Original Research Article

Stem cell management is a novel innovation in the health care sector. The study based on research conducted by professionals in the field.

Abstract

Background: A physician offers treatments to prevent, treat, and manage sickness and to maintain mental and physical well-being. According to the World Health Organization, health care includes all raw materials and services aimed to enhance health, including "preventative health, therapeutic, and supportive interventions, either aimed to people either to nations." Stem cell is one of the innovations of health care industry. Globally, stem cells are used to treat over 130 diseases and it is estimated that more than 500 clinical trials are being done to develop therapies using stem cells. Henceforth, this paper aim is to enhance the stem cell role in health care industry and to find the health professional attitude towards stem cell management.

Methods: For the study purpose both primary and secondary data are used. The primary data collected from the doctors through a cross sectional questionnaire. The secondary data collected from records of the WHO, various journals, scientific study and clinical trials.

Results: The study found that stem cell is the novel innovation in the health care sector. Thus, saving the baby's cord blood now can ensure child's access to his/her own stem cells for such cellular therapy and other diseases treatment in the future. The study determine that the attitude of the health professional are positive towards stem cell management in India and they need government takes necessary action to developed the stem cell management for better health sector in India.

Conclusions: Thus it can be concluded that with the increases of the cases the scientists try to find the use of stem cell in the treatment of various diseases. It does clearly indicate that stem cell boost the immune system. The data analysis of the study confirms that doctors in India have a positive view toward stem cell management. As a result, if sufficient initiative is made by healthcare professionals and the government, stem cell management has a wide range of adoption and acceptance opportunities.

Keywords: Stem cell Management, Stem cell, Clinical Trials Attitude, Health sector, Innovation

Introduction

Life improves slowly and goes wrong fast, and only catastrophe is clearly visible.

Due to certain diseases, the health is regulated by health technologies. A growing number of innovative health solutions are being produced of advances in science and technology to prevent disease. In the health care system, stem cell technologies have had a significant impact. Until now, a considerable of resources has been spent on this, and it has been extremely effective at treating a wide variety of diseases. In the field of medical science, stem cell research is without a doubt one of the most exciting and controversial areas. Stem cell research has advanced significantly since the first bone marrow transplants in the 1960s and the isolation of embryonic stem cells from mice in the 1980s, when the first embryonic stem cells were isolated. Stem cell banking is one of the most promising and emerging field of life sciences. Stem cell research shows that it acts as an internal repair mechanism, dividing to replenish other cells. Several physicians are now praising stem cells as a means to relieve human suffering as the results continue to improve. Starve to death Stem-Cell-Research is a rapidly developing field that has the ability to change the world of diagnosis. "Stem cells are cells that have the ability to divide indefinitely in culture and give rise to specialized cells." Unlike other cell types, stem cells are unspecialized and capable of self-renewal through cell division, even after long periods of inactivity; and under certain physiologic or experimental conditions, they can be transformed to become tissue- or organ-specific cells with special roles. Stem cell banking or preservation is the process of extracting, processing, and storing stem cells so that they can be used for therapy in the future, whenever Stem cell banks are being built more and more around the world in order to preserve their biological features, prevent contamination and deterioration, and promote their effective use in clinical and applied research, as well as current and future therapeutic applications. (Changbin Sun J. Y., 2016)

There are basically three sources of stem cells; bone marrow, embryonic cells and cord blood.

Bone marrow: Bone marrow is a sponge-like substance found inside bones. Such immature cells are referred to as hematopoietic stem cells or blood-forming stem Bone marrow transplantation is a tough and time-consuming technique that requires a precise and accurate match. (B.Resnik, 2002)

Embryonic cells: Embryonic stem cells are pluripotent stem cells derived from the inner cell mass of a blast cyst, an early-stage pre-implantation embryo. On the other hand the

treatment based on embryonic cells involves a lot of controversies as it requires the culture of embryo or waste fetus. (M.F. Pera, 2000)

Cord blood: The third and the richest source of stem cells is the cord blood. Umbilical cord blood is blood that remains in the placenta and in the attached umbilical cord after childbirth. Cord blood is collected because it contains stem cells, which can be used to treat hematopoietic and genetic disorders. Umbilical cord blood contains inexhaustible, non-controversial sources of stem cells for therapy. (P.S. Dhot, 2003)

Stem cell treatment serves as an internal repair system, dividing to replenish other cells. In some organs, such as the gut and bone marrow, stem cells regularly divide to repair and replace worn out or damaged tissues. In other organs, however, such as the pancreas and the heart, stem cells only divide under special conditions. These characteristics of Stem Cells are driving Scientists to be able to tackle conditions like Alzheimer's disease or Parkinson's disease, which currently are incurable. It is believed that once stem cell technology is fully developed, patients could be able to grow back a failing kidney, burnt skin or even a malfunctioning lung. (S L Preston, 2003)

