A Unique Case of Dark Brown Plasma: Why Colour Variation should be Reported

Nayab Afzal

Department of Laboratory Medicine, National Medical Centre, Karachi, Pakistan

ABSTRACT

The normal physiological colour of plasma and urine ranges from yellow to straw-coloured. In this case report, we describe the occurrence of unusual, dark brown-coloured plasma and cola-coloured urine in a 42-year-man admitted to the Emergency Department. The patient presented with high-grade fever (102°F), chills, nausea, vomiting, dark stools, and dark urine for three days. The plasma was found to be dark brown in colour. He was diagnosed with Dengue hemorrhagic fever (DHF) and rhabdomyolysis (RM). He was closely monitored and treated successfully at our hospital. This case highlights the importance of plasma colour variations and also sheds light on a rare cause of dark brown-coloured plasma. Every case of brown colouration of the plasma must be promptly reported to the clinician and must also be mentioned in the patient report as this will help in timely diagnosis and favourable patient outcomes.

Key Words: *Blood plasma, Urine, Dengue fever, Rhabdomyolysis.*

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INTRODUCTION

The normal physiological plasma looks from yellowish to straw-coloured.[1] A great variation in colour may be seen in different pathological conditions. Hemolysis causes red colouration, and milky plasma is seen in hypertriglyceridemia.[2,3] Some uncommon colours are bright pink caused by cyanide poisoning and green plasma which occurs in cases of excessive estrogens in a patient's blood due to oral contraceptive pills or hormonal therapy.[4,5] A 3-month-old baby boy had strawberry pink colouration of blood due to familial combined hyperlipidemia.[6]

Here, we present an unusual case of a dark brown-coloured plasma sample along with cola-coloured urine in a patient who presented in the Emergency Department (ED).

CASE REPORT

A 42-year male with no known pre-existing medical conditions presented to the ED with high-grade fever (102 °F), chills, nausea, vomiting, dark stools, and dark cola-coloured urine for three days. The patient's fever was partially reduced with antipyretic medications but never reached baseline, while vomiting and black stools occurred at a frequency of 5-6 times per day.

Correspondence to: Dr. Nayab Afzal, Department of Laboratory Medicine, National Medical Centre, Karachi, Pakistan
E-mail: nayabfaizan@gmail.com

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The patient had a normal respiratory, musculoskeletal, and neurological examination. Blood samples were taken for various haematological and biochemical tests, and the plasma sample was noted to be dark brown, prompting concerns about complications of dengue fever (DF). The unusual colour of the plasma raised concerns about complications of DF, *i.e.*, Dengue Hemorrhagic Fever (DHF) and was immediately reported to the treating physician for further investigations.

On investigations, a complete blood count (CBC) revealed normal haemoglobin and leucocytes with lymphopenia and thrombocytopenia. Dengue NS-1 antigen and dengue IgM were positive while dengue IgG was negative, suggesting recent dengue infection. Lactate dehydrogenase (LDH) was 2981 mg/dl (normal range: 240-480 mg/dl) and creatine phosphokinase (CPK) was 2192 U/L (normal: <195 U/L). Other investigations are presented in Table I. The values of liver function tests (LFTs) and enzymes declined steadily and eventually normalized by the time of discharge. Urinalysis reported cola-coloured urine (Figure 1) with a pH of 7.0, positive erythrocytes (+), and proteinuria of 3+. Urine microscopy showed 1-2 red cells/HPF, 2-4 pus cells/HFP, and granular casts (+), with no bacteria, yeasts, or crystals. The laboratory reported the plasma as dark brown (Figure 2). Results for blood culture, malarial parasite on ICT, and peripheral film were negative. The patient's dark brown plasma and cola-coloured urine raised suspicion of *in-vivo* hemolysis and rhabdomyolysis (RM). However, normal electrolytes, glucose-6-phosphate dehydrogenase (G6PD) levels, antistreptolysin O titer (ASOT), C3, and C4 ruled out *in-vivo* hemolysis. Chest X-ray, abdominal ultrasound, and echocardiography showed no abnormalities. The patient was diagnosed with DHF with RM and was given antipyretics and antiemetics, and was hydrated.

Table I: Various biochemical and haematological parameters during the course of admission.

