UMBILICAL CORD BLOOD BANKING: A REVIEW

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ABSTRACT

Umbilical cord blood is blood that remains in the placenta and in the attached umbilical cord after childbirth. Cord blood is collected because it contains stem cells which can be used to treat hematopoietic and genetic disorders. In certain disease conditions or as a side effect of chemotherapy or radiotherapy, the bone marrow may stop functioning. At such times, a stem cell transplant becomes necessary to regenerate the bone marrow. Umbilical cord blood (UCB) banking has become a new obstetrical trend. It offers expectant parents a biological insurance policy that can be used in the event of a child or family member's life threatening illness and puts patients in a position of control over their own treatment options. To sensitize the community in a catalytic manner, health workers, community leaders and community volunteers can act as an effective change agent, to bring about a behaviour that can lead to improvement in their real life practices, thereby reducing the prevalence of health problems in people. Therefore, this literature review aims to find out importance, public knowledge especially knowledge of antenatal mothers about cord blood banking.

Keywords: *Umbilical cord, Blood, Banking.*

1. INTRODUCTION

In placental mammals, the umbilical cord (also called the birth cord or funiculars umbilical) is the connecting cord from the developing embryo or fetus to the placenta. During placental development, the umbilical cord is physiologically and genetically part of fetus and in humans normally contains two arteries (the umbilical arteries) and one vein (the umbilical vein), embedded within Wharton's jelly. The umbilical vein supplies the fetus with oxygenated, nutrient-rich blood from the placenta.

The umbilical cord is attached to baby through a hole in your baby's stomach which later becomes your baby's belly button. The umbilical cord is the source of oxygen and nourishment to your baby while they are in womb. There are no nerves around umbilical cord so cutting it is not painful.

Cord blood contains blood producing hematopoietic stem cells as well as mesenchymal stem cells. Hematopoietic stem cells have the ability to generate brain cells, skeletal muscle cells, cardiac muscle cells and liver cells. Cord blood stem cells are the major source of hematopoietic stem cells and mostly used to regenerate a patient's blood and immune system that have been weakened or damaged by radiation or chemotherapy. The cord blood is collected

immediately after birth of the baby once the umbilical cord has been cut. The procedure of collecting cord blood stem cells does not in any way, alter the normal birth-related procedures. The efficiency of collecting a cord blood stem cell sample is dependent on the amount of cord blood that is collected. The larger the stem cell sample amount that is collected, the better its survival rate of cells in transplant. Collection of cord blood is done either by syringe or gravity blood bag.

Once you have decided to collect and store your baby's cord blood, a cord blood company must be chosen. The cord blood company will be responsible for providing the cord blood collection kit, assisting you in arranging for the delivery of the specimen to their laboratory, processing and testing the cord blood specimen and ultimately cryogenically storing the specimen for your family.

Majority of Indian population are still unaware about cord blood banking, its importance and especially antenatal mothers.

2. IMPORTANCE OF CORD BLOOD BANKING

- A review of clinical studies envisaged that although used mainly for transplantation of hematopoietic stem cells in the treatment of blood disorders, umbilical cord blood (UCB)- based therapies are now being used increasingly for novel applications in nonhematopoietic diseases and as a form of cellular regenerative therapy or immune modulation. An increasingly broad range of disorders, however, are reflected in ongoing registered trials, which suggests greater activity, interest and investment in UCB (Umbilical Cord Blood)- derived cellular therapy. Geographically, Asian countries appear most active in UCB-derived cellular therapy and our analysis of ongoing studies suggests this trend will likely continue. Regular assessment of published and ongoing activity in UCB transplantation for emerging novel indications will be critical for informing UCB banking establishments and funding agencies to guide changes in banking practices related to emerging trends in cell therapy.
- Umbilical cord blood is a potential vast source of primitive hematopoietic stem and progenitor cells available for clinical application to reconstitute the hematopoietic system and/or restore immunological function in affected individuals requiring treatment. Cord blood can be used as an alternative source for bone marrow transplantation and its use is developing into a new field of treatment for pediatric and adult patients presenting with hematological disorders, immunological defects and specific diseases.
- Type 1 diabetes results from the loss of normal immunological self-tolerance, which may be attributable to the failure of Foxp3+regulatory T cells (Tregs). Umbilical cord blood is rich in Tregs and therefore has the potential to prevent or delay the onset of type 1 diabetes. A number of other potential therapeutic indications for autologous cord blood have been proposed, including cerebral palsy and hypoxic-ischemic encephalopathy. Recruitment to clinical trials using cord blood banking policy in Australia. The burgeoning consumer demand for storage of cord blood highlights the need for regulatory bodies to develop and adapt the policies to facilitate research that may extend the use of cord blood beyond currently recognized indications. Consumers, researchers and policymakers must also recognize specific ethical issues associated with collection and storage of cord blood, including storage in public and private banks, informed consent, ownership, access and the principle of beneficence.
- A study on "umbilical cord blood transplant for malignancies: a hope or hype" declared that cord blood is a rich and unlimited source of hematopoietic stem cells for allogeneic stem cell transplant to treat a variety of oncologic, genetic, hematologic and immunodeficiency disorders. Since the first successful cord blood transplant in 1968, a large number of cord blood banks have been established all over world for collection and storage of cord blood for future use. Majority of such transplants are performed in children, however the number in adults have been growing steadily in recent years. Results from various transplant registries reveals that a single cord blood provides enough stem cells to provide short and long term engraftment, and has low incidence and less severity of graft versus host disease. With a high booming birth rate and a large genetic diversity, India has potential to become the largest supplier of cord blood stem cells in world. To meet the future transplant need of the country, sincere efforts from various institutes and government agencies are needed to increase the number of public cord blood banks in India.

