

Health Care Professionals' Knowledge and Attitudes Regarding Umbilical Cord Blood Banking in Saudi Arabia

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ABSTRACT

Background: Umbilical cord blood banking (UCB) serves as a backup source for maintaining human health. The aim of this study was to assess the knowledge and attitudes about UCB banking among health professionals in Saudi Arabia.

Methods: This cross-sectional study was conducted from July to September 2021. The sample consisted of 384 multidisciplinary health care professionals and students (medicine, dentistry, pharmacy, nursing, and medical sciences) from different cities across Saudi Arabia, using an online self-administered questionnaire.

Results: A total of 58% had not heard of UCB banking, and 60% did not know what UCB banking is. Specialists/consultants had significantly ($p > 0.001$) higher scores than students, interns, and general practitioners. The major sources of information about UCB banking were medical personnel (21.88%) and social media (20.83%). In terms of cord blood storage, the majority used public blood banks (41.15%), with the remainder (32.29%) using private (32.29%) banks. A total of 68.23% had agreed to donate their cord blood for research purposes, and 85.16% believed a decision about cord blood donation should be shared between the parents.

Conclusion: Most health practitioners in Saudi Arabia had not heard about, or had poor knowledge of, UCB banking. The main sources of information about UCB banking were medical personnel and social media, and most participants had good attitudes toward UCB banks. It is recommended that health practitioners' knowledge about UCB banking and current therapeutic options be boosted because they are the primary trusted source of public health information.

Key words: Umbilical cord blood, Umbilical cord blood banking, Health care professionals' attitudes, Knowledge, Saudi Arabia

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INTRODUCTION

Umbilical cord blood (UCB) banking has received

much attention over the past several decades. They can be thought of as "life banks" due to their role as a backup source for maintaining human health [1,2] by, immediately after the birth of a baby [3], collecting and storing UCB. UCB is the blood present in the umbilical cord and placenta after childbirth that contains a substantial number of stem cells [4,5]. In the past, UCB was treated as medical waste [6], but recently,

scientists discovered that UCB is a rich source of unique stem cells, and it is now considered a promising treatment option [7].

There are generally two types of stem cells: embryonic stem (ES) cells and non-ES cells. Non-ES cells are found in several tissues, including UCB, bone marrow, skin, and products of pregnancy, such as the amniotic fluid and placenta [8]. The preference for UCB stem cells over other sources is expanding in the medical field due to the fact that UCB can be collected through a non-invasive procedure, without risk to the donor [9]. UCB is viewed as a primary stem cell source. Now, UCB is widely accepted as an unlimited alternative source to bone marrow and the peripheral blood of hematopoietic stem cells (HSCs) [8].

Clinical applications of UCB transplantation (UCBT) date back to 1988, when the procedure was used for a 5-year-old boy suffering from Fanconi's anemia [10,11]. Since then, it has been widely used in transplants to treat a wide variety of life-threatening diseases, including acute and chronic leukemia, aplastic anemia, Fanconi anemia, myelodysplastic syndromes, β thalassemia, bone marrow failures, metabolic diseases, and immune deficiencies [12–16].

The first public UCB bank was established in New York in 1993 [17]. There are two types of UCB banks. In private UCB banks, UCB is stored at a certain cost, and the collected UCB is only available to the child or the child's family for potential personal (autologous) use. In contrast, public UCB banks store UCB at no charge, and the UCB is available to anyone who needs a transplant (allogenic transplant) [18]. Currently, there are more than 100 UCB banks around the world [19]. In Saudi Arabia, there are currently two public UCB banks; there are no private banks because they are prohibited by law [6].

Several studies have been conducted internationally exploring knowledge about UCB banking, its usefulness, and the private and public banks alternatives among pregnant women and healthcare professionals. These studies have revealed that pregnant women have poor knowledge about the donation of UCB and the differences between public and private banks [20]. In a recently published integrative

review, nine papers covering studies of health care professionals' knowledge, attitudes, and practices pertaining to UCB donation and banking were retrieved, and the authors concluded that there was an overall lack of knowledge about UCB bank options [21].

Some previous studies aimed to identify the barriers to pregnant women gaining knowledge to form opinions and attitudes about UCB banking, and researchers have determined that women are not well-informed about this topic [22–24]. Only a few health care professionals consistently provide UCB banking education for pregnant women, despite most patients identifying health care professionals as the key source of information on the topic. So, the main barriers to UCB banking are a lack of knowledge and the high cost involved [1,25].

