IMPACT OF FLUID RESUSCITATION ON THE OUTCOMES OF CRITICALLY ILL CHILDREN IN EMERGENCY ROOM

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ABSTRACT

Background: *Critically ill people may lose fluid because of serious conditions, sepsis, and need additional fluids urgently to prevent dehydration or kidney failure. Appropriate early fluid resuscitation improves survival. There are relatively easy and practical measurements to use in the clinical context. One of them is inferior vena cava aortic index.*

Objectives: *To evaluate the association between fluid resuscitation and outcomes in critically ill children, and to estimate the accuracy of newly introduced ultrasound index in assessing fluid responsiveness in critically ill patients.*

Subjects and Methods: *This prospective study was carried in Luxor international hospital pediatric intensive care unit. It included 100 critically ill pediatric patients to evaluate the association between fluid resuscitation and outcomes and to Estimate the accuracy of newly introduced ultrasound index in assessing fluid responsiveness in critically ill patients.*

Results: *28 day mortality was significantly higher among fluid non- responders than fluid responders .there was significant difference between the two groups regarding PICU stay .It also showed that after fluid bolus, there was significant difference between responders and non-responders regarding heart rate, O2 saturation and serum osmolarity. There was weak positive correlation between post- resuscitation IVC-Aortic index and CVP.*

Conclusion: *Fluid resuscitation affects the mortality rate, picu stay and haemodynamics in critically ill children. Also, IVC/Aorta index assessment seems to be a quick, simple, noninvasive, and reliable method to access the fluid status in the emergency room.*

Keywords: *Fluid resuscitation, critically ill children, mortality, IVC/Aorta index.*

INTRODUCTION

Critically ill people may lose fluid because of serious conditions, sepsis, and need additional fluids urgently to prevent dehydration or kidney failure. Colloid or crystalloid solutions can be used for this purpose. Crystalloids have small molecules, are cheap, easy to use, and provide immediate fluid resuscitation, but may increase oedema. Colloids have larger molecules, cost more, and may provide swifter volume expansion in the intravascular space, but may induce allergic reactions, blood clotting disorders, and kidney failure **(Lewis et al., 2018)**.

The ideal resuscitation fluid should be one that produces a predictable and sustained increase in intravascular volume, has a chemical composition as close as possible to that of extracellular fluid, is metabolized and completely excreted without accumulation in tissues, does not produce adverse metabolic or systemic effects, and is cost-effective in terms of improving patient outcomes **(Myburgh et al., 2013)**.

The goal of hemodynamic resuscitation is to achieve adequate oxygen delivery by maintaining adequate cardiac output and perfusion pressure. This is typically attempted initially with intravascular volume expansion. However, in pediatric studies examining fluid responsiveness, only 40% to 69% of children responded to intravascular volume expansion **(Lukito et al., 2012**; **Raux et al., 2012**; **Chandler et al., 2011**; **Pereira et al., 2011)**.Appropriate early fluid resuscitation improves survival **(Han et al., 2003)**. However, fluid over load after patient stabilization affects oxygenation index (OI) and can lead to increased morbidity **(Arikan et al., 2012)**.

Numerous hemodynamic variables have been proposed as predictors of fluid responsiveness. Static variables are based on a single observation in time. This includes clinical observations such as heart rate and arterial blood pressure, preload pressures such as central venous pressure (CVP) and pulmonary artery occlusion pressure, and preload volume estimates from thermo dilution and ultrasound dilution **(Gan et al.,2013)**.

Dynamic variables reflect the variation in preload induced by mechanical ventilation. With positive pressure ventilation, the vena cava blood flow is impeded during inspiration, causing a decrease in venous return and pulmonary artery blood flow. This effect on venous return can be quantified as inferior vena cava diameter variation (ΔIVCD) **(Michard et al., 2005)**.

Finally, there are relatively easy and practical measurements to use in the clinical context, especially when large number of patients with severe hypovolemic and or septic shock requiring aggressive fluid replacement **(Ketharanathan et al., 2014)**.

It is in this regard we propose the use of the inferior vena cava to abdominal aortic (IVC:Ao) diameter index as a new and relevant tool in emergency department (ED) to assess shock in its early stage.

PATIENTS AND METHODS

This prospective study was carried in Luxor international hospital pediatric intensive care unit. It included 100 critically ill pediatric patients.

Inclusion criteria:

Infants and children aged from 2 months up to 15 years admitted in Pediatric intensive care unit.

Exclusion criteria:

- Infants and children below 2 months or above 15 years.
- Patients who admitted at ward.
- Patients who are negatively balanced, Nephrotic syndrome and head trauma.

Methods:

History:

Age, sex, previous pediatric intensive care unit or neonatal intensive care unit admission…etc

Clinical examination:

All critically ill children presented at emergency room and admitted at pediatric intensive care unit were anthropometric measurements (e.g, height and head circumfence) were recorded, capillary filling time and CVP also calculated on admission and after the fluid bolus.

