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Nurses' Knowledge and Practices about Blood Transfusion in Gaza Governmental Hospitals

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Nurses' Knowledge and Practices about Blood Transfusion in Gaza Governmental Hospitals

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Dedication

This thesis is dedicated to:

The sake of Allah, my Creator and my Master,

My great teacher and messenger, Mohammed (May Allah bless and grant him), who taught us the purpose of life,

My homeland Palestine,

To my father and mother for their love, efforts since childhood, prayers, and unlimited support,

To my brothers who have been around me since childhood to this day, and they have been supportive of me everywhere,

To my lovely sisters, Taghreed, Ola, Abeer, Reem, and Naheel whose have always been provided with love and support.

To my little soulmate in Turkey, Reema,

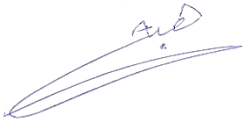
To all my friends, as well as my colleagues, who I've worked with in all my workplaces.

To every one supported me to make this study a reality

Heba Ahmad Abdelrahman Abu Nada

Declaration

The researcher certifies that this thesis has submitted for the degree of master and any of its parts has not been submitted for a higher degree to any other university or institution.

Signed: 

Heba Ahmad Abdelrahman Abu Nada

Date:20/12/2021

Acknowledgment

In the name of Allah, the Most Merciful, the Most Compassionate all praise to be Allah, the Prayers and Peace be upon all the best creations, and the end of prophets and messengers, our Master Muhammad peace be upon him.

First and foremost, Great thanks to Allah, who has given me the strength and will to study on one side and to complete my research despite the great difficulties I have been through. I am totally sure that this work would have never become truth, without His guidance**.**

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Hospitals were participated in the questionnaire, and mangers involved in Key Informants Interviews.

Heba Ahmad Abdelrahman Abu Nada

Abstract

Blood transfusion is a life- saving common procedure. However, its associated-mistakes can lead to morbidity and mortality. Therefore, it must be performed by well-trained, highly qualified health care personnel due to potential life-threatening complications. The aim of this study was to assess level of knowledge and practice among nurses working at Gaza Governmental Hospitals to blood transfusion. To fulfill the aim of the study, the researcher used cross-sectional descriptive mixed approaches for data collection. A convenience sample of 400 nurses, with a response rate of 100%, consisted of 221 females and179 males with a mean of age 31.0±6.8 from the medical, surgical and obstetric departments completed a self-administered, modified (Routine Blood Transfusion Knowledge Questionnaire) to measure nurses' level of knowledge and practice. Of these only 100 were observed during the process of blood transfusion using a checklist that was especially design for this purpose. A sample of 12 nurses' managers, head nurses and blood bank directors were purposively interviewed for the qualitative part.

Based on the scale: poor: less than 50%, moderate: 50-74.9% and 75% and more indicates good level, the results of this study revealed that almost all nurses have a moderate to a good level of knowledge where 43.5 % of nurses have good level of knowledge and only 4.85% have poor knowledge with a mean 0f 71±1.1. Nurses' knowledge was honestly poor in the areas related to the initial blood flow during the 1st 15 minutes, transferring blood from the blood bank, priming blood with normal saline, compatible fluids, the optimum time for starting blood after its arrival to the department and the blood transfusion related policy issue. However, only 9% of nurses reflected satisfactory level of practice and 31 % of them performed in a poor manner with a mean of 57.4± 10.2. The findings showed a noticeable deficiency in the nursing performance related to donning gloves, using normal saline as the main Intravenous fluid line, transmitting blood in a special box, measuring vital signs and remaining with the patient for the 1st 15 minutes. The findings of this study revealed absence of any statistically significant differences in the overall level of knowledge nor practice in relation to nurses' characteristics. However, receiving training programs significantly affected the level of nurses' knowledge, while the hospital has a statistically significant effect on the level of practice among nurses. Moreover, nurses working in Al-Shifa Hospital performed better than others. A positive correlation was detected between the knowledge and practice levels. However, a gap between nurses' knowledge and actual practice was detected. This study emphasizes the importance of in-service training courses for nurses besides establishing of a written policy related to blood transfusion in order to improve nurses' knowledge and practice and to avoid blood transfusion complications. To explore this topic more deeply, longitudinal and observational studies are recommended in different settings.

Key words: Knowledge, Practice, Blood Transfusion

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List of Abbreviations

AABB	American Association of Blood Banks
ABO	A, B, O and AB
AIDS	Acquired Immunodeficiency Syndrome
BT	Blood Transfusion
CBBS	Central Blood Bank Society
CBC	Count Blood Cell
CVI	Content Validity Index
G H	Governmental Hospitals
GS	Gaza Strip
GVHD	Graft Versus Host Disease
HCS	Health Care System
ICU	Intensive Care Unit
IED	Internal Emergency Department
KIIs	Key informants Interviews
Ig A	Immunoglobin A
MoH	Ministry of Health
NGOs	Non-Governmental Organizations
NMC	Nassar Medical Complex
NS	Normal Saline
OR	Operating Room
PCBS	Palestinian Central Bureau of Statistics
RBCs	Red Blood cells
RBTKQ	Routine Blood Transfusion Knowledge Questionnaire
SHOT	Serious Hazards of Blood Transfusion
SOP	Standard Operation Procedures
SPSS	Statistical Package of Social Science
TR	Transfusion Reaction
TRALI	Transfusion Related Acute Lung Injury
UNRWA	United Nation Relief Work Agency
V/S	Vital Signs
WHO	World Health Organization

