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Exploring insights of a pediatric stem cell transplantation team

Barennise Arries

Cape Peninsula University of Technology, P.O. Box 1906, Bellville, 7535, South Africa

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ABSTRACT

Background: The treatment options for children with childhood cancers have expanded to not only surgery, chemotherapy, radiotherapy, and biotherapy, but also hematopoietic stem cell transplantation (HSCT). There are many challenges linked to this type of treatment. One of the challenges is the insight into how the stem cell team members perceive the treatment of the children.
Objective: To explore the insights of a paediatric stem cell transplantation team.
Design and methods: A qualitative study method was employed. Data were collected using face-to-face personal interviews with sixteen (16) eligible participants. Non-probability sampling method was used to select participants. Thematic analysis and coding were used to transcribe data. The setting was a private and public hospital in the Western Cape where hematopoietic stem cell transplantations were performed.
Results: The team was positive about this treatment option for childhood cancers. Selected members of the team experienced psychological encounters to practice in a hematological setting, especially with sick children. However, certain members could disconnect psychologically from the patients.
Conclusions: The management of hematopoietic stem cell transplant patients is complex, and the multidisciplinary team must have a suitable approach towards these patients. Training of team members should include hematopoietic stem cell transplantation for children. Haematology practitioners must be well-informed about stem cell research in children. Health education in the community regarding stem cell transplantations should be conducted to create awareness.

1. Introduction and Background

The most common cancers in children younger than 15 years, is leukemic and brain and central nervous system tumours. Ages 15–19 have an incidence of Hodgkin's lymphoma and thyroid cancers, which were the top two diagnosed this year. Treatment in teens and children, diagnosed with cancer, can be treated successfully. The number of deaths in children younger than 15 years, has decreased by more than 50 % between 1975 and 2017. This was due to clinical trials and advances in treatment. Cancer is still the second leading cause of death in these youngsters, after accidents. The estimated death statistics for this group are 1190 in children younger than 15 and 540 in teens 15–19 years. There are different survival rates for different children's cancers. Survival rates have increased to 84 % since the 1970 s when it was only 58 %, because of clinical trials and advanced treatments. This is according to the United States of America database registry (cancernet.com editorial board, 01/2021 (Accessed November 2021). Adediran et al (2016) stated that allogeneic stem cell transplantation is a cure for sickle cell anaemia in children, who are born with this disease and can die before they reach the age of five years and that paediatric patients are more tolerable than adults.

There are 800–1000 children diagnosed with cancer annually in South Africa. The most common cases are leukaemia, lymphoma, brain tumours neuroblastomas (Wills tumours), and soft tissue sarcomas (cansa.org. za (Accessed November 2021).

Haematology is the study of blood, blood-forming organs, and blood disorders and the treatment of these disorders and malignancies (healio.com (Accessed November 2021). According to Trounson and De Witt (2016), stem cell transplantations are procedures where the hematopoietic stem cells are used for engraftment in bone marrow to treat patients, including children with blood disorders. HSCT in children can be successful, but patients can still die during different stages of the procedure. The multidisciplinary team members' assessment in the pre-transplant period is extremely crucial. The treatment stages involve conditioning with high doses of chemotherapy and/or radiation therapy, the infusion of stem cells after aspiration, and a period of engraftment of the stem cells into the bone marrow. The child will remain in the isolation unit until recovery or death. Haematological malignancies,

E-mail address: arriesb@cput.ac.za.

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such as leukaemia, involve specific abnormalities in the blood. The haematological team should be able to interpret the laboratory results, identify the patient's condition, assess the patient's needs, and formulate a treatment plan accordingly (Smeltzer et al., 2016).

Haematology is part of blood science, which consists of education in the management of blood disorders, including hematopoietic stem cell transplantations. Blood is one of the most important organs in the body. It interlinks with the structures of the body, regulates body temperature, and carries nutrients and other substances. Any deviations from the normal processes can be fatal for a person.

The development of blood cells is called haematopoiesis, and it takes place in the bone marrow, liver, lymph nodes, and spleen where the stem cells are found. Blood cells arise from these stem cells. The sternum and iliac crest are the main places where haematopoiesis occurs. The production of blood cells is influenced by growth factors, cytokines, and oxygen. In normal circumstances, are cells produced as the body loses them. Leucocytes, erythrocytes, and platelets are mature cells, that go through specific phases to reach this maturity (Blann & Ahmed, 2014). The insights of the paediatric hematopoietic stem cell team were explored in this study.

Fig. 1.1. Shows the development of blood cells.

