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# Acceptability of the Establishment of an Umbilical Cord Blood Stem Cell Bank by Pregnant Women in Côte d'Ivoire in 2023

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## ABSTRACT

Umbilical cord blood is the blood contained in the umbilical cord of mammals. It contains immature haematopoietic progenitors, or stem cells. In therapy, stem cells are used to treat a wide range of haematological and non-haematological malignant and benign pathologies. However, in traditional societies in Sub-Saharan Africa, and particularly in Côte d'Ivoire, blood as well as the placenta and its appendages are associated with taboos and are subject to rituals. As a result, very little data exists on the donation and banking of umbilical cord blood. This study is therefore being conducted to assess the level of acceptability of pregnant women attending the Yopougon General Hospital with a view to setting up an umbilical cord blood bank at the Institut Pasteur de Côte d'Ivoire. This was a descriptive cross-sectional study that lasted thirty days. After approval from the health authorities, a questionnaire written in French in the form of closed and open questions was administered to pregnant women using a semi-directed method. Data was entered using smartphones and the free ODK Collect application. Two hundred and eighty-nine women took part in the study. More than half of the participants (52%) were in favour of cord donation, and 84% were in favour of banking. On the other hand, 13% were opposed to donation, with safety being the main reason for refusal.

***Keywords:*** Pregnant women, Stem cells, Umbilical cord blood, Biobank, Côte d'Ivoire

## INTRODUCTION

Umbilical cord blood or placental blood is the blood contained in the placenta and umbilical cord of mammals. It contains at least as many immature haematopoietic progenitors of different blood lineages as bone marrow, endothelial stem cells, mesenchymal stem cells and unrestricted somatic stem cells [1]. In therapy, they are used to treat a wide range of haematological malignancies and benign diseases, not least in children with acute lymphoblastic leukaemia [2] and Fanconi anaemia [3].

Compared with bone marrow and haematopoietic stem cells (HSC) mobilised from peripheral blood, cord blood has a number of advantages for transplantation, including its availability, negligible risk to the donor, less stringent requirements for HLA (Human Leucocyte Antigen) matching

and lower risk of graft-versus-host disease [4].

The report by the World Bone Marrow and Blood Transplantation Network (WBMT) for the period 2006-2013 indicates an estimated low rate of 3% of HSC transplantation activity in the African / Eastern Mediterranean Region (AFR / EMRO) as a proportion of total reported transplant activity [5]. However, this region is already faced with a heavy burden of communicable diseases, and the proportion of mortality linked to non-communicable diseases (NCDs) is high, ranging from 27% to 88% of total mortality.

These NCDs include malignant blood diseases, with a prevalence in 2012 of 9.11% and an overall incidence of 53.36 new cases per year [6], and benign diseases such as sickle cell anaemia, with an estimated prevalence of 14% new cases [7]. As a result, the treatment of malignant and benign blood diseases requires intensification therapy such as allogeneic stem cell transplantation because of the initially unfavourable prognosis of the majority of patients in these countries. Thus, myeloablative or non-myeloablative therapeutic intensification with adult haematopoietic stem cell transplantation from umbilical cord blood could significantly improve the prognosis of NCDs.

Furthermore, the African Society of Blood and Bone Marrow Transplantation (AfBMT) indicates that out of 54 African countries, HSCT is only available in six (6) countries (Algeria, Egypt, Morocco, Nigeria, South Africa and Tunisia) and only two (2) countries (Algeria and Morocco) have an umbilical cord blood bank [8].

Furthermore, the ability to carry out research and transplants using umbilical cord blood stem cells depends on the creation of cord blood cell "banks" (a concept similar to the creation of "blood banks"). A biobank acquires its legitimacy through social acceptance [9].

According to **Koffi et al (2020)** and **Florence, (2018),** in traditional societies in Sub-Saharan Africa, and particularly in Côte d'Ivoire, blood as well as the placenta and its appendices are associated with taboos and are subject to rituals in communities [10 ;11].

In addition, there is very little data on the donation and banking of cord blood in the opinion of pregnant women in Côte d'Ivoire. The present study was therefore conducted to assess the level of acceptability of pregnant women attending the Yopougon General Hospital with a view to setting up a cord blood bank (BSCO) at the Institut Pasteur de Côte d'Ivoire.