Chapter One

1.1 Introduction

Allah Almighty says: "and that whoever saved it should be regarded as though he had saved all mankind" (Holy Qur'an, chapter 6, ayah 32). Undeniably, the greatest human gift offered to another human being is saving his/her life. Blood transfusion (BT) is a great way for saving lives (Batiha & Albashtawy, 2013). Humans have recognized the importance of blood as a vital force and essence of life since the beginning of time and become interested in knowledge regarding blood (Toby et al., 2016). Blood is a liquid of connective tissue which is made up of three different life-saving components: plasma, platelets and red blood cells (RBCs) that must be adequately available, safe, correctly and rationally used and administered in a timely manner (Garraud & Tissot, 2018). The amount of blood that circulates within individuals is determined by their size and weight. The average human adult volume is about five to six liters of circulating blood (Sharma & Sharma, 2020). Blood is necessary for transporting oxygen, nutrients and other essential elements to different body tissues as well as removing metabolic residues. It also contains a number of clotting factors which normally intervene when bleeding occurs (Doherty & Kelley, 2021). Blood is stored as a whole or in separate components. The most important components are red blood cells, plasma, platelets, granulocytes and cryoprecipitate. Red blood cells (RBCs) contain hemoglobin which binds to oxygen and is considered the primary source of oxygen delivery in the body. Each single unit of packed red blood cells has a volume of approximately 450 mL and contains approximately 250 mg of iron (Lotterman & Sharma, 2020: Bachowski et al., 2017).

BT is one of the most common treatments worldwide that has been evolved in the early ninetieth century until today. It is one of the five widely used medical procedures (Philip et al., 2015). More than nine million patients in 90 different countries receives blood components each year (Yami et al,.2021). For example, 10-20% of patients admitted to the American hospitals receive blood (Pfuntner, et al., 2011).

BT is the process of transfer of blood or derivatives from a donor to the blood stream of another recipient's circulation (Encan & Akin, 2019). Blood demand is frequently increased by variety of factors such as: obstetric hemorrhage, cancer, major surgical operations, traffic

accidents, armed conflicts, malnutrition, sickle cell disease and childhood anemia, thalassemia, HIV, malaria and parasitic infections (World Health Organization (WHO), 2019; American Association of Blood Banks (AABB), 2017). Despite the significant advancements in BT procedures, there are significant side effects and potential risk factors that could endanger recipients' health (Abd Elhy & Kasemay, 2017). Transfusion process manned through multidisciplinary healthcare team, there are at least 23 stages between taking a pre-transfusion compatibility blood sample, the recipient receiving their transfusion and the completion of the transfusion including nurses with different levels of transfusion experience and awareness (Kavaklioglu et al., 2017). Therefore, collaboration is required among members of the multidisciplinary health care team to function properly; highly functional teams value knowledge and experience and use each member's abilities to collaborate to provide the best possible outcome for patients (Bielby, 2018).

Nurses play a major role in the process of blood transfusion where they are directly responsible for four of the five stages of the process starting from pre-transfusion preparation till post-transfusion activities and monitoring the patients during these processes (lee et al., 2016). Therefore, it is essential that nurse has a solid understanding of basic transfusion practice and being able to apply this knowledge confidently (Bradbury et al., 2017).

Errors can take place at any stage of transfusion process. Such errors are typically human made and are frequently related to factors such as environments, procedures and policies (Carayon et al., 2014). The most frequent error being failure to perform the final patient identification check at the bedside. Two steps that are critical in the transfusion chain of events leading to errors are the collection of blood samples for pre-transfusion testing and checking the patient's identification at the bedside before blood administration, being mainly attributed to nurses (Nakamura et al., 2021). Hence, assessing nurses' knowledge is a useful approach to lowering risks and reducing blood component wastage in order to perform safe and effective transfusion (Yami et al., 2021). All nurses must be knowledgeable about all aspects of care including the principles of safe, effective patient identification, aseptic technique during transfusion, proper documentation, and adequate management of adverse reactions (Zaccheo, 2017). The positive identification of patient depends largely on the knowledge and the performance of the nursing team, which highlights the importance of scientific knowledge and commitment to standards about BT and the technical skills of nursing personnel in order to prevent complications and adverse consequences of BT (Bielby

et al., 2020; Hijji et al., 2013). Therefore, nurses should be aware of their responsibilities to improve the quality of care provided to patients, the institutional policy related to BT and professional standards (lee et al., 2016).

From a different aspect, the healthcare system must not only ensure the availability of required blood products, but also must pay close attention to patient management during administration blood products. Therefore, health care facilities must have to establish a safe blood transfusion practice guideline to ensure that the entire process of blood availability and transfusion are well monitored, managed and coordinated (Bediako et al., 2020). Such guidelines can unify the procedure and minimize the complications and improve safety.

1.2 Statement of the Problem

Blood transfusion is a life- saving common procedure. However, its associated-mistakes can lead to morbidity and mortality (Majeed et al, 2020). More than 118 million units of blood are collected globally every year with annual rates of transfusing 31.5 units per 1,000 populations in high income countries, 15.9 units per 1,000 populations in middle income countries and 6.8 units per 1,000 populations in low-income countries (WHO,2020). It is used to replace blood losses caused by surgery, injury, chemotherapy, hematology and oncology patients (Iqbal et al.,2021). Locally, the total number of blood units transfused in both governmental and private hospitals at the Gaza Strip (GS) was approximately 44,910 units in 2020. According to the latest statistics, these units were transfused to patients diagnosed with different health care problems such as: patients undergoing Cesarean Sections (5,355 cases), cancer patients (7169 cases), patients with renal failure (666 cases) and cardiac patients and patients with thalassemia (350 cases) (Central Bank Blood Society (CBBS), 2020). Generally, the demand for BT is increasing in the world and in GS because of the increased access to more advanced medical and surgical procedures, increased life expectancy and existence of transfusion dependent -thalassemia and sickle cell disease in the children besides the complex context of GS.

