



Revista Brasileira de Hematologia e Hemoterapia Brazilian Journal of Hematology and Hemotherapy

www.rbhh.org



Original article

Association between maternal and fetal factors and quality of cord blood as a source of stem cells



Rodrigo Dias Nunes*, Flávia Maria Zandavalli

Universidade do Sul de Santa Catarina (UNISUL), Florianópolis, SC, Brazil

ARTICLE INFO

Article history:

Received 16 February 2014

Accepted 3 July 2014

Available online 26 November 2014

Keywords:

Stem cells

Fetal blood

Transplantation

Cord blood stem cell transplantation

Blood banks

ABSTRACT

Objectives: To comparatively analyze maternal and fetal factors and quality markers of blood samples in a public umbilical cord blood bank.

Method: This is a cross-sectional descriptive study that revisited 458 records of donations from September 2009 to March 2013 at the Hemocentro de Santa Catarina. The means of markers were used to define cutoff points for the quality of cord blood.

Results: Most donations came from women with ages between 18 and 29 years (62.8%), gestational age ≥ 40 weeks (55.2%), vaginal delivery (51.3%), primiparous (41.4%), and with male newborns (54.4%) weighing between 3000 and 3499 g (41.8%). The volume of the donations ranged from 71.6 to 275.2 mL, the total nucleated cell count ranged from 4.77×10^8 to 31.0×10^8 cells and CD34⁺ cells ranged from 0.05 to 1.23%. There were statistically significant differences in the volume with respect to gestation age > 38 weeks (p -value = 0.001), cesarean section (p -value < 0.001) and birth weight > 3500 g (p -value < 0.001). The total nucleated cell count was positively affected by cesarean section (p -value = 0.022) and birth weight > 3500 g (p -value < 0.001). There was no statistically significant difference between the variables and the percentage of CD34⁺ cells.

Conclusions: Delivery route and birth weight influence the volume of cord blood and the total nucleated cell count. Gestational age influences only the volume of cord blood.

© 2014 Associação Brasileira de Hematologia, Hemoterapia e Terapia Celular. Published by Elsevier Editora Ltda. All rights reserved.

Introduction

Umbilical cord blood, which previously used to be discarded, can be collected shortly after birth and has great capacity to reconstitute the hematopoietic system.¹ Several studies have shown the simplicity of umbilical cord blood collection, in addition to the lack of risk for both mother and newborn, low

risk of graft-versus-host disease and low risk of transmitting infectious-contagious diseases.^{2,3} Furthermore, it is a useful alternative of hematopoietic stem cells for transplantation to treat diseases of the blood, immune system and for genetic disorders.^{3,4}

One of the limitations of this type of transplant is the volume and contents of the blood collected from the umbilical cord which is an obstacle to hematopoietic stem cell

* Corresponding author at: Av. Pedra Branca n° 25, Cidade Universitária Pedra Branca, 88137-270 Palhoça, SC, Brazil.

E-mail address: rodrigo.dias.nunes@hotmail.com (R.D. Nunes).

<http://dx.doi.org/10.1016/j.bjhh.2014.07.023>

1516-8484/© 2014 Associação Brasileira de Hematologia, Hemoterapia e Terapia Celular. Published by Elsevier Editora Ltda. All rights reserved.

grafting. The main parameters used in umbilical cord blood banks include the total nucleated cell (TNC) count, percentage of CD34⁺ cells, and the volume of blood.⁵

Transplantations using umbilical cord blood are still in the research phase and variables that might improve the quality of blood are currently the focus of research, inasmuch as knowing these factors may result in lower costs and less waste of time in the evaluation, processing and storage of material.^{6,7}

Recent studies report that some variables affect the quality of the umbilical cord blood, especially those related to maternal and fetal features such as placental weight, birth weight, gestational age (GA), route of delivery, gender of the newborn, among other things; thus research is being developed in this area to attempt to improve cell levels, which is essential to increase grafting success rates.

Objectives

The aims of this study were to determine maternal and fetal characteristics of umbilical cord blood donors, to evaluate quality markers of umbilical cord blood, as well as to determine associations between maternal and fetal characteristics and these quality markers.

