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Case Report

Paediatrics Section

Thrombocytopenia Associated Multi-Organ Failure: A Fatal Complication of Diabetes Ketoacidosis

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ABSTRACT

Thrombocytopenia Associated Multiple Organ Failure (TAMOF) is an extremely rare fatal thrombotic microangiopathic disorder in children that can occur in association with Diabetes Ketoacidosis (DKA). An 11-year-old adolescent boy presented with severe DKA and later on he developed severe thrombocytopenia, intrinsic renal failure and pulmonary haemorrhage. The clinical picture was most consistent with TAMOF. The clinical condition, renal function test and platelet counts were gradually improved after multiple transfusion of fresh frozen plasma. A high index of suspicion of TAMOF is required in children with DKA who present with severe TAMOF. Plasma transfusion is suggested to be a life-saving intervention in a child with TAMOF secondary to DKA.

Keywords: Child, Plasma transfusion, Renal failure

CASE REPORT

An 11-year old emaciated adolescent boy presented with five days history of vomiting, pain in abdomen; altered sensorium for the last 24 hour. He was diagnosed diabetes mellitus type 1 two years back (with poor control). Medical and family history was not significant.

On examination, he had tachypnea, tachycardia, acidotic breathing, hypotension, hypoxemia and Glasgow coma scale score was 5. Initial investigations revealed hyperglycaemia (blood glucose 545 mg/dL), pH 6.93, bicarbonate level of 4.6 mmol/l, ketonuria 3+ glucosuria (3+). Complete blood count showed a haemoglobin of 10.7 g/dL, total leukocyte count 9,500/cumm and manual platelet counts of 20,000/µL. Qualitative CRP was negative.

Initially, he was diagnosed a case of DKA with severe thrombocytopenia. Fluid resuscitation and regular insulin infusion was started. After 24 hours of admission, he developed worsening of renal functions and oliguria. The peripheral blood film showed schistocytes (<5%), elevated LDH level (1179U/L). Blood culture was sterile; and serum lipase, amylase, anti-nuclear antibody, complements and anti-streptolysin titer values were within normal range. Coagulation studies and CT scan of the brain were unremarkable. ADAMTS13 (A Disintegrin and Metalloproteinase with A Thrombospondin type 1 motif, member 13) testing could not be done because of financial constraints. Renal biopsy could not be done because of thrombocytopenia.

These findings were consistent with TAMOF. He received 2 unit of Platelet Rich Plasma (PRP) and 6 unit of fresh frozen plasma transfusion. After one week of hospitalisation his clinical condition, renal function test, platelet counts and other lab parameters gradually improved [Table/Fig-1]. He was discharged on subcutaneous insulin and ask for regular follow-up in paediatric endocrinology clinic.

DISCUSSION

TAMOF is a recently described form of thrombotic microangiopathic syndrome. It is a clinical phenotype of multi-organ microvascular thrombosis characterised by presence of multiple-organ failure (>2 organ dysfunctions), new onset thrombocytopenia and elevated Lactate Dehydrogenase (LDH) levels [1]. It includes Thrombotic Thrombocytopenic Purpura (TTP), secondary Thrombotic Microangiopathy (TMA) and Disseminated Intravascular Coagulation (DIC). It has been developed secondary to sepsis, toxins, auto-immune diseases (Diabetes mellitus), radiation, transplantation and malignancy [2]. TAMOF in children is associated with very high mortality [3].

Lab parameter	On admission	Before plasma and platelets transfusion	After plasma and platelets transfusion
Haemoglobin (gm%)	10.7	10.5	11.8
White blood cells	9,500/cumm	8960/cumm	7600/cumm
Platelets count (µL)	20000/µL	16000/µL	170000/µL
Urea (mg/dL)	32 mg/dL	125/mg/dL	32/mg/dL
Creatinine (mg/dL)	0.78 mg/dL	2.7/mg/dL	0.5/mg/dL
LDH(U/L)	----	1179 U/L	108U/L
Random blood glucose (mg/dL)	545 mg/dL	346 mg/dL	120/mg/dL
pH	6.93	7.05	7.35

[Table/Fig-1]: Details of laboratory parameters on admission, before and after plasma transfusion.