Nurses play a major role in the process of blood transfusion where they are directly responsible for four of the five stages of the process starting from pre-transfusion preparation till post-transfusion activities and monitoring the patients during these processes (Choudhary et al., 2020). Since Nurses are the largest segment of health care providers at the Gaza Governmental Hospitals, they should have good levels of knowledge and practice related to

the process of BT. There are several global studies that assessed knowledge and practice among nurses related to BT. Unluckily, results showed a major deficit in knowledge and /or practice in this context (Bediako et. al, 2020; Encan & Akin, 2019; Kabinda, et al., 2014). In spite of the abundance of studies over the world related to this topic, in Palestine, there were no previous studies (up to the researcher's knowledge) conducted to assess nurses' knowledge and practice about BT. Moreover, the number of studies assessing the nurses' practice during BT is scanty.

1.3 Justifications

The rapid advancements of human knowledge in the medical field have saved the lives of millions of people worldwide and BT has played significant role in this field when used correctly (lee et al., 2016). Medical staff should be aware of their roles and responsibilities in transfusion process and familiar with hospital policies regarding BT.Therefore, they should receive training and evaluated until they reach the necessary competence (Dos Santos et al., 2021).

Nurses are the primary handlers in BT process, they are involved in most BT phases. Nurses are playing an essential role in certifying BT safety through assessing transfusion indications, identifying patient correctly for avoiding any possible errors, identifying transfusion reactions and documenting the procedures (Majeed et al., 2021). Moreover, many studies have documented errors that can occur at all stages of the transfusion process over the last years and many initiatives have been launched to reduce the occurrence of errors. Finding indicated better ways to avoid such errors are training and supporting staff who are directly involved in transfusion process (Kavaklioglu et al., 2017).

In 2020, GS used approximately 44,910 blood units and its derivatives. GS lives in a chronic and emergency political condition (Ministry of Health (MoH), 2020). No local studies were conducted to assess nurses' knowledge and practice related to BT. This study will assess the level of knowledge and practice related to BT among nurses working at the GH in GS, which is crucial for safe transfusion. Since people living in the GS are exposed to a lot of scenarios that will increase the need for BT, nurses should be highly competent because of the lack of equipment and medications related to siege imposed against Gaza since 2007. Gazan nurses who work under several severe stressors should be able to transfuse blood with minimum mistakes. Therefore, this study will be the starting point for more advanced research studies,

using different designs, in order to help decision-makers to pay more commitments and make some recommendations related to BT clinical guidelines among nurses' and other health care professionals and enhance nurses' knowledge and practice related to BT. From the researcher's clinical experience in females' internal medicine and medical departments at GH, many patients were receiving BT and were exposed to many complications, which could endanger their lives. Thus, patients are in need for special nursing care to minimize BT complications.

The results of this study will be useful for health care professionals, planners, policy makers and all staff who are engaged in BT process. Hence, the results of this study will be disseminated to stakeholders, policy actors and others who are involved in improving the knowledge and practice of nurses regarding BT. The final results of this study would identify the possible gaps as well as potential areas that need interventions to improve knowledge and practice of health care providers, especially nurses, which will be reflected in improving patients' outcome and reducing the numbers of BT-related complications.

The researcher hopes that the findings of this study will add value to the nursing profession internationally and in Palestine particularly. From an academic paradigm, this study will serve as the basis for reviewing the nursing curricula in the local universities and in-service training in both medical and nursing education to pay more attention to BT. In practice, this study will provide suggestions to hospital management and to health policymakers to take several actual steps in order to improve knowledge and practice of BT among nurses. In addition, in nursing care, this study will provide a baseline to deal with patients and act properly throughout the BT process, which will result in a safe BT. In research, this study will serve as a body of knowledge for many types of future studies and will inspire other researchers for advanced studies related to BT process.

1.4 Aim of the study

The main aim of the study is to assess the level of knowledge and practices of nurses working at Gaza Governmental Hospitals related to BT to promote patient safety and reduce associated morbidity and mortality.

1.5 Objectives of the study

1. To assess the level of knowledge among nurses working at governmental hospitals in the Gaza Strip about blood transfusion.
2. To assess practices related to blood transfusion among nurses working at governmental hospitals in the Gaza Strip.
3. To identify variations in knowledge and practice about blood transfusion among nurses working at Gaza Governmental hospitals in relation to their characteristics.
4. To develop recommendations to enhance knowledge, practice and policy related to safe practice of blood transfusion.

1.6 Context of the study

1.6.1 Geographical and demographic context of Gaza Strip

The Gaza Strip (GS) is a tiny area of land on the east coast of the Mediterranean Sea with almost two million people packed in here. GS is divided into five governorates: North Gaza, Gaza City, Mid Zone, Khan-Younis and Rafah (Annex 1). The estimated population of the GS in 2020 was 2.04 million, accounting for 40.1% of all Palestinians. The population distribution by sex shows that 1.03 million were males compared to 1.01 million were females (PCBS, 2019).

1.6.2 Socioeconomic context

The ongoing complex emergencies in the GS over the past few years, with severe shortages of life basics, the extensive siege and the semi-permanent border closures have had a severe impact on the poorest and most vulnerable people in the GS.

