ORIGINAL ARTICLE

Level of Knowledge About Umbilical Cord Blood Donation Among Health Sciences Students

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ABSTRACT

Introduction: One of the origins of hematopoietic stem cells for the treatment of leukemia, myelomas, lymphomas, genetic disorders, immune system defects and blood cell disorders is the donation of umbilical cord blood (UCB). This study is conducted to determine the level of knowledge among Health Science students about UCB donation and to compare the level of knowledge among students from different gender and programs. **Methods:** A cross-sectional study was conducted among health sciences students at a public university in Malaysia. The sample size was calculated by using Raosoft online sample size calculation. A total of 341 students were needed to participate in this study. The questionnaire was distributed randomly to the students using online survey and they were required to respond to a structured questionnaire consisting of 15 items related to UCB donation. Their knowledge was assessed using descriptive statistics. One-way ANOVA test was used to compare the level of knowledge among students from different gender and programs. **Results:** Out of 341 health sciences students participated in the study, 87.7% were female, with age ranging from 19 to 25 years. The students had a mean knowledge score of 4.78 (SD=2.84). There was a significant difference of knowledge regarding UCB donation between the types of the programs, but no significant difference in knowledge on UCB between genders. **Conclusion:** This study revealed that the health science students had insufficient knowledge regarding UCB donation. Efforts should be made to increase the awareness and knowledge of UCB donation among young generations in Malaysia.

Keywords: Knowledge, Donation,Transfusion, Umbilical cord blood, Health sciences students

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INTRODUCTION

Umbilical cord blood (UCB), long known by the mother or baby as useless, is now commonly recognized as a valuable source of hematopoietic stem cells (HSC). UCB is an alternative to HSC transplantation of bone marrow and peripheral blood (1). In the treatment of about eighty diseases, including leukaemia, myeloma, lymphomas and immune system defects, UCBs are currently used as a source of stem cells (2).

Since the first successful cord blood transplant performed in 1988 in a 6-year-old boy with Fanconi anaemia using his sister's stem cell, the number of transplants has steadily increased. Over the last 20 years, it has been estimated that more than 20 000 cord blood transplants have been performed worldwide (3). The stem cells of UCB act as an alternative to bone marrow transplantation since UCB can be used between donor and recipient with a less perfect tissue type match. UCB also gives patients who do not have a tissue-compatible relative and who are unable to find a matched unrelated adult donor a chance of survival (4).

With the number of cord blood transplants, cord blood banks (CBB) have been developed globally to provide transplant centers with high-quality cord blood units (5). The CBB allows individuals to use allogeneic transplantation to store their UCB for potential use and donate the UCB. UCB donation can be lifesaving for patients in need of a transplant from a compatible donor. In Malaysia, the donated UCB is processed and stored

at the National Blood Centre or Pusat Darah Negara (PDN). Whenever the stem cell in UCB is required, PDN will provide the matched UCB for the patient. However, the knowledge on cord blood is vital among Malaysian population for the promotion of the UCB donation. Therefore, there is a need to spread the knowledge and awareness regarding the cord blood among Malaysian population so that can increase the rate of UCB donation in Malaysia.

A variety of studies have been conducted in many countries to gauge the knowledge and awareness of people about donating UCBs. Unfortunately, most of the results have shown inadequate and unsatisfied knowledge level (1). Insufficient information and awareness about UCB donation appear to be the contributing factor in the shortage of available UCB. Ostensibly, the UCB should be made more readily available to increase the pool for HLA-matched cord blood when needed for transplantation (6). Health care providers

In order to encourage new parents to donate their UCB, effective promotional programs are crucial to spread the information. The students who are involved in the health sciences field needed to be knowledgeable as they would play an important role in promoting and informing the parents about the options to donate UCB. The students' knowledge is an important starting point for successful UCB donation programs as well as for their own benefit as future parents.

This study is conducted to determine the level of knowledge among students of the Faculty of Health Sciences in Universiti Teknologi MARA (UiTM) Puncak Alam, Selangor, regarding UBC donation and to compare the level of knowledge among students from different gender and programs.

MATERIALS AND METHODS

Study Population and Design

The sample size was determined using an online sample size estimate from Raosoft online sample size calculation. Out of the population of 1589 health science students, 341 students were eligible to participate in this study (CI = 95%, margin of error = 5%, population size = 1589, distribution of response = 50 %). This sample size included the addition of 10% of the non-response rate. The participants included male and female students from different Health Sciences programmes from Faculty of Health Sciences, UiTM Puncak Alam. The inclusion criteria were full-time bachelor's degree students from year one to year four. The exclusion criteria for this study were part-time students and the students whom unwilling to answer the survey.

