

Distance from the Skin to the Lumbar Epidural Space in Basrah Obstetric population

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Abstract: Many anatomical structures are penetrated by needle during epidural anaesthesia which is one of the common procedures to relief pain during obstetric delivery. Multiple physical parameters like, age, height, weight and body mass Index may correlate with distance from the skin to epidural space. Till now the depth of epidural space in obstetric patient in Basrah is not studied. Aim of the study : To find the distance from the skin to epidural space at the level L3 – L4 in Basrah obstetric population and its correlation with the body mass index(BMI) in order to improve the success rate of the technique and minimize the errors of epidural analgesia and its complication. Patients and Methods: Two hundred fifty five pregnant women had been included in this study. The distance was measured for each patient, the distance from skin to needle hub was noted and this distance subtracted from the entire needle length to give the distance from skin surface to epidural space (SE).Result: The distance from the skin to epidural space ranges between (3 -7cm) with mean of $4.43 \pm SD 0.96$ cm 1, 2, 3. The distance from skin to epidural space was significantly correlated with the body weight and body mass Index(BMI).Conclusion: Distance from the Skin to the lumbar epidural space in most Iraqi obstetric patients in Basrah ranges between (3 -7cm) with mean of $4.43 \pm SD 0.96$ cm closely correlated with the body weight and body mass Index. The distance from the skin to the epidural space in Iraqi obstetric women in Basrah was greater than Asian countries that reported in Japanese, Chinese, Pakistan but lower than that reported about British and German women. The distance from the skin to the epidural space was significantly greater in British, compared with other countries Japanese, Chinese, Pakistan, German, Iraq(Basrah).

1. Introduction

Labour pain is ranked high on the pain rating scale when compared to other painful life experience and some labour women Who have been described it as the worst pain ever experienced {1}. Therefore different methods of labour pain relief are available in labour rooms but epidural techniques have been shown to provide excellent pain relief, minimal side effects and high patient satisfaction{2, 3}. While neuraxial analgesia is usually safe, complications can occur and some of them are directly attributable to the technique itself such as failure rate(14%), post dural puncture headache(0.21% to 1.6%) and nerve damage cause by needle trauma(0.6 per 100, 000) {4}. Although postdural puncture headache is an uncommon complication but when occurs it can produce severe morbidity and can severely limit a new mother's ability to care for her newborn{5, 6}. The common technique used for the conducting of epidural analgesia in labour rooms depends on correct identification of epidural space{7}. The needle penetrated many anatomical structure from skin to epidural space (Skin, subcutaneous tissue, supraspinous and interspinous part of posterior spinous ligament and ligamentum flavum) {8}. Different parameters can affect the depth of epidural space from the skin surface. One of these factors is the effect of hormonal changes during pregnancy that lead to weight gain, softening of tissues and ligaments. In addition to that physical parameters including age, ethnicity, weight and height also affecting the depth{5, 9}. For that reasons, an accurate estimate of the distance from the skin to the epidural space (SE distance) would aid in minimizing the complications and improving the outcomes.

The aim of the study

- 1) To measure the average distance from the skin to the lumbar epidural space in Basrah obstetric population and its correlation with the body physical parameters in order to improve the success rate of the technique and minimize the errors and its complications.
- 2) To compare the distance from skin to epidural space(SE) of the present study with (SE) estimated in different countries.

2. Patients and Methods

This prospective study was carried out in Al - Mosawy private hospital labor room department between March 2013 and April 2017. After taking the approval of Basrah Medical College Committee research Institute and the approval of Al - Mosawy private hospital verbal and written informed consent were obtained for all patients. In addition a full description of the procedure step by step was explained to all patients before handling the procedure. A total of two hundred fifty five pregnant women had been included in this study. Obstetric women admitted to the labor room requesting an epidural for labor analgesia were assessed for the fitness prior to commencing the procedure. Absolute and relative contraindications for epidural analgesia were excluded from our study. Absolute contraindications include patient refusal, lack of adequate equipment, lack of expertise or supervisory staff, severe coagulopathy, and infection at the site of puncture. Some patients may be technically challenging because of previous back surgery, such as