Laboratory data:

CBC, ABG, Electrolytes,24 hours urine , Serum sodium, creatinine, Hct, serum osmolarity ….etc on admission and after fluid bolus.

Imaging:

Ultrasound examination (IVC-AO index) was done 2 times; first on admission and second time after the fluid bolus. The examinations were conducted with the patients in the supine position. The transducer was placed in the median line, inferior to the xiphoid process. Following a slight change of the transducer placement, the IVC and Ao were visualized from the same site. The inferior vena cava was measured in its intrahepatic fragment beneath the confluence with the hepatic veins (2 cm below the diaphragm), where its walls were parallel. The diameter of the aorta was taken 1 cm above the celiac trunk **(Kosiak et al., 2008)**.

Participants were stratified into fluid responders and fluid non –responders .both groups were compared as regarding demographic data, underlying disease, 28 day mortality PICU stay, hemodynamic data, CVP and ultrasound index were also compared upon inclusion in the study and after fluid bolus.

Criteria of responders:

Fluid responsiveness was defined as ≥ 15% increase in cardiac index after a 15 mL/kg fluid bolus **(Lammi et al., 2015)**.

Data management and analysis:

Data was managed and analyzed using the statistical package for social sciences (SPSS) version 23. Continuous data were expressed as mean (standard deviation) and analyzed using t test. Categorical data were expressed as frequency (percent) and analyzed using chi square test. Linear correlations were tested. P-value<0.05 was considered to declare a result as statistically significant in this study.

Ethical consideration:

The aim of the study was explained to parents or caregivers of the patients before collection of data. Privacy of all data was assured.

- A written informed consent was obtained from patients or their legal guardians.
- An approval by the local ethical committee was obtained before the study.

- The authers declared no potential conflicts of interest with respect to the research,authorship,and /or publication of this article.

- All the data of the patients and results of the study are confidential and the patients have the right to keep it.

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RESULTS

Demographic data and other patient characteristics.

A total of 100 children aged below 15 years were included in the study, the mean age was 3.3 years, 54% of them were males and 46% were females. 36% of the studied children were with DKA and 16 % were with sepsis.

The mean PICU stay was 6.5 days and the mortality at 28 days was 18%. The details of demographic and socioeconomic characteristics of the children are presented in table 1.

		Mean / N	SD / %
Age (years)		3.3	2.76
sex	Male	54	54%
	female	46	46%
underlying disease	gastroenteritis	24	24%
	DKA	36	36%
	sepsis	16	16%
	pneumonia	6	6%
	metabolic disease	4	4%
	poor feeding and CP	14	14%
Fluid responders		88	88%
PICU stay		6.5	3.6
28 day mortality		18	18%

Figure (1): Percentage frequencies of sex distribution in the studied children

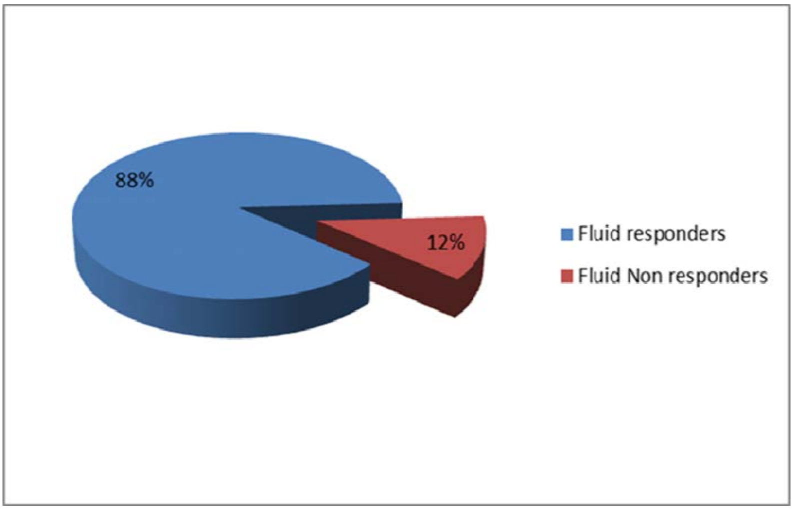


Figure (2): Percentage frequencies of underlying diseases of the studied children.