A cross-sectional study was carried out on 341 students from March 2020 to June 2020. The study participants were full-time undergraduate students from eight health sciences programs which are Medical Laboratory Technology, Environmental Health and Safety, Medical Imaging, Optometry, Occupational Therapy, Physiotherapy, Nursing, and Nutrition and Dietetics programs. Self-selecting sampling was used to select the study participants when the inclusion or exclusion of participants is determined by whether the students they agree or decline to participate in the study, either explicitly or implicitly. All students were required to answer the questionnaire regarding umbilical cord blood donation and their knowledge were assessed using descriptive statistics.

Data Collection and Instrument

Ethical approval from the Research Ethics Committee of the Universiti Teknologi MARA (UiTM) was obtained prior to commencement of this study. The reference number for the ethical approval was REC/497/19. All data obtained were kept confidential. The participants were told about the intent of the study and their participation was entirely voluntary. The questionnaire was distributed to the students from the Faculty of Health Sciences, UiTM Puncak Alam, Selangor using online survey (Google Form).

The tool used to collect information from respondents is through a structured questionnaire. Questionnaire consisting of 15 items from the previous study was used to obtain data (1). There were two main sections in the questionnaire. The first section contained a survey of sample statistics, such as age, gender, and age. The second section was a survey of students' knowledge of cord blood, definition, collection and its uses.

Statistical Analysis

The data obtained was analyzed using version 25 of the SPSS. Using descriptive statistics, all the research variables were summarized and published. In terms of the frequency distribution, categorical variables such as gender, age and programs were summarized and published. To compare the degree of awareness regarding UCB donation between male and female health sciences students, independent t-test was used. One-way ANOVA test was used to compare the level of knowledge among students from different programs in the Faculty of Health Science. Significant value was set as α=0.05. To assess substantial differences between classes, post hoc analysis was used.

RESULTS

A total of 341 students completed the questionnaire, accounting for 100% response rate. The majority of the students (n=299, 87.7%) were female. As expected of university students, 333 were aged between 19 – 25 years old (97.7%). The number of participants that participated is set out in Table I.

Table I: Number of respondents participated

Characteristic		n	%
Gender			
	Male	42	12.3
	Female	299	87.7
Age			
	19 – 25	333	97.7
	26 – 30	8	2.3
Programmes			
	Medical Laboratory Technology	43	12.6
	Environmental Health and Safety	43	12.6
	Medical imaging	43	12.6
	Optometry	42	12.3
	Occupational Therapy	43	12.6
	Nursing	43	12.6
	Nutrition and Dietetic	42	12.3
	Physiotherapy	42	12.3

Table III (a): Knowledge score on umbilical cord blood donation.

Items		n	%	Mean (SD)
Average total score		341		4.78 (2.84)
Knowledge score	0	25	7.3	
	1	27	7.3	
	2	30	7.6	
	3	38	10.0	
	4	43	13.8	
	5	41	11.4	
	6	31	12.6	
	7	36	7.3	
	8	33	8.5	
	9	25	7.9	
	10	6	4.7	
	11	5	0.9	
	12	1	0.6	

Table III (b): Overall student's knowledge analysis

Items	Category of assessment	n	%
Knowledge	Low	120	35.2
	Moderate	115	33.7
	High	106	31.1

The knowledge scores were classified into three groups which were low, moderate and high. A student's knowledge score was classified as "low" when the score is less than or equal to 3, "moderate" when total score is between 3 to 6 and "high" when the score is greater than 6. Based on Table III (a) and (b), the majority of the students (n=120, 35.2%) were classified as having a low level of knowledge regarding UCB.

There was no significant difference in mean knowledge score between male and female students. The outcome of the knowledge score comparison between male and female students is shown in Table IV.

The results from analysis suggested that the mean knowledge scores were significantly different "between Medical Laboratory Technology and Optometry", and "between Nursing and Environmental Health and Safety, Medical Imaging, Optometry, Occupational Therapy, Nutrition and Dietetic and Physiotherapy". Table V presents the result of comparison of knowledge score between programs.

Table IV: Comparison of knowledge score between male and female groups.