Analytes	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Reference Ranges
Total bilirubin (mg/dl)	1.12	1.50	4.99	4.45	3.24	2.91	1.94	<1.1
Direct bilirubin (mg/dl)	0.19	0.26	2.48	2.17	1.69	1.27	0.95	upto 0.2
Ind .bilirubin (mg/dl)	0.93	1.24	2.51	2.29	1.55	1.64	0.99	upto 0.95
ALT (U/L)	115	222	229	328	305	184	125	9-43
AST (U/L)	437	647	668	910	838	255	130	10-35
ALP (U/L)	59	60	106	120	111	87	72	40-130
GGT (U/L)	56	86	258	239	188	165	130	10-50
Sodium (mmol/L)	133	136	137	135	136	137	135	135 - 148
Potassium (mmol/L)	3.9	3.9	3.3	3.1	2.9	3.2	3.2	3.5-5.3
Chloride (mmol/L)	106	108	110	110	106	112	111	98-108
HCO3 (mg/dl)	24	26	23	22	26	25	26	24-32
Urea (mg/dl)	36	27	18	19	13	13	14	10-50
Creatinine (mg/dl)	1.1	1.1	0.8	1.0	0.8	0.7	0.7	0.6 - 1.3
LDH (mg/dl)	2981	3957	2954	-	-	590	452	240-480
CPK (U/L)	2192	2347	-	1152	-	288	180	<195
Heamoglobin (g/dl)	14.3	13.7	12.7	11.7	11.2	12.0	12.2	13 - 16.5
Haematocrit (%)	43.8	42.2	39.1	36.2	37.0	39.4	36	40 - 52
Leukocytes (cmm)	8080	7790	14010	23000	9670	7830	7600	4000 - 11000
Normoblasts	NIL	NIL	NIL	20/100	12/100	10/100	5/100	NIL
Platelets (cmm)	21000*	44000**	49000	71000	105000	115000	120000	150000 - 450000

** First unit of megaunit transfused at admission. ** Second unit of megaunit transfused on day 2.*
Ind bilirubin, indirect bilirubin; ALT, alanine transaminase; AST, aspartate transaminase; ALP, alkaline phosphatase; GGT, gamma-glutamyl transferase; HCO3, bicarbonate; LDH, lactate dehydrogenase; CPK, creatinine phosphokinase.

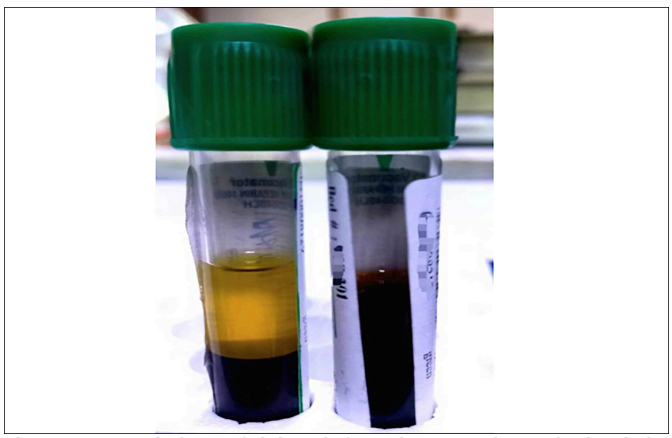

Figure 1: Normal plasma (Right tube), Dark Brown Plasma (Left tube).

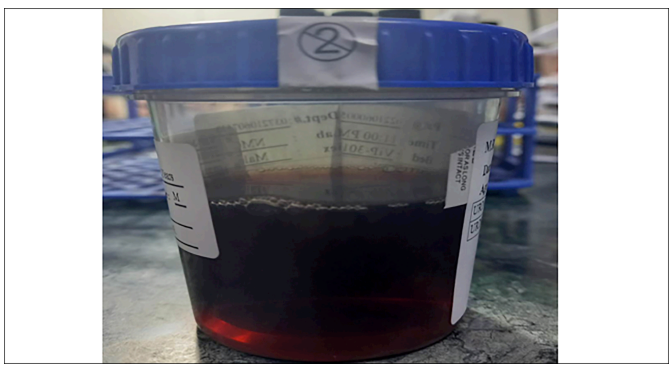

Figure 2: Dark cola-coloured urine collected on the day of admission.

