

Frequency of Deep Venous Thrombosis in Patients Presenting with Diabetic Ketoacidosis

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ABSTRACT

Background: Diabetic ketoacidosis (DKA) is a state of severe insulin deficiency, either absolute or relative, resulting in hyperglycemia and ketonemia. DKA arises because of a lack of insulin in the body. **Objective:** Objective of this study is to determine the frequency of deep venous thrombosis in patients presenting with diabetic ketoacidosis. **Methods:** Study Design: Descriptive case series. Setting: Department of Medicine, Lahore General Hospital, Lahore. Duration: 6 months (18-08-2016 to 17-02-2107). Data Collection: Total 100 patients were enrolled. Standard treatment for DKA was given. After 3 days of admission, patients were evaluated for presence of swelling in legs, tenderness, Warmth or erythema of the skin. Data was analyzed in SPSS 21. **Results:** The mean age of patients was 50.39±6.202 years. Male to female ratio was 1.12:1. The swelling in legs was present in 33(33%), tenderness was present in 25(25%) and DVT was present in 37(37%) cases. **Conclusion:** The frequency of DVT in patients presenting with DKA was 37%.

Keywords: DVT, Tenderness, Diabetic Ketoacidosis, Swelling, Diabetes Mellitus.

INTRODUCTION

Diabetic ketoacidosis (DKA) is a state of severe insulin deficiency, either absolute or relative, resulting in hyperglycemia and ketonemia. Although possibly underappreciated, up to 10% of cases of intracerebral complications associated with an episode of DKA, and/or its treatment, are due to hemorrhage or ischemic brain infarction.^[1] DKA is an acute, major, life-threatening complication of diabetes mellitus. It carries a substantial risk of life threatening complications such as cerebral oedema and is the commonest cause of diabetes related death. The current criteria for diagnosis published by the International Society for Paediatric and Adolescent Diabetes is blood glucose >11 mmol/L, venous pH <7.3 or bicarbonate <15 mmol/L, and ketonaemia and ketonuria.^[2]

Rates of DKA vary around the world. About 4% of people with type 1 diabetes in United Kingdom develop DKA a year while in Malaysia the condition affects about 25% a year. DKA was first described in 1886 and, until the introduction of insulin therapy in the 1920s, it was almost universally fatal. The risk of death with adequate and timely treatment is currently around 1–4%. Up to 1% of children with DKA develop a complication known as cerebral edema. The true incidence is difficult to establish.

Population based studies range from 4.6 to 8 episodes per 1,000 patients with diabetes. DKA remains a significant clinical problem in spite of improvements in diabetes care. In the USA the prevalence has risen, whilst mortality has fallen.^[3]

According to the 2011 Joint British Diabetes Societies (JBDS) guideline for the management of DKA, capillary blood ketones should be measured in order to monitor the response to DKA treatment. The method of choice is bedside measurement of blood ketones using a ketone meter. In the absence of blood ketone measurement, venous pH and bicarbonate should be used together with bedside blood glucose monitoring to evaluate treatment response.^[4-6]

There are associations linking with the development of deep venous thrombosis (DVT) in DKA patients. Diabetes has a propensity for hypercoagulability and DKA promotes a prothrombotic state. Retrospective studies have shown patients with DKA are at higher risk of developing DVT.^[7]

Aim of this study is to assess the frequency of DVT in patients presenting with DKA. Literature has reported that the frequency of DVT is very high in patients of DKA but there is also ambiguity that some reported as low as negligible in DKA patients admitted in emergency. So it is important to confirm the extent of the problem in local setting as other studies have been reported in foreign countries and no local data is available in this regard.

MATERIALS AND METHODS

Study design: Descriptive case series

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Duration: 6 months (18-08-2016 to 17-02-2017)

Sample size: Sample size of 100 cases is calculated with 95% confidence level, 10% margin of error and taking expected percentage of DVT i.e. 50% in patients of DKA.

Sampling technique: Non-probability, consecutive sampling.

Inclusion criteria:

Patients of age 40 – 60 years of either gender of DKA (It is defined as blood glucose >11mmol/L, venous pH<7.3 or bicarbonate <15mmol/L, and ketonaemia (+1 on dipstick) and ketonuria at time of presentation.