Variables	Male (n=42) Mean (SD)	Female (n=299) Mean (SD)	Mean diff (95% CI)	t-stats[a] (df)	p-value
Knowledge total score	1.976 (0.715)	1.956 (0.828)	0.091 (-0.221, 0.26)	0.163 (57.618)	0.871

[a]Independent t-test

Table V: Comparison of knowledge score between programmes

Variable (Programmes)	n	Mean (SD)	F-stats (df) [a]	p-value
Medical laboratory technology	43	2.279(0.70)		
Occupational therapy	43	1.90(0.81)		
Environmental Health and Safety	43	1.93(0.85)		
Nursing	43	2.558(0.628)		
Medical Imaging	43	1.883(0.73)	7.625 (7,333)	< 0.05[b]
Optometry	42	1.523(0.706)		
Nutrition and dietetic	42	1.857(0.813)		
Physiotherapy	42	1.714(0.834)		

[a]One-way Anova test
[b]"Medical Laboratory Technology and Optometry" and "Nursing and Environmental Health and Safety, Medical Imaging, Optometry, Occupational Therapy, Nutrition and Dietetics and Physiotherapy" are significantly different by post-hoc test Scheffe's procedure.

DISCUSSION

The goal of this study was to determine the level of knowledge among health science students in UiTM Puncak Alam, Selangor, about umbilical cord blood donation (UCB).
All of the students in this study participated voluntarily and they have successfully answered all the questions

given within a few minutes. The participants include male and female students from different programs under the Faculty of Health Sciences. The participants were not briefed or provided with any information regarding UCB beforehand.

Most of the researchers from previous studies selected pregnant women as their subject. Surveys were done on pregnant women in several countries such as German, Hong Kong and India (7-9). Pregnant women were the potential donors of stem cell and therefore their knowledge is vital to enrich the UCB supply. There was also a research done by using public citizen in a country as their main subject (1). However, in this study, health sciences students were chosen as subjects because they will become healthcare workers in the future. Their knowledge is also significant for the success of the voluntary UCB donation campaign. However, no study had been conducted to assess the knowledge from this population. Insufficient information and awareness about cord blood donation will be the contributing factor for the shortage of available cord blood.
Based on previous studies, a glaring lack of knowledge regarding UCB donation was displayed among pregnant women (7), the same goes for the public citizen as they may not have any exposure to health education or related health sciences program respectively. In contrast, in this study health science students were chosen as subjects to determine the knowledge of this group that are educated directly through health science programs. UCB expertise provides basic information on the terms of cord blood, processing, use and storage of cord blood.

Knowledge of Health Sciences students on the donation of umbilical cord blood.

First and foremost, the student's basic knowledge was assessed on the term of cord blood itself. Cord blood is classified as blood in the blood vessels of the placenta and umbilical cord after birth, according to the United States Food and Drug Administration (FDA).Only 19.1% of students define cord blood correctly as both types of blood while more than half of the students answered the first question wrongly. Many of them were not familiar with the term cord blood and they might misunderstand the term of cord blood to be solely the blood in the umbilical cord. Besides that, half of the students are well aware that a rich supply of stem cells can be generated by cord blood.
Apparently, the collection of cord blood was completed after birth. Stem cells in the cord blood were obtained from a portion of cord still attached to the placenta after the newborn was delivered (9).The majority of students answered correctly on cord blood collection to be performed after delivery. This result was probably due to most of the students' learning of the basic process in delivery of baby. Cord blood was always considered a medical waste for centuries (10). However, only 27.3% students knew cord blood was treated as medical waste if there was no intended donation. The mothers were expected to sign an informed consent prior to the collection of cord blood if the donation was intended, and they would be screened for infectious diseases such as HIV reactivity, Hepatitis B and C in advance (10).

More than half of the students (68.6%) knew the method to collect cord blood while the rest had no idea how cord blood can be collected. In addition, half of the students (53.7%) had no idea whether or not the processing of cord blood was unpleasant for the mother and infant. In comparison to bone marrow obtained from the pelvic bone of the donor and causing pain, cord blood is collected by a non-invasive and painless procedure by sterilely puncturing the umbilical vein section with a needle and enabling cord blood to flow into an anticoagulant-containing sterile bag to avoid clotting (11). Furthermore, the collection also posed no risk to the mother or baby; there were relatively rare blood infections from viruses.
About 53.4% students also did not know whether the collection is risky to the mother and baby.The results showed that most of the health sciences students were lacking in information regarding the collection of cord blood as most of them answered the questions related to cord blood collection wrongly or indicated their answer as "I do not know".

Next, 51.0% of students did not recognize the use of

Table II: Students' knowledge towards umbilical cord blood donation.

Items	Answers	n	%
Cord blood is	Blood in cord blood after birth	122	35.8
	Blood in placenta after birth	76	22.3
	Both	65	19.1
	I do not know	78	22.9
Umbilical cord blood can provide a rich source of	Proteins	79	23.2
	Vitamins	26	7.6
	Stem cell	172	50.4
	I do not know	64	18.8
Cord blood collection is done	Before delivery	22	6.5
	After delivery	222	65.2
	I do not know	97	28.4
In case of no donation, cord blood is always	Given to parents	125	36.7
	Medical waste	93	27.3
	I do not know	123	36.1
Cord blood can be collected from	Natural birth	15	4.4
	Cesarean section	5	1.5
	Both	234	68.6

CONTINUED

Table II: Students' knowledge towards umbilical cord blood donation.(CONT.)

