

Original Research Article

Efficacy of educational campaign on human leucocyte antigens screening for stem cell donation

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ABSTRACT

Background: Nearly all cells express the proteins known as human leukocyte antigens, or HLA. They aid in distinguishing our own cells from foreign substances and are principally in charge of the body's immunological response. It's interesting to note that every person inherits a distinct collection of antigens from their parents, with half coming from the mother and the other half from the father. This implies that these options can be programmed into youngsters from birth. This study aimed to evaluate how well undergrad students in particular colleges in greater Noida, Uttar Pradesh, are informed about HLA screening for stem cell donation.

Methods: Using convenience sample techniques, a pre-experimental study design is used to evaluate the awareness programme on HLA screening for stem cell donation.

Results: According to the study's findings, the majority of the sample (84%) had poor knowledge of stem cell donation during the pre-test, 16.0% had average knowledge, and 0% had good knowledge. During the post-test, however, the majority (61.0%) had good knowledge, with around 30.0% having average knowledge and only 9.0% having poor knowledge.

Conclusions: In summary, the majority of participants had low pre-test knowledge of HLA and stem cell donation; but, following an awareness presentation on the subject, most of them performed well on the post-test and had good understanding about HLA, DKMS, and stem cell donation. The awareness campaign was a success all around, and some of the participants are even eager to give.

Keywords: Effectiveness, HLA, Knowledge, Immunological response, Screening, Stem cells, Stem cell donation

INTRODUCTION

HLA stands for "human leukocyte antigen," which are protein molecules that we inherited from our parents. At

this point, there are about 600 different types of HLA molecules. Before receiving a stem cell transplant, your HLA type needs to be determined.¹ To do this, a blood sample is taken. HLA antigens are glycoproteins that are

present on the surface of almost every body cell. Their primary function is to serve as recognition molecules for the initiation of an immune response. HLA antigen-producing specialised immune cells transport peptides from foreign substances (like viruses and bacteria) to immune system effector cells. Immune system effector cells then drive the cellular and humoral components of the reaction.^{1,2}

The lab will also determine the HLA type of any individuals who may donate stem cells to you. It is important to determine how closely the recipient's and donor's HLA match during stem cell transplantation. An HLA "match" is any pair of individuals who have any number of HLA molecules in common.^{2,3} HLA matching usually uses six HLA molecules. The greater the similarity between two individuals, the more molecules they share. If two individuals share the same HLA type, they are considered excellent matches. To put it another way, because they won't recognise one other as "foreign," their immune systems will not fight one another.²

The group of people most likely to have an HLA match is siblings, or brothers and sisters who share a mother and a father. A pair of siblings are called "HLA identical matches" if they receive the exact same HLA molecules from both parents. Nevertheless, it is also conceivable for two unrelated individuals to coincidentally share a high level of HLA. Although uncommon, it is nevertheless conceivable that you and a friend or maybe even a complete stranger share some HLA molecules. When you and your acquaintance share three HLA molecules, for example, this is called a "three HLA antigen match".³

Human leukocyte antigens (HLA) are proteins that are present in almost all cells.³ They are principally responsible for the body's immune response and help differentiate between our own cells and foreign substances. Interestingly, each individual receives a unique set of antigens from both parents, with half of the antigens originating from the mother and the other half from the father. Thus, the following possibilities might be present in a kid at birth: Siblings from the same parents have a 25% (1 in 4) probability of having a close HLA match. It's quite improbable that your extended family will get along.⁴

HLAs have a major impact on the body's immune response to foreign substances. They identify the tissue type of the individual, which varies from person to person.^{4,5} HLA testing is done to see if the recipient's tissues and the donor's tissues are compatible prior to organ or stem cell transplantation. likewise referred to as human leukocyte antigen and human lymphocyte antigen. HLA matching matches donors with recipients of blood or bone marrow transplants. The definition of a "match" is two individuals with the same HLA type. It is significantly more challenging than blood typing.⁵

In a cross-sectional survey of 351 students, Marta Hreczuk (2021) investigated the knowledge, opinions, and attitudes of Warsaw University students about hematopoietic stem cell transplantation. The results of the survey showed that 59% of respondents gave accurate responses. Over 25-year-olds and female respondents had higher levels of knowledge, and 41.6% of respondents were listed in the donor database, with greater references to medical students. The results of the study show that the students who were surveyed had generally favourable attitudes and average knowledge levels.⁶

