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Effect of Neonatal Oxidative Stresses on Serum Level of Vitamin A and Vitamin E

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Abstract

Background: Free radicals are described as molecules with one or more unpaired electrons in their outer shells and are produced continuously in all cells as a byproduct of cell metabolism. When the antioxidant system is not functioning properly and there is an excess of free radicals (FRs), oxidative stress occurs. Redox homeostasis is the state of equilibrium between the antioxidant system and the generation of free radicals. Essential micronutrients vitamin A and vitamin E have an antioxidant impact because they can interact with oxygen free radicals.

Aim of Study: Measure vitamin and E in neonates before and after exposure to oxidative stresses during NICU admission.

Patients and Methods: The current study included 10 matched controls and 40 newborns, 30 of whom were hospitalized to the neonatal critical care unit at Ain Shams, during the period of January to June 2015. According to various procedures and co-morbidities they had, the study was aimed to assess the levels of serum vitamin A and E in hospitalised neonates before admission and after discharge. By comparing these findings to controls (as an indication to oxidative stress).

Results: Vitamin A and B serum levels before admission were decreased in the study group when compared to controls. In addition, there was a significant drop in both vitamin A and E serum levels in cases at discharge than before admission. There was a significant drop in both vitamin A and B in preterms when compared to term neonates. There was also a significant drop in vitamin A and E serum levels with different neonatal intensive care unit (NICU) procedures, which include, mechanical ventilation, total parenteral nutrition (TPN), blood transfusion, and phototherapy.

Conclusion: The results of the present study revealed, a significant consumption of both vitamins A and E as antioxidants in different neonatal co-morbidities, and the need of an extrademand of these vitamins in, preterms, neonates with prolonged NICU stay, and neonates exposed to multiple NICU procedures including, (MV, phototherapy, TPN infusion, and blood transfusion).

Key Words: *Vitamin A and E – Oxidant stress – Neonates – NICU.*

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Introduction

NEONATAL intensive care unit (NICU) stressors such nosocomial infections, drugs, and procedures, as well as birth trauma and hypoxia episodes, have all been experienced by newborns since birth. Free radicals, chemical entities having one or more unpaired electrons in their outer shell, are created by these stresses in the body. Free radicals are mostly created in cells that generate aerobic energy since oxygen is utilised in all aerobic reactions. Free radicals quickly interact with neighbouring molecules to receive the electrons they need to recover their stability, but this interaction harms the nearby molecules by altering their structure or function **[1,2]**.

Free radicals play a role in a number of biological processes, such as the body's defence mechanisms against bacteria, viruses, and cancer cells. They also play a role in the dilation of blood vessels, neurotransmission, and gene regulation. Their output can be too much for the body to handle. The body has evolved defences against or to take advantage of free radical activity. These defences are made up of incredibly intricate antioxidant systems that cooperate to prevent free radical harm to the body's cells and organ systems **[3]**. An antioxidant is any chemical that can prevent free radicals from damaging cells by stabilising or deactivating them. Superoxide dismutase, catalase, and glutathione peroxidase are examples of en-

zyme-based antioxidants. Non-enzymatic antioxidants include vitamins E, C, and A, billirubin, and ubiquinone.

Enzyme-based antioxidants begin to develop and mature late in the third trimester, while non-enzymatic antioxidants begin to cross the placenta in late gestation [4].

Because of maturational deficiencies (including their antioxidant defence system), medical interventions, nutritional deficiencies and increased susceptibility to infection and inflammation, as well as poor control of free radical-generating stimuli in the environment, the neonatal period is a vulnerable time for free radical damage and injury, in addition neonates have low levels of vitamin A, and, E in their blood [5].

Examples of non-enzymatic antioxidants that are most frequently used are vitamin E and vitamin A. Being a fat-soluble vitamin, vitamin E works as an antioxidant by preventing perioxidation of the lipid bilayer. The adipose tissue is where the majority of vitamin E is kept [6]. Normal lung development and the health of the respiratory tract's epithelial cells depend on vitamin A. The body's capacity to control the production of free radicals may decline, leading to an unbalanced state. Following effects of this imbalance include bronchopulmonary dysplasia, necrotizing enterocolitis, respiratory distress syndrome, hypoxic ischemic encephalopathy, retinopathy of prematurity, intraventricular haemorrhage, and periventricular leukomalacia in the neonatal era [7]. Accordingly, reducing the neonates' exposure to various stresses and giving them antioxidants may help preventor decrease the severity of these diseases [8].