Since 2007, Israel has been enforcing a long-term siege on the Palestinian economy, limiting the entry and exit of goods and people. The siege increased citizens' reliance on foreign aids and resulted in economic and social deterioration; creating a situation known as a complex chronic disaster of catastrophic proportions, with a negative impact not only on Palestinian's health, but also on health determinants (UNRWA, 2019). Restrictions on the movement of people and goods, including preventing access to the Israeli labor market, worsened the economic status of the people living in the GS. Furthermore, unemployment rate in 2018 has reached 54% in the second quarter and it was higher among young people. The poverty rate

increase from 39% in 2011 to 53% in 2018. People suffered from moderate or severe food insecurity that reached 68% while 11% of children under the age of five years were stunted and anemic (UNRWA, 2019). Despite Israel's withdrawal from Gaza in 2005, the territory remains occupied. Israel has direct external control over Gaza as well as indirect control over life within the territory. It controls Gaza's air and maritime space, as well as six of the seven land crossings. In recent years, Israel launched a number of military operations against the GS, the most recent of which occurred in May 2021 and was one of the most violent, resulting in many martyrs and injuries. In this period, the demand for blood products increased according to the director of blood bank who was interviewed. Every time people in GS is exposed to a military operation, there are hundreds/thousands of causalities. The population of the GS is living in a state of instability and the possibility of any military escalation at any time; the national blood supply must cover every day needs and be ready for unexpected escalations. This situation, along with other hematological diseases such as sickle cell anemia, thalassemia, Iron Deficiency Anemia among children and pregnant women and surgeries that require BT, increases the demand for urgent BT. Since, a total number of 92,027 surgeries were performed in hospitals in the Gaza Strip and 58,032 of them were performed in the GH; therefore, ensuring a safe blood transfusion becomes a necessity (M.o.H, 2020).

Moreover, people in GS are living in a complicated context and no one can predict what will happen. Thus, the nature of the political situation in GS requires that the health care system to be on full readiness for emergency situations which may result in an increasing number of patients requiring BT. Therefore, paying attention to the process of collecting, distribution and availability of blood units in the hospitals and training health professionals who are dealing with BT process, in order to increase efficiency and effectiveness of BT process, will decrease morbidity and mortality and lead to a better life for our community.

1.7 Health Status in Palestine

The health care system (HCS) in the GS is fragmented, with services delivered by four providers without complete coordination: Ministry of Health (MoH), the United Nations Relief and Work Agency (UNRWA), Non-Governmental Organizations (NGOs) and the private sector. The MoH is the primary provider and is in charge of service coordination among all providers. In 2020, the total current health expenditure in US dollars reached 3.2 million while the MoH’s total cash revenues were approximately $6,093,022 (MoH, 2020).

The number of health insured individuals in Palestine reached 3,458,227; constituting 79% of the total Palestinian population. The percentage of individuals with governmental health insurance was 32%, while the percentage of individuals with UNRWA insurance was 15%, 2% with private insurance, 29% of the individuals have governmental and UNRWA insurance, 0.2% have governmental and private insurance, 0.7% have UNRWA and private insurance, 0.7% of the total Palestinian population have Israeli insurance and 0.3% have other insurance (PCBS, 2019).

There are 27 hospitals in GS; the MoH runs 13 of them with a combined capacity of 1600 beds plus 500 beds operated by NGOs. Generally, bed ratio to the population in Palestine is 13, 3 per 10,000 populations (MoH, 2020). These hospitals have 3049 beds in total. From these beds, 105 are for ICUs, 98 in MOH hospitals and 7 in the private hospitals (MoH, 2020).

Human resources who serve people are one of the most important components of HCS; the number of employees in the health sector in the MoH was the highest in Palestine. The total number of health-care workers was 15,271 in GS at rate of 53.1 per 10.000 people. There are 4,489 nurses working in the health sector at percentage (40.2%) with 16.2 nurses per 10,000 people. The number of physicians working at the MoH was 2001, with 9.6 doctors per 10,000 people (MoH, 2020).

1.8 Blood Transfusion Service in Gaza Strip

The vast majority of blood transfusion services are concentrated in hospitals. MoH is the primary provider of blood transfusion services in Palestine; it oversees the other institutions that provide this service**.** The number of blood donors in MoH hospitals in GS was 35,503, with 10,870 voluntary donations accounting for 48.8% percent of donors and 13,144 (51.2%) were donated to relatives or acquaintances. Transfusion-transmitted diseases were tested for all donated blood units. Hepatitis B virus had a positive percent of 0.4 %, Hepatitis C virus had a positive percent of 0.12 % and Human Immunodeficiency Virus had 0%. The total number of transfused blood units and their components in Gazan MoH hospitals in 2020 was 44,910 units (MoH, 2020). According to CBBS statistics (2020), as mentioned above, people who receive most of the BT included: cardiac patients undergoing open heart surgeries (272) cases, thalassemia patients (350 cases), patients undergoing Cesarean Sections (5,355 cases), renal failure who need blood (666 cases) and cancer patients (7169 cases).

1.9 Operational definitions

1.9.1 Knowledge

Nurses get a score less than 50% considered to have poor knowledge, those with score 50%-74.9% considered to have moderate knowledge, while those having scores equals 75% and higher known to have good knowledge.

1.9.2 Practice

The mean of optimal practice is identified by using a cutoff point of 75%; thus, nurses with satisfactory practice regarding blood transfusion should have a mean score of 75% and higher while those with a score from 50%-74.9% considered with fair practice and less than 50% have poor practice.

