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SCIENTIFIC JOURNAL
OF MEDICAL RESEARCH

Vol. 3, Issue 9, pp 21-24, Winter 2019

ISSN: 2520-5234

ORIGINAL ARTICLE

Changes in Gases, Electrolyte and Lactate acid during Normal Delivery and Caesarean section

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ARTICLE INFORMATIONS

Article History:
Submitted: 26 December 2018
Revised version received:
2 January 2019
Accepted: 3 January 2019
Published online: 1 March 2019

Key words:
Caesarean section
Blood gas
Serum electrolytes

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ABSTRACT

Objectives: Normal delivery is the process of an expelled fetus from the uterus through the vagina. Caesarean section is the use of surgery to deliver one or more babies. Blood Gas analysis (BGA) is an important test to monitor the equilibrium conditions and the basic parameters for gas concentration, gas control, and breathability control.
Methods: heparin tubes (2 ml) of blood for measurement of (PH, PCO2, PO2, Hct, SO2(est), tHb(est), Na+, K+, Ca++, Ca++(7.4), Cl-, HCO3-act, HCO3-std, BE(ecf), BE(B), BB(B), ctCO2, AnGap, CH+, mOsm, Glu, Lac).
Results: significant increases were appearing in the level of sodium (Na+) in the caesarean section (C.S.), but the other parameters did not have any significant effect on the labor type. (2 ml) Were used to measure blood gas analysis. I wonder why this woman was entered to the Operations Hall.
Conclusion: we conclude that the blood gas and serum electrolytes except Sodium had no effect on the type of delivery.

Citation: AL-Amiri R.M., Khadum H.S. and Issa A.H. "Changes in Gases, Electrolyte and Lactate acid during Normal Delivery and Caesarean section". Sci. J. Med. Res. 2019; 3 (9): 21-24.

INTRODUCTION

The term "Blood gas testing" it refers to the determination of the partial pressures of the physiologically active gases in the blood (pO2, pCO2), the pH of blood, and the oxygen saturation of the hemoglobin SaO_2 [1], and the measurement of electrolytes (sodium, potassium, chloride, ionized calcium, and magnesium), glucose, lactate, and creatinine, usually at the same time[2,3]. Blood gas tests can also measure bicarbonate levels in the blood. Many blood gas analyzers also report levels of lactate, hemoglobin, various electrolytes, oxyhemoglobin, carboxyhemoglobin and methemoglobin[4].

Any change in the pH of the blood, in terms of health and disease, is due to changes in three variables: carbon dioxide, relative concentrations of electrolytes, and weak total acid concentrations[5].

Partial oxygen pressure (PaO_2): measures the pressure of dissolved oxygen in the blood and the ability of oxygen to move from the airspace of the lungs into the blood. Carbon Dioxide Partial Pressure ($PaCO_2$): measures the pressure of carbon dioxide dissolved in the blood and the ability of carbon dioxide to leave the body.

PH: pH measures hydrogen ions (H +) in the blood. The blood pH is usually between 7.35 and 7.45. A pH below 7.0 is called acid, and a pH above 7.0 is alkaline. In this case, the blood is weakly basic bicarbonate (HCO_3): bicarbonate is a chemical (buffer) that prevents the pH from turning into too acidic or alkaline[6]. Oxygen content (O_2-CT) and oxygen saturation (O_2Sat). The O2 content determines the amount of oxygen in the blood. Oxygen saturation measures the amount of hemoglobin in red blood cells that carry oxygen (O_2).

Acidosis is a process that causes an increase in acidity in the blood and other bodily tissues that is an increase in the concentration of hydrogen ions[7].

Metabolic acidosis can be caused by an increase in the production of metabolic acids, such as lactic acid, or impaired ability of the kidneys to release acid, such as renal acidosis from the renal tubular or renal acidosis of kidney failure.

Respiratory acidosis is due to the accumulation of carbon dioxide in the blood (hypercapnia) due to hypoventilation, such as lung disease, head injuries, and medications, especially anesthetics and sedatives[8,9].