Fig. 1.1. displays where the production of red blood cells occurs in the bone as previously mentioned in the text. Stromal cells supply a framework for other cells. The macrophages produce growth factors to make erythrocytes, stock iron and take away any remains (Blann & Ahmed, 2014).

This figure explains the entire process of how haematopoiesis occurs.

Fig. 1.2. explains the process where the multi-potential hematopoietic stem cells can change into myeloid or lymphoid cells. Stem cells undergo various processes to change into these normal cells before they are released into the bloodstream (Smeltzer et al., 2016).

2. The role of stem cell transplantation

Transplantation is a process in which damaged bone marrow is replaced by new bone marrow. This method of treatment for malignant or non-malignant diseases is now a recommended treatment after surgery, radiation, and biotherapy (mayoclinic.com (Accessed November 2021)).

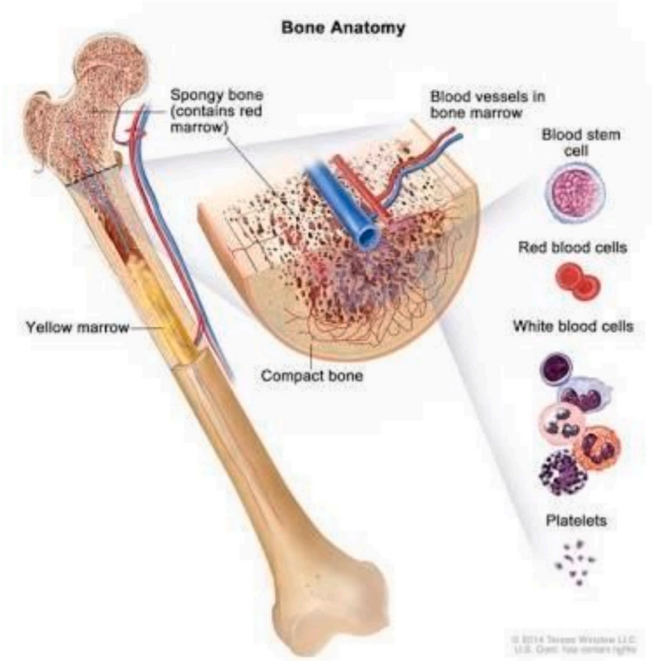

Fig. 1.1. The long bone.

With radiation and biotherapy three valuable properties are recognized as it firstly can divide and renew itself for lengthy periods, as well as developed in specialized cell types. (Next Bioscience, 2021). Stem cell transplantation in children is focused on replacing the diseased bone marrow with healthy bone marrow. Conditions identified in children are leukaemia, aplastic anaemia, and sickle cell leukaemia. Treatment will consist of first high doses of chemotherapy and/or radiation (https://www.rochester.edu > encyclopedia > content (Accessed September 2021).

Gross and Pulsipher (2015) stated the rationale for hematopoietic stem cell transplant in children includes the following: develop more marrow space, restrain the patient's immune system to impaired graft rejection and for severe treatment of hematopoietic blood cancer (childhood-cancer/chils-hct-hp-pdg (Accessed November 2021). Autologous stem cell transplantations are used for neuroblastomas, lymphomas, and brain tumours. Diseases such as leukaemia in children are treated with allogeneic bone marrow transplants. Some diseases are resistant to even high doses of chemotherapy. HSCT offers children who are at substantial risk of relapse with chemotherapy, a better chance of survival and has become the preferred choice of treatment for such high-risk patients, but only if a Human Leucocyte Antigen (HLA)- matched donor is available. It is stated that this topic is poorly researched. Donors are selected from databases, considering the histocompatibility of the donor and patient. Currently, HLA −A, −B, and –C are performed for Class 1 and HLA-DRB1 and DQB1 for Class 11 (Eyrich & Schulze, 2019).

3. Theoretical framework

The Virginia Henderson nursing theory was used to explore the perceptions of the multidisciplinary team on HSCT for children. The framework brings out the concept of the stem cell transplanted child in a holistic manner. The child in the haematology unit can be treated under the main assumptions in Henderson's theory emphasized in the following four major concepts: the individual, the environment, health, and nursing. These concepts are all relevant to the health challenges of a hematopoietic stem cell transplant patient (George, 2014). The objective of the study was to explore the perceptions of the multidisciplinary team of HSCT of children. The study aimed to retrieve information from data to achieve the objective of the study.

4. Methodology

Hesse-Biber (2017) stated that methods are tools that researchers use to collect data to make sense of reality. They also stated that the methodology brings out the philosophical standpoint and method together. This is the process where researchers collect the data, to analyse, describe, and explain the phenomena (Maree, 2016).