1.9.3 Blood Transfusion

BT starts from physician order till several hours after transfusion. It consists of five stages, order to transfuse, patient preparation prior blood collection, pre transfusion activities, intra transfusion activities and post transfusion. Documentation is essential part of each stage. Management of reaction if occurs is part of the process (Lister et al., 2021).

Chapter Two

Literature Review

2.1 Conceptual Frame Work

Knowledge as a variable is an essential one influencing all the phases of BT's practice (Abd Elhy & Kasemy, 2017). Thus, there are multiple variables affecting both nurse's knowledge and practice such as sociodemographic variables and extraneous variables. Furthermore, these factors could trigger the chance for knowledge deficit which may lead to poor practice.

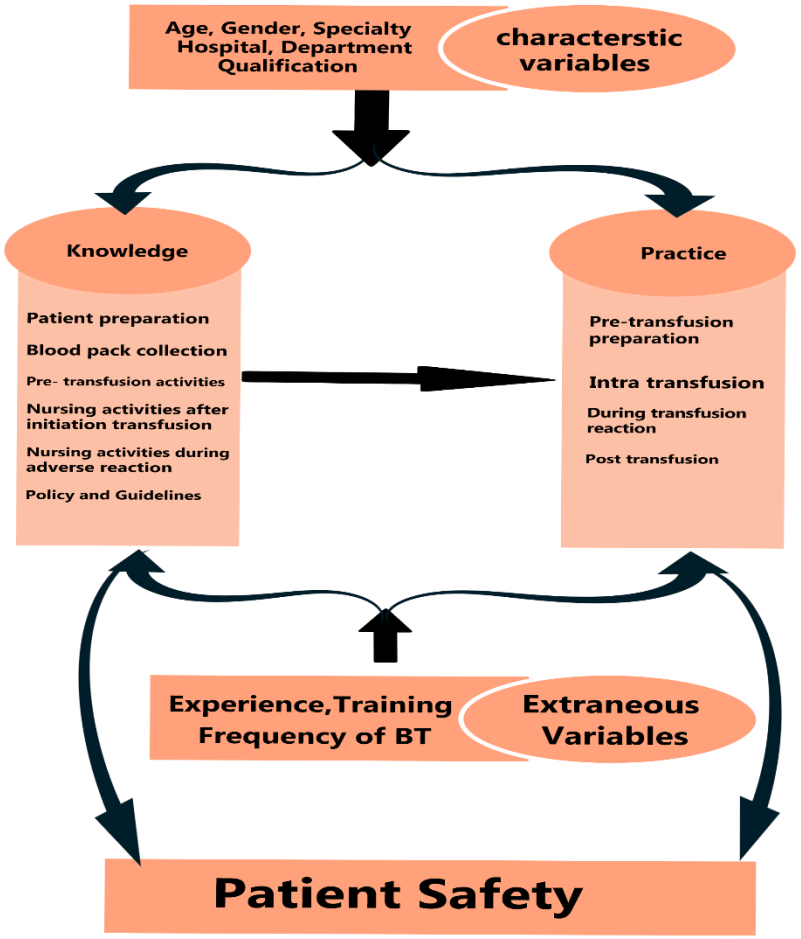

Figure (2.1): Diagram of conceptual framework (Self-developed)

2.1.1 Patient preparation

The patient should be ready for transfusion prior to picking up blood from the blood bank. For example, appropriate IV access, consent completed, pre-medication administered if required.

2.1.2 Blood pack collection

Blood pack collection which includes method used to transport blood from blood bank, Knowledge of basic ABO terminology, Information to ensure collecting the right blood from blood bank**.**

2.1.3 Pre-transfusion initiation nursing activities

Pre-transfusion initiation nursing activities as patient identification, indications for blood warming, best time to start the transfusion, steps for patient identification, suitable filter size of transfusion set.

2.1.4 Nursing activities after initiation transfusion

Post blood transfusion as (activities routinely performed by nurses after starting the blood transfusion., the Maximum duration of using a blood administration set for continuous multiple transfusions, maximum duration for completing a unit of blood, agents compatible with blood, vital signs recording after starting a transfusion**.**

2.1.5 Adverse transfusion reaction

Adverse transfusion reactions are an important cause of iatrogenic harm and most are preventable. Failure to monitor patients is a great problem and enhanced patient monitoring will prevent many of problems related to adverse transfusion reaction.

2.1.6 Policy and Guidelines

Guidelines describe protocols and explain major process regarding transfusion practice such as donor blood screening for infectious diseases, determining the need for transfusion, ABO compatibility tests and patient identification. Moreover, providing a transfusion standardized

approach can minimize potential errors, maximize administering effectual blood products and promote safety.

The conceptual framework illustrates the main domains that contribute nurse's knowledge and practice related to BT Figure (2.1). The conceptual framework shows the relationship between characteristics variables as independent variables and the dependent variables; nurses' knowledge and practice regarding BT. Sociodemographic data and extraneous variables include: age, gender, specialty, qualification level, hospital, department, experience and receiving of any training programs.

BT related knowledge can be divided into six dimensions: patient preparation prior transfusion, blood collection, issues prior BT, issues during blood administration, issues related to complication of transfusion and issues related to policy and guidelines regarding transfusion. The effect of sociodemographic data and other variables are not limited to the knowledge; but it affects practice also. Such data affect all aspects of nursing practice regarding BT, including: pre-transfusion care, intra transfusion, nursing intervention with adverse reaction and post transfusion. Sociodemographic factors influence nurses' practice either directly and directly. Furthermore, the conceptual framework explains another relationship between knowledge of blood transfusion as independent variable and the practice of transfusion as a dependent variable. Nurses' practice during BT will be affected by nurses' knowledge itself and the presence of guidelines and policy and their adherence to these guidelines. From the researcher's perception, proper and safe BT's practice is expected when nurses have enough knowledge, apply their knowledge and adhere to the universal or local guidelines. Having adequate knowledge about BT and practicing it according to high guidelines and protocols can increase the quality of BT procedures and minimize the risks of complications. Thus, decreases the BT related morbidity and mortality and promotes patients' safety.