A study conducted in Brazil in 2021 among pregnant women found that 61% were aware of UCB banking, but 86.9% knew little or very little about it [26]. Also in 2021, a study of Polish women showed that 84.6% of the Polish pregnant women were aware of the possibility of UCB banking. Among these women, social media was considered the main source of information (47.5%) about UCB banking. However, 86.8% of the participants indicated that their doctor was their preferred source of reliable information, which is likely why 61.8% of the women assessed their level of knowledge about UCB banking to be insufficient [27].

Moreover, an interesting qualitative study conducted in Australia in 2020 among public and private maternity health professionals (midwives and obstetricians) revealed that informing parents about or discussing UCB banking with them was not a priority or part of their routine practices [28].

In Saudi Arabia, as in other countries, knowledge and attitudes about UCB banking among pregnant women appear to be minimal. Two survey-based studies showed that about half of the subjects were unaware of UCB banking and its uses; however, more than half of the women had a good attitude toward UCB donation [6,29].

Health care professionals, nurses, and midwives are supposed to inform pregnant women about this topic during prenatal consultations, because pregnant women need to be aware of the options

that exist for their infant's cord blood in order to make a clear decision [30] before giving birth. In line with this premise, the aim of the present study was to evaluate the knowledge and attitudes about UCB banking among health care practitioners in Saudi Arabia.

MATERIALS AND METHODS

This cross-sectional study investigated the level of knowledge and attitudes about UCB banking among health care practitioners in Saudi Arabia. Participants were recruited using a convenience sampling method. The study's inclusion criteria included students and practitioners in various health specialties (medicine, dentistry, pharmacy, nursing, and medical sciences) in Saudi Arabia. Participants who did not agree to the study's informed consent or who did not fulfill the participant criteria were excluded. Data were collected from July to September 2021. All participants agreed to the informed consent before completing the study questionnaire, and all data are kept anonymous. Participants voluntarily completed an online self-administered questionnaire in English. The questionnaire was distributed via a link shared with health care professional groups on social media platforms (Twitter, WhatsApp, and Telegram). Completion of the questionnaire took from 3 to 5 minutes.

The questionnaire was composed of three sections. Section one included nine demographic questions asking about gender, age, education level, specialty, years of practice, whether in a private or governmental college, region of residence, and nationality. It also contained two questions that assessed respondents' general awareness of UCB banking. Section two consisted of 12 multiple-choice questions that assessed knowledge about UCB banking, with one correct answer worth one point for each question. The total knowledge score, ranging from zero to 12, was the sum of correct answers in this section. Section three had four multiple-choice questions to assess attitudes toward UCB banking. The questionnaire was based on an earlier study, with minor changes [6]. SPSS v.25 (IBM, Inc., Armonk, NY, USA) and Excel software were used to analyze the data. Descriptive statistics, including the mean, standard deviation, count, and percentage, are used to present the data. Statistical significance was set at a p-value of 0.05. Data were analyzed with chi-square, linear regression, t-test, and ANOVA.

Ethical approval was secured from the Institutional Review Board of Umm al-Qura University with number of HAPO-02-K-012-2021-08-728. Before answering the study questionnaire, all the participants were asked to agree the study consent.

Table 1: Participant demographic variables (n=384).

Variable	Count	%	
Gender	Male	86	22.4
	Female	298	77.6
Nationality	Saudi	369	96.1
	Non-Saudi	15	3.9
Study institution	Governmental	354	92.2
	Private	30	7.8
Qualification	Student	272	70.8
	Intern	37	9.6
	General practitioner/resident	33	8.9
	Specialist/consultant	42	10.9
Specialty	Medicine	186	48.4
	Dentistry	40	10.4
	Pharmacy	41	10.7
	Nursing	32	8.3
	Medical sciences	85	22.1
Regions	East	52	12.5
	West	266	69.3
	North	9	2.3
	South	16	4.2
	Central	41	10.7

UCB banking had previously been known by 42.2% of the participants, while 40.1% who answered the questionnaire knew what UCB banking is. After we gave the participants a thorough and clear description of UCB banking, they were asked 12 multiple choice questions to assess their knowledge about it. Participant answers to the items regarding UCB banking were varied, and their answers are given in Table 2. The mean total score for correct answers was 5.7, with an SD of 3.4. The possible score ranged from 0 to 12, which was the highest possible score for knowledge.