Literature Review

The chronological history 1940 s 1950's The origins of modern stem cell transplantation The first human marrow transplants 1960's Breakthroughs in immunology 1970's 1980's Clinical bone marrow transplantation takes off 1980 s Widening indications widening donor choices 1990's Widening indications widening donor choices new drugs 1990's. New stem cell sources, new indications, New conditioning regimens Improved outcomes, older patients, the rise of cord blood, cell therapy. (MD, 2009)

In 2003, less than 30 diseases were able to get cured or supported with stem cell, but today over 85 diseases can be cured and supported. Stem cell transplantation facilities are increasing in India but for optimal utilization of these facilities, it is important to create concept awareness. At present, lack of awareness about the huge potential to be gained from the storage of cord blood stem cells and highly technical nature of the process is the key reason for a small customer base in the country. (Ujala Joshi, 2017)

Given the current state of our knowledge about stem cells and their actions, patients should continue to be counseled against medical travel for unproven stem cell–based therapies at this time. (Olle Lindvall, 2009)

According to the studies stem cells are not only kept for future, its useful for existing patients. If any family member already has a disease, the family takes a sensible decision and save a cord blood for the patient treatment and it more effective in sibling case. (Besser, 2010)

The goal of research using stem cells is not always to produce a stem cell therapy. Basic research over the last four years has shown that stem cells can be used to understand diseases, which may help scientists create new drug therapies. (NHS, 2011)

During the past several years there has been a vivid research in the field of stem cell. (Radhika P Ramachandran, 2011) Almost non-existent a few years ago in the country, stem cell banking is now a flourishing business with more and more people wishing to store their baby's cord blood as a form of bio-insurance, even though it comes at a heavy price. Cord blood storage is fast gaining momentum as a less traumatic alternative to treat neurological illnesses, and as a guarantee for the family against a host of diseases. (Amit Kumar, 2011)

Stem cells from cord blood are much easier to get because these cells are readily obtained from the cord and the placenta at the time of delivery. The stem cells obtained from umbilical cord blood are less likely to be rejected in transplants than bone marrow stem cells. (Hend S. Mohammed, 2015) Understanding stem cell is important for efforts that are designed to alleviate the risk it poses to both individual patients and the broader research field (Jee Leng LYE, 2015)

People should be made aware of such applications and government should help in providing such benefits by subsidizing them (Alaie, 2015).

In large part, consumer demand for established and new forms of health care has traditionally been mediated through the role of the doctor acting to define demand in terms of ‘clinical need” (Brian Salter, 2016). In recent investigation, the knowledge on stem cells and its role in treatment of different diseases developed awareness among people and moved them to adopt stem cell collection and preservation techniques (AB, 2017).

Use of cord blood for health problems that develop in the future, a need has arisen for the collection and storage of cord blood throughout the world as it holds promise for the treatment of many devastating diseases of humankind. (Aksa Peter, 2017)

Private and public cord blood banks both benefit families by offering a precious and less painful alternative for stem cell sourcing. Families should consider reputable and established private blood banks if they have a family member at a high risk of developing diseases treatable by cord blood stem cell with in the future, and other families should consider donating cord blood to a public bank if they would like to help save the lives of others. (Landis, 2017)

Attitude

Attitude refers to a person's learned tendency to respond positively or negatively to an object, situation, concept or individual. The definition is also considered to be a belief of individuals which reflects and can sometimes be demonstrated in conduct. (Joseph F. Hair, 2010)

Knowledge, belief, and perception were used to assess health professionals' attitudes in this study.

Objective

1. To explore the important of stem cell management in health sector
2. To analyses the attitude of health professional towards stem cell management in India.

The following hypotheses were developed based on the relationship of underlying factors and attitude of physician towards stem cell management.

Null Hypothesis: Health Professionals has positive attitude towards stem cell management in India.

Alternative Hypothesis: Health Professionals has negative attitude towards stem cell management in India.

Research Methodology

Data collection and sampling process

The primary data in this study consists of data collected from a questionnaire, in which stem cell information and attitudes were obtained. Doctors from several hospitals and clinics in the Delhi-NCR filled out the questionnaires. Jaypee Hospitals, Fortis Hospital, and different doctor's clinics are among the major hospitals. A total of 140 questionnaires were given, with the respondents returning 125 of them. However, ten surveys were not entered into the data set because the respondents did not match the knowledge requirements for stem cell management. After screening out the cases, 15 remaining questionnaires were deleted due to two reasons: missing values and 94 outliers. As a result, only 100 valid surveys were employed in the data analysis. The response rate was 72%.