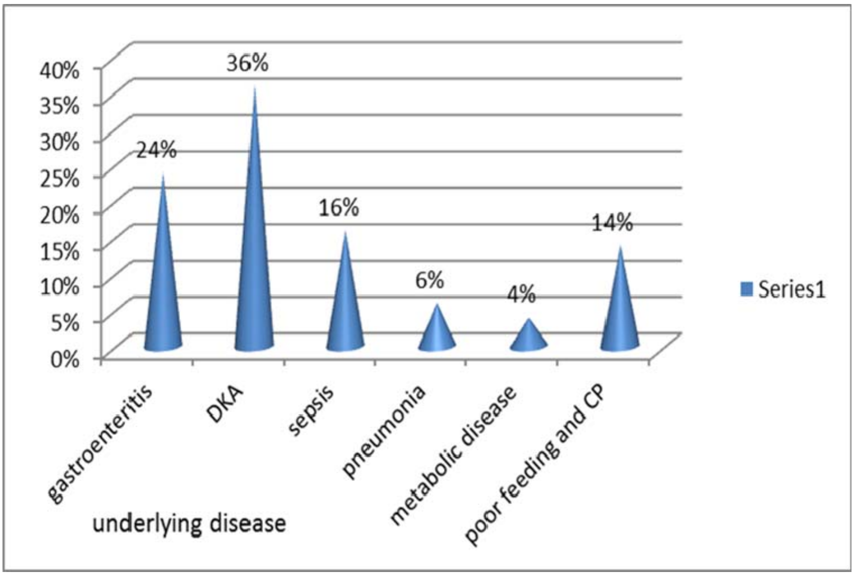


Table (2): Relationship between fluid responsiveness and underlying disease of the studied children

		Fluid Responders N=88	Fluid Non responders N=12	P-Value
Underlying disease	Gastroenteritis	24 (100%)	0	0.001
	DKA	36 (100%)	0	
	Sepsis	4 (25%)	12 (75%)	
	Pneumonia	6 (100%)	0	
	Metabolic disease	4 (100%)	0	
	Poor feeding and CP	14 (100%)	0	

Table 2 shows that there was significant difference between responders and non-responders regarding underlying disease (p=0.001).

It also shows that 100% of children with gastroenteritis were Fluid Responders compared to 0% of children were Fluid Non responders.

It also shows that 25% of children with sepsis were Fluid Responders compared to 75% of children were Fluid Non responders.

Table (3): Relationship between fluid responsiveness and demographic characteristics of the studied children

	Fluid Responders (Mean ± SD)	Fluid Non responders (Mean ± SD)	P-Value
PICU stay	3.54 ± .7	2.83 ± .718	.001
28 days mortality	6 (33.3%)	12 (66.7%)	.001

Table 3 shows that there was significant difference between responders and non-responders regarding PICU stay (p=.001).

It also shows that 33.3% of children with 28 days mortality were Fluid Responders compared to 66.7% of children were Fluid Non responders.

Table (4): Hemodynamics and lab data before and after fluid resuscitation

variable	before fluid resuscitation (Mean ± SD)	after fluid resuscitation (Mean ± SD)	p-value
Heart rate	175.8±22.436	153±23.668	.001
O2 saturation	86.88±1.358	92.52±2.765	.001
serum osmolarity	330.88±16.035	317.8±16.379	.001
Hct	41.9±2.97	36.18±2.443	.001
serum Na+	135.98±7.75	135.3±7.024	.001
Creatinine	1.924±.2349	1.706±.0267	.001

Table 4 shows that there was significant difference between mean heart rate before and after fluid (p=.001), there was significant difference between mean O2 saturation before and after fluid (p=.001). Also there was significant difference between mean serum osmolarity before and after fluid (p=.001).

It also shows that there was significant difference between mean Hct before and after fluid (p=.001), there was significant difference between mean serum Na+ before and after fluid (p=.001). Also there was significant difference between mean Creatinine before and after fluid (p=.001).

Table (5): Ultrasound indices and CVP before and after fluid bolus

	before fluid bolus (mean± SD)	after fluid bolus (mean ±SD)	p-value
IVC-Aortic index	.8392 ± .011	.9616 ± .128	.001
CVP	5.38 ± .498	7.27± 1	.001

Table 5 shows that there was significant difference between mean IVC-Aortic before and after fluid bolus (p=.001). Also there was significant difference between mean CVP before and after fluid bolus (p=.001).

Table (6): Hemodynamic and lab data after fluid bolus

		Fluid Responders (Mean ± SD)	Fluid Non responders (Mean ± SD)	P-Value
HR		147.7 ± 17.8	198.3 ± 8.88	.001
O2 saturation		93.27 ± 1.93	87 ± 1.2	.001
serum osmolarity		314.3 ± 14.14	343.5 ± 3.7	.001
Hct		35.68 ±1.83	39.83 ± 3.27	.001
serum Na+		135.41±7.36	134.5±3.85	.676
creatinine		1.643 ± .21	2.167 ± .19	.001
CRT	**Less than 3 seconds**	86(100%)	0	.001
	More than 3 seconds	2(14.3%)	12(85.7%)	

Table 6 shows that after fluid bolus, there was significant difference between responders and non-responders regarding heart rate (p=.001).There was also significant difference in O2 saturation (p=.001) and serum osmolarity (p=.001).

There was also significant difference in Hct (p=.001) and creatinine (p=.001).Also there was significant difference in CRT between the two groups (p=.001).

Table (7): Pre-fluid resuscitation ultrasound indices and CVP

	Fluid Non responders (Mean ± SD)	Fluid Non responders (Mean ± SD)	P-Value
IVC-Aortic index	.84±.01028	.8392±.01084	.794
CVP	5.398±.4980	5.250±.50	.338

Table 7 shows that before fluid bolus, there was no significant difference between responders and non-responders regarding IVC-Aortic index (p=.794) and CVP (p=.338).