## MATERIALS & METHODS

### Type, period and population of the study

This was a descriptive cross-sectional study lasting thirty (30) days and conducted from 1 to 30 September 2023 in the antenatal consultation unit of the Yopougon Attié General Hospital (YAGH) in the District of Abidjan (Côte d'Ivoire).

The study population consisted of pregnant women aged 18 years and older, in apparent good health and having given their consent to participate in the study.

### Determining the sample size

Sampling was opportunistic, with all eligible women contacted during normal working hours over the study period.

The sample size was calculated using the formula below

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where **n** is the minimum sample size and **z** is the standard deviation at the 90% confidence level. This corresponds to 1.645. **P** = prevalence of acceptance, **d** = level of precision (0.05).

### Data collection tools and techniques

A questionnaire written in French, in the form of closed and open questions, was designed. It was tested by means of a pilot survey in order to assess any difficulties and make any necessary corrections.

This questionnaire included in detail the items necessary for the compilation of the indicators defined as part of this study. It consisted of 4 parts: (i) Sociodemographic and obstetric characteristics (occupation, ethnicity, level of study, professional status, religion, age of the pregnant woman, gestational age and number of children), (ii) Practices regarding the placenta and umbilical cord after childbirth, (iii) Knowledge of cord blood and cord blood banks, (iv) Acceptability of cord blood donation and banking and (v) Reasons for refusing to donate cord blood.

With the agreement of the health authorities at the chosen facility, the questionnaire was administered to pregnant women using a semi-structured method after a brief interview about the purpose of the study. Administration of the questionnaire lasted an average of thirty minutes per woman.

The pre-tested questionnaire was administered to the pregnant women to assess their knowledge and practices with regard to the placenta and umbilical cord after delivery, and the acceptability of donating and banking cord blood.

Data was collected using smartphones and the free ODK Collect application.

### Data analysis

The data were analysed using Microsoft Excel and XLSTAT statistical software (Addinsoft, Paris, France) [12]. Categorical variables were presented in terms of numbers and percentages.

### Ethical considerations

Ethical approval was obtained from the National Ethics Committee for Life Sciences and Health (NECLSH) of Côte d'Ivoire under reference number **234-23/MSHPCMU/CNESVS-km**.

Authorisation for the survey was also obtained from the head of the selected centre. Oral consent was obtained from the women before the questionnaire was administered. They were informed of the purpose of the study and how it would be conducted. They were also informed that their participation was entirely voluntary and that they could withdraw from the study at any time without this affecting their subsequent medical follow-up.

The confidentiality of the data and the anonymity of the women were ensured by indirect identification using a subject code for research purposes.

## RESULT

### Sociodemographic and obstetric characteristics

The sociodemographic and obstetric characteristics are shown in Table 1. Two hundred and eighty-nine (289) pregnant women were included in this study. The age of the respondents ranged from 17 to 42 years, with an average of 27±6 years. The most common age group was between 25 and 34 (46.02%).

The majority of women belonged to the Akan ethnic group (41.52%), followed by the Kru group (21.8%), the Mande (18%) and the Gour (12.11%). Finally, the proportion of non-Ivorian women in this study was 6.57%.

In terms of religion, 79.24% of the women were Christians, followed by Muslims and Animists with 28.72% and 1.04% respectively.

One hundred and ten (110) pregnant women, either 38.06%, had an average level of education (at least secondary level), sixty-eight (78), either 23.53%, had a higher level of education, sixty-two (62), either 21.45%, had no level of education and 16.95% had an elementary (primary) level of education.

In terms of occupation, the majority (59.52%) were employees. 21.8% of respondents were housewives. Students and pupils accounted for 18.68% of the respondents.

One hundred and thirty-two (132) women (45.67%) were first-time mothers.

The most common gestational age was between 4 and 6 months (41.86%).