- As per a study on "Cord Blood Banking: from theory to an application" cord blood units are now routinely used as an alternative source of hematopoietic stem cells from unrelated donors for allogeneic transplantation. Unrelated cord blood unit donation is an altruistic act, anonymous and free. Doctors are selected on medical criteria. Then, only cord blood unit containing more than 100 × 10 (7) total nucleated cells and more than 1.8 × 10 (6) CD34+ cells are cryopreserved according to Reseau Francais de Sang Placenta ire recommendations. Cord blood unit's qualification will be completed by viral and functional tastings and the clinical outcome of the newborn child 6 weeks after the collection. Since the last 5 years, cord blood banking is growing in order to enhance the French registry of volunteer donors by increasing both the number and diversity of the donors listed and make available cord blood banking for transplantation.
- Umbilical cord blood transplantation from HLA-identical siblings, as per a study named Family-directed umbilical cord blood banking provides good results in children. These results support targeted efforts to bank family cord blood units that can be used for a sibling diagnosed with disease which can be cured by allogeneic hematopoietic stem cell transplantation or for research that investigates the use of allogeneic or autologous cord blood cells.

3. PUBLIC KNOWLEDGE ABOUT CORD BLOOD BANKING

- A study on knowledge about umbilical cord blood banking among Greek citizens declared that umbilical cord blood supplies in Greece are not sufficient to meet the high transfusion needs. This study checked the attitudes and knowledge about umbilical cord blood of randomly selected Greek citizens (n=1,019) by means of standard anonymous questionnaire. Forty-eight percent of respondents knew about umbilical cord blood and had full knowledge about storage/donation offers. Media (35%) and doctors (25%) were the main source of information. With regard to future decisions, 84% of the sample would store/donate umbilical cord blood, of whom 57% would keep the umbilical cord blood in a private bank.
- An analysis of obstetricians and their role in cord blood banking: promoting a public model showed that umbilical cord blood, the blood remaining in the umbilical cord at birth, can be collected at birth and be a source of stem cells for a patient in need of bone marrow transplant. Obstetricians and other health care practitioners are recognized as patient's primary source for medical information affecting the mother and her neonate and frequently are asked to provide education and guidance regarding options of private and public cord blood banking. As the use of cord blood continues to grow in medicine and research uncovers more potential for cord blood, cord blood banking has become an important resource. Obstetricians and other health care practitioners should have a primary role in efforts to increase awareness of umbilical cord blood donation and be involved in initiatives to expand current public banking activities.
- A cross tabulation analyses measured levels of awareness and understanding among practicing obstetricians regarding umbilical cord blood donation and the use of UCB in transplant therapy. Obstetricians are generally familiar with the utility of donated cord blood in transplantation, but could benefit from additional information regarding how cord blood is used in transplantation. Further, obstetricians play an important role in encouraging women to donate their baby's cord blood to a public CBB and are willing to do so that indicated a desire for more information so they can effectively educate their patients.
- A research on awareness and acceptance of public cord blood banking among practicing obstetricians in the United States concluded that both affiliated and non-affiliated obstetricians report being somewhat or very familiar with the use of cord blood in transplant therapy, but some misperceptions concerning clinical application exist. Eighty percent of affiliated obstetricians feel confident discussing cord blood options with their patients; however, 49% indicated that they have insufficient knowledge of cord blood donation to effectively answer patient's questions about donation.
- A survey was carried out to check patient's knowledge of umbilical cord blood banking. 425 patients completed the survey; 37% had no knowledge of UCBB. Older patients and those with higher degrees of education were more aware of UCBB. 71% of patients were not planning UCBB, with "expense"

and "insufficient knowledge" as the primary reasons cited. Only 14% of patients were educated about UCBB by their nurse or obstetricians. Although 90% of patients expected their obstetrician to answer their questions on UCBB. Patients are poorly informed about UCBB, especially ethnic minorities, younger patients and with lesser degrees of education.

- Umbilical cord blood, a study named 'India's first public cord blood repository—looking back and moving forward' says, is an established source of stem cells useful for hematopoietic reconstitution. The first clinical transplantation in France by Eliane Gluckman in 1988 using HLA matched umbilical cord blood from a sibling on a 6-year old boy with Fancon's anemia is an example of successful transplantation. Our cord blood repository was established as the part of the Life Sciences initiative, almost 7 years ago.

4. MATERIALS AND METHODS

The writing of this review is based on collection of best international and national journals. Journals were collected through PubMed database, research gate and google scholar. So after screening best useful 12 articles were suitable as literature review material.

5. CONCLUSION

Most young women, antenatal mothers, obstetricians and rural population are unaware about cord blood banking. The cord blood education program should be developed in each state by involving health and Medical departments of each state and develop a good network of obstetricians and social workers, develop manpower in various aspects of the banking activity, develop methods of process and analysis and above all, increase the level of awareness among the medical, paramedical fraternity and the general public regarding cord blood program. Information booklets, pamphlets in local languages regarding cord blood banking should be distributed to aware general public at grass root level and in-service education program regarding cord blood banking should be introduced to educate obstetricians, clinical nurses and all paramedical faculty.

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