Table (8): Ultrasound indices and CVP after fluid bolus

	Fluid Responders Mean ± SD	Fluid Non responders Mean ± SD	P-Value
IVC-Aortic index	.9791±.12725	.8333±.01155	.001
CVP	7.545±.685	5.25±.50	.001

Table 8 shows that after fluid bolus, there was significant difference between responders and non-responders regarding IVC-Aortic index (.9791±.12725and .8333±.01155 respectively)(p=.001).There was also significant difference in CVP (7.545±.685 and 5.25±.50 respectively) (p=.001)

Table (9): Correlation between IVC-Aortic index and CVP

Pre-fluid resuscitation			Post-fluid resuscitation		
		CVP			CVP
IVC-Aortic index	Pearson Correlation	.077	IVC-Aortic index	Pearson Correlation	.201*
	P-Value	.445		P-Value	.045

Figure (3): Correlation between pre- resuscitation IVC-Aortic index and CVP

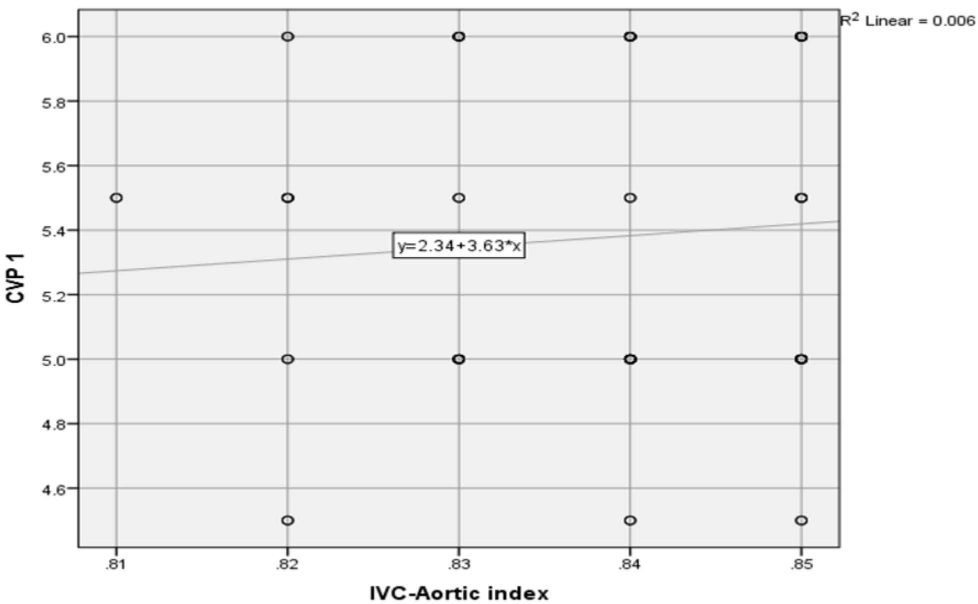


Table 9 and figure 3 shows that there is no correlation between pre- resuscitation IVC-Aortic index and CVP (Pearson Correlation=.077, P-Value=.445).

Figure (4): Correlation between post- resuscitation IVC-Aortic index and CVP

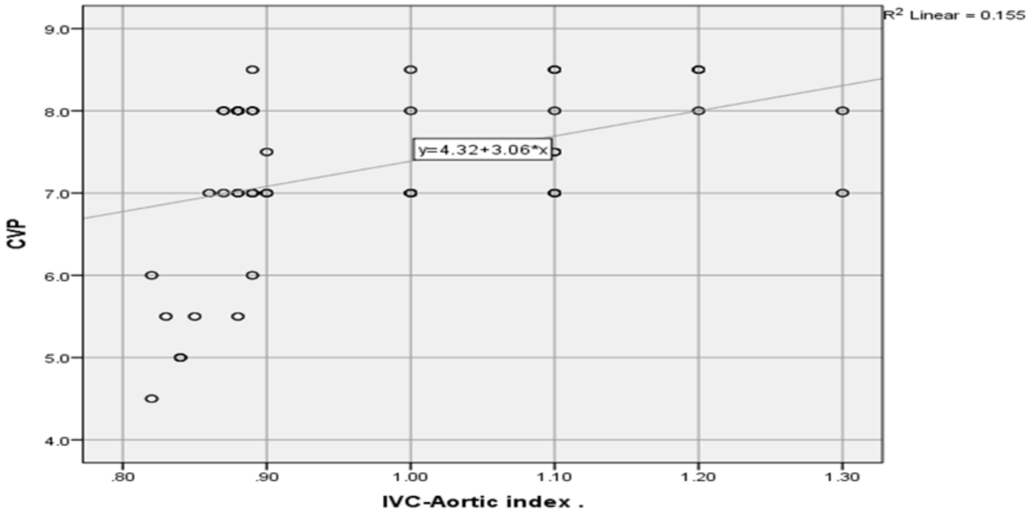


Table 9 and figure 4 shows that there is weak positive correlation between post-resuscitation IVC-Aortic index and CVP (Pearson Correlation=.201, P-Value=.045)