**Table 1: Sociodemographic and obstetric characteristics**

| Characteristics | Number | Frequency (%) |
|---|---|---|
| **Age range** | | |
| 18-24 | 108 | 37.37 |
| 25-34 | 133 | 46.02 |
| 35-42 | 48 | 16,60 |
| **Ethnic group** | | |
| Akan | 120 | 41.52 |
| Gour | 35 | 12.11 |
| Kru | 63 | 21.79 |
| Mande | 52 | 17.99 |
| Non Ivorian | 19 | 6.57 |
| **Religion** | | |
| Animist | 3 | 1.03 |
| Christian | 203 | 70.24 |
| Muslim | 83 | 28.72 |
| **Level of education** | | |
| No level | 62 | 21.45 |
| Primary | 49 | 16.95 |
| Secondary | 110 | 38.06 |
| Higher | 68 | 23.52 |
| **professional status** | | |
| Pupil/student | 54 | 18.68 |
| Employed | 172 | 59.51 |
| Housewife | 63 | 21.79 |
| **Parity** | | |
| Multiparous | 83 | 28.72 |
| Nulliparous | 132 | 45.67 |
| Primiparous | 74 | 25.60 |
| **Gestational age range** | | |
| [0-3] | 50 | 17.30 |
| [4-6] | 121 | 41.86 |
| [7-9] | 118 | 40.83 |

## Practices regarding the placenta and umbilical cord after childbirth

Of the 157 women who had already given birth, the majority (66.88%) said they had left the placenta at the hospital, while the others (33.22%) said they had buried it in the backyard in accordance with their tradition (Table 2).

**Table 2: Practices concerning the placenta and umbilical cord after childbirth**

| Variable | Number | Frequency (%) | IC 95% |
|---|---|---|---|
| **If you have already given birth, what did you do with the placenta after your delivery? (N=157)** | | | |
| Buried in the courtyard | 52 | 33.12 | [25.76 - 40.48] |
| Leaving the hospital | 105 | 66.87 | [59.62 -74.24] |

## Knowledge of cord blood and cord blood banks

The results of the survey on knowledge of umbilical cord blood and cord blood banks reported in table 3 show that 79% of the women surveyed were unaware that the placenta and umbilical cord contained blood, and that this blood could be donated. Similarly, 97% were unaware of the existence of umbilical cord blood donation, and almost all (99.65%) were unaware of the existence of umbilical cord blood banks anywhere in the world.

**Table 3: Knowledge about cord blood and cord blood banks**

| Variables | Number | Frequency (%) | IC 95% |
|---|---|---|---|
| **Do you know that the placenta and the cord contain blood called umbilical cord blood?** | | | |
| No | 228 | 79 | [74 - 84] |
| Yes | 61 | 21 | [16 - 26] |
| **Have you ever heard of donating umbilical cord blood?** | | | |
| No | 281 | 97 | [95 - 99] |
| Yes | 8 | 3 | [1 - 5] |
| **Do you know that there are cord blood banks in the world?** | | | |
| No | 288 | 99.65 | [99 - 100] |
| Yes | 1 | 0.34 | [0 - 1] |

**Acceptability of cord blood donation and banking**

The results of the survey recorded in table 4 show that 52.6% or 152 women were in favour of donating umbilical cord blood and 129 or 84.86% were in favour of storing it in a biobank.

**Table 4: Acceptability of cord blood donation and banking**

| Variable | Number | Frequency (%) | IC 95% |
|---|---|---|---|
| **If it came up, would you be willing to donate cord blood after giving birth? (N=289)** | | | |
| **Don't know** | 100 | 34.60 | [29 - 40%] |
| **No** | 37 | 12.80 | [9 - 17%] |
| **Yes** | 152 | 52.59 | [47 - 58%] |
| **Would you agree to have your child's cord blood stored in a cord blood bank? (N=152)** | | | |
| **Don't know** | 21 | 13.81 | [8.3 - 19.3%] |
| **No** | 2 | 1.31 | [0.0 - 3.1%] |
| **Yes** | 129 | 84.86 | [79.1- 90.5%] |

**Reasons for refusing to donate cord blood**

The results in table 5 show that safety reasons (59.45%), health reasons (18.91%) and cultural reasons (13.51%) are the main reasons why women refuse to donate umbilical cord blood.

