requirement of Ephedrine: Among the 100 parturients, 44 developed hypotension and 41 of these required ephedrine. The incidence of hypotension and the requirement of ephedrine were higher in parturients with shorter stature, higher weight, BMI, BSA, AC and WHR.

Table 1: Demographic Data of the Patients, Anthropometric Measurements and Spinal Block Characteristics.

Variables	No. of Patients	Mean	Standard Deviation	Median
Age (years)	100	26.79	3.70	26.50
Weight (kg)	100	78.57	9.46	78.00
Height (cm)	100	155.87	4.57	156.00
BMI (kg/sqm)	100	32.50	4.95	31.28
BSA	100	1.78	0.09	1.79
AC	100	95.13	2.53	95.00
Waist to Hip ratio	100	0.97	0.06	0.99
Gestational Weeks	100	38.30	0.63	38.00
ASA risk	100	2.00	0.00	2.00
Pulse rate	100	87.60	5.13	87.50
SBP	100	121.54	6.69	120.00
DBP	100	79.67	4.69	80.00
Respiratory Rate	100	19.33	1.51	20.00
Time to reach maximum block level	100	6.51	3.03	6.50

Table 2: Distribution of Patients by Height and Spinal Block Level (T4 and T6).

Height	T4	T6	No. of Patients
145-149	6	2	8
150-154	13	16	29
155-159	12	25	37
160-164	2	20	22
165-169	0	4	4
Total	33	67	100

Table 3: Distribution of Patients by Weight and Spinal Block Level (T4 & T6).

Weight	T4	T6	No. of Patients
60-64	0	3	3
65-69	0	14	14
70-74	0	23	23
75-79	1	14	15
80-84	6	9	15
85-89	11	3	14
90 and above	15	1	16
Total	33	67	100

Table 4: Distribution of Patients by BMI and Spinal Block Level (T4 & T6).

BMI	T4	T6	No. of Patients
18.5-24.9	0	1	1
25.0-29.9	0	41	41
30.0-34.9	2	18	20
35.0-39.9	23	7	30
40 and above	8	0	8
Total	33	67	100

Table 5: Distribution of Patients by BSA and Spinal Block Level (T4 & T6).

BSA	T4	T6	No. of Patients
1.60-1.69	1	16	17
1.70-1.79	7	33	40
1.80-1.89	18	18	36
1.90-1.99	6	0	6
2.0.-2.09	1	0	1
Total	33	67	100

Table 6: Distribution of Patients by AC and Spinal Block Level (T4 & T6).

AC	T4	T6	No. of Patients
90-92	0	19	19
93-95	2	38	40
96-99	22	10	32
100 and above	9	0	9
Total	33	67	100

Table 7: Correlation Between Anthropometric Measurements and Time Taken to Achieve Maximum Block Level (T4 and T6).

Variables (N=100)	Time taken maximum block level :Correlation Coefficient (r)	p-value
Weight (kg)	-0.822**	<0.001
Height(cm)	0.561**	<0.001
BMI (kg/mt²)	-0.871**	<0.001
Body Surface Area (m²)	-0.627**	<0.001
Abdominal Circumference (cm)	-0.725**	<0.001
Waist Hip Ratio	-0.477**	<0.001

Table 8: Correlation Coefficient Between Anthropometric Measurement vs DBP.

Anthropometric Measurement vs DBP	Correlation Coefficient (r)	p-value	Sig. at 5% level
Weight (kg)	-0.594**	<0.001	Yes
Height(cm)	0.383**	<0.001	Yes
BMI(kg/mt²)	-0.628**	<0.001	Yes
BSA(m²)	-0.463**	<0.001	Yes
Abdominal Circumference (cm)	-0.576**	<0.001	Yes
Waist-Hip ratio	-0.430**	<0.001	Yes

Table 9: Correlation Coefficient Between Anthropometric Measurement vs MAP

Anthropometric Measurement vs MAP	Correlation Coefficient (r)	p-value	Sig. at 5% level
Weight (kg)	-0.564**	<0.001	Yes
Height(cm)	0.370**	<0.001	Yes
BMI(kg/mt²)	-0.600**	<0.001	Yes
BSA(m²)	-0.437**	<0.001	Yes
Abdominal Circumference (cm)	-0.522**	<0.001	Yes
Waist-Hip ratio	-0.431**	<0.001	Yes

Table 10: Distribution of Patients by Height and Hypotension.

	Hypotension		
Height	**Y**	**N**	**No. of Patients**
145- 149	8	0	8
150-154	18	11	29
155-159	15	22	37
160-164	3	19	22
165-169	0	4	4
Total	44	56	100

Table 11: Distribution of Patients by Height and Ephedrine Administration.

	Ephedrine		
Height	**Y**	**N**	**No. of Patients**
145-149	8	0	8
150-154	16	13	29
155-159	14	23	37
160-164	3	19	22
165-169	0	4	4
Total	41	59	100

Table 12: Distribution of Patients by Weight and Hypotension.