lumbar fusions and Harrington rods. Relative contraindications for neuraxial block, Low platelets but no bleeding, Infection remote from site of lumbar puncture, Raised intracranial pressure, Hypovolemia, Fixed cardiac output (eg, severe aortic stenosis){10}. Age, height and weight were measured and body mass index (BMI) was calculated as: $MI = \text{Weight (kg)} / \text{Height (meter)}^2$ {11}. Before doing the epidural puncture, a secured i.v cannula and 500cc crystalloid fluid given to the obstetric women. Standard monitoring according to the guidelines of the Royal College of anesthesia and pain management includes blood pressure monitoring, heart rate, electrocardiogram (ECG), oxygen saturation (SPO₂) and CTG (CARDIOTOCCOGRAPHY) for fetal heart monitoring. After putting the patient in a sitting position with a complete sterile preparation, a midline approach through a line drawn between the superior border of the posterior iliac crest will intersect the L4 spinous process for identification of L3-L4 intervertebral space{12}. Eighteen (18) gauge smith-portex Tuohys needle, 8cm long with 1cm space marking was used with local infiltration of 3CC 2% lignocaine to the skin. The needle was inserted in the skin at the determined landmark and it advanced slowly and steady until loss of resistance is noted. The distance from the skin to the needle hub was noted and this distance subtracted from the entire needle length to give the distance from skin surface to epidural space (SE){13}

Statistical analysis

The SPSS version 23 was used for data analysis. Descriptive statistics were used to measure the mean, standard deviation(SD), maximum, minimum and range of age, height weight, body mass Index and depth from skin to epidural space. The pearson correlation coefficient was used to study the relationship of the distance from skin to epidural space with height, weight and body mass Index. Statistically significant correlation was considered when P value less than 0.05.

3. Results

Two hundred fifty five pregnant women aged between 14 – 40 years with mean 26.73 ± 6.17 years. Weight between 50 – 115 kg with mean 68.43 ± 11.5 kg. Height 150 – 177 cm with mean 162.04 ± 5.75 and body mass index of (18 – 38 kg/m²) with mean 26.09 ± 4.25 kg/m². The distance from the skin to epidural space ranges between (3 -7cm) with mean of 4.43 ± 0.96 cm. The distance from skin to epidural space was significantly correlated with the body weight and body mass Index(BMI) but there is no significant correlation with age and height. The distance from the skin to the epidural space in Iraqi obstetric patients in Basrah was greater than that reported in Japanese, Chinese, Pakistan but lower than that for British and German women. The distance from the skin to the epidural space was significantly greater in British, compared with other countries that reported in Japanese, Chinese, Pakistan, German, Iraq (Basrah). The results were plotted in Figures : 1, 2, 3, 4.

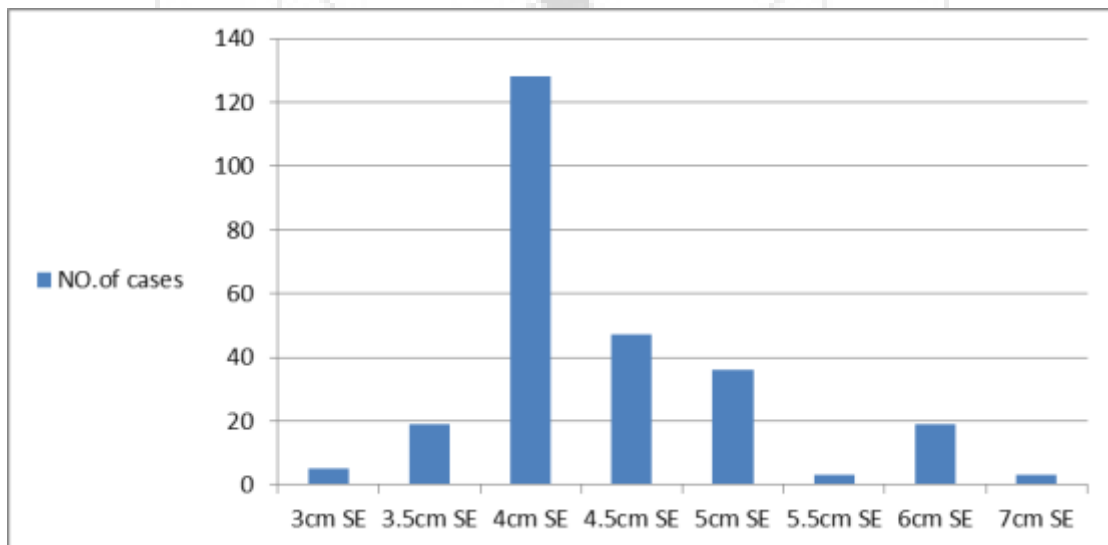


Figure 1: Histogram showing the distribution frequencies of distances (cm) from skin to epidural space(SE) in cm n=255.