Exclusion criteria:

Patients with hypertension, liver problems, renal problems, respiratory disorder like asthma, smoker or alcohol user, patients underwent knee or hip replacement surgery

Data collection procedure: 100 Patients fulfilling the inclusion criteria was selected from emergency. Demographic information was also obtained. Then all patients were admitted in ward and were followed-up there. Standard treatment was given. After 3 days of admission, patients were evaluated for presence of swelling in legs, tenderness, Warmth or erythema of the skin. In cases of presence of these signs, venography was done for confirmation of presence of DVT Deep venous thrombosis: It was labeled if there was swelling in legs, tenderness, Warmth or erythema of the skin (anyone or more) along with venography confirmation (which involves injecting a peripheral vein of the affected limb with a contrast agent and taking X-rays, to reveal whether the venous supply has been obstructed) already taking oral therapy for T2DM presenting within 24 hours of DKA. All this information was recorded on proforma.

Data analysis:

The collected information was entered into IBM SPSS version 21 and analyzed through it. Quantitative variables like age, BMI and duration of T2DM was calculated at mean & standard deviation. Qualitative variable like gender and DVT was calculated as frequency and percentage.

RESULTS

In this study total 100 cases participated. The mean age of patients was 50.39±6.202 years. The mean BMI of patients was 25.99±4.53 kg/m². The mean duration of T2DM was 5.47±2.84 years. Swelling in legs was present in 33(33%) patients, tenderness in 25(25%) patients, warmth or erythema of skin in 16(16%) patients, obstruction on venography was present in 17(17%) patients. [Table 1]

The study results showed that ≤ 50 years patients were 48 in which DVT was present in 17 cases while in 20 cases in patients aged >50 years (p-value=0.753). DVT was present in 20 males while in 17 females (p-value=0.871). In patients with ≤5 years duration of T2DM, DVT was present in 17 cases while in 20 patients with >5 years duration of T2DM (p-value=0.438). [Table 2]

Table 1: Demographics of patients

Age (years)	50.39±6.20
BMI (Kg/m ²)	25.99±4.53
Duration of T2DM (years)	5.47±2.84
Sign & symptoms	
Swelling in legs	33
Tenderness	25
Warmth or Erythema of skin	16
Obstruction on venography	17

Table 2: Comparison of DVT with effect modifiers

		DVT		Total	p-value
		Present	Absent		
Age (years)	≤ 50	17	31	48	0.753
	> 50	20	32	52	
Sex	Male	20	33	53	0.871
	Female	17	30	47	
Duration of T2DM	≤ 5	17	34	51	0.438
	> 5	20	29	49	

DISCUSSION

DKA is a state of severe insulin deficiency, either absolute or relative, resulting in hyperglycemia, ketonemia, acidemia, and systemic inflammation. Diabetes mellitus has not been described as a specific isolated risk factor for DVT in children, although a propensity for hypercoagulability has been noted in diabetic adults.^[8] In our study the frequency of the DVT was present in 37(37%) patients however the association with age, duration of diabetes and sex has insignificant effect with DVT. In this study the tenderness was noted in 25(25%) patients, warmth erythema of skin noted in 16(16%) and Obstruction on venography was present in 17(17%) patients.

Clinicians need to know the potential complications of DKA. DVT and pulmonary embolism are infrequent but do occur in patients with prolonged immobility or increased hemoconcentration. Diabetes mortality for both types remains at 1% to 2%. Between 20% and 30% of cases occur in patients with newly diagnosed diabetes.^{9, 10} Davis J et al,^[7] resulted that Diabetes has a propensity for hypercoagulability and DKA promotes a prothrombotic state. Retrospective studies have shown younger patients with DKA and a femoral CVL are at higher risk of developing DVT. A central femoral line should avoided in such patients. DVT prophylaxis and Doppler follow up should also be considered. There are associations linking with the development of DVT in DKA patients. Diabetes has

a propensity for hypercoagulability and DKA promotes a prothrombotic state.

Two case controlled studies found an increased rate (50%) of clinically apparent DVT in very young children (less than 3 years) with DKA who required femoral CVC insertion when compared with age-matched nondiabetic controls (who also underwent femoral CVC insertion).^[11,12] Comparatively, an incidence rate of 1.5–18.3% has been described for clinically or radiologically apparent femoral CVC-associated DVTs in the PICU population.^[11,13]

According to recently reported study by Gutierrez et al.^[12] In their series, 4 of 8 DKA patients that required a femoral CVC developed symptomatic DVT. None of the control patients in that study demonstrated DVT. Several studies found the incidence of DVT determined by ultrasonography or venography to be 2 to 3 times higher than DVT diagnosed by signs and symptoms alone.^[13,14] Pediatric venous thromboembolism registries have reported that 28% to 50% of DVT episodes in children occurred in the presence of an acute or chronic CVC.^[15,16] Not much literature available to find the frequency of DVT in DKA patients, so we recommend that further studies must be conducted in future to evaluate the results of our study.

CONCLUSION

According to our study the frequency of DVT in patients presenting with DKA was 37%.

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