Methods

This is an observational, cross-sectional, epidemiological study that revisited 458 charts of patients who, between September 2009 and March 2013, donated umbilical cord blood at the Blood Umbilical Cord and Placental Bank (BSCUP) of the Hemocentro de Santa Catarina (HEMOSC), located in the city of São José, Santa Catarina. Nine medical records of patients who performed allogeneic donations were excluded. Data collection began after the study was approved by the Research Ethics Committee of HEMOSC, and data were collected from computerized registers in the Cryobiology Sector of HEMOSC, located in Florianópolis, Santa Catarina.

Donation candidates were submitted to the standard survey of HEMOSC before collection in order to assess personal history, family history, and laboratory results with standard questions used for all kinds of blood donation. All patients who agreed to donate signed an informed consent form before the collection.

A data collection instrument was developed exclusively for this study which investigated the maternal age, gestational age, route of delivery, number of previous pregnancies, gender and newborn weight. Moreover, the preprocessing (blood volume) and post-processing data (TNC and CD34⁺ counts) of the umbilical cord blood were studied. The means of markers were used to define cutoff points for the quality of cord blood.

Blood collection was performed extra-utero and carried out by a trained professional in a separate room. As soon as placental delivery occurs, the placenta is taken to an area reserved for collection where the umbilical cord is cleaned with an antiseptic solution and the blood is drained by gravity through the most distal puncture site. The blood is stored in a standard blood bag containing citrate-phosphate-dextrose anticoagulant.

Once collected, these samples are labeled and sent to blood banks, where they undergo safety testing, HLA typing and cryopreservation. Typically, collections are kept for a time not exceeding 24–28 h at $22 \pm 2^\circ\text{C}$ before processing, and then cryopreserved in liquid nitrogen, under controlled freezing rates and stored long term in accordance with international criteria at a temperature lower than -150°C .^{1,8,9} The umbilical cord blood was processed within a maximum of 48 h after being collected as is determined by the National Health Surveillance Agency (ANVISA).²

Collected data were stored in the Microsoft Excel computer program and later exported to the Statistical Package for the Social Sciences (Version 16.0) for analysis.

Qualitative variables are described as absolute and relative frequencies, while quantitative variables are described as means \pm standard deviations.

The Chi-squared test (χ^2) or Fisher's exact test was used to test the homogeneity of proportions. Prevalence ratios (PR) and 95% confidence intervals (95% CI) were calculated. The level of significance was set for a *p*-value < 0.05 .

Results

Most donations came from women with ages from 18 to 29 years (62.8%) and from 30 to 34 years (24.4%), gestational age ≥ 40 weeks (55.2%), vaginal delivery (51.3%), primiparous (41.4%), and with male newborns (54.4%) weighing between 3000 and 3499 g (41.8%).

Comparisons between maternal and fetal characteristics and cord blood volume are shown in [Table 1](#).

Statistically significant differences were found in respect to cord blood volume for gestational age > 38 weeks (*p*-value = 0.001), cesarean delivery (*p*-value < 0.001) and birth weight > 3500 g (*p*-value < 0.001).

A smaller volume of umbilical cord blood was collected when the gestational age was below 37 weeks and 6 days compared with gestational ages between 38 and 39 weeks and 6 days. Vaginal route of delivery was associated with a smaller volume of cord blood when compared to cesarean delivery. Newborn weight between 2500 and 3499 g was associated with lower volume of umbilical cord blood when compared with infants weighing 4000–4999 g. The prevalence of lower volume was approximately two times higher than the reference value.

The comparison between maternal and fetal characteristics and TNC count is presented in [Table 2](#).

Vaginal route of delivery was associated with a lower TNC count than cesarean delivery. Birth weights between 2500 and 3499 g were associated with lower TNC counts compared to those between 4000 and 4499 g, which were at least 2.4 times greater.

There were no statistically significant differences between quality markers – blood volume, TNC count and percentage of CD34⁺.

Discussion

Cord blood is increasingly emerging as an alternative source of stem cells to the bone marrow for transplants, as it has a good number of hematopoietic progenitor cells with potential

Download English Version:

<https://daneshyari.com/en/article/3333049>

Download Persian Version:

<https://daneshyari.com/article/3333049>

[Daneshyari.com](https://daneshyari.com)