5. Research design

A qualitative exploratory contextual design was used to gather information in this research project. This design was employed to establish the participants' understanding of their perceptions when caring for children who had undergone HSCT. Exploratory studies are designed to increase knowledge, especially in a specialized field (Grove et al., 2018). This was confirmed by Botma et al (2017), who stated that exploration is conducted in-depth to understand or explain the phenomenon researched in the study. They suggested that in an exploratory study, the researcher will attempt to collect new data if little or no previous research is known about a phenomenon.

6. Population and sampling

The population in this study was the multidisciplinary team practicing in the two haematology units in the two hospitals in the Western Cape. They consist of doctors, nurses of all ranks (professional, enrolled,

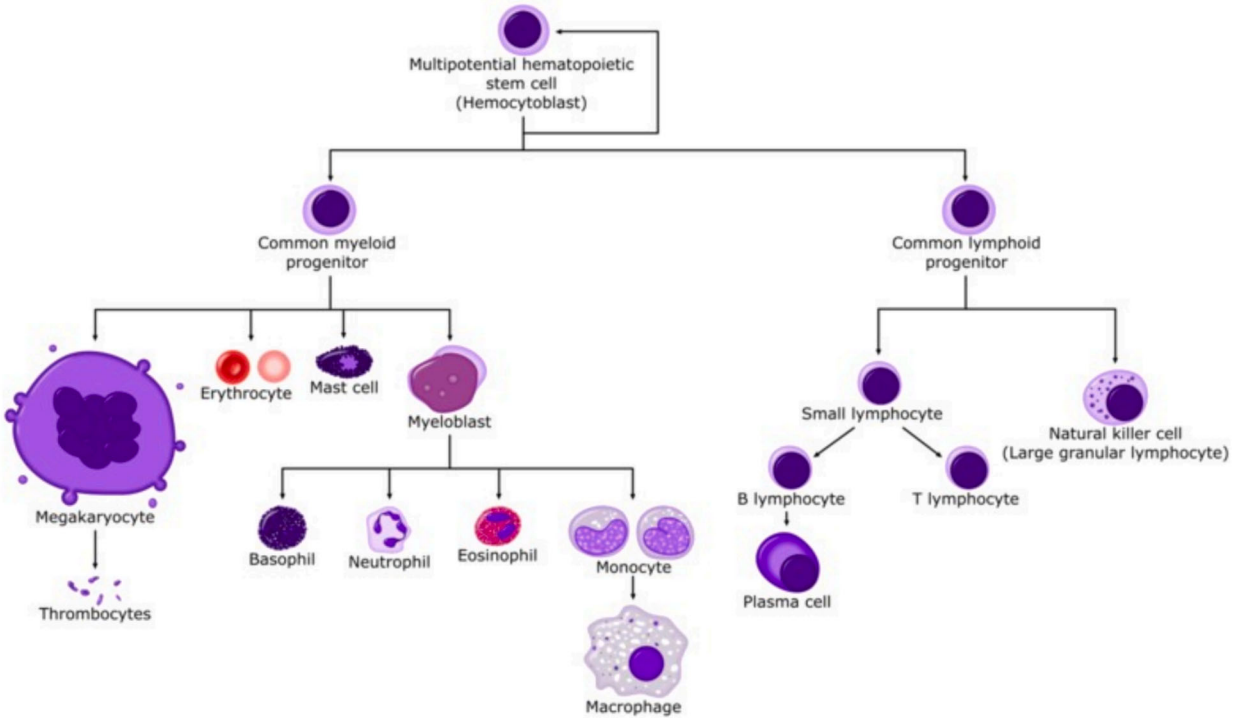

Fig. 1.2. The process of haematopoiesis.

auxiliaries), as well as caregivers. Dieticians, physiotherapists, and social workers also formed part of this team. A non-probability purposive sampling technique was used, which is also called judgmental sampling (Burns & Grove, 2017). Holloway and Galvin (2017) agree that purposeful sampling is based on the researcher's judgment. All participants met the inclusion criteria. The sixteen (16) members consisted of seven (7) professional nurses, three (3) enrolled nurses, one (1) caregiver, one (1) dietician, one (1) physiotherapist, one (1) radiographer, one (1) social worker and one (1) doctor. Their years of experience in practicing in stem cell transplanted patients range from two to thirty years. One (1) of the professional nurses in the private hospital was oncology/haematology trained, and four (4) professional nurses were not trained in either oncology or haematology. Two (2) professional nurses in the public hospital were oncology/haematology trained. None of the enrolled nurses or the caregiver was oncology/ haematology trained and no one of the physiotherapists, the radiographer, or the social worker was oncology/haematology trained. The doctor did his specialty in haematology.