Table (10): Correlation between IVC-Aortic index and CRT

Pre-fluid resuscitation			Post-fluid resuscitation		
		CRT			CRT
IVC-Aortic index	Pearson Correlation	.077	IVC-Aortic index	Pearson Correlation	-.57-*
	P-Value	.448		P-Value	.001

Figure (5): Correlation between pre- resuscitation IVC-Aortic index and CRT

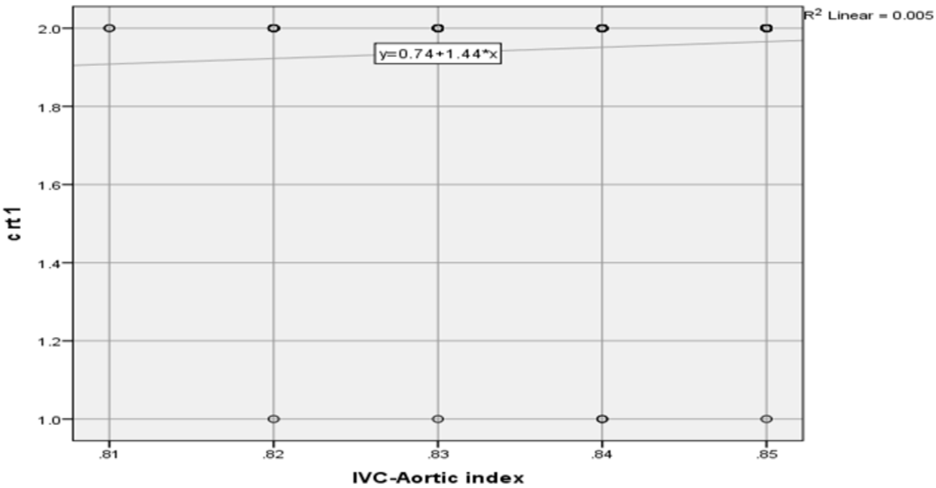


Table 10 and figure 5shows that there is no correlation between pre- resuscitation IVC-Aortic index and CRT (Spearman Correlation=.077, P-Value=.448).

Figure (6): Correlation between post- resuscitation IVC-Aortic index and CRT

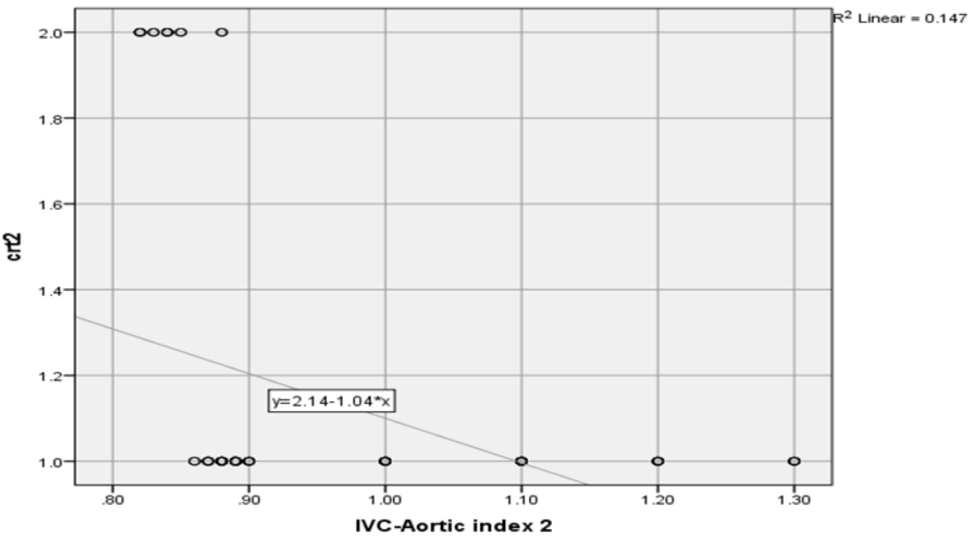
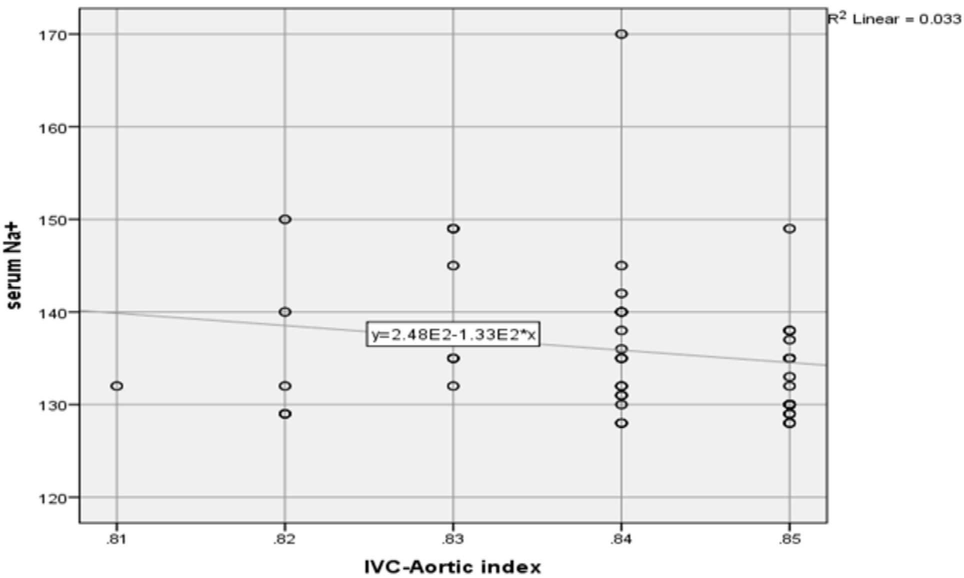