Patients and Methods

Patients and study design:

This three-month controlled cross-sectional study included 40 neonates full term and preterm admitted to Ain Shams University's Pediatric Hospital's NICU (January – June 2015). The neonates exposed to mechanical ventilation, total parenteral nutrition administration, sepsis, phototherapy, and blood transfusion were included as cases (thirty neonates), and ten healthy neonates were included as controls. The study excluded neonates with any congenital disease, surgical intervention, or referral from another neonatal intensive care unit.

Methods:

All recruited patients had a complete medical history, which included gestational age, weight, perinatal events, the day of admission, the indication and duration of admission to the neonatal intensive care unit, and the duration of any procedure, blood products and drugs used during admission. Complete blood count (CBC), C-reactive protein (CRP), blood culture, bilirubin level were evaluated in all involved patient. Vitamin A and E levels were performed on all neonates at the time of admission and at the end of their stay in the neonatal intensive care unit using high performance liquid chromatography (HPLC), Following the manufacturer's recommendations. The normal serum vitamin A level was 20-80g/dl. The normal serum level of vitamin E was 500-1500mg.

The study has been approved by the local ethical committee. After explaining the purpose and methodology of the study, all participants' parents signed a written informed consent form.

Statistical analysis:

The Statistical Package for Social Science was used to edit, code, tabulate, and transport the acquired data to a computer (SPSS 20 for windows). Based on the type of data obtained for each parameter, the data were displayed, and the necessary analysis was carried out. For non-numerical data like frequency and percentage as well as numerical data like mean, standard deviation (SD), and range, descriptive statistics were used. The statistical significance of the difference between the means of the two study groups was assessed using the Student *t*-Test. The statistical significance of a difference between the means of more than two research groups was assessed using the ANOVA test. Using Pearson's correlation analysis method: To assess the relationship between two quantitative variables' strength. The correlation coefficient, represented by the sign "*r*", describes the strength and direction of a linear relationship between two variables. To determine the statistical significance of the difference between two means measured twice for the same study group, the paired *t*-test was used.

Results

The results of the current study expressed vitamin A and E serum levels as indicators for oxidative stress in neonatal intensive care unit (NICU). The involved neonates were 18 full term; with mean gestational age of 37.2 ± 2.9, 12 preterm with mean gestational age of 31.8 ± 1.4 and 40% were males and 73% were delivered by cesarean section. Tables (2,3) illustrated the initial diagnoses and the stresses to which the neonates had been exposed.

Table (1): Indication, number of indications and duration of admission among the cases.

	N	%
Indication of admission:		
Jaundice	12	40.0
RD	4	13.3
Hemorrhagic disease of newborn	2	6.7
RD & sepsis	4	13.3
Hemorrhagic disease & RD	2	6.7
Jaundice & sepsis	2	6.7
Number of indications:		
Single	18	60.0
Double	8	26.7
Combined	4	13.3
Length of hospital admission:		
Mean ± SD	7.6	3.4
Range	4-15	
Median	7	

RD: Respiratory distress.

Table (2): NICU procedures performed on neonates during their NICU stay.

	N	%
Ventilation (N=14):		
CPAP	5	16.7
MV	9	30.0
None	16	53.3
Phototherapy/Exchange transfusion (N=18):		
Single phototherapy	4	13.3
Double phototherapy	10	33.3
Triple phototherapy	2	6.7
Exchange transfusion	2	6.7
None	12	40.0
Blood transfusion (N=4):		
Received	4	13.3
Not received	26	86.7
Parental nutrition (N=12):		
Partial	8	26.7
Total	4	13.3
Not received	18	60.0

MV : Mechanical ventilation.
CPAP: Continuous positive airway pressure.

Table (3): Comparison of vitamin A and E serum levels before with their level after admission among cases.

	Mean	± SD	Minimum	Maximum	*p*	Sig.
Vitamin A before	31.953	14.3255	14.0	64.0	.0001	HS
Vitamin A after exposure to stress	16.557	9.2632	4.7	37.0		
Vitamin E beforeexposure to stress	400.43	122.155	130.0	749.0	.0001	HS
Vitamin E afterexposure to stress	278.20	80.351	108.0	377.0		
Vitamin A drop valueexposure to stress	15.4	13.5	2.0	29.0		
Vitamin E drop valueexposure to stress	174.2	112.0	11.0	427.0		

Table (4): Comparison of Vitamin A and E serum levels in cases and controls.