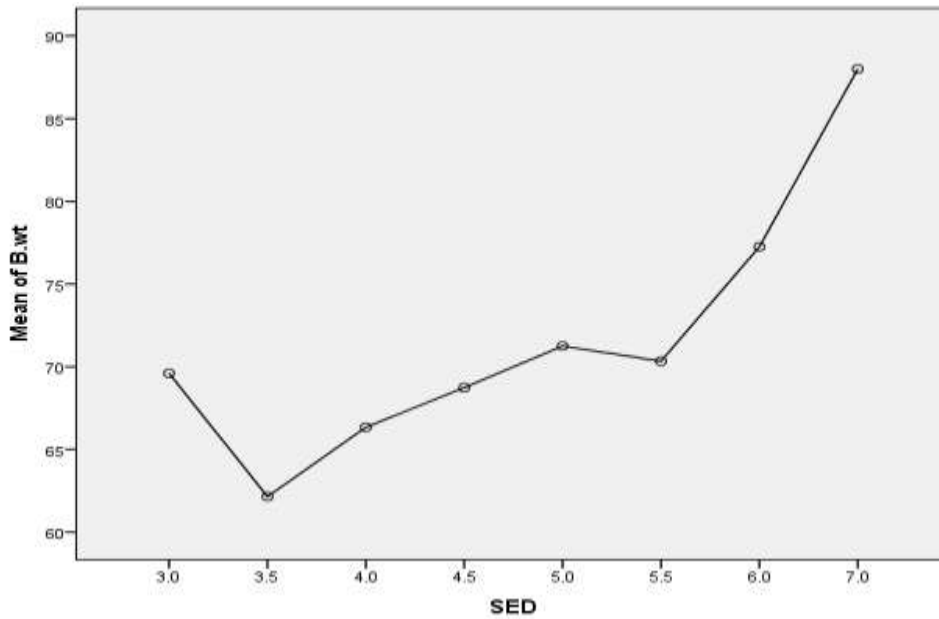


Figure 2: Mean Plots of women body weight(Kg) and distance(cm) from skin to epidural space(SE) at level ofL3 – L4.

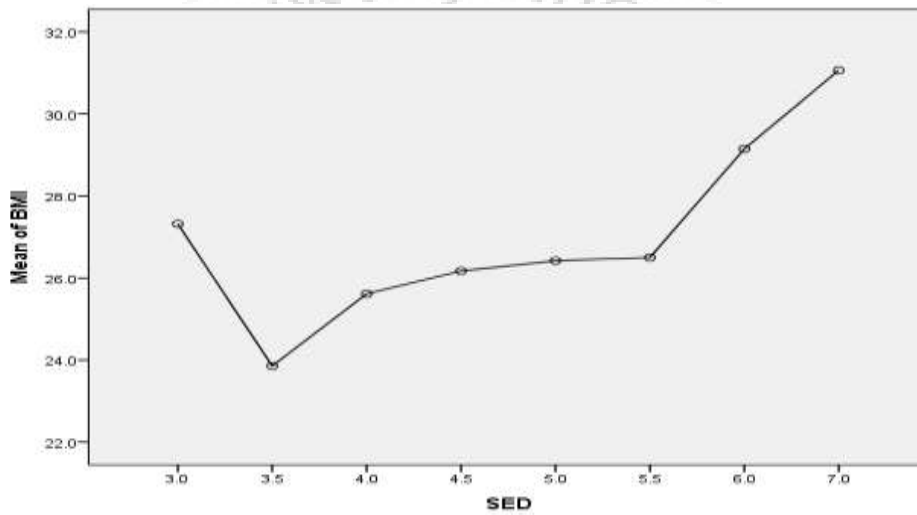


Figure 3: Mean Plots of women body mass Index (BMI) and distance(cm) from skin to epidural space(SE) at level ofL3 – L4.