	Hypotension		
Weight	**Y**	**N**	**No. of Patients**
60-64	0	3	3
65-69	1	13	14
70-74	0	23	23
75-79	1	13	15
80-84	12	3	15
85-89	14	0	14
90 and above	16	0	16
Total	44	55	100

Table 13: Distribution of Patients by Weight and Ephedrine Administration.

	Ephedrine		
Weight	**Y**	**N**	**No. of Patients**
60-64	0	3	3
65-69	1	13	14
70-74	0	23	23
75-79	1	13	15
80-84	9	6	15
85-89	14	0	14
90 and above	16	0	16
		5	
Total	41	9	100

Table 14: Distribution of Patients by BMI and Hypotension.

	Hypotension		
BMI	**Y**	**N**	**No. of Patients**
18.5-24.9	0	1	1
25.0-29.9	0	41	41
30.0-34.9	6	14	20
35.0-39.9	30	0	30
40 and above	8	0	8
		5	
Total	44	6	100

Table 15: Distribution of Patients by BMI and Ephedrine Administration.

	Ephedrine		
BMI	**Y**	**N**	**No. of Patients**
18.5-24.9	0	1	1
25.0-29.9	0	41	41
30.0-34.9	5	15	20
35.0-39.9	28	2	30
40 and above	8	0	8
Total	41	59	100

Table 16: Distribution of Patients by BSA and Hypotension.

	Hypotension		
BSA	**Y**	**N**	**No. of Patients**
1.60-1.69	2	15	17
1.70-1.79	9	31	40
1.80-1.89	26	10	36
1.90-1.99	6	0	6
2.0.-2.09	1	0	1
Total	44	56	100

Table 17: Distribution of Patients by BSA and Ephedrine Administration.

	Ephedrine		
BSA	**Y**	**N**	**No. of Patients**
1.60-1.69	2	15	17
1.70-1.79	8	32	40
1.80-1.89	24	12	36
1.90-1.99	6	0	6
2.0.-2.09	1	0	1
Total	41	59	100

Table 18: Distribution of Patients by AC and Hypotension.

	Hypotension		
AC	**Y**	**N**	**No. of Patients**
90-92	0	19	19
93-95	6	34	40
96-99	29	3	32
100 and above	9	0	9
Total	44	56	100

Table 19: Distribution of Patients by AC and Ephedrine Administration.

	Ephedrine		
AC	**Y**	**N**	**No. of Patients**
90-92	0	19	19
93-95	5	35	40
96-99	27	5	32
100 and above	9	0	9
Total	41	59	100

Table 20: Distribution of Patients by Waist to Hip Ratio and Ephedrine Administration.

	Ephedrine		
Waist to Hip ratio	**Y**	**N**	**No. of Patients**
0.80-0.84	0	3	3
0.85-0.89	0	16	16
0.90-0.94	0	5	5
0.95-0.99	9	18	27
1.0 and above	32	17	49
Total	41	59	100

Table 21: Correlation Coefficient Between Anthropometric Measurement vs Heart Rate.

Anthropometric Measurement Vs HR	Correlation Coefficient (r)	p-value	Sig. at 5% level
Weight (kg)	-0.306**	<0.001	Yes
Height(cm)	0.223*	0.026	Yes
BMI(kg/mt²)	-0.327*	0.001	Yes
BSA(m²)	-0.218*	0.029	Yes
Abdominal Circumference (cm)	-0.376**	<0.001	Yes
Waist-Hip ratio	-0.212*	0.034	Yes

- **Height:** Among the 44 parturients with hypotension, 26 had a height <155 cm (χ^2=25.58, p<0.001). Among the 41 parturients requiring ephedrine, 24 had a height <155 cm (χ^2=23.66, p<0.001) (Tables 10-11).
- **Weight:** Among the 44 parturients with hypotension, 32 had a weight above 80 kg (χ^2=81.76, p<0.001). Among the 41 parturients requiring ephedrine, 39 had a weight above 80 kg (χ^2=76.51, p<0.001) (Tables 12-13).
- **BMI:** Among the 44 parturients with hypotension, 38 had a BMI $\geq$35 (χ^2=82.95, p<0.001). Among the 41 parturients requiring ephedrine, 36 had a BMI $\geq$35 (χ^2=76.78, p<0.001) (Tables 14-15).
- **BSA:** Among the 44 parturients with hypotension, 33 had a BSA $\geq$1.8 (χ^2=35.22, p<0.001). Among the 41 parturients requiring ephedrine, 31 had a BSA $\geq$1.8 (χ^2=33.18, p<0.001) (Tables 16-17).
- **AC:** Among the 44 parturients with hypotension, 38 had an AC $\geq$96 cm (χ^2=60.51, p<0.001). Among the 41 parturients requiring ephedrine, 36 had an AC $\geq$96 cm (χ^2=60.51, p<0.001) (Tables 18-19).
- **WHR:** Among the 44 parturients with hypotension, 33 had a WHR $\geq$1 (χ^2=29.3, p<0.001). Among the

41 parturients requiring ephedrine, 32 had a WHR $\geq$1 (χ^2=29.3, p<0.001) (Tables 20-21).