	Group				*p*	Sig.
	Cases at admission		Control			
	Mean	± SD	Mean	± SD		
Vitamin A	32.0	14.3	71.2	2.9	.0001	HS
Vitamin E	400.4	156.2	827.0	60.9	.0001	HS

Table (5): Correlation of vitamin A and E levels with GA, LOS, CRP and TSB.

		Vitamin A before admission	Vitamin A at discharge	Vitamin E before admission	Vitamin E at discharge	Vitamin A drop value	Vitamin E drop value
GA	*r*	.061	.126	.108	.092	.100	.122
	p	.749	.509	.571	.629	.598	.520
	Sig	NS	NS	NS	NS	NS	NS
LOS	*r*	–	.207	–	.129	.372	.781
	p	–	.273	–	.498	.043	.0001
	Sig		NS	–	NS	S	HS
CRP	*r*	–.063	–.565	.714	.590	.216	.808
	p	.864	.089	.020	.073	.549	.005
	Sig	NS	NS	S	NS	NS	HS
TSB	*r*	–.393	–.070	.503	.212	.397	.148
	p	.118	.788	.040	.414	.115	.572
	Sig	NS	NS	S	NS	NS	NS

GA: Gestational age. LOS: Length of stay. CRP: C-reactive protein. TSB: Total serum bilirubin.

Table (6): Comparison of vitamin A and E serum levels at admission and before discharge according to indications of admission.

	Vitamin E at admission			Vitamin E before discharge			Vitamin A at admission			Vitamin A before discharge		
	Mean	± SD	*p*	Mean	± SD	*p*	Mean	± SD	*p*	Mean	± SD	*p*
RD	350.00	176.093	.289	202.00	5.774	.362	29.000	.8165	.003	15.000	1.8257	.005
Jaundice	458.08	123.173	NS	306.25	92.331	NS	33.683	11.0610		17.167	9.5426	HS
Haemorhgic Disease of newborn	300.50	.707		199.00	.000		30.500	.7071		15.500	.7071	
RD & Sepsis	333.00	35.223		168.00	38.114		25.100	16.8653		11.750	6.6521	
Jaundice & sepsis	335.50	.707		245.00	1.414		24.500	.7071		13.500	.7071	
Haemorhgic dis. & RD	300.50	.707		205.00	.000		30.000	1.4142		4.850	.2121	
RD & sepsis & jaundice	250.25	295.893		200.25	123.265		20.500	12.7083		9.55	2.8868	

RD: Respiratory distress.

Table (7): Relationship between indications of admission and drop value in vitamin A and E.

	Mean	± SD	*p*	Sig.
Vitamin A drop value:				
RD	10.0000	2.16025	.0001	HS
Jaundice	8.5167	3.97945		
Haemorhgic Disease of newborn	17.0000	1.41421		
RD & Sepsis	20.3500	10.22855		
Jaundice & sepsis	12.0000	1.41421		
Haemorhgic dis. & RD	22.1500	1.20208		
RD & sepsis & jaundice	20.0000	9.82344		
Vitamin A:				
RD	202.0000	170.31931	.021	S
Jaundice	93.8333	45.42893		
Hemorrhagic disease of newborn	159.5000	.70711		
RD & sepsis	274.0000	2.94392		
Jaundice & sepsis	190.5000	.70711		
Haemorhgic dis. & RD	194.5000	.70711		
RD & sepsis & jaundice	277.0000	172.62870		

RD: Respiratory distress.

Table (8): Relationship between maturity and vitamin A and E serum levels at admission and before discharge.

	Maturity				*p*	Sig.
	Preterm (N=12)		Fullterm (N=18)			
	Mean	± SD	Mean	± SD		
Vitamin A at admission	31.20	13.93	32.46	14.96	.819	NS
Vitamin A before discharge	16.83	10.13	16.37	8.94	.896	NS
Vitamin E at admission	402.92	209.59	370.44	112.81	.586	NS
Vitamin E before discharge	221.58	103.01	200.94	62.99	.500	NS
Vitamin A drop value	11.98	7.21	37.58	23.78	.739	NS
Vitamin E drop value	173.81	120.40	177.00	20.22	.782	NS

Table (9): Relationship between type of ventilation and vitamin A and E serum levels at admission and before discharge.

