Diabetes mellitus in the context of blood transfusion
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Abstract
Diabetes mellitus is one of the commonest medical conditions affecting humans. However, knowledge of diabetes mellitus in the context of blood transfusion is lacking. In this article, the eligibility of people with diabetes as donors, issues faced during blood component transfusion to diabetics and impaired glucose tolerance among chronic blood recipients will be discussed, along with discussion of the present state of evidence.

Keywords: Diabetes Mellitus, Blood Transfusion, Blood Component Transfusion, Blood Donors, Iron Overload, Diabetes Mellitus, Type 2, Diabetes Mellitus, Type 1.

Introduction
Diabetes has become endemic to human society, and over 400 million people live with this syndrome across the world. It is natural that there will be questions regarding the safety of blood donation in persons with diabetes, as well as about the viability of blood taken from them. There may be further questions about the safety of blood component transfusion in persons with diabetes. Unfortunately, strong evidence based knowledge for any of these questions is lacking.

Fit to Donate Blood?
Are persons with diabetes eligible to donate blood? In general, if well controlled, persons with diabetes can do so safely. The guidelines of the National AIDS Control Organization (NACO) advise that prospective donors be screened for any serious illness, primarily to safeguard donors. Patient advisories by the American Diabetes Association clearly mention that statements as persons with diabetes cannot donate blood are a myth. However, opinion varies about whether all persons with diabetes are eligible for donation. The World Health Organization (WHO) British and European Guidelines have only included persons with diabetes well controlled on diet or oral medications as eligible donors, while the American Red Cross Society has deemed even persons well controlled on insulin as eligible. It should also be noted that persons with diabetes who had injected bovine insulin sourced from the UK after 1980 are not eligible for donation even under the American Red Cross guidelines. This caution is included as a preventive measure against Cruetzfeld Jacob Disease. Modern diabetes care, however, does not use animal insulin, and only recombinant human insulin and insulin analogues are available today.

The published evidence of the safety of blood donation in insulin dependent diabetes is scant. One published study which gives the donor reaction rate in type 1 diabetic autologous blood donors showed a donor reaction rate of 4.8% as compared to 2.7 % for normal donors. Therefore, it is advisable to avoid blood donation by individuals with type 1 diabetes, as per the WHO criteria, until further studies clearly demonstrate safety.

Even for type 2 diabetes, published evidence about the safety of blood donation is sparse. Though the WHO, British and European guidelines have included non-insulin requiring persons with type 2 diabetes as eligible donors, a systematic review found no data relating to blood donor safety in type 2 diabetes controlled on oral hypoglycaemic agents. Few studies have observed that repeated blood donations may increase insulinsensitivity both in persons with type 2 diabetes, as well as non-diabetics. Therefore, blood donation may have the potential to prevent the development of diabetes in normal persons by preventing iron overload. This, however, needs confirmation through well-designed studies.

Fit to Receive Blood?
What are the transfusion guidelines for persons with diabetes? By and large, the only potential problem is that blood bag solutions contain a small amount of glucose (approximately 2.5 g of dextrose monohydrate in 100 ml of Citrate Phosphate Dextrose (CPD) solution; one blood bag of 450 ml contains about 69 ml of CPD), and therefore, in serious conditions, when a large number of transfusions have to be given, the patient needs to be closely monitored.

The long term effect of one-time transfusion on glycaemic control has not been studied. In the short term, HbA1C may be lowered due to mixing of normal red blood cells...
(RBCs) with RBCs of the person with diabetes.\textsuperscript{12} HbA1C has been deemed an unreliable marker for glycaemic control in diabetic blood recipients even in autologous donors.\textsuperscript{13}

**Iron and the Pancreas**

One well known potential effect of repeated transfusions, seen in thalassemia and sickle cell anaemia, is the development of iron overload, and insulin dependent diabetes as a result.\textsuperscript{14-16} The pancreatic islet cells are susceptible to the toxic effects of iron overload and chelation may be needed to prevent or delay the development of iron-induced diabetes. Patients needing repeated transfusions need to be followed up annually for diabetes. Since impaired Insulin levels and abnormal glucose tolerance usually precedes the formation of such a diabetic condition, serum C-peptide as well as oral glucose tolerance test may be useful in the monitoring of such patients. The clinical signs of secondary iron overload like hepatomegaly, abnormal liver function tests and signs of heart failure are also important clues and should be checked.

**Limitations of the Evidence**

There are limitations in searching for evidence of donor and transfusion related complaints. There is a marked lack of published studies detailing the evidence we have so far. The lack of published evidence has resulted in contradictory stands of different national blood organizations regarding the safety of blood donation in persons with diabetes. Furthermore, the effects of blood component transfusion in persons with diabetes have also not been studied extensively. Hence, more needs to be done regarding evidence based transfusion management of persons with diabetes.

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