2.2.1 History of Blood Transfusion

In ancient times, blood has been associated with the notions of possessing supernatural abilities, personality traits or being susceptible to demons and evil powers (Feyisa et al., 2021). Therefore, many attempts to blood transfusion were more myth than reality in terms of therapy and treatment prior to the 17th century. The circulatory system was first mentioned in the 17th century. Once it was discovered that the heart was pumping large amounts of blood into the vessels, the concept of replacing blood by drinking was replaced by infusing blood directly into the vessels (Learoyd, 2012). Furthermore, medicine has made significant advances in understanding circulation over the last hundreds of years (Sharma &Sharma, 2021). Since William Harvey discovered the mechanism of the circulatory system in 1660, scientists focused on blood transfusion process; initially transferring animal blood to humans.

The first human-to-human BT was performed in England for patient with postpartum hemorrhage by James Blundell in 1818 (Bowman et al., 2019). In the early 1900s, a significant progress has been made in the understanding of blood typing, blood components and blood storage (lotterman & Sharma, 2021). Transfusion medicine encompasses both laboratory and clinical medicine; physicians from a variety of specialties including pathology, hematology and pediatrics who contribute to the field. Later in 1939, Landsteiner discovered Rhesus system which decreased previous transfusion reactions. The risks of blood borne diseases such as hepatitis and HIV are now less than one in every million transfused units due to remarkable advanced technology and safety (Di Minno et al., 2016). The first blood transfusion for surgery was achieved in 1906 at Case Western Reserve University in Cleveland. The First World War was the motivation for the quick progress of blood banks and transfusion techniques and the world's first blood donor service was established in 1921 by the British Red Cross. The first blood bank was established in a Leningrad hospital in 1932 and the US government established a national program for blood collection in 1940 (Fong, 2020).

The presence of professional with explicit knowledge in this zone of performance has become a necessity. The role of nursing in hemotherapy has undergone several changes to keep up with the evolution in this field. New protocols were necessary not only to comply with legal requirements, but also to standardize various activities, provide quality service

and minimize risks and complications in all stages of the blood cycle (De Oliveira et al.,2017).

2.2.2 Patient's safety

The health sector is extremely pressurized; a complex system in which the possibility of errors and accidents is always present (WHO, 2019). Patient's safety is the absence of preventable harm to patients and the avoidance of unnecessary hurt which caused by healthcare professionals (Witczak et al., 2021). It is considered big challenges for healthcare organization and an important aspect of healthcare quality over the world; it has a prominent impact on health care delivery (WHO, 2019). According to Vaismoradi and his colleagues, unsafe care is estimated to be responsible for the loss of 64 million disability-adjusted life years each year across the world; therefore, patient's harm during the provision of healthcare is documented as one of the top ten causes of disability and death in the world (Vaismoradi et al., 2020). Ensuring patient's safety is global issue that distresses every country over world, therefore; investment in patient safety increases financial savings and better patient's outcomes; the cost of prevention is typically much lower than the cost of treating harm (WHO, 2019).

From a different aspect, patient's safety is one of nursing's primary concerns evidenced by provision comprehensive and safe health care; therefore, nurses' role maintains patient's safety either in short-term or long-term care settings and protects patients from harms during receiving care (Sermeus, 2016). Nurses practice regarding BT and patient's safety are inextricably linked; nurses are performing countless tasks to preserve patient's safety through protecting patients from any potential complications (Yesilbalkan et al., 2019). From the patients' safety aspect, nurses' roles include: monitoring patients for any clinical deterioration, detecting errors and near misses, understanding care processes, identifying any changes in patient's condition, initiating transfusion and discontinuing the BT (De young, 2018). Moreover, nurses certify patient's safety through following organizational strategies to identify any risks or harm that may threat patient's life; therefore, they frequently assess patients, double-check, monitor activities, offer assistance and communicate with other healthcare providers (Henneman, 2017). The levels of nurses' knowledge and skills have been identified as contributing factors in improving patient's safety and lowering the incidence of adverse events. Thus, nurses' adherence to patient's safety principles is crucial for procedures' success; it aims to prevent practice errors and achieve sustainable and safer

healthcare systems and consequently reduce the risk of errors by following safe BT policies, auditable performance standards and educational initiatives (Vaismoradi et al., 2020).

It was observed that there is a relationship between nurses' ratio and patient's safety, which led to an increased number of risky events, illness and even death. Needleman and colleagues reported that as nurses to patient's ratio increased; nurses' errors during care went down (Needleman et al., 2018). Nurses have had to overcome obstacles that have hampered safe care practices, such as insufficient staffing ratios, poor communication and long working hours (Kowalski & Anthony, 2017).

2.2.3 Nurses' Knowledge and practices about blood transfusion

Knowledge is the corner stone which drives nurses' actions because it permits attributing meaning to the multiplicity of phenomena that surround them, whether those relating to physical objects, people, events or abstract ideas. Therefore, deficiency in knowledge leads to poor performance and considered significant contributing factor to transfusion errors (Japheth et al., 2020 ;Gupta, 2016; Saillour-Glénisson et al., 2002).