Blood cancer and other dangerous blood disorders including thalassemia, leukaemia, and aplastic anaemia are among the many terrible blood illnesses that experts believe can be cured by transfusion of blood stem cells from a healthy volunteer donor (whether related or unrelated to the recipient). If you are healthy and between the ages of 18 and 50, you can register to become a stem cell donor. This implies that individuals with blood-related illnesses such as Thalassemia as well as cancer patients might benefit from blood stem cell transplants if the donor and recipient are compatible.⁶ Worldwide, matched unrelated donor transplants (MUDT) are already performed on over 10,000 patients annually. Institutions that perform hematopoietic progenitor cell transplantation (HPCT) have noted a considerable rise in transplant frequency in India. The yearly growth rate of HPCTs is around 10%, with 1878 transplants reported by Indian stem cell transplant registries in 2016. The lack of published MUDT outcome data in India, with publications limited to autologous and allogeneic matched unrelated transplants, was our driving force for sharing our MUDT data.^{6,7}

A cross-sectional study led by Abdulrahman Almaeen (2018) assessed 217 medical and dentistry college students at Jouf University on their knowledge of stem cells and their possible applications in medicine. The results demonstrated that 50.7% of the students were aware of the Saudi stem cell donor registry. Seventy percent of the students had a good attitude score for stem cell research and its medical relevance, whereas 72.4% of the students had medium understanding. The study's findings indicate that there was a strong positive association between the knowledge and attitude ratings. It is recommended that medical and dentistry students participate in a variety of interventional educational programmes that highlight the significance of stem cells in the medical profession.⁸

AM Gulbis (2014) carried out a descriptive study to find out how HCT clinicians felt about vaccinations and their knowledge of recommended practices. The study's conclusions show that 96% of survey respondents were aware of the recommendations for post-HCT vaccinations. 74% of respondents said that more than 70% of their patients obtained influenza vaccinations, and 41% reported that they advised patients who qualified for live vaccinations. However, according on our examination of the pharmacy data, 38% of patients had their first round of

vaccinations before the recommended time frame of six months after HCT, and 60% had done so by a year later. The study's conclusion is that more investigation into the vaccination's effectiveness and specific demographics is necessary to reduce the notable disparity between the post-HCT immunization guidelines and clinical practice.⁹

A prospective cross-sectional study was carried out by Daiane Rubinato Fernandes (2019) to determine the level of carers' awareness and proficiency about hand cleanliness in hematopoietic stem cell transplantation. The results of the study demonstrate that every one of the 37 participants understood the need of practising good hand hygiene. 95.5% of them linked it to preventing disease or clearing dirt. 64.9% of respondents agreed that using an alcoholic solution after washing hands with soap and water was crucial when entering and leaving the room, while 91.9% of respondents highlighted how important it was to do so. The professions rated 3.91 steps in disagreement with the alcoholic solution and an average of 6.16 steps while demonstrating the washing technique. Even though the study acknowledges the importance of the approach, its results emphasise the need for improvements in this procedure due to gaps in timing and execution.¹⁰

In a descriptive cross-sectional study conducted by Marwan Fahad ALtemani (2018), 120 physicians and medical students in Tabuk City, Saudi Arabia were asked to complete an evaluation on their knowledge, attitudes, and use of stem cell treatment between April and December 2017. According to the results, the majority of males (81.6%) 45 of the medical students and 75 of the 120 physicians were males. Nobody scored very well; rather, knowledge was deemed to be poor in 21% of cases, fair in 76.5%, and good in 2.5 percent. Merely 0.8% of participants rated their disposition as outstanding, 9.2% as satisfactory, 73.1% as impartial, and 16.8% as appalling. The practise received ratings of 14.3%, 52.9%, 21.8%, and 10.9% for exceptional, good, fair, and terrible, respectively. The study's conclusion is that medical professionals and students in Tabuk, Saudi Arabia, have inadequate information, attitudes, and practises. To bring the information up to speed, an educational intervention is very necessary.¹¹ This objective of the study was to evaluate the knowledge of human leukocyte antigen screening for stem cell donation before and after the test, to assess the success of a campaign to raise awareness of self-HLA testing for stem cell donation and to determine the relationship between the pre-test knowledge score and particular demographic factors.

METHODS

Study design

In order to accomplish the intended goals, a pre-experimental research design is adopted to assess the awareness program on HLA screening for stem cell donation among the undergraduate students.

The demographic characteristics in this study include the students' ages, genders, levels of education, subjects selected in high school, and awareness about HLA screening and self-screening tests.