Items	Answers	n	%
Cord bood collection is painless for the mother and baby	True	144	42.2
	False	14	4.1
	I do not know	183	53.7
Are there any health risk associated with cord blood collection	Yes	98	28.7
	No	61	17.9
	I do not know	182	53.4
Cord blood can treat disease such as	Bone fractures	12	3.5
	Blood cancer	143	41.9
	Epilepsy	12	3.5
	I do not know	174	51.0
Cord blood infusion can treat the same disease as bone marrow transplant	True	135	39.6
	False	14	4.1
	I do not know	192	56.3
Cord blood is stored for many years at	Room temperature	10	2.9
	Extremely low temperature	186	54.5
	I do not know	145	42.5
Who is the beneficiary of the stored cord blood	Cord-blood donated child	79	23.2
	Any match	124	36.4
	Research	23	6.7
	I do not know	115	33.7
Cord blood can be stored for	1 years	13	3.8
	5 years	17	5.0
	20 years	53	15.5
	I do not know	258	75.7

cord blood. For the treatment of over eighty diseases, including leukemia, myeloma, lymphoma, genetic deficiency, immune system defects and blood cell disorders, cord blood were used as a source of stem cells (2). Some of the students might get the information regarding the use of cord blood through their syllabus or media coverage. For example, through their Obstetrics & Gynaecology subject, nursing students may be well informed about stem cells present in cord blood that can treat blood disorders. Meanwhile, about half of the students (56.3 %) still had no idea that the same illness as bone marrow transplantation could be treated by cord blood infusion. When asked about the beneficiary of stored cord blood, the majority of them answered wrongly.

Most of the health science students had insufficient knowledge on the use of cord blood in HSC transplantation based on this observation. Half of the students wrongly referred to the temperature used to store cord blood for the preservation of cord blood. Cord blood is kept at extremely low temperatures in a specially designed liquid nitrogen freezer (10). Lastly, the majority of students (about 75.7%) did not know cord blood can be stored for up to 20 years.

The knowledge score was determined on the basis of the total number of questions that each student correctly answered. The results showed that the students had a mean knowledge score of 4.78 (SD=2.84). The knowledge scores were then classified into three groups which were low, moderate and high. The results showed the majority of students (n=145, 46%) were classified as having low knowledge regarding UCB. This result is similar to a study in Saudi Arabia in which college graduates demonstrated a significant lack of cord blood donation knowledge (1). In this study, the results probably due to lack in education through Health Science programs and misinformation received. The students might receive the information on UCB from internet since their use has become more widespread in recent years, leading more people to search for information using this medium. In the previously mentioned study on Italian women, most of them acquired information on UCB through internet and rarely from healthcare provider. However, information obtained through the Internet may be insufficient, blurry, and not always independent. This would lead to misunderstanding and incorrect knowledge towards UCB. Hence, that most of the students that acquired information through internet gave low score in this study.

Knowledge of Health Science students on the donation of umbilical cord blood between programmes.

Interestingly, the current study revealed that the mean knowledge score was statistically significantly different between types of programs. There were significant differences stated between "Medical Laboratory Technology and Optometry" and also between "Nursing and Medical Imaging, Environmental Health and Safety, Optometry, Occupational Therapy, Nutrition and Dietetic and Physiotherapy". The mean knowledge scores for Medical Laboratory Technology and Nursing is higher than the rest of the program. Medical Laboratory Technology students get the exposure regarding cord blood through their Haematology subject in which they learn about processing and preservation of the cord blood. Nursing students get exposed to the cord blood donation through Obstetrics & Gynaecology subject. Indeed, cord blood collection was primarily done by obstetricians, midwives and nurses (2). Nursing students might be well-informed on cord blood while doing their practice. Therefore, syllabus might influence the knowledge of health sciences students regarding cord blood.

CONCLUSION

The study showed that the majority of health sciences students in UiTM Puncak Alam had an inadequate knowledge regarding umbilical cord blood (UBC) donation. The students were not aware on the importance and usage of UCB. Therefore, there is a need for the faculty and other relevant stakeholders to make an effort to provide and spread the information regarding UCB donation among he students and young generations to increase the knowledge, awareness and encourage them for cord blood donation, hence increase the rate of UCB donation in Malaysia.

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