The patient received mega platelet transfusions due to hematemesis and melena. Haemoglobin and Liver function tests (LFTs) showed a gradual downward trend for the first four days but later became stable. The patient's renal function tests remained normal throughout admission, and urine pH remained above 6.0, so alkalinization of urine was not required. Urine myoglobin, serum methemoglobin, and serum methemalbumin tests were not available at our hospital. The patient was discharged on the 7th day and reported no active complaints upon follow-up 5 days later with normal CBC and LFTs. Close monitoring of urine output and electrolytes was done to prevent acute kidney injury (AKI) due to RM.

DISCUSSION

DF usually presents as an acute febrile illness with nausea, rash, malaise, and/or positive dengue serology for IgM and IgG, and dengue virus antigen (NS1). DF may progress to a more severe condition called DHF. DHF occurs due to changes in vascular permeability and may prove to be fatal.[7] DHF presents as bleeding (hematemesis, epistaxis, melena), raised hematocrit, and low platelets (<100,000/cm).[8] All typical signs and symptoms of DHF were noted in this patient. He was managed with antipyretics and antiemetics and was hydrated with normal saline and two pints (280 ml each) of mega platelets. This treatment caused a rapid rise in platelet counts (Table I) and relief in hematemesis and melena.

Dark brown plasma can be caused by various factors such as methemoglobin, myoglobin, methemalbumin, and severe intravascular hemolysis.[9] In intravascular hemolysis, large amounts of haemoglobin are released from red blood cells, causing iron present in haemoglobin to change from the normal, ferrous (Fe^{2+}) to ferric (Fe^{3+}) form and resulting in the formation of methemoglobin. Methemoglobin and methemalbumin give a brown colour to the plasma.[10] Methemoglobinaemia can also be caused by oxidizing drugs, such as dapsone, quinones, and sulfonamides or toxins. However, there was no history of such drug use or exposure in this patient.

Myositis along with RM is a rare complication of DF. Laboratory findings of RM include increased levels of serum alanine transaminase (ALT), aspartate transaminase (AST), LDH, CPK, hyperkalemia, hyperuricemia, hyponatremia, and hyperphosphatemia. Symptoms of RM include myalgia, weakness,

swelling, and tenderness of involved muscles, but may not be seen in every patient.[10] This patient presented with severely elevated CK, ALT, AST, normal electrolytes, dark brown plasma, and dark cola-coloured urine but without any muscle pain or weakness. A large amount of myoglobin is released from muscles during RM, which causes the plasma and urine to become dark brown. In the case of dark urine due to myoglobinuria, the urinalysis is positive for hemolysed blood with very few red blood cells, as seen in this patient. Quantitative measurement of myoglobin in urine using the spectrophotometric method is also available but is usually not required in clinical practice. One of the most important biomarkers for dengue myositis and RM is CPK. AKI may occur in 13-50% of RM cases. RM-induced AKI is caused by the deposition of intratubular myoglobin casts, direct myoglobin toxicity, and renal vasoconstriction.[10] Elevated serum muscle enzymes like LDH, ALT, and AST also confirm muscle injury or inflammation. The patient was closely observed for AKI by strict input/output charting, and monitoring serum urea, creatinine, and electrolyte levels. He maintained good urine output (>200 ml/hr) and normal renal functions. The patient's haemoglobin showed a slight decline with nucleated red blood cells on the fourth admission day but later recovered spontaneously. The rest of the hospital stay remained uneventful, and the patient was discharged with instructions for adequate fluid intake and a follow-up visit after a week.

Dark brown plasma requires attention in the laboratory and should be reported promptly to the clinicians for appropriate management. The colour of the sample may aid in diagnosis and improve patient outcomes. Early identification of rare complications such as RM in DF is crucial for patient survival. As RM can present with only dark cola-coloured urine, adding a remark about the sample colour in patient reports is recommended.

PATIENT'S CONSENT:
Written informed consent was taken from the patient.

COMPETING INTEREST:
The author declared no competing interest.

AUTHOR'S CONTRIBUTION:
NA: Conception, the acquisition, analysis, interpretation of data, drafting the work, and final approval of the version.

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