BT is an important aspect of nursing practice; majority of transfusion chain is heavily dependent on the nurse's knowledge and abilities. Consequently, nurses' abilities should be accompanied with comprehensive understanding of transfusion process, excellent communication skills and ability to interact with a diverse range of people (Majeed et al; 2020). It was evidenced that an appropriate level of knowledge and performance play significant roles in preventing and controlling BT complications (Masror et al., 2021). Unfortunately, recent studies have been reported inadequate level of nurses' knowledge regarding BT in various countries around world (Rudrappan, 2019; Yesilbalkan et al. 2019; Hijji et al., 2012; Saillour-Glénisson et al., 2002).

Nurses had little understanding of basic ABO and Rh compatibility. This problem was highlighted in (Serious Hazard of Transfusion (SHOT) data where the first recommendation was training in ABO and D blood group principles for any clinical staff with involvement in the transfusion process (Bolton-Maggs & Cohen, 2013). Good practice is extremely important element for safe and effective transfusion; it contributes to make appropriate decisions about blood use based on clinical findings and laboratory parameters, ensure giving the right blood products to the right patient at the right time, monitoring patients for possible adverse effects of transfusion and managing them if they occur and finally

documenting the process (Kipkulei & Lotodo, 2019). Thus, nurses must not only administer the blood, but also know their indications, clarify the patients' concerning doubts about the transfusion procedure and be able to detect any type of adverse event (Nunes da Silva et al.,2017). Practice is always based on recent evidence-base studies. Therefore, it is pivotal to implement and encourage consistent use of evidence-based practice because it ensures the highest quality care, improves patient's outcomes, lowers healthcare costs and reduces variation in care delivery (Noor et al, 2021). Therefore, in order to deliver high quality care and function efficiently, nurses must have sufficient knowledge that they have actually used in practice (Kieft et al., 2014).

Limited studies in literature were conducted to assess nurses' practice regarding transfusion; most of them indicated unsatisfactory practice level concerning blood transfusion; such poor practice could endanger recipient's life (Hijji et al., 2010). In this context, an observational study was carried in Nepal, aimed to assess 86 practices of BT among health care personnel. The study revealed suboptimal BT practices among personal healthcare. It was showed that only 43.5% of health care participants wore gloves during the procedure, and only 16.5% of participants checked the patency of IV cannula by flushing with normal saline (NS) 0.9% prior initiation of transfusion. In regards to documentation, 95% of cases was done. According to these findings; a significant knowledge practice gap among healthcare personnel can be associated with lack of a quality culture, quality system, and quality management in the area of blood transfusion practices (Sapkota. et al., 2018). Another recent descriptive observational study carried out by (Majeed et al; 2020) sought to assess practices regarding blood transfusion among 200 nurses; selected randomly from different wards. The results revealed that less than 50% staff nurses performed appropriate practices before collection of blood bags from blood banks, and checks in the blood bank. More than 50% of nurses exhibited appropriate practices before initiation of blood transfusion and less than half of the nurses did proper practices after initiation of blood. A different study purpose was to identify the blood transfusion practice among nurses in public hospital. The researcher observed nurses' practice in the following points during time of transfusion, vital signs monitoring and reaction. The findings illustrated that 53.4% of participants had inadequate practices regarding blood transfusion, 6% participants begin transfusion after 30 minutes of dispatching from the blood bank and 9.3% participants did not do vital sign monitoring. The study confirmed the need to produce strategies to make sure the right and continuous filling of blood transfusion forms. Because it is necessary for observing analyzing and continuous

improvement of blood transfusion practices. This study identified the documentation failure that can lead to happening of adverse events associated with blood administration (Reis et al., 2016). It was reported a noticeable enhancement in the level of nurses; knowledge and practice about BT after training programs (Hendey et al., 2017). The importance of nurses' role in safe blood transfusion practice requires involving nurses in relevant and continuous training, using effective educational strategies for improving their knowledge and performance, even for those with adequate knowledge and satisfactory performance needs continuous refreshment (Freixo et al., 2017; Nunes da Silva et al., 2017).

Pervious study was carried out by Khaelef et al (2018) to evaluate the effectiveness of training program on nurses' competent practice towards children receiving blood transfusion at Benha University Hospital. They a used structured interviewing questionnaire sheet to assess nurses' knowledge regarding blood transfusion for children and Observational checklist to assess the actual nurses' practices towards caring for them. The finding revealed improvement in both nurses' total knowledge and practice scores post-implementation of the training program than pre-program implementation (Khaelef et al., 2018). This is consistent with Soliman & Elhapashy (2021) Study which sought to evaluate the efficiency of a training module about safety blood transfusion on nurses' competences at the hematology department in Oncology Center Mansoura University. The researcher adopted pre-experimental one group pre and post-test design. The study revealed a strong positive relation between nurses' knowledge and practices scores post-training. The study concluded training module on safety blood transfusion can positively improve nurses' level of knowledge and practice (Soliman & Elhapashy, 2021).

In conclusion, previous studies conducted in various countries revealed that healthcare professionals, particularly nurses, had a lack of knowledge and practice about blood transfusion procedures and risks. This proposes that there is a risk of unsafe blood transfusion practice occurring in clinical settings.