RESULTS

A total of 384 participants completed the questionnaire, with a mean age of 24.57 years and a standard deviation (SD) of 8.39 years. The majority of the respondents were female (n=298, 77.6%), and there were 86 males (22.4%). Among those participants, 369 (96.1%)

were Saudi, and only 15 (3.9%) were non-Saudi. The qualifications of the participants were 272 (70.8%) students, 37 (9.6%) interns, 33 (8.9%) GPs/residents, and 42 (10.9%) specialists/consultants. For the place where they studied, 354 of the respondents had graduated or were still studying in governmental colleges, and only

Table 2: Knowledge about UCB banking.

Question	Correct answer	n	%
Cord blood is	Blood in in the cord and placenta blood after birth	125	32.60%
Umbilical cord blood can provide a rich source of	Stem cells	288	75.00%
Cord blood collection is done	After delivery	244	63.50%
	Medical waste	195	50.80%
Cord blood can be collected from	Natural births and caesarean sections	224	58.30%
Cord blood collection is painless for the mother and the baby	True	189	49.20%
Are there any health risks associated with cord blood collection?	No	125	32.60%
Cord blood can treat diseases such as	Blood cancer	205	53.40%
Cord blood infusion can treat the same diseases as a bone marrow transplant	True	202	52.60%
Cord blood is can be stored for many years at	Extremely low temperatures	178	46.40%
Who is the beneficiary of the stored cord blood?	Any person who matches the cord blood	134	34.90%
Cord blood can be stored for	20 years	84	21.90%

The total knowledge score was tested against different demographic variables. Using linear regression, it was found that there was a significant direct relationship between the total knowledge score and age (p<0.001, R-squared=0.115). According to ANOVA, the total knowledge score was significantly different according to qualification, with specialists/consultants having significantly higher scores than students, interns, and general practitioners, as shown in Table 3. The t-test and ANOVA showed that the total knowledge score was not significantly different in terms of gender, region, nationality, specialty, or place of study/work, as shown in Table 3.

Table 3: The relationship between total knowledge scores and participants' demographic data.

SD	Mean	Knowledge		P-value
		Options	Variable	
Gender	Male	5.15	3.57	0.096
	Female	5.87	3.35	
Qualification	Student	5.18	3.18	>0.001
	Intern	5.57	3.18	
	General practitioner/resident	6.58	4.05	
	Specialist/consultant*	8.57	3.01	
Specialty	Medicine	5.93	3.6	0.398
	Dentistry	5.83	3.05	
	Pharmacy	4.93	3.3	
	Nursing	5.09	3.45	
Study/work organization	Medical sciences	5.79	3.17	0.571
	Governmental	5.74	3.38	
Region	Private	5.33	3.8	0.83
	East	5.65	3.22	
	West	5.76	3.54	
	North	6.56	2.74	
	South	4.94	3.43	
Nationality	Central	5.59	2.98	0.226
	Saudi	5.67	3.41	
	Non-Saudi	6.8	3.41	

*A Tukey's post hoc test showed that specialists/consultants had significantly higher levels of knowledge than students, interns, and general practitioners. There were no significant differences between students, interns, and general practitioners.

The participants' attitudes toward UCB banking are summarized in Table 4. The primary sources of information about UCB banking were medical personnel and social media. The majority (41.15%) stored their own or their wife's cord blood in a public UCB bank, and the remainder (32.29%) used public UCB banks. A total of 68.23% had donated their cord blood for research purposes, and 85.16% believed that the decision whether or not to donate should be shared between the parents.

Table 4: Attitudes about UCB banking.

Question	Options	Count	%
What has been your major source of information on the subject?	Hospital educational materials	49	12.76
	Medical personnel	84	21.88
	Traditional media	33	8.59
	Social media	80	20.83
	I did not hear about it before	138	35.94
Where would you store your (or your wife's) cord blood?	Public UCB bank	158	41.15
	Private UCB bank	124	32.29
	I do not want to store any cord blood	102	26.56
Would you donate cord blood for research?	Yes	262	68.23
	No	122	31.77
Should the decision about donation be shared between the parents?	Yes	327	85.16
	No	57	14.84

UCB = Umbilical cord blood.

30 (7.8%) were from a private college. Finally, the median number of years of experience was zero, with a range of 0 to 35 years. The demographic results are presented in detail in Table 1.

DISCUSSION

The aim of the present study was to assess Saudi Arabian health care professionals' knowledge and attitudes about UCB banking. However, 58% of the respondents had not heard of UCB banking previously, and 60% did not know what it is. Specialists/consultants had significantly higher scores than students, interns, and general practitioners. Conversely, the total knowledge score was not significantly different in terms of gender, region of residence, nationality, specialty, and place of study/work. The main sources of information about UCB banking for the participants were medical personnel or social media. Most of the participants had good attitudes about storing and sharing cord blood for research in UCB banks.