	Ventilation				*p*	Sig.
	Preterm (N=9)		Fullterm (N=5)			
	Mean	± SD	Mean	± SD		
Vitamin A at admission	36.9	19.2	31.2	8.2	.542	NS
Vitamin A before discharge	12.0	7.3	15.8	8.3	.388	NS
Vitamin E at admission	433.7	120.5	482.2	251.7	.629	NS
Vitamin E before discharge	193.4	66.5	234.4	84.0	.333	NS
	MV		CPAP			
	Mean	± SD	Mean	± SD		
Vitamin A drop value	20.0	20.6	15.4	8.4	.346	NS
Vitamin E drop value	240.2	84.2	247.8	186.7	.917	NS

MV = Mechanical ventilation. CPAP = Continuous positive airway pressure.

Table (10): Relationship between management strategies done in jaundice and vitamin A and E serum levels at admission and before discharge.

	Procedures in jaundiced cases								*p*	Sig.
	Single phototherapy (N=4)		Double (N=10)		Triple (N=2)		ET (N=2)			
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD		
Vitamin A at admission	27.50	12.71	28.62	10.68	25.50	.71	14.00	.00	.367	NS
Vitamin A before discharge	13.50	2.89	19.70	9.41	9.50	.71	9.50	.71	.125	NS
Vitamin E at admission	492.25	295.89	311.20	134.09	251.50	.71	328.50	.7	.321	NS
Vitamin E before discharge	215.25	123.26	210.40	99.43	128.50	.71	202.00	2.83	.739	NS
Vitamin A drop value	14.0	9.8	8.9	3.4	16.0	.0	4.5	.7	.075	NS
Vitamin E drop value	277.0	172.6	100.8	64.2	123.0	.0	126.5	3.5	.05	S

Table (11): Correlation of blood transfusion with vitamin A and E serum levels at admission and before discharge.

	Blood transfusion				*p*	Sig.
	Not received		Received (N=4)			
	Mean	± SD	Mean	± SD		
Vitamin A at admission	28.14	10.87	36.75	7.27	.0001	HS
Vitamin A before discharge	16.15	8.09	19.18	16.55	.553	NS
Vitamin E at admission	370.19	164.01	469.50	12.71	.243	NS
Vitamin E before discharge	196.38	78.75	292.50	7.51	.023	S
Vitamin A drop value	11.98	7.21	37.58	23.78	.0001	HS
Vitamin E drop value	173.81	120.41	177.00	20.22	.959	NS

Table (12): Correlation of parental nutrition with vitamin A and E serum levels at admission and before discharge.

	Parental nutrition						*p*	Sig.
	Not received		Received PPN (N=8)		Received TBN (N=4)			
	Mean	± SD	Mean	± SD	Mean	± SD		
Vitamin A at admission	29.79	11.96	28.80	14.27	48.00	17.34	.049	S
Vitamin A before discharge	19.94	9.42	10.63	4.90	13.18	9.62	.038	S
Vitamin E at admission	316.22	113.66	467.13	196.92	518.50	43.88	.009	HS
Vitamin E before discharge	208.72	83.51	191.63	88.16	246.50	45.61	.553	NS
Vitamin A drop value	9.84	4.33	18.18	9.57	34.82	26.95	.001	HS
Vitamin E drop value	107.50	54.10	275.50	113.04	272.00	89.49	.0001	HS

PPN: Partial parenteral nutrition. TBN: Total parenteral nutrition.

Discussion

Free radicals are highly reactive molecules containing one or more unpaired electron, they donate or abstract electron from other molecules in attempt to pair their electrons and generate a more stable species [9].

Oxidative stress is caused by imbalance between the production of free radicals and the efficacy of the body's redox system. Free radical reaction lead to oxidation of lipids, protiens, polysaccharides, and to DNA damage [10].

There are numerous processes that trigger the overproduction of FRs during the perinatal period, including free iron, the nitric oxide cascade, phagocytic activation, hypoxia, and hyperoxia [5]. As a result, newborns are more vulnerable to oxidative stress than adults are because of an imbalance between their high oxidant load and immature oxidant defences, high oxygen exposure, infections or inflammation, and free iron, which speeds up the fenton reaction and produces extremely toxic hydroxyl radicals [1].

Numerous newborn conditions, including bronchopulmonary dysplasia (BPD), retinopathy of prematurity (ROP), necrotizing enterocolitis (NEC), periventricular leukomalacia, renal failure, intraventricular Hge, and oxidative hemolysis, have been linked to oxidative stress, which affects many organs and produces a variety of symptoms depending on the organ most affected [11].

