BLOOD MISMATCH: The Hidden Facts

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Blood mismatch: The hidden facts

by Dr. J.A. Ongeng'o

"Five live births with one live baby!" Dr. Brown exclaimed.

"Yes, the first is alive, the second weighed 5.1Kg at birth, was jaundiced and died after two days. The subsequent three died in utero ..." Dr. Ochieng' added.

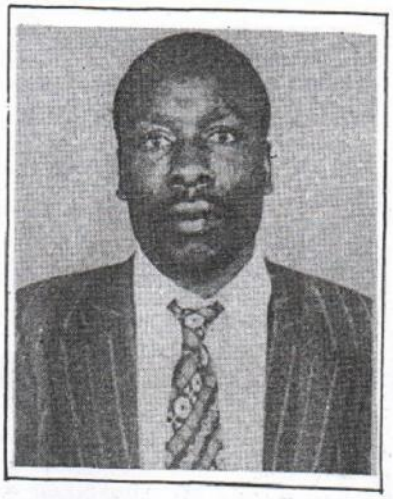
Ruth, the mother of these children never attended antenatal clinic ever since she started delivering. After losing four children, she decided to consult a doctor.

"Determine the blood group and test for syphilis as well, then give her a booking in two weeks time," summarized Dr. Brown.

That was my first day in the high risk clinic and it would have taken me ages to establish the cause of the deaths. As Dr. Brown pronounced blood group, I immediately recalled what we called Rhesus Isoimmunization in college. Most victims of this condition, in which the blood group of the baby is incompatible with that of the mother, die before or soon after birth and the survivors suffer serious mental retardation and other neurological deficits.

After Ruth's next visit, records showed a negative test for syphilis and blood group B negative. Herein lay the answer to this puzzle.

In the previous issue I discussed anaemia and concluded that though blood transfusion is the only remedy in severe cases, it is not always safe. Blood transfusion must be regarded as a form of therapy which carries significant risk and is potentially lethal. It is as a result of this that the doctor usually consciously and deliberately weighs the potential benefits against the known risks before transfusion. However, in cases where the mother "transfuses" her own baby with her incompatible blood before birth, the doctor does not hold such a direct responsibility unless he is given a chance to follow the mother during the antenatal period.



Dr. J.A. Ogeng'o: "Blood transfusion must be regarded as a form of therapy which carries significant risk and is potentially lethal".

In this issue, I shall discuss foeto-maternal blood incompatibility together with the dangers of blood transfusion with specific attention to the immunological reactions. Before this, however, let us briefly consider blood grouping.

The membranes of human Red Blood Cells contain a variety of antigens, the best known being A and B. It is the type of antigen that determines the group. Thus, those with antigen A belong to group A; those with B to B; those with both to AB and those with none to O. Besides this ABO system, there is Rhesus antigens, (named after the monkeys in which it was first studied). Of the many antigens, the D is the most important. Individuals with antigen D are Rhesus positive (Rh+) while those without are Rhesus negative (Rh-).

It is based on the latter that blood groups are designated positive or negative as, for example, A+ or B-. Each antigen has an antibody against it i.e. anti - A; anti - B and anti - D. These antibodies may occur naturally (by inheritance) or may be produced by exposure to the Red Blood Cells of another individual such exposure may occur via transfusion or during pregnancy when foetal Red Blood Cells cross the placenta and enter maternal circulation.

MOTHER-BABY BLOOD MISMATCH (Haemolytic disease of the Newborn)

When a Rhesus negative mother carries a Rhesus positive baby (foetus), (the positive having been inherited from the father), small amounts of foetal blood leak into maternal circulation. This leakage increases during:

- delivery
- abortions
- manual removal of the placenta
- pregnancy included hypertension

The antigens of these few Red Blood Cells stimulate the mother to produce antibodies against them (D antigens). These few antigens only sensitize the mother and in the first pregnancy the child is not affected. However, in subsequent pregnancies, the maternal antibodies are produced more rapidly in larger quantities. These cross to the foetus and start destroying the foetal Red Blood Cells (RBCs)

To compensate for the loss of RBC, the blood forming organs like the liver and spleen increase in size. The babies develop anaemia in utero which may progress to cause congestive cardiac failure and eventual death. If the baby is born alive, the liver is unable to handle the products of RBC destruction and for some of them, a yellow substance called bilirubin accumulates and causes yellowness of the eyes and tongue (jaundice).