**Table 5: Reasons for refusing to donate cord blood**

| Variables | Number | Frequency (%) | IC. (95%) |
|---|---|---|---|
| Safety is not assured | 22 | 59.45 | [43.6 -75.2%] |
| You don't know where to give blood | 3 | 8.10 | [0.0 – 16.9%] |
| Health reasons | 7 | 18.91 | [6.3 – 31.54%] |
| Cultural reasons | 5 | 13.51 | [2.5 – 24.53%] |

## DISCUSSION

The aim of this study, carried out in the General Hospital of the largest town in the District of Abidjan, was to gather the opinions of pregnant women on the donation of umbilical cord blood for storage for therapeutic and research purposes.

It took place over thirty (30) days. Two hundred and eighty-nine (289) women took part. The population size of this study is in similar proportions to data reported **by Nwannadi et al. (2014) and Hassall et al. (2008)** in surveys conducted in Makurdi, Nigeria and Mombassa, Kenya respectively on related issues [13 ;14].

Of the two hundred and eighty-nine (289) women included in this study, one hundred and fifty-two (152), either more than half, agreed to donate umbilical cord blood after childbirth and the majority of them (84%) were in favour of banking. This proportion may be considered encouraging given that, on the one hand, only 21% of women gave a favourable opinion on cord blood donation in a study conducted by **Nwaanndi et al. (2014)** in Nigeria and, on the other hand, almost 60% of the women in this study were salaried employees [13]. Indeed, in Africa and singularly in Côte d'Ivoire, women's empowerment is largely dependent on their social status [15]. From this point of view, the proportion of women who gave their consent would be subject to few outside influences, including those of their spouse.

The results also show that only 13%, or one woman in 10, expressed an unfavourable opinion. In addition, over 60% of these participants were opposed to umbilical cord blood donation for safety reasons. The future of the cord and especially what will be done with it are major concerns for them. This argument was reported as the main reason for refusal **by Meissner and Pepper (2013)** in a project carried out in South Africa on the creation of a public umbilical cord blood stem cell bank [16]. A good awareness campaign on the uses to which it will be put could therefore improve the proportion of women donors.

Cultural reasons, which seem to be almost immutable, were mentioned by very few participants in this survey. As a result, there

were no major obstacles to overcome in carrying out this project in Côte d'Ivoire. Most of the women surveyed belong to four (4) ethnic groups: Akan, Krou, Gour and Mande. According to the latest general population and housing census (GPHC), these groups represent 90% of the Ivorian population [17].

As most cultural and traditional practices are closely linked to ethnicity, the data reported in this study would be, by analogy, the perception of the population as a whole.

Also, in this study, although more than half the women had either an average (secondary) or higher level of education and had already given birth (primiparous and multiparous), almost all were unaware of the possibility of donating umbilical cord blood after giving birth. This lack of awareness of cord blood banking was also reported by **Fernandez al. (2003**) in a survey carried out in Halifax, Canada, on the knowledge and attitudes of pregnant women regarding the collection, testing and banking of cord blood stem cells [18]. Moreover, the results of this survey revealed that 72% of participants wanted to receive information from healthcare professionals on the subject. The present study could therefore constitute a pilot project with a view to large-scale awareness-raising to popularise this practice in Côte d'Ivoire. This could explain the relatively high percentage of undecided women revealed by the results. In fact, 33% of the women included in the study, either one woman in three, did not know whether or not they should donate their cord.

The results also show that two-thirds of women who had already given birth (66.87%) left their umbilical cord in hospital. Notwithstanding those who had taken their umbilical cords to the hospital for ritual purposes, many attached little importance to them and did not even mention them after giving birth.

So donating them for medical research would be a humanitarian gesture and would contribute to medical research aimed at finding therapeutic solutions to certain diseases, such as anaemia in children.

## CONCLUSION

The data reported in this survey conducted in the largest health centre in the municipality of Yopougon during the study period suggest that the vast majority of the population would be in favour of umbilical cord donation and banking.

### *Declaration by Authors*

**Ethical Approval:** Approved

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**Conflict of Interest:** The authors declare no conflict of interest.

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