Enzymatic and non-enzymatic antioxidants can be separated into two categories. Vitamin A and Vitamin E are two of the most significant non-enzymatic antioxidants.

In the current investigation, blood levels of vitamins A and E were assessed before admission and after discharge from the newborn intensive care unit (NICU). A current sickness was evident by the reduced vitamin A and E levels in patients compared to controls. Additionally, it was discovered that the cases' serum levels of vitamins A and E were lower after release than they had been upon NICU admission. This shows that oxidative stress is the primary cause of these antioxidant vitamins' intake. Slater et al., observed that xanthine, uric acid, and malondialdehyde (MDA) levels were higher in cases than controls when they examined the impact of newborn intensive care procedures on oxidative stress in two groups of neonates [12].

Regarding maturity, it was previously established that preterm neonates had a higher risk of both vitamin A and E insufficiency and a higher demand than term neonates [13].

Though not statistically significant, the findings of the current investigation showed a negative association between the drops in vitamin A and E levels and gestational age. According to Navarro et al., low birth weight newborns had significantly lower levels of vitamin A than normal neonates, which is consistent with this. Another study found that compared to full-term normal infants, preterm infants and full-term infants with low birth weight had decreased serum vitamin E levels. Additionally, they stated that there was a statistically significant but modest connection between cord blood vitamin E and gestational age. On the contrary to these studies, Chan et al., reported that there was no significant difference between vitamin E levels of preterm and term babies [14,15,16].

In the current study, vitamin A and E levels were assessed in relation to the various neonatal intensive care unit (NTCU) procedures patients underwent, including blood transfusions, phototherapy, total parenteral nutrition (TPN), mechanical breathing, and TPN.

The current study demonstrated a significant decrease in both vitamin A and E levels when taking into account the effects of phototherapy and exchange transfusion on those levels. The rate of decline is greater in triple phototherapy than in single phototherapy. As evidence of oxidative stress, Gathwala et al. found an increase in thiobarbituric acid reactive material following phototherapy. After phototherapy, jaundiced infants' serum levels of uric acid, vitamin C, bilirubin, and MDA all decreased, according to Aycicek et al. Dahiya, et al too; reported a rise in malonedialdyde (MDA) (as an indicator of oxidative stress) in neonates who receive phototherapy compared to controls. In addition, Stokowski ct al., found that Phototherapy contribute to oxidative stress in neonates, especially, prematures. Abdelatif et al. also found an increase in nitric oxide and decrease in malondialdyde (MDA) in jaundiced neonates after phototherapy [17-21].

On the contrary, Akisu et al., reported that phototherapy did not affect both vitamin E level and antioxidant enzymes activities in both terms and preterms [22].

The levels of vitamins A and E scrum significantly dropped following exchange transfusion (ET), which is relevant. In contrast to other infants with STB >200mg/l, Shahab et al. (2008) reported no significant difference in oxidative stress after

exchange transfusion in jaundiced neonates with low levels of total serum bilirubin. Additionally, no association between exchange transfusion and oxidative stress was found by Gopinathan et al. **[23,24]**.

The current investigation about mechanical ventilation revealed a substantial decrease in vitamin A and E levels, although this difference was not significant between synchronised intermittent mechanical ventilation (SIMV) and continuous positive airway pressure (CPAWP), two different forms of breathing (CPAP).

In agreement with this study, Gitto et al., confirmed that oxidative stress was higher in mechanical ventilation compared by nasopharyngeal continuous positive air pressure (CPAP) **[25]**.

Also, Vento et al., showed that resuscitation with 100% O_2 trigger long term elevation of oxidative damage, compared to those provided with room air. In addition, other studies reported decrease oxidative stress and neonatal mortality with resuscitation by 21 % O_2 **[26-29]**.

The current investigation revealed a very significant decline in serum levels of vitamins A and E in newborns who received parenteral nourishment. According to one study, there is an increase in lipid peroxidation following the in vivo delivery of intralipid, which is consistent with this. In newborns receiving parenteral feeding, Basu et al., showed an increase in serum MDA production. In addition, a different study found that giving TPN to newborns increased their generation of free radicals. Nitric oxide generation in infants was reportedly affected by total parenteral nutrition (TPN), according to Dalqic et al. Additionally, one study found that all groups of neonates who received TPN had higher urine peroxide levels **[30-34]**.