Table 10 and figure 6 shows that there is moderate negative correlation between post-resuscitation IVC-Aortic index and CRT (Spearman Correlation= -.57-, P-Value=.001).

Table (11): Correlation between IVC-Aortic index and serum Na+

Pre-fluid resuscitation			Post-fluid resuscitation		
		serum Na+			serum Na+
IVC-Aortic index	Pearson Correlation	-.182-	IVC-Aortic index	Pearson Correlation	-.139-
	P-Value	.07		P-Value	.169

Figure (7): Correlation between pre- resuscitation IVC-Aortic index



and serum Na+

Table 11 and figure 7shows that there is no correlation between pre- resuscitation IVC-Aortic index and serum Na+ (Pearson Correlation= -.182-, P-Value=.07).

Figure (8): Correlation between post- resuscitation IVC-Aortic index and serum Na+

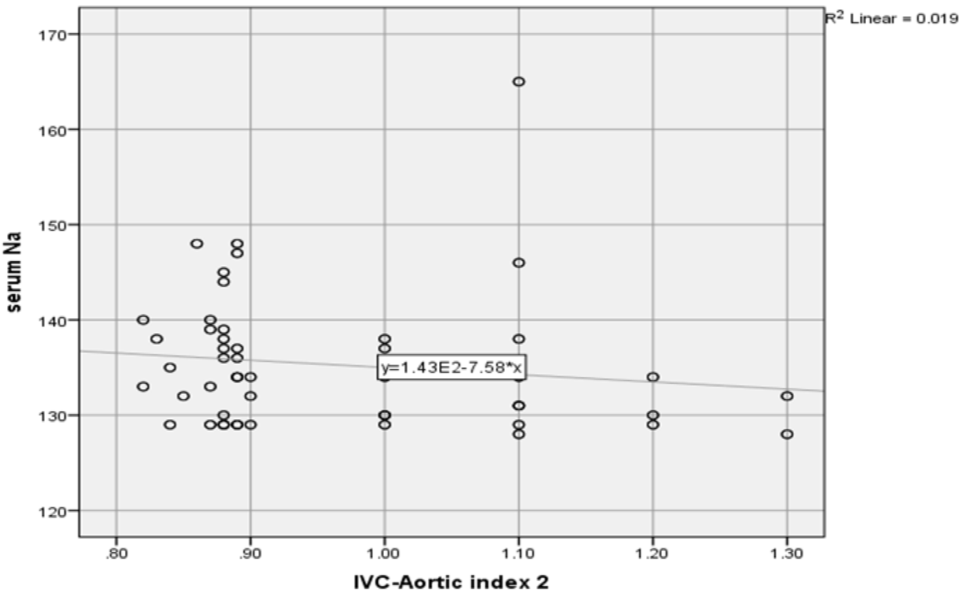


Table 11 and figure 8 shows that there is no correlation between post- resuscitation IVC-Aortic index and serum Na+ (Pearson Correlation = -.139-, P-Value=.169

DISCUSSION

This study was designed to identify relation among fluid resuscitation, mortality rate and length of hospital stay at pediatric intensive care unit and to estimate the accuracy of newly introduced ultrasound index in assessing fluid responsiveness in critically ill patients.

In our study the main reason for ICU admission in the study population was diabetic keto-acidosis and this represented 36% of the population. We also found that 12% of the studied patients were fluid non-responders. Marik et al supposed that nearly 50% of the study population was fluid non- responders **(Marik et al., 2009)**.

In our study we found that 28 day mortality was significantly higher among fluid non-responders (66.7%) than fluid responders (33.3%). Cordemans et al performed an observational study of 123 mechanically ventilated patients with extended hemodynamic monitoring for Fluid management in critically ill patients. The primary outcome was 28-day mortality, they found that fluid non-responders were strong independent predictors of mortality (OR 7.14, p= 0.001) **(Cordemans et al., 2012)**. The international paediatric treatment guidelines indicate that 60 ml/kg of isotonic resuscitation fluid given in the 1st hour of development of shock leads to a 9 fold reduction in mortality, **(Rivers et al., 2001, Han et al., 2003)**.