To date, the association between DKA and TAMOF in children is only reported in a few of cases in the literature [Table/Fig-2] [4-7]. Patra KP et al., reported first case of TAMOF in a 12-year-old adolescent girl who presented with DKA along with acute pancreatitis and after few days she developed thrombocytopenia and intrinsic renal failure [4]. She was treated with plasmapheresis only. Khan MR et al., discussed another case of TAMOF associated with DKA in a 14-year adolescent girl who was treated with plasmapharesis and renal replacement therapy [5]. Recent case of TAMOF in a diabetic infant was reported by Kumar R et al., which was treated with multiple transfusion of fresh frozen plasma [7]. This case was also treated with multiple plasma transfusion in addition to supportive treatment.

S. No.	Author	Year	Age/Sex	Laboratory finding	Treatment received	Outcome
1	Patra KP et al., [4]	2011	12 year/F	Creatinine-raised Platelets count- low LDH- increased Lipase- increased	Plasmapheresis	Survived
2	Khan MR et al., [5]	2013	14 year/F	Creatinine-3.5mg/dL Platelet counts-45000/mm LDH level-1439IU/mL	Plasmapheresis and dialysis	Survived
3	Merrick V et al., [6]	2014	9 year/F	Creatinine- raised Platelet counts-31000/mm Amylase-raised	Plasmapheresis	Survived
4	Kumar R et al., [7]	2016	13 month/M	Creatinine-1.8 mg/dL Platelet counts-20000/mm LDH level-800IU/mL ADAMTS-13-34%	Fresh frozen plasma transfusion only	Survived

[Table/Fig-2]: Summary of case reports of TAMOF secondary to DKA in children [4-7].

CONCLUSION(S)

In any child presenting with DKA associated with moderate to severe thrombocytopenia, intrinsic renal failure (Raised urea and creatinine with oliguria), TAMOF should be considered as a differential diagnosis. Early recognition of this fatal condition and specific management can result in a significant improvement.

REFERENCES

[1] Nguyen TC, Carcillo JA. Bench-to-bedside review: Thrombocytopenia-associated multiple organ failure- A newly appreciated syndrome in the critically ill. Crit Care. 2006;10(6):235.

[2] Scully M, Hunt BJ, Benjamin S, Liesner R, Rose P, Peyvandi F, et al. Guidelines on the diagnosis and management of thrombotic thrombocytopenic purpura and other thrombotic microangiopathies. Br J Haematol. 2012;158:323-35.

[3] Nguyen TC, Han YY, Kiss JE, Hall MW, Hassett AC, Jaffe R, et al. Intensive plasma exchange increases a disintegrin and metalloprotease with thrombospondin motifs-13 activity and reverses organ dysfunction in children with thrombocytopenia associated multiple organ failure. Crit Care Med. 2008;36:2878-87.

[4] Patra KP, Scott LK. Diabetic ketoacidosis preceding thrombocytopenia associated multiple organ failure in a child. JOP. 2011;12:40-43.

[5] Khan MR, Maheshwari PK, Haque A. Thrombotic microangiopathic syndrome: A novel complication of diabetic ketoacidosis. Indian Pediatr. 2013; 50:697-99.

[6] Merrick V, Malik M, Vaidya M. Diabetic ketoacidosis preceding thrombocytopenia associated with acute renal failure and pancreatic enzyme elevation. Pediatric Critical Care Medicine. 2014;15(4):61. doi: 10.1097/01.pcc.0000448982.07798.36.

[7] Kumar R, Mcsharry B, Bradbeer P, Wiltshire E, Jefferies C. Thrombocytopenia-associated multiorgan failure occurring in an infant at the onset of type 1 diabetes successfully treated with fresh frozen plasma. Clinical Case Reports. 2016;4(7):671-74. doi:10.1002/ccr3.587.

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