SAMPLE DESCRIPTION

In this survey, four demographic characteristics were measured: gender, age, education, practice area, and experience. A summary of these demographic characteristics is shown in table no.1.

The study found that 38% of health professions (mainly doctors) are male and 62% are female. 14% are less than 30 years, 33% and 29% are belong to the age group of 31-40 years and 41-50 years. 24% are belongs to above 50 years.

Table 1-Demographic Characteristics Data

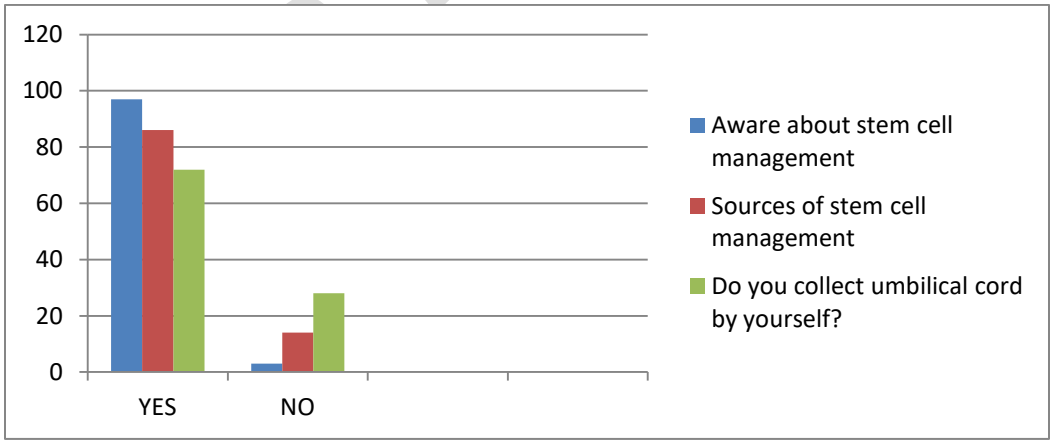
	Category	Frequency
Gender	Male	38

	Female	62
Age	Less than 30 year	14
	31-40years	33
	41-50 years	29
	Above 50 years	24
Educational status	Graduate(MBBS)	22
	Post- Graduate (MD)	36
	MS	24
	Diploma after Graduation	18
Practicing	In Government hospital	19
	In private Hospital	26
	In own Clinic	29
	In both own clinic and private hospital	24
Experience	Less than 10 years	26
	10-20	32
	20-30	22
	More than 30 years	19

Health Profession awareness toward Stem Cell Management: Descriptive Statistics

From the figure-1 the results showed that 97% of health professions are aware of stem cell management. Stem cells are derived from umbilical cord, bone marrow, tooth pulp, etc., and 86% of health professions are familiar with these sources.

Figure 1 Health Profession awareness



Reliability test

A reliability test performs to check the internal consistency among the items in the variables. Cronbach's alpha, which is a common measure of internal consistency, was applied in this research. The cronbach's alpha $\alpha \geq 0.70$ is considered as acceptable

(Whiston, 2009). In this study the value of cronbach's alpha for each variable is for knowledge is .883, for attitude is .794 and perception is .770. The items used in each variable to determine the scale of attitude knowledge, have 5 items scale, belief have 4 items and perception has 4 items scale.

Table 2. Reliability test results

Factor	Number of items	Cronbach' alpha
Knowledge	5	.883
Belief	4	.794
Perception	4	.770

Table 3. Knowledge Belief Perception

	Mean	Std. Deviation	N
Knowledge	2.0737	.71691	100
Belief	2.1743	.73373	100
Perception	1.6855	.59659	100

Factor analysis

The 13 items questions were detected in three separate factors with eigen values larger than 1.0 and were thus of interest to this research. The components explained 68.45% of the overall variance, which is more than the acceptable variance explained of approximately 60%. 2007 (Naresh Malhotra)

For this investigation, the KMO (Kaiser-Meyer-Olkin) value was 0.850, and the Bartlett's Test of Sphericity (Bartlett, 1954) likewise obtained statistical significance (sig. 0.000). As a result, the scale was determined to be appropriate for exploratory factor analysis.