According to the current study, vitamin A and E plasma levels were decreased in newborns who received blood transfusions. In line with this, Collard et al., discovered that neonates' urine levels of MDA rise after receiving blood transfusions. On the other hand, Dani et al., reported that after blood transfusion, total hydroperoxide and total antioxidant capacity (TAC) were unchanged **[35,36]**.

Vitamins A and E were linked to the indications of admission in the current investigation, such as, When it comes to jaundiced people, there is a pathological amount of bilirubin that requires attention even if a natural rise in bilirubin is a preventive mechanism against oxidative stress.

According to the current study, jaundiced newborns have significantly lower serum levels of both vitamin A and vitamin E. Also there is a negative correlation between total serum bilirubin (TSB) and vitamin E and A serum levels.

In agreement with this, Turgut et al., study's discovered lower amounts of vitamin A and E in infants with jaundice than in controls. Additionally, Davutoglu et al., discovered that compared to controls, infants with jaundice had lower antioxidant enzyme activity and higher levels of oxidative stress. On the other hand, in jaundiced newborns, Kumar et al., discovered a drop in malondialdehyde (MDA) and an increase in the activity of antioxidant enzymes **[37-39]**.

Neonatal sepsis is another study that demonstrates the need for admission. The current study demonstrates a considerable reduction in both vitamin A and E levels in septic neonates, as well as a favourable link between C-reactive protein (CRP) and vitamin A and E drop values.

In agreement with the present study, Batra et al. also found increase in reactive oxygen substances (ROS) in neonates with sepsis, also, Cancelier et al., found increase in oxidative parameters in umbilical cord of neonates that have any sign of sepsis. In addition, Marom et al., found that bacteremic neonates produce a significantly higher amounts of nitric oxide. And other studies found increase in malonaldialdyde (MDA) in term and preterm neonates with early and late onset sepsis **[40-45]**.

In support of the link between respiratory disorders and antioxidant levels, Falciqlia et al., reported that low levels of alpha tocopherol and selenium (antioxidants) in premature infants were significantly associated with an increase in respiratory morbidities. The present study revealed a significant decrease in both vitamin A and vitamin E serum levels in respiratory distressed neonates (RD). According to Rocha, one of the risk factors for bronchopulmonary dysplasia is oxidative stress (BPD). Also according to Saugstad, oxidative stress and BPD are related. According to Jobe, prolonged exposure of newborns who require oxygen after 32 weeks to greater oxygen saturation levels causes oxidative stress, which raises the risk of BPD. Additionally, according to Joung et al., oxidative DNA damage is a crucial process. in pathogenesis of BPD **[46-50]**. As regards length of stay (LOS), the present study showed a positive correlation between both vitamin A and vitamin E drop values and the length of stay in neonatal intensive care

unit, which mostly attributed to the severity of the disease, decrease enteral intake, an additional comorbidity, and the increase chance to use morc invasive procedures.

Conclusion: When compared to newborns with a single comorbidity, there was a highly significant decline in both vitamin A and E levels in neonates with multiple comorbidities. Therefore, it can be concluded that throughout the patient's admission to neonatal critical care, vitamin A and E consumption was related to several co-morbidities and the operations the patient underwent. The study's objective was to clarify the function of vitamins A and E as antioxidants with the intention of evaluating their regular administration as a means of reducing the consequences of this issue in newborns.

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تأثير الضغوط المؤكسدة لحديثى الولادة على مستوى فيتا مين أ وفيتامين هـ فى الدم

يتعرض الأطفال حديثى الولادة لاجهادات عديدة منذ الولادة منها نقص الأكسجين بالدم والصدمات أثناء الولادة وبالاضافة إلى الاجهادات التى تحدث فى وحدة العناية المركزة منها تسمم الدم واستخدام الاجهزة والادوية المختلفة أثناء هذا يفرز الجسم الشوارد الحرة والتى تعرف بأنها مواد كيميائية تحتوى على الكترون واحد أو أكثر غير مزدوج فى غلافها الخارجى ولتستعيد ثباتها تتفاعل مع الجزيئات المجاورة فتغير تركيبها أو وظيفتها. بالرغم من أن هذه الشوارد الحرة لها دور فى بعض العمليات الحيوية كالدفاع ضد الفيروسات والبكتيريا والخلايا السرطانية لكن معدل افرازها يمكن أن يزيد عن قدرة الجسم للتخلص منها.