Lactate concentrations increase with decreased tissue perfusion due to anaerobic cell respiration[10]. Lactate levels, therefore, indicate the severity of the disease, which progresses during the critical "golden hours"[10,11]. Early detection and guided treatment by measuring the lactate level during this golden period provide the maximum benefit in terms of a better outcome[10,12].

During pregnancy, the respiratory component of the mother's acid-base system demonstrates a gradual decrease in arterial tension to CO_2 and an increase in the oxygen tension, as well as the metabolic element - a parallel decrease in plasma bicarbonate[13,14]. This leads to primary respiratory alkalosis and secondary compensatory metabolic acidosis and, therefore, to a normal pH, usually in the alkaline part of the normal range. There is no true "pregnancy acidosis", but there is a decrease in the total acid content and a total base; primary reduction in pCO_2 is buffered by a renal mechanism action that controls the loss or preservation of bicarbonate[13,14].

Despite good follow-up in the delivery, there are still adverse outcomes at delivery. A supplementary test is required for early prognosis of prolonged delivery and fetal hypoxia. One of the most important causes is dysfunctional labor. The major cause for perinatal mortality and morbidity is birth asphyxia secondary to abnormalities occurring during labor. Many trials have been done in the past for detection of the abnormalities in labor so that timely intervention can be done to improve perinatal outcome without increasing the caesarean section rate. Maintaining a partogram is very useful for assessing the dysfunctional labor[11].

These factors are very important in determining the patient's condition is dangerous or not, if stable, the labor passes smoothly.

The aim of the study: Since the rate of caesarean section increased in previous years. This study aims to research on the causes of increased incidence of obstetrics labor in women and the increasing rate of cesarean deliveries at current time and clarifying the role of blood gas analysis between the two groups of women who deliver by normal and caesarean section. Therefore the study is designed to achieve the following objectives: Measurement the quantities of pH, pCO_2, pO_2, Hct, sO_2(est), tHb(est), Na^+, K^+, Ca^{++}, Ca^{++}(7.4), Cl^-, HCO_3-act, HCO_3-std, BE(ecf), BE(B), BB(B), $ctCO_2$, AnGap, CH^+, mOsm, Glu, Lac). Because they are considered critical factors on the health of the patient, we want to know whether these factors influence the determination of the type of birth in women who have a normal delivery or caesarean section.

Ethics and Consent: Informed consent was obtained from all patients, and their identities remained anonymous during the entire study process

MATERIALS AND METHODS

This is a cross-sectional study carried out at Al-Basrah Teaching Hospital for Maternity and Childhood in Basrah, Iraq from October 2017 until February 2018. A 25 pregnant female were included in this study 16 were delivered by caesarean section and 9 by normal delivery. A two ml blood sample was collected from each pregnant female at the time of admission by heparin tube then the blood sample store at 4c°. All factors measured by automated by use[i15]. Statistical package for social science (SPSS) version 20 was used to analyze the data T-test.

RESULTS

As shown in Table 1 in comparison between normal delivery and C.S. groups, there is a significantly higher level of Na^+ in those women with C.S. in comparison with normal delivery, while that C.S. showed no significantly higher level of pO_2, SO_2(est), and Cl^-, but normal delivery appeared no significantly higher level of pCO_2 and K^+. While no significant variation was recorded in the level of pH, $Ca^{++}$and Ca^{++} (7.4), between normal and caesarean section groups.

Table 1: **The level of Blood Gas and Electrolytes in normal delivery and Caesarean Section.**

Variables	Normal labor n=9	Caesarean Section n=16	P. Values
pH	7.388333±.0588494	7.381187±.0682839	0.786
pCO_2	34.288889±7.3946677	33.731250±6.3398968	0 .852
pO_2	153.56±53.257	156.94 ± 51.344	0.879
SO_2(est)	97.22±6.496	98.00±4.258	0.753
Na+	135.44 ±2.404	141.06 ±9.983	0.046*
K^+	5.088889 ±.5158596	4.900000 ±.9215928	0.518
Ca^{++}	1.120000 ±.0438748	1.118125 ±.1133854	0.954
Ca^{++}(7.4)	1.116667 ±.0350000	1.110625 ±.1196366	0.853
Cl^-	108.33±3.122	109.06 ±3.941	0.616

(*) This mean significant, P value <0.05. (Value was expressed as Mean ± SD)

In comparison between normal delivery and C.S. groups, that the C.S. showed no significantly higher level of glucose, but normal delivery appeared no significant variation was recorded in the level of lactate and Hemoglobin. (Table 2).