No significant bradycardia was observed in any parturient requiring intervention. Intraoperative crystalloids were administered based on weight, fasting status and development of hypotension.

The increasing incidence of obesity in recent years, attributed to lifestyle changes and dietary habits, has made maternal obesity a major health concern, particularly due to excessive weight gain before and during pregnancy. Few studies have investigated the correlation between anthropometric measurements and spinal anesthesia block characteristics and hemodynamics. This study utilized easily measurable anthropometric parameters such as BMI, BSA, WHR, and AC to determine their correlation with the level of spinal anesthesia and subsequent hemodynamic changes.

Our findings indicate that short stature, increased BMI, BSA, WHR and AC are associated with a faster achievement of the maximum block level following spinal anesthesia administration. These factors also significantly affect hemodynamic parameters, including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and heart rate, with an increased incidence of hypotension in these parturients. Parturients with higher BMI, BSA, WHR, and AC achieved a higher maximum block level.

A similar study conducted in 2016 on 50 parturients undergoing elective cesarean section with ASA status I and II showed that anthropometric measurements were correlated with spinal anesthesia block characteristics and hemodynamic changes[1]. In contrast to our study, the previous study began the surgery after the parturient achieved a minimum dermatomal level of T4, whereas our study required a minimum level of T6. Our study found that 33% of the parturients achieved a maximum block level of T4, while 67% achieved T6. The previous study reported a maximum block level of T2 in 4% of parturients. Similar to our findings, parturients with short stature, high BMI, BSA, WHR and AC achieved a faster maximum block level. Additionally, hypotension was observed in 54% of parturients in the previous study compared to 44% in our study and significant differences were observed in the anthropometric measurements between parturients with and without hypotension. In the previous study, bradycardia was observed in 18% of parturients, whereas no significant bradycardia requiring intervention was noted in our study[1].

Another study in 2016 compared abdominal circumference with the initial block level achieved after spinal anesthesia administration. This study included 42 parturients with term gestation and ASA status I and II but excluded those with BMI >30 kg/m² and height <155 cm or >170 cm[2]. Our study found a strong correlation between higher abdominal circumference and a faster achievement of the maximum block level, as well as a greater incidence of hypotension. Conversely, the previous study found a strong correlation between abdominal circumference and the initial block level within the first five minutes but no correlation with the maximum block achieved or the incidence of hypotension, bradycardia, or the requirement of ephedrine[2].

A study conducted in 2011 examined the correlation between BMI and the development of hypotension following spinal anesthesia. It included 100 parturients divided into two groups based on pre-gestational BMI: below 25 kg/m² and above 25 kg/m²[3]. Similar to our findings, the study concluded that parturients with higher BMI had an increased incidence of intraoperative hypotension and a greater need for vasopressors[3].

An earlier study in 1990 investigated the influence of obesity on the spread of spinal anesthesia in patients undergoing lower limb orthopedic surgery. The study divided 80 patients into two groups based on BMI and administered spinal anesthesia either at the L3-L4 or L4-L5 interspace[4]. Our study included only parturients undergoing cesarean section, with spinal anesthesia administered at the L3-L4 interspace. The previous study found that patients with high BMI had a greater incidence of higher block levels, especially when anesthesia was administered at the L3-L4 interspace[4].

A 2014 study examined the effects of intra-abdominal pressure (IAP) in pregnant women on the level of spinal anesthesia and the incidence of hypotension. The study included 170 parturients and measured preoperative IAP, adjusting the spinal anesthesia dose based on height and weight[5]. The study concluded that high IAP contributed to an increased incidence of high spinal block and hypotension, recommending proper dosing to avoid complications. In our study, although IAP was not measured, a similar correlation was observed between higher abdominal circumference and increased incidence of hypotension[5].

A 2018 study assessed WHR and BMI as risk factors for hypotension in parturients undergoing cesarean section. The study included 236 parturients of ASA I, II, III and IV status and found no significant correlation between WHR, BMI and the development of hypotension, contrary to our findings[6]. Our study showed a significant correlation between BMI, WHR, and the level of block achieved, as well as hemodynamic changes[6].

Lastly, a 2015 study hypothesized that obesity independently affects spinal anesthesia outcomes. It included 209 patients undergoing total knee replacement surgery and found that patients with higher BMI had increased incidences of hypotension and a longer duration of subarachnoid block[7].

Although our study found a similar correlation, it focused on parturients undergoing cesarean section, and our study population did not include patients with BMI <18.5 kg/m² or >40 kg/m²[7].

CONCLUSION

In conclusion, our study highlights the significant impact of anthropometric measurements on the spread and speed of spinal anesthesia, as well as subsequent hemodynamic responses in parturients undergoing cesarean sections. Proper assessment of these measurements can help in planning anesthesia management and mitigating intraoperative complications.

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