7. Data collection

Data were collected during July and August 2015, on different days, because of shift changes involving the health care team. Each interview lasted 45 to 60 min. The data was collected at two hospitals in the Western Cape where hematopoietic stem cell transplantation was executed for pediatric patients. In-depth semi-structured individual interviews were conducted using an interview guide, consisting of seven (7) questions, as set out below:

Knowledge:

- When performing stem cell transplantation, there are certain processes/steps to be followed. From your point of view, what are these processes/steps?

Perception:

- In your view, how do other health care professionals react towards patients undergoing stem cell transplantation?
- What is the general attitude of health care professionals toward children undergoing stem cell transplantation?
- What is the attitude of health care professionals regarding the death of a patient who had stem cell transplantation?

Practice:

- What are the roles of the health care professional responsible for looking after patients undergoing stem cell transplantation?
- As a health care professional, describe your role regarding stem cell transplantation.
- How do you plan the care of a patient undergoing stem cell transplantation

The interviews were conducted at the two hospitals where the multidisciplinary team were practicing, in a soundproof room. The semi-structured or focused interviews allowed the researcher to focus on the issues at hand and the area of interest could easily be explored. All audio recordings were transcribed verbatim by a professional, independent transcriber.

7.1. Data analysis

A professional transcriber transcribed all the audio recordings. The researcher, assisted by her supervisor, analyzed the data following certain steps according to Maree (2016) to achieve a rereading of the printed transcriptions multiple times, and themes and subthemes started to emerge.

8. Rigor in qualitative research

This concept in qualitative research is obtained through trustworthiness, which consists of credibility, transferability, dependability, and conformability. Credibility is achieved by being around research for a long time (Brink et al., 2017). This was achieved through prolonged

engagement, as the researcher collected data for two months. Transferability means that the results of the project can be transferred to situations outside of the research study. The readers can then correlate the findings of the study meaningfully and can compare it with their own experiences (Brink et al., 2017). Polit and Beck (2018) as seen dependability as how true or consistent the research findings would be if the study were to be replicated in a similar context. The data presented and findings obtained must be able to stand true through time. The dependability of the study will be enhanced by aligning the theory, methodology, and analytical processes of the study. Polit and Hungler (2018) assert that conformability is measured by the research findings in comparison with the data collected. In this study, conformability was achieved by associating the objective with the interview questions.

9. Ethical considerations

The research proposal was reviewed by the institutional ethics committee at the Cape Peninsula University of Technology (CPUT). Permission and support letters obtained from the hospital managers, the Head of the Haematology department, and the Unit Managers of each department where the study was conducted, all formed part of the submission to the ethics committee at CPUT for approval. Data collection commenced after ethical approval was obtained. Ethical principles such as respect, beneficence, and justice were considered in this study. The research proposal was also peer-reviewed by four (4) academics before acceptance by the university's institutional research and ethics committees. This is a rigorous review process with input from all the committee members on both the research and ethics committees. No changes were required after the proposal was approved.

10. Results and findings

One theme was identified from the interviews and two (2) subthemes after coding and thematic analysis were applied.

THEME: *Perceptions of the multidisciplinary team members.*

The subthemes that were identified were positive thinking about stem cell transplantation for children and sadness about children being sick during stem cell transplantation and their death.

SUBTHEME*: Positive thinking about stem cell transplantation for children.*

Some of the participants felt that the multidisciplinary team members felt good about children's stem cell transplantation:

so, I mean I will say their attitude is good (P3).

Some participants agreed that the children recover in a shorter period than the adults:

we feel positive as the staff because kids, recover so quickly when they are having the transplant (P 11).

Another participant agreed:

they do much, much better than adults. They recover quickly, the children (P 15).

Some of the participants believed that this type of treatment gives children a second chance at life:

> for children, I will say it is difficult if it is them, but I feel like at least they need another chance. They are still young so for them it is positive (P10). shoo. This is a wonderful opportunity to and a second chance at life, and I must say they tolerate the transplants so much better than adults (P 16).

SUBTHEME*: Sadness with children being sick during stem cell transplantation*

The participants were emotional about the children who are going through the transplant procedures:

it is always quite emotional (P4).

it is not very pleasant. I mean, you do not want any child to be sick (14).