Also, there was significant difference between mean HR before and after fluid bolus (175 and 153 respectively) (p=.001). Also there were significant difference between mean O2 saturation, serum osmolarity, Hct, serum Na + and Creatinine before and after fluid bolus.

Also, there was significant difference between mean IVC-Aortic before and after fluid bolus (.8392 and .9616 respectively) (p=.001). Also there was significant difference between mean CVP before and after fluid bolus (5.38 and 7.27 respectively) (p=.001).

A study in paediatric sepsis involved sixty patients and showed similar haemodynamic stability at six and twelve hours among those resuscitated with saline or gelatin polymer (Haemaccel). Haemodynamic variables including heart rate, capillary refill time, pulse volume, and blood pressure were used to assess resolution of shock. The study supposed that resuscitation with saline required 20 ml/kg more than the volume of gelatin polymer needed to achieve haemodynamic stability, measured by capillary wedge pressure **(Upadhyay et al., 2005)**

Maitland et al supposed that there were similar improvements in central venous pressure with equal volumes of either 0.9% saline or 4.5% human albumin solution among children with severe malaria **(Maitland et al., 2003)**. Other studies showed that there were similar reductions in acidosis and other manifestations of shock **(Maitland et al., 2005)** in children receiving human albumin solution or saline and in those receiving albumin or Gelofusine (a gelatin based colloid) **(Akech et al., 2006)**.

Our study showed that there was significant difference between responders and non-responders regarding PICU stay (p=.001). It also showed that after fluid bolus, there was significant difference between responders and non-responders regarding heart rate (147.7 ± 17.8 and 198.3 ± 8.88 respectively) (p=.001).There was also significant difference in O2 saturation (93.27 ± 1.93 and 87 ± 1.2 respectively) (p=.001) and serum osmolarity (314.3 ± 14.14 and 343.5 ± 3.7 respectively) (p=.001). There was also significant difference in Hct (35.68 ±1.83 and 39.83 ± 3.27 respectively) (p=.001) and creatinine (1.643 ± .21and 2.167 ± .19 respectively) (p=.001). Also there was significant difference in CRT between the two groups (p=.001).

It also showed that after fluid bolus, there was significant difference between responders and non-responders regarding IVC-Aortic index (.9791±.12725and .8333±.01155 respectively) (p=.001).There was also significant difference in CVP (7.545±.685 and 5.25±.50 respectively) (p=.001).

Our study showed that there was weak positive correlation between post- resuscitation IVC-Aortic index and CVP (Pearson Correlation=.201, P-Value=.045), and it also showed that there was moderate negative correlation between post- resuscitation IVC-Aortic index and CRT (Spearman Correlation= -.57-, P-Value=.001).

The body fluid status assessment within the diagnostic and therapeutic management of acute and chronic disorders contains a vital role in their recovery. There are completely different ways of evaluating the body fluid status however none are optimum and have some limitations. The ideal method ought to be simple to perform, quick, precise, and repetitive **(Sridhar et al., 2012)**.

In 1979, Natori et al. proved good correlation between the changes in IVC diameter and right atrial blood pressure. Studies were conducted on the usefulness of sonographic IVC diameter assessment in monitoring body fluid status in patients undergoing hemodialysis **(Chang et al., 2004, So¨nmez et al., 1996)**, patients with nephritic syndrome **(Donmez**

et al., 2001), or those hospitalized in ICU.

The IVC is a high capacitance vessel that can distend and collapse. Thus, in volume depletion, it is easily collapsible and has a smaller diameter. With fluid replacement, the collapsibility reduces and the diameter increases. In fluid overload, the vein elasticity reaches threshold more that is minimally distensible and cannot collapse, thus maintains a relative constant diameter. The IVC size varies greatly between individuals and it does not correlate well with BMI or body surface area (BSA) **(Blehar, 2010)**. Also, there is a lack of clear IVC diameter reference values for pediatric and adult population.

Cheriex et alsupposed that the optimum values of IVC diameter ranging between eight and eleven and half mm per square meter of BSA on the basis of measurements from the examined group of adult hemodialysis patients **(Cheriex et al., 1989)**. According to Chang et al., there is a significant reduction of complications if the body dry weight of hemodialysis patients determined and monitored with the sonographic method to evaluate the fluid status **(Chang et al., 2004)**.

The IVC collapses during inspiration due to decreased intrathoracic pressure and expands during expiration due to increased intrathoracic pressure. The degree of collapsibility during the respiratory cycle predicts the fluid status of the individual patient **(Feissel et al., 2004)**. But, accurate measurements of the varying diameter are often difficult.

The correlation of IVC diameter, body height, and BSA has already been proven. With critically ill or emergency patients, accessing BSA is difficult and time consuming. The usefulness of this method would considerably increase if IVC diameter was compared with a parameter independent of body fluid status correlating with body growth and BSA. The aorta is a non-collapsible structure and maintains a relatively constant diameter regardless to the fluid status **(Sridhar et al., 2012)**.