The factor analysis technique is used to analyse the underlined meaning of items. The factor analysis converts a set of things into new variables that are separate and emphasise the same meaning. The number of additional variables is kept to a minimum. Varimax rotation is then used to rotate the generated components. Factor analysis found three factors, as shown in table no.2 rotated components matrix. The factor loadings of these three factors are listed in the table below, which is more than. The number 5 means acceptance. (Joseph F. Hair, 2010).

Table 4 Factor analysis results

	1	2	3
I feel that stem cells will have a number of benefits in the future.	.802		
Instead of using stem cells from any other human being, it is best to use own stem cells.	.800		
I'm familiar with stem cell therapy research on the various diseases.	.759		
I believe that preserving stem cells will help protect the baby from future illnesses.	.734		
I'll be recommending stem cell therapy to patients in the future.	.688		
I'm aware the Indian Council of Medical Research has issued recommendations on the use of stem cells in therapy.		.848	
I am strongly in favor of stem cell therapy.		.780	
When I see encouraging findings from stem cell clinical research conducted by scientists, it enhances my faith.		.700	
I'm worried that the number of stem cells in cord blood may not be enough for older children and adults to be treated.		.585	
I believe that collecting stem cells from the umbilical cord is a simple and painless technique.			.838
I believe that the government should be involved in stem cell storage policy that private companies must make.			.618
I believe doctors will feel comfortable to promote stem cell management once their hospitals are allowed to do so.			.563
I'm honest with our patients regarding stem cell therapy, including whether or not certain treatments have been scientifically established and should not be used as a treatment.			.509

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.a

a. Rotation converged in 8 iterations.

Factor 1: Knowledge of stem cell management– This factor explains for 26.2% of total variance. This factor consists of the statements that they would benefit in the future (.802)

+ use own stem cells rather than other human being stem cells (.800) + stem cell therapy research on various diseases (.759) + prevention of future disease in children (.734) + recommending stem cell patients (.688). The statements in factor show that health professions are well-versed on stem cell research and uses. According to a 2018 survey, the knowledge of stem cell management in the health profession seems to be quite good. (Anupam Sachdeva, 2018)

Factor 2 (Perspective and belief toward stem cell management) explains for 26.1 percent of total variance. This factor includes statements such as Indian Council of Medical Research has issued recommendations on the use of stem cells in therapy (.848) + in favor of stem cell therapy (.780) + positive response by Scientist on stem cell research (.700) + concerned about the use of stem cells found in umbilical cord due to the amount of stem cells (.585). These statements reflect the perspective of health professionals while making decisions on stem cell management. Doctors have increased their confidence in stem cell management as a result of the positive response from scientists and the government; a similar study done in 2021 revealed a favorable perspective toward stem cell research.(Abdulrahman Almaeen, 2021)

Factor 3 (Perception of stem cell management) - This factor explains for 16.1% of total variance. This factor includes statements about the collecting technique (.838), government engagement in stem cell storage (.618), and doctors actively promoted stem cell management (.563) and gave patients with an honest overview of stem cell banking (.509). These as among that pregnant women are deeply concerned about their baby's future well-being. Consumer perceptions influence health professionals' attitudes about stem cell management, which can alter the information provided to pregnant parents concerning stem cell preservation in either a positive or negative way.(Lisa Peberdy J. Y., 2016) It was found that patients who suffer from cancer have belief on stem cell are its usability in treatment (E Frick, 2007)

Correlation

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The Pearson correlation method is used to assess the link between the variables since it helps in identifying the relationship between the three variables (knowledge, perspective and perception). This study was mostly used to summaries the correlation between the existing variables.

Table 5 Correlations results

		Attitude	Affective	Behavior	Cognition
Overall Attitude	Pearson Correlation	1	.889	.807	.839
	Sig. (2-tailed)		.000	.000	.000

	N	100	100	100	100
Knowledge	Pearson Correlation	.889	1	.633	.609
	Sig. (2-tailed)	.000		.000	.000
	N	100	100	100	110
Belief	Pearson Correlation	.807	.633	1	.476
	Sig. (2-tailed)	.000	.000		.000
	N	100	100	100	100
Perception	Pearson Correlation	.839	.609	.476	1
	Sig. (2-tailed)	.000	.000	.000	
	N	110	110	110	110

Pearson correlation is the best approach for testing the relationship between variables. The efficiency and relevance of factor analysis will be evaluated using these coefficients, and the results will be supported for multiple regression analysis. Because the correlation coefficient has a statistical significance of less than 0.0005, all of the variables have positive relationships with one another.

The table clearly shows that all three components of overall attitude, knowledge, belief and perception, have a strong and positive connection with attitude, with p values of 0.00 for all three components, which is less than p0.05.