I Feel it with the parents and some children do not know what is going on (P12)

One participant agreed that it can be emotional, but he knows not to get attached to the patients emotionally

It is always very emotional with kids especially, but I know where to draw the line. I will never get too attached (P5).

11. Discussion

The two (2) subthemes that emerged, were positive thinking about stem cell transplantation for children as well as sadness brought about with children being sick during stem cell transplantation. There were various statements from the participants regarding stem cell transplantation. All the participants were positive about this second chance, especially for children. It was sad for the participants to experience the suffering of the patients through the recovery process of stem cell transplantation. The participants formed an emotional link with the patients and could not bear their physical challenges through the recovery process.

11.1. Positive thinking about stem cell transplantation for children

This subtheme emerged after the participants were asked how the healthcare providers felt about stem cell transplantation as a treatment option for children. Dealing with transplanted children can be incredibly challenging for the nurses. Participants (P1, P2, P4, P5, P12, P14, and P16) expressed that it was an emotional experience for them to nurse these children through the recovery process. However, despite the emotional experiences of nursing these children, most of the participants (P3, P4, P5, P7, P10, P11, P15, and P16) displayed a cheerful outlook towards HSCT for children. This could supply sick children suffering from haematology blood cancers, a second chance for survival. Gross and Pulsipher (2015) established that stem cell transplantation is an advantage for paediatric patients, as more marrow space is developed to restrain the patient's immune system to prevent rejection of the stem cells. In light of the aforementioned, these sick children normally recover quicker than adults. Adediran et al (2016) agreed that allogeneic stem cell transplantation is a cure for sickle cell anaemia in children, who are born with this disease and can die before they reach the age of five years and that paediatric patients are more tolerable than adults. This is in line with the positive thinking of the participants in this study regarding stem cell transplantation as a cure for children.

11.2. Sadness with children being sick during stem cell transplantation

This subtheme emerged when the participants were asked how the multidisciplinary team reacted when a child was sick during the stem cell transplant period. Henderson's (George, 2014) component of communicating different feelings and needs is very applicable here as the multidisciplinary team voluntarily revealed their feelings of sadness to the interviewer. One participant declared that it is very emotional (P4) to care for children during this period when they are sick and P14 said it is not pleasant. One participant (P 12) said that they feel for the parents and that the children do not know what is going on.

An enrolled nurse (P5) felt that he was not emotionally attached and that he knew "where to draw the line between him and the patients". By this, he meant that he could detach himself from the patient who was dying.

12. Conclusion

The study has revealed that the multidisciplinary team working with stem cell transplanted patients in the two hospitals in the Western Cape were positive about HSCT for children and that they are emotional when

the children are sick during the stem cell transplantation period, but some know how to detach them emotionally from the patients. Training can play a greater role in providing them with professional knowledge and skills to practice. The study highlighted the significance of having the right perceptions regarding the multidisciplinary team in hematological diseases and HSCT to care for these children regularly. The researcher hopes that further research will be undertaken, particularly in rural areas to educate more families in this regard. Finally, this study emphasized how important it is for all healthcare team members to keep updated with new knowledge to conduct health promotion and give advice to patients and family members regarding stem cell transplantation, particularly, to dispel myths.

13. Limitations

One of the limitations of the study was the fact that one study focussing on the topic cannot give a thorough understanding of the phenomena explored. The other limitation of the study was the translation of the interviews from Afrikaans to English.

14. Recommendations of the study

Standard operating procedures should be compiled to ensure consistency in care for HSCT patients in all hospitals, where hematological transplants take place. Continuous education and training programs should be implemented in the health services, especially primary healthcare, to equip healthcare professionals with knowledge and thus improve their service to stem cell transplanted patients. Continuous awareness and health promotion programs in the communities are necessary to make patients and their families aware of the option of stem cell transplantation for blood disorders. A haematology course especially for health care professionals is recommended to provide them with the necessary information to be able to care for stem cell transplanted patients. The study can also help to ensure that haematology and stem cell transplantation are integrated with practice and theory in the curriculum of health care professionals such as dieticians, social workers, physiotherapists, and radiographers. Training manuals regarding stem cell transplantation should be made available to health care professionals in the field.

15. Areas for further research

Hematopoietic stem cell transplantation awareness in rural areas. Health promotion and education on stem cell transplantation by specialists of the subject and HSCT in young children and the implications of early detection. The importance of debriefing for the multidisciplinary team with the death of a hematopoietic stem cell transplanted patient.

CRediT authorship contribution statement

Barennise Arries: Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability.

The study materials and instruments used during the current study are available from the corresponding author on reasonable request.

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