Study setting

The study was carried out at the chosen Greater Noida college. The students at Sharda University in Greater Noida make up the study population.

Study duration

The duration of this study was 6 weeks (dec1,2022-jan 31, 2023). This duration comprised of data collection period.

Sample

The sample for this study will be undergraduate students from a certain Greater Noida institution.

Sample size

The current study has a sample size of 100 students from certain institutions in Greater Noida.

Sampling Technique

Non-probability convenience sampling methods are applied in this investigation.

Inclusive criteria

Undergraduate students, those who are willing to take part in the research and those who are present at the time of data collection were included.

Selection and development of the tool

Tools were prepared on the basis of objectives of the study. A structured knowledge questionnaire was selected to assess the knowledge of nursing student regarding human leukocytes antigen self-screening.

Description of tool

A blue print of the items was prepared on the three domains of learning, mainly knowledge, understanding and application. A development of criteria checklist for validating the tool.

TOOL 1: Development of questionnaire (items)

Descriptions of the tool: the tool consists of section 'A' and 'B'

Section A: A Performa for selected personal information was used to collect the sample characteristics. Demographic Performa included 8 items, such as, age of

students in a years, gender of the students, types of family, education status, residence of student, no of screening taken per day, year of student studying.

Section B: It includes structured knowledge questionnaire. The related literature was reviewed for the construction of the structured knowledge questionnaire. It consisted of 21 questions.

All the items were multiple choice questions, which had 4 alternative responses. A score value of one was allotted to each correct response and for wrong response zero was awarded. Thus there were 21 maximum obtainable scores. The level of knowledge was categorized based on the scores obtained.

Data collection procedure

The final data collection was done after obtaining formal written permission from the concerned authority of selected colleges of Greater Noida. The data was collected from 100 students who filled the sampling criteria through the non-probability simple purposive sampling technique.

The students were asked to participate in the study after the introduction of the topic which is human leukocytes antigen self-screening. The purpose of study was explained and students were asked to fill out pre-test and post-test. The questionnaire was administered to the students after explaining the necessary instructions. The time taken to complete the structured questionnaire was approximately 30 minutes for each group. The respondents were co-operative and the data was collected and compiled for data analysis.

Ethical consideration

For the present study, the investigator took into consideration the ethical value. Prior permission was obtained from the authorities of college. The purpose was explained to the sample and informed verbal consent was taken. Confidentiality was promised and ensured. The participants were given freedom to quit from the study in between if not willing.

Plan of data analysis

The data collected by the researcher was transferred to a master sheet prepared for each research tool. The descriptive as well as inferential statistics were used to achieve the objective of the study.

RESULTS

It reveals that the majority of the sample was between the ages of 19 and 20 (49%), that the majority of them were female (63%), that the majority of them were enrolled in an academic programme from 2022 to 2023 (56%), that the majority of the sample's family members (63%), that the majority of the sample (72%) did not know anything

about HLA, and that the majority of the sample (87%) did not want to donate stem cells.

Table 1: Information about the percentage distribution and frequency of sample characteristics (n=100).

Demographic variables	N	Percent
Age in years		
≤18	19	19
19-20	49	49
>20	32	32
Gender		
Male	37	37
Female	63	63
Year enrolment		
2020-21	40	40
2021-22	4	4
2022-23	56	56
Any family members involved in medical profession		
Yes	37	37
No	63	63
Previous knowledge on HLA		
Social media	6	6
Family & friends	13	13
Others	9	9
No	72	72
Are you willing to stem cells		
Yes	13	13
No	87	87

Data reveals that the majority of the sample (84%) had poor knowledge before the test, while the average level of knowledge was held by about 16.0% of the sample, and none of them had good knowledge. By contrast, the majority (61.0%) of the sample had good knowledge after the test, while the average level of knowledge was held by about 30.0% of the sample, and only 9.0% of the sample had poor knowledge (Table 2).

Table 2: Information on the frequency and percentage distribution of the sample based on the test takers' knowledge levels before and after the test (n=60).

Knowledge level	Scoring	Pre-test		Post-test	
		N	%	N	%
Poor	≤7	84	84.0	9	9.0
Average	8-14	16	16.0	30	30.0
Good	>14	0	0.0	61	61.0

Table 3 reveals that, there was a statistically significant difference noted in the mean scores of knowledges at $p < 0.001$ between pre and post-test among sample. It shows that the intervention was effective in improving the knowledge regarding HLA screening for stem cell donation. Hence researcher failed to accept null hypothesis (H_0).