Table 2: **The level of Glucose, Hemoglobin, and Lactate in normal delivery and Caesarean Section.**

Variables	Normal labor n=9	Caesarean Section n=16	P.Values
Glucose	4.314286±1.0699355	7.100000 ±7.8745159	0.273
Lactate	2.002857 ±.5599022	2.148182 ±.8046840	0.658
Hct	36.00 ±4.873	36.88 ±4.924	0.673
tHb(est)	12.233333 ±1.6492423	12.531250 ±1.6815543	0.672

The value was expressed as (Mean ± SD)

As shown in Table 3 in comparison between normal delivery and C.S. groups, it appeared that C.S. showed no significantly higher level of AnGap and CH^+, but normal labor appeared no significantly higher level of $ctCO_2$. While no significant variation was recorded in the level of HCO_3 -act, HCO-std, BE (ecf), BE (B), BB (B), and mOsm, between normal and caesarean section groups.

Table 3: **The level of Bicarbonate and other blood gases in normal delivery and Caesarean Section.**

Variables	Normal labor n=9	Caesarean Section n=16	P. Values
HCO_3-act	19.977778 ±2.6361799	19.481250 ±3.0131310	0.673
HCO_3-std	20.922222 ±1.7852015	20.58750 ±2.4600474	0.700
BE(ecf)	-5.011 ±2.5988	-5.613 ±3.5031	0.630
BE(B)	-4.300000 ±2.2422087	-4.800000 ±3.2253165	0.654
BB(B)	42.533333 ±2.4407990	42.175000 ±3.4061709	0.764
$ctCO_2$	21.00 ±2.872	20.44 ±3.076	0.652
AnGap,	11.78 ±3.232	12.58 ±5.616	0.684
cH^+	41.222222 ±5.5629978	42.366667 ±7.1868597	0.667
mOsm	270.266667±4.5296247	270.466667 ±5.7580510	0.930

The value was expressed as (Mean ± SD)

Discussion

During measurement of blood gas indices we observed that there were high level (not significant) of PO_2 and SO_2 and at the same time there were increased level of PCO_2 and CO_2 in normal labor this might be explained by that in C.S. the women try to increase the delivered of PO_2 and SO_2 and decrease elimination of CO_2 to the fetus thus providing a favorable environment for the fetus in utero and at delivery[15].

However, there was a significant increase in Na^+ level and a non-significant increase of Cl^- level in women with C.S. at the same time there was no significant decreased in K^+ level in C.S. this result similar with[16].

Our study showed no significant higher level of glucose in C.S. women, while no significant variation was recorded in the level of lactate similar results were also recorded by the study of researchers[17].

An increase in the production of other acids can also lead to metabolic acid0sis. For instance, lactic acidosis can happen from:

1. Severe hyp0xemia (PaO2 <36 mm Hg), which leads to a reduction in the Oxygen rate diffusion from arterial blood to the tissue.
2. Hypoperfusion (for example, hyp0v0lemic shock), which leads to an insufficient supply of Oxygen to the tissue.

An increase in lactate, which is disproportionate to the proportion of pyruvate in, for example, mixed venous blood, is termed "lactate excess" and may also be an indicator of fermentation due to anaerobic metabolism; in which cells of muscle undergo an intense exercise[18]. Studies have shown that if there is increased muscle activity there is an accumulation of lactate in response to it. In cases of prolonged labor due to exhaustion of uterine musculature and hypoxia, there is to an accumulation of lactate. Hypoxia is known to reduce the force and coordination of smooth muscle contraction[19]. An inefficient uterine action is one of the most common causes of poor progress in labor[20].

Conclusions

I noticed that these critical factors in women who were born caesarean section are the same in the woman who was born normal labor, where there are no significant differences here; I wonder why this woman was entered to the Operations Hall. Knowing that I excluded the cold cases that should give the birth Caesarean section of known medical reasons.

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