The aortic diameter correlates with BSA, age, and sex of the patient **(Poutanen et al., 2003)**. Kosiak et al. supposed that IVC/ Ao is more specific in assessment of body fluid status **(Kosiak et al., 2008)**. so measuring the IVC/Ao regardless to the respiratory cycle has made the study easier, and does not necessitate viewing reference values for each age group **(Sridhar et al., 2012)**. Sonographic IVC/Ao for fluid status in young individuals from the American Journal of Emergency Medicine concluded that for the healthy young population, the IVC/Ao reference value is 1.2 ± 0.17 SD **(Kosiak et al., 2008)**.

The IVC/Ao seems to play a very important role in diagnosing fluid status in emergency patients. The simplicity of the examination technique with quite constant measurement points will eliminate the examiner dependence. The IVC/Ao index assessment may be used in every situation where body fluid status affects further treatment and prognosis.

CONCLUSION

Fluid resuscitation affects the mortality rate, picu stay and haemodynamics in critically ill children. Also, Sonographic IVC/Aorta index assessment seems to be a quick, simple, noninvasive, and reliable method to access the fluid status in a busy setup like an emergency room.

RECOMMENDATIONS

1. Fluid Resuscitation decreases 28 days mortality rate among clinically ill children.
2. Fluid Resuscitation affects hemodynamics of clinically ill patients.
3. The IVC/Ao index plays a very important role in diagnosing fluid status in emergency patients.

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تأثير الإنعاش بالمحاليل على نتائج الاطفال ذوى الحالات الحرجة بقسم الطوارئ

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تم تصميم هذه الدراسة لتحديد العلاقة بين الإنعاش بالسوائل ومعدل الوفيات وطول الإقامة في وحدة العناية المركزة للأطفال وتقييم دقة الموجات فوق الصوتية التى أدخلت حديثا في تقييم الاستجابة للسوائل في المرضى الذين يعانون من أمراض خطيرة.

كان السبب الرئيسي للحجز بوحدة العناية المركزة في مجتمع الدراسة هو الحماض الكيتوني السكري ، وهذا يمثل 36 ٪ من السكان. وجدنا أيضا أن 12 ٪ من المرضى الذين شملتهم الدراسة كانوا غير مستجيبين السوائل.

في دراستنا وجدنا أن معدل الوفيات خلال 28 يومًا كان أعلى بكثير بين غير المستجيبين للسوائل (66.7٪) من المستجيبين للسوائل (33.3٪).

أيضا ، كان هناك فرق كبير بين متوسط ضربات القلب قبل وبعد اعطاء السوائل وكان هناك أيضا فرق كبير بين متوسط نسبة الاكسجين بالدم ومتوسط نسبة الصوديوم والكرياتينين بالدم قبل وبعد اعطاء السوائل.

كان هناك فرق كبير بين متوسط مؤشر قطر الوريد الأجوف السفلي للشريان الابهر قبل وبعد اعطاء السوائل وكان هناك أيضا فرق كبير بين متوسط الضغط الوريدي المركزي قبل وبعد اعطاء السوائل.

أظهرت دراستنا أن هناك فرقًا كبيرًا بين المستجيبين وغير المستجيبين للسوائل فيما يتعلق بمدة الإقامة بالعناية المركزة للأطفال.

كما أظهر أنه بعد اعطاء السوائل ، كان هناك فرق كبير بين المستجيبين وغير المستجيبين فيما يتعلق بمعدل ضربات القلب و كان هناك أيضًا اختلاف كبير في تشبع الدم بالاكسجين واسمولية الدم والكرياتنين و الوقت اللازم لإعادة تعبئة الشعرية الدموية بين المستجيبين وغير المستجيبين للسوائل.

كما أظهرت الدراسة أنه بعد اعطاء السوائل ، كان هناك فرق كبير بين المستجيبين وغير المستجيبين فيما يتعلق بمتوسط نسبة قطر الوريد الأجوف السفلي للشريان الابهر وكان هناك أيضا فرق كبير بين متوسط الضغط الوريدي المركزي بين المجموعتين.

وجدنا أن هناك علاقة إيجابية جيدة بين مؤشر قطر الوريد الأجوف السفلي للشريان الابهر والضغط الوريدي المركزي بعد الإنعاش بالسوائل وكذلك هناك علاقة عكسية متوسطة بين مؤشر قطر الوريد الأجوف السفلي للشريان الابهر و الوقت اللازم لإعادة تعبئة الشعرية الدموية.

إن مؤشر قطر الوريد الأجوف السفلي للشريان الابهر يلعب دورًا مهمًا في تشخيص حالة السوائل لدى مرضى الطوارئ. إن بساطة تقنية الفحص مع وجود نقاط قياس ثابتة تمامًا يمكن أن تقضي على الاعتماد على الفاحص. يمكن استخدام تقييم مؤشر قطر الوريد الأجوف السفلي للشريان الابهر في كل حالة تؤثر فيها حالة سوائل الجسم على مزيد من العلاج والتشخيص.