جسم الانسان يهاجم هذه الشوارد الحرة بما يسمى بمضادات الأكسدة والتى ترف بأنها مواد قادرة على تثبيط هذه الشوارد قبل مهاجمة الخلايا ومنها انزيماتية والتى تبدأ تكوينها فى الشهور الأخيرة من الحمل وغير انزيماتية والتى منها فيتامينات أ و هـ وسى وتبدأ فى عبور المشيمة فى أخر الحمل.

تعتبر فترة حديثى الولادة أكثر الفترات عرضة للضغط التأ كسدى وبالأخص المبتسرين وذلك لعدم نضج أجهزة الجسم والتى منها أجهزة الدفاع ضد الأكسدة وزيادة تعرضهم للعدوى. من أهم الأمثلة لمضادات الأكسدة هى فيتامين أ وفيتامين هـ : فيتا مين هـ والذى يخزن فى الأنسجة الدهنية، فيتامين أ وهو مهم لأكتمال نمو الجهاز التنفسى.

من هذا فإن عدم التوازن فى الأكسدة ومضادات الأكسدة مسئول عن كثير من الأمراض ومنها الأمراض الرئوية المزمنة ومتلازمة الشدة فى الجهاز التنفسى والتهاب الأمعاء النخرى وإصابة المخ نتيجة نقص الأكسجين والنزيف البطينى وإصابة الشبكية للخدج. ولذلك من المهم عمل توازن بينهم وذلك بمحاولة إضافة مضادات الأكسدة لمنع أو تقليل خطورة هذه الأمراض.

الهدف من البحث هو قياس نسبة فيتامين أ وفيتامين هـ فى الأطفال حديثى الولادة والذين يتعرضون للضغط التأكسدى وذلك لتوضيح دورهم كمضادات أكسدة واستخدامهم بعد ذلك للتقليل من عواقب هذه المشكلة. يشتمل البحث على ٤٠ حالة من حديثى الولادة الذين يتم توافدهم إلى وحدة العناية المركزة لحديثى الولادة بمستشفى الأطفال جا معة عين شمس وتم تقسيمهم إلى مجموعتين من حديثى الولادة ١٠ طبيعيين و٣٠ ممن دخلوا العناية المركزة.

خضع كل الأطفال موضع الدراسة للتالى : دراسة التاريخ المرضى المفصل، الاختبارات المعملية لـ : تسمم الدم، نسبة الصفراء بالدم، فيتامين هـ وفيتامين أ.

ومن هنا فإن نتائج هذا البحث اشارات إلى الآتى :

- نسبة فيتامين أ و هـ فى حديثى الولادة الطبيعيين أعلى من الأطفال المتوافدين على وحدة العناية المركزة.
- إنخفاض واضح فى نسبة فيتامين أ و هـ فى الدم لحديثى الولادة بعد خروجهم من وحدة العناية المركزة.
- نسبة فيتامين أ و هـ فى الدم للمبتسرين أقل من مكتملى النمو.
- إنخفاض واضح فى نسبة فيتامين أ و هـ فى الدم لحديثى تبعاً للأجهزة المستخدمة بالعناية المركزة سواء كانت تنفس صناعى، جهاز ضوئى، تغذية عبر الوريد أو نقل دم.
- يوجد علاقة إيجابية بين نسبة إنخفاض فيتامين أ و هـ فى الدم وطول مدة الإقامة بالعناية المركزة لحديثى الولادة.
- يوجد علاقة إيجابية بين نسبة إنخفاض فيتامين أ و هـ فى الدم لحديثى الولادة وتعدد أسباب دخولها.
- يوجد علاقة إيجابية بين نسبة إنخفاض فيتامين أ و هـ ونسبة الصفراء الكلية بالدم.
- يوجد علاقة إيجابية بين نسبة إنخفاض فيتامين أ و هـ ومؤشر تسمم الدم عند حديثى الولادة.

ولذلك فمن هذه الدراسة نجد استهلاك واضح لفيتامين أ و هـ فى الدم لحديثى الولادة والمبتسرين كمضادات أكسدة ويزداد هذا الاستهلاك تبعاً للأجهزة المستخدمة بالعناية ولتعدد أسباب دخولها وأيضاً زيادة مدة الإقامة بها وذلك بسبب زيادة الضغط التأ كسدى الناتج عن هذا.