Distance/cm

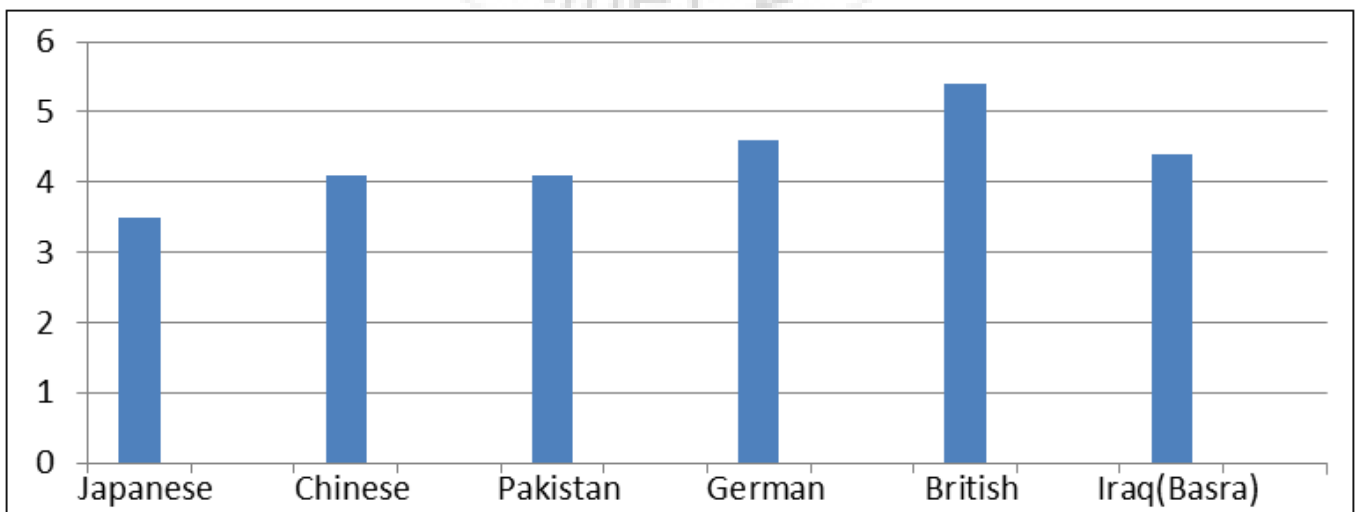


Figure 4: Comparison of Estimated distance(cm) from skin to epidural Space in obstetric patient in different countries

4. Discussion

Different studies have been carried out in different countries to predict the depth of epidural space and in most of these studies, the measurements were taken at the level of L3/L4 vertebral interspace [12]. Lumbar epidural technique is much more superior and best method for labour analgesia for many reasons. The success of epidural analgesia must be based on correct identification of epidural space depending on palpable anatomical landmark and proper procedure [5, 7, 12]. Otherwise the needle may not be introduced appropriately and it may reach the ligamentum flavum resulting in failure of block. On the other side if the needle is introduced too far it will result in puncturing of the dura and lead to injection of high doses of local anaesthetic drugs which have toxic and fatal effects on respiratory and cardiovascular system and the development of wet tap with the possibility of postdural puncture headache [5, 6]. So important planning for epidural analgesia is the estimation of the distance from the skin to epidural space. In the current study, the women aged between 14 – 40 years with mean $26.73 \pm SD 6.17$ years. Weight between 50 – 115 kg with mean $68.43 \pm SD 11.5$ kg. Height 150 – 177 cm with mean $162.04 \pm SD 5.75$ and body mass index of (18 – 38 kg/m²) with mean $26.09 \pm SD 4.25$ kg/m². The distance from the skin to epidural space ranging between (3 – 7 cm) with mean of $4.43 \pm SD 0.96$ cm. The distance from skin to epidural space was statistically significantly correlated with the body weight and body mass index (BMI) but there is no significant correlation with age and height. These findings are identical to the results obtained from other studies (Fakhre, *et al* 2009; Hirabayashi, *et al* 2011 and Komaljt, *et al*: 2011 [14, 15, 16]). Also Susan *et al* 1983 demonstrated that there was a direct relationship between patient weight and (SE) but no relationship between height and (SE). However, variation in (SE) depends on most variable structure is the subcutaneous tissue of the area which the needle passed through it [8]. The result obtained from the current study indicates that the distance from the skin to the epidural space in Iraqi obstetric patients in Basrah was greater than that reported in Japanese, Chinese, Pakistan but lower than that reported about British and German women. These differences in (SE) among these populations in different countries are due to many reasons. The vertebral shape, body composition and shape may be affected by a person's ethnicity or race [17]. Asians have larger vertebral bodies and smaller transverse and spinous processes when compared with Caucasians [18]. Therefore, this explains that the distance from the skin to the epidural space in Chinese, Japanese and Pakistan had a smaller distance. Then, comparison of distance from skin to epidural space (SE) with estimated (SE) in different countries revealed that the distance from the skin to the epidural space was significantly greater in British, compared with other Japanese, Chinese, Pakistan, German, Iraq (Basrah).

5. Conclusion

The distance from the skin to the epidural space of most obstetric women in Basrah with a mean of $4.43 \pm SD 0.96$ cm. The distance from skin to epidural space was statistically significantly correlated with the body weight and body mass index (BMI) but (SE) is not correlated with age and height. The distance from the skin to the epidural space

in Iraqi obstetric patients in Basrah was greater than that reported in Japanese, Chinese, Pakistan but less than that reported in British and German women. The distance from the skin to the epidural space was significantly greater in British, compared with other countries Japanese, Chinese, Pakistan, German, Iraq (Basrah).

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