When the level of bilirubin goes high, it is deposited in certain parts of the brain, causing a disorder called **Kernicterus.** In this condition, an obviously jaundiced child fairly suddenly develops lethargy and poor feeding, a weak high-pitched cry and a retracted neck. In premature infants, slowed respiratory rate and episodes of breathlessness may develop. Total caesation of breathing and convulsions may be the terminal events. However, the survivors show disorders of movement, seizures, deafness, mental retardation and other neurological deficits.

DIAGNOSIS

- The mother is usually Rh negative and the father Rh positive.
- The first affected child usually follows a normal child or an abortion. It occurs in about 17% for Rh+ve foetus to Rh-ve mother who have delivered or aborted at least one of Rh+ve baby.
- The child is usually huge, jaundiced with enlarged liver and spleen
- Anaemia is obvious
- May have convulsions and or slowed mental development

MANAGEMENT AND CONCLUSIONS

Recognition of mothers at risk during ante-natal period is the hallmark of salvation because it is possible to prevent sensitization from occurring the first time by administration of antibodies against the D antigen (anti-D) during the post partum (after delivery) period. This confers passive immunity which is harmless to the mother but capable of preventing the mother from actively forming antibodies.

After delivery, if the baby is already affected, exchange transfusion is done — the baby's blood is

replaced with Rh –ve blood. The details of immunization schedule with anti-D antibody and exchange transfusion are left to the attending doctor. Nonetheless, the follow-up of Rh-ve mothers to delivery and beyond must be a collaborate effort between obstetricians and paediatricians in a set-up with ample facilities. In this however, your role as a parent is central – know your blood group and attend ante-natal clinics always.

It is interesting to note that in advanced countries, while the prevalence of Rhesus incompatibility has remained more or less the same, that of Haemolytic disease of the newborn has greatly fallen mainly due to proper diagnosis follow-up and the advent of anti-D. In Kenya, however, this remains a big problem because many mothers do not attend antenatal clinics, neither do they deliver in hospitals. This is compounded by relative inaccessibility of facilities and lack of adequate knowledge. This article aims at correcting the latter. Attending anti-natal clinic will save you the agony of losing babies in utero or soon after birth. So start now!

IMMUNOLOGICAL TRANSFUSION REACTIONS

Although a lot of attention is paid to ABO and Rhesus antigens, there are several other antigens which cause a transfusion reaction. When incompatible, blood is transfused; the antigens on the Red Blood cells provoke the release of antibodies against them (antigens). These antibodies bind onto the antigens on the RBCs and destroy them (Hoemolyse).

This haemolysis may be due to haemolysis inside the blood vessels here referred to as intravascular haemolysis or outside the blood filtering organs like the spleen. (extravascular)

Intravascular haemolysis is most commonly associated with an incompatibility in ABO system. Fortunately, the administration of incompatible blood is associated with onset of symptoms before much blood has been introduced and if transfusion is stopped, no serious harm may result. Such symptoms include:

- Skin rash
- Flashing of the face
- Restlessness
- Chest tightness and pain
- Increased pulse and respiratory rate
- Generalized tingling sensation
- Back pain and pain in the thighs
- Nausea and vomiting
- Cyanosis
- Delirium
- Shock
- A bleeding tendency may develop after transfusion of incompatible blood causing blood to ooze from the injection site and mucus membranes.
- If massive haemolysis occurs, the amount of urine reduces markedly (Oliguria) and may eventually reach zero (Anuria). This may be due to circulatory failure and subsequent precipitation of haemoglobin in functionally depressed kidneys.

In extravascular haemolysis, the commonest offender is Rh incompatibility. In this case, reactions are not spectacular. Fever and chills may alternate and there may be delay in onset.

TREATMENT

Transfusion is usually stopped if the reaction is life threatening. The prevention of renal failure is of paramount importance. Skin rashes are usually treated with anti-histamines while fever is by anti-fever (antipyretic) drugs.

CONCLUSION

Blood mismatch is potentially lethal and can occur due to technical errors. If reactions do not occur due to mismatch, transmission of diseases is not guaranteed as absent. This compounds the dangers as some of the disease like hepatitis and AIDS are eventually lethal.

The only solution to this conglomeration of dangers is to try and limit transfusions. Once again, a stitch in time can save nine. Give your doctor a chance to diagnose the cause of your anaemia now as he might treat you without transfusion!

It is also advisable to marry people of the same kind of blood, for example, if a lady is Rh- she should marry a man with Rh- blood and if she is Rh+, she should marry a man with Rh+. This will help avoiding further complications of mis-matched blood between mother and baby. In other words, couples wishing to marry should find out their blood groups before marriage and make a decision with the full knowledge of what lies ahead.