In this study, 60% of the participants did not know the correct description of UCB banking. Similar findings were reported by Hatzistilli and colleagues from Greece in a survey of health care professionals [31], where 85% had low levels of knowledge about cord blood and UCB banking. This might indicate that UCB banking is not marketed well, even among health care professionals; such a revolutionary area requires that health care professionals be educated on the topic, given that they are the primary source of medical knowledge for the public.

The bivariate analysis from the present study is consistent with the findings from the previous

study in Greece [31] in finding no statistically significant relationships between most of the demographic characteristics and the percentage of correct responses. However, in this study, specialists/consultants exhibited better knowledge on the topic than students, interns, or general practitioners, while in the Greek study [31], a statistically significant relationship was found between correct answers and the professional role, with physicians correctly answering the most questions, followed by blood nurses, midwives, and last, non-specialist nurses. This could be related to higher rates of attendance at continuing education programs, scientific workshops, and conferences, which differ from country to country.

Few studies have examined the knowledge, attitudes, and practices of health professionals regarding UCB banking and donation. When the participants in the present study were asked if there are any health risks associated with UCB collection, only 30% of the health care professionals answered correctly. Conversely, when the same question was asked in an earlier study conducted in Saudi Arabia among pregnant women, 50% answered correctly [6]. Because the same question was asked, it was supposed that health care professionals would exhibit higher levels of knowledge than pregnant women. Thus, the results are unexpected and might indicate that health care professionals are deficient in knowledge about this area in comparison to the public. The reasons for this unexpected result might be due to pregnant women being more interested because of the personal matter of their pregnancy than health care professionals, who received the same information as a part of their curricula.

While expectant parents see health care professionals as the key source of information about UCB banking options [32–38], they unfortunately receive most of their information from untrusted sources, such as the media, family, and friends, and these sources are often based on unscientific information that is misleading or can cause panic [23,39]. Specifically, health care professionals were the source of information for 10% of public respondents in the Saudi [6] study, 6.7% in France, 18.9% in the United Kingdom, 21.5% in Italy, 22.9% in Spain, and 24.8% in Germany [24]. Conversely, in Switzerland, 60% of the participants received information from their health care professionals [40]. One of the explanations for this discrepancy is that there is a clear shortage of evidence-based guidelines regarding UCB banking to assist health care professionals in providing accurate information to their patients.

The present study highlighted the necessity of educating health care providers with accurate and detailed information about UCB banking and the currently available therapeutic options because they play an active role in educating expectant parents, who require accurate and unbiased information to support their decision-making about their care from a trusted source with no financial interest. Interestingly, most studies are in agreement about the importance of educating health care professionals about UCB banking so that they can confidently discuss the topic with their patients [41-44].

Further research into the topic using valid and reliable tools is required to gain a thorough understanding of health care professionals' knowledge and practices regarding UCB banking. The use of these research findings will contribute to the development of future educational curricula, professional educational campaigns, and training programs for health care professionals and medical students about UCB collection, storage, and uses. That, in turn, impacts the professionals' ability to effectively perform their role regarding the precious resource of stem cells.

This study had a relatively large sample size and a diversity of cities. Some of the limitations encountered were the convenience sampling technique, which may not be representative of the population. Therefore, the results should

be interpreted carefully. In addition, this was a short-term study, and thus there is no long-term follow-up to analyze whether enhanced knowledge about UCB donation might lead to an increase in donation rates. In addition, the questionnaire was a simple, self-reported format, and more points are needed for a better investigation.

CONCLUSION

More than half of the participating health care practitioners in Saudi Arabia had not heard and did not know about UCB banking, indicating that health care practitioners' knowledge levels were poor. Knowledge was significantly better with increased age and among specialists/consultants. The main sources of information about UCB banking were medical personnel or social media. A majority of the participants had good attitudes about storing and sharing cord blood in UCB banks for future research. It is recommended that educational stakeholders and continuing education bodies boost health care practitioners' knowledge about UCB banking and the currently available therapeutic options, given that health care practitioners are the primary source of trusted health information for the public.

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LIST OF ABBREVIATIONS

UCB: Umbilical cord blood.

ES: Embryonic stem.

HSCs: Hematopoietic stem cells.

UCBT: transplantation.

SD: Standard deviation.

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