The correlation coefficient can be used to assess the strength of a relationship. According to the table, the correlation coefficients for all three components of attitude, knowledge, belief and perception with overall attitude were r=.889, r=.807, and r=.839. Thus, of the three components, knowledge has the greatest influence on the overall attitude of health professionals toward stem cell management in India, followed by perception and belief.

HYPOTHESIS ANALYSIS

Null Hypothesis: Health Professionals has positive attitude towards stem cell management in India.

Alternative Hypothesis: Health Professionals has negative attitude towards stem cell management in India.

Table 6. One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Attitude	100	1.9445	.57805	.06631

	Test Value = 0

	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Attitude	29.326	75	.000	1.94452	1.8124	2.0766

The total attitude of the health professional towards stem cell management is positive. The mean of the attitude is 1.9455 that's means the alternative hypothesis for objective is accepted as there is the positive attitude towards stem cell management.

In order to explore correlation analyzed for used there is a significant relation between total attitude and other components of attitude.

Result and Discussion

The researchers focused at health professionals' attitudes toward stem cell management in terms of their knowledge, beliefs, and perceptions. The study's findings have substantial implications for stem cell management and have added to the current body of knowledge by identifying a variable of health professional attitude toward stem cell management. The study looked into whether a health professional's attitude toward stem cell management had an impact on knowledge, belief, and perception. Furthermore, factor result supports acceptable statistical results in determining the relationship between knowledge, belief, and perception characteristics of stem cell management in India. After that, correlation analysis revealed that knowledge has the greatest impact on health professionals' attitudes, followed by belief and perception, because knowledge shows that stem cells promise a brighter future for protecting children from future illnesses. Because of the government's inadequate involvement and lack of promotion, despite having information and awareness about stem cell management, very few individuals continue to engage in the stem cell management process action. Finally, the t test gives support to the hypothesis that doctors in India support stem cell management. As a result, if the government takes the necessary steps, stem cell management has a wide range of implementation and acceptability options.

Conclusion

The health sector is regarded as one of the most vital in India, with significant investment. To strengthen India's health sector, stem cells play a critical role. Globally, stem cells are utilized to treat around 130 diseases, and it is estimated that over 500 clinical trials are being conducted to develop stem cell therapeutics. According to medical experts, stem cells obtained from a newborn's cord blood are particularly rich and can differentiate into blood and immune system tissues, as well as heart, brain, spinal, and pancreatic tissues. In India, about 70% of patients who require bone marrow transplantation do not find a match because of a lack of information and a lack of maintenance of stem cells. The cost of purchasing stem cells is higher than the cost of treatment. The number of disorders treatable with stem cells is rising rapidly. Studies

have been directed at the possibility of utilizing cord blood stem cells to treat some of the most serious diseases, such as heart disease and stroke, due to their ability to transform into multiple cell types. Thus, storing the baby's cord blood now can secure the child's future access to his or her own stem cells for cell therapies and other disease treatment.

Other developed countries, such as the U. S., China, and the U.K., among others have more clinical trials than India. This study notifies the Indian government about the present state of stem cell research, which is essential in India. The Indian government has been very active in fostering stem cell research, particularly in clinical trials, basic research, and application development. The need for research is to spread knowledge about stem cells throughout society.

According to the findings, doctors have generally positive attitudes toward stem cell management. Despite the fact that experts believe stem cell management will be quite beneficial in the future. Scientists' encouraging stem cell research strengthens doctor trust. Similarly the study in 2016 shown that the most important roles of the healthcare professional caring for the expectant mother and her family is to provide unbiased, evidence-based information to assist parents in making decisions about their child's care that best suit their family's needs while also reflecting their own values, beliefs, and priorities. Further research should focus on understanding health professionals' perspectives and attitudes, as well as how cord blood collection may influence their birth management approaches, as this may have an impact on the information provided to pregnant parents, either positively or negatively. (Lisa Peberdy J. Y., 2016)

Suggestion and Recommendation

Stem cell therapy has proven to be a highly effective and promising method of therapeutic application and improvement, since there are no effective treatments for the various serious disorders. The involvement of the government is required to drive stem cell management in the health sector further. The current study has several limitations. There are several reasons for this, including a smaller than estimated health care professional who completed the questionnaire, resulting in a small sample size. However, the findings are significant because this was the first study of this kind in Delhi-NCR on the topic of stem cell management, which is still in its beginning phases in the city. As a result of these findings, stem cell management is a preferable possibility for disease treatments. Scientists may soon be ready to initiate additional stem cell research and clinical trials for a wide range of disease possible treatments.

Author Disclosure Statement

The authors state that they have no conflicts of interest in study.

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