Except for age expressed in years and year enrollment ($p < 0.05$), the data in table 4 indicated that there is no statistically significant ($p > 0.05$) correlation between the

sample's post-test demographic factors and knowledge level. As a result, the researcher agreed with the null hypothesis (H_0).

Table 3: Information on the comparability of sample knowledge scores between the pre- and post-test (n=100).

Knowledge	Mean	Standard deviation	Mean difference	Paired t-test	P value
Pre-test	4.61	2.49	10.51	20.31	0.001 (S)
Post-test	15.12	4.66			

($p < 0.05$ is a meaningful level) Significant and non-significant terms are used

Table 4: Information on the relationship between post-test demographic variables and knowledge level of post-test (n=60).

Demographical variables	Level of Knowledge						Chi- square test (χ^2)	Df p value
	Poor		Average		Good			
	N	%	N	%	N	%		
Age in years								
21-30	1	11.1	4	13.3	14	23.0	11.01	Df=4 p=0.02 (S)
31-40	7	77.8	10	33.3	32	52.5		
41-50	1	11.1	16	53.3	15	24.6		
Gender								
Male	2	22.2	11	9	26	42.6	2.30	Df=2 p=0.31 (NS)
Female	7	77.8	11	21	35	57.4		
Year enrolment								
2020-21	2	22.2	18	60.0	20	32.8	9.43	Df=2 p=0.05 (S)
2021-22	0	0.0	0	0.0	4	6.6		
2022-23	7	77.8	12	40.0	37	60.7		
Any family members involved in medical profession								
Yes	1	11.1	10	33.3	26	42.6	3.58	Df=2 p=0.16 (NS)
No	8	88.9	20	66.7	35	57.4		
Previous knowledge on HLA								
Social media	1	11.1	1	3.3	4	6.6	4.71	Df=6 p=0.58 (NS)
Family and friends	0	0.0	6	20.0	7	11.5		
Others	1	11.1	4	13.3	4	6.6		
No	7	77.8	19	63.3	46	75.4		
Are you willing to stem cells								
Yes	0	0.0	6	20.0	7	11.5	2.77	Df=2 p=0.25 (NS)
No	9	100.0	24	80.0	54	88.5		

($p < 0.05$ significant level) S- Significant and NS-Non-Significant

DISCUSSION

In this study majority of the sample (84%) had poor knowledge, average level of knowledge was held by about 16.0% of the sample, and none of them had good before the test and the most (61.0%) of the sample had good knowledge after the test which is similar to study conducted by Almaeen et al where a total of 72.4% of the students possessed medium knowledge while 70% of the students possessed high attitude score towards stem cell research and its medical significance.⁸

In this study there was a statistically significant difference noted in the mean scores of knowledges at $p < 0.001$ between pre and post-test among sample. A significant relationship was observed between the Saudi Stem Cell

Donor Registry awareness and knowledge score with p-value of 0.04 conducted by Almaeen et al.⁸

Also a similar study done by Shah et al where Student nurses having inadequate knowledge while in post-test (18%) of student nurses having moderate level of knowledge and (82%) having adequate level of knowledge nobody was found at the inadequate level.¹⁴

In this study except for age, the data indicated that there is no statistically significant ($p > 0.05$) correlation between the sample's post-test demographic factors and knowledge level, which is similar to the study where the relationship between the age, gender, college type, year of education, marital status and smoking status with the knowledge and attitude scores was not found to be significant.⁸

Limitation

There was a clear constraint on how broadly the study could be used because it was limited to students at any college between the ages of 18 and 35.

CONCLUSION

Our study reveals that the majority of the sample (84%) had poor knowledge before the test, while the average level of knowledge was held by about 16.0% of the sample, and none of them had good knowledge. By contrast, the majority (61.0%) of the sample had good knowledge after the test, while the average level of knowledge was held by about 30.0% of the sample, and only 9.0% of the sample had poor knowledge. There was a statistically significant difference noted in the mean scores of knowledges at $p < 0.001$ between pre and post-test among sample. It shows that the intervention was effective in improving the knowledge regarding HLA screening for stem cell donation. The information in Table 4 showed that, during the post-test, there is no correlation between the sample's demographic factors and knowledge level ($p > 0.05$).

The findings of the study concluded that majority of student nurses were having inadequate level of knowledge & the educational campaign was effective among student nurses regarding stem cell collection, preservation & its benefits.

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