2.2.3.1 Nurses' role and responsibilities in Blood transfusion process

Nurses are front-line healthcare providers who accomplish countless tasks and bear many responsibilities during blood transfusion. They therefore particularly serve as vital links between various health professionals who are engaged in the transfusion chain. Moreover. they are closer to the patients than other health providers and spend most of their time in

providing care to the patients (Lee et al., 2016). Worldwide, the role of the nurse in the complex transfusion process continues to be at the forefront of patient safety concerns and recommendations (Riveira et al., 2020)

Nurses' role is evolving as a fundamental part of efforts starting from patient's preparation and blood bag collection till monitoring patient after transfusion in order to enhance appropriate use of blood components, reduce procedural risks and improve transfusion practice in general. Moreover, nnurses are responsible for providing safe transfusion with high standards of care (Hurrell, 2014). They must be aware of all issues related to the components of BT procedure, probable adverse reactions and essential emergency care if needed (Reis et al., 2016).

Nurses working in hospital face many stressors on their time and often have to make difficult decision about patient care (Bolger &Moss, 2015). Therefore, transfusion errors are practitioner-related; main nursing responsibility is preventing potential errors by applying bedside checkup in all transfusion phases (Bolton-Maggs, 2018). Such errors can be prevented totally through using innovative technology such: as bar coding and use of hand-held computers as effective methods to decrease errors. However, using on knowledge and staff training as a key solution to reduce the associated errors is still important (Noor et al., 2021; Tetteh, 2015).

Nurses and nurse managers can use local knowledge gained from observing active and latent errors to make changes at the unit level in order to improve patient's safety (Noor et al., 2021). Therefore, it is essential for nurse to adhere with clinical guidelines and monitor patient closely for possible complications that may arise. Therefore, it is indispensable for nurses to be empowered in order to meet these responsibilities since BT requires trained and skilled personnel to carry out tasks properly in order to fulfill their primary responsibility (Duarte et al., 2017). Hence, it was evidenced that commitment of guidelines from order of request to sampling, labeling, laboratory testing, collection and finally with administration of blood product promote patient safety (lee et al., 2016). Nurses, additionally, conduct transfusion audits together with blood bank technical staff in order to recognize specific zones which need education, training and clinical guidance to improve transfusion clinical governance (Bielby et al., 2018).

2.2.4 Decision to transfuse blood product

The decision to transfuse should be based on clinical judgment taking into account the benefits and risks of transfusion as well as any alternative therapies that may be available. The benefits of BT should outweigh the risks (Murphy et al., 2021). Patients should be thoroughly evaluated prior requesting a BT. This should include assessing the pre-transfusion history, a physical examination with complete vital signs (V/S), cardiac, respiratory and peripheral vascular examinations. This step will prevent doctors from ordering BT depending only on the hemoglobin level; thus, avoid unnecessary transfusion (Lee et al, 2016). Complications from unnecessary transfusions result in higher costs, morbidity and poor patient outcomes. Blood product requests must be filled out completely, including: patient's information, diagnosis, indications for transfusion, previous history relevant to blood transfusion such as pregnancy, transfusion reactions, types of blood components required and the urgency of the request (Norfolk, 2013). Any missing information in blood request form can lead to possible errors and increase the risk for transfusion reactions (Patidar et al.,2018). Nurses should inform patients and their families about the impending transfusion. The information should include: BT indication, its risks and benefits and transfusion reaction symptoms. Aside from that, the nurse should record baseline V/S within 30 minutes before starting the transfusion (Hijji et al., 2013). Adams and Tolich (2011) interviewed twenty-one patients about their transfusion experiences and concluded that patients lacked information, and brochures were insufficient, and interaction with nurses was most helpful in reassuring and educating patients.

2.2.5 Blood transfusion administration

BT administration consists of five interlinked stages, four of them are directly related to the nursing role, including preparation prior to collecting blood units from the storage site, pre-transfusion activities, post-transfusion activities and patient monitoring post transfusion (lee et al., 2016). Therefore, it is essential that nurse has a solid understanding of basic transfusion practice and being able to apply this knowledge confidently (Bradbury et al., 2017)

2.2.5.1 Patient preparation prior blood collection

The issue of assessing and ensuring patient's readiness for a blood transfusion is crucial. Therefore, the patient must be well informed and psychologically prepared for the blood

therapy. Patient preparation process includes: clear medical orders, readily intravenous access, consent form and delivery of any pre-medications or other solutions (lee et al., 2016). This is proved by several previous studies where majority of the studied sample had adequate knowledge about patient preparation prior to blood transfusion, such as checking the patency of the intravenous access line, recording baseline V/S, providing information to the patient and not bringing blood from the bank prior to the administration of any prescribed pre-medication, what kind of decisions to be made by the nurse with an incomplete order or ensure that informed consent has been obtained (Bediako et al., 2020; Abd Elhy & Kasemy ,2017; Tetteh, 2015). However, many nurses lack sufficient knowledge about patient preparation prior to blood bag collection and also the importance and methods of patient-identification confirmation (Hijji et al., 2012; Abd Elhy & Kasemy, 2017).

2.2.5.1.1 Consent form

BT is a common clinical practice that is associated sometimes with adverse events. Therefore, transfusion consent is a standard safety requirement (Murphy et al.,2021) Several surveys conducted in the United Kingdom showed that 20% or more of blood transfusions were inappropriate and alternatives to transfusion were underutilized (SHOT, 2019: 2020). Therefore, it is important that patients should be fully informed of the benefits, risks and alternatives of transfusion prior giving their consent informed; they should be given the opportunity to ask questions. The ultimate responsibility for informed consent rests with the physician after giving a complete explanation about benefits, risk and alternatives (Strini et al., 2021). Valid consent for transfusion should be obtained for all patients who will likely or definitely receive a transfusion, such as when blood is routinely requested prior to surgery or sample is taken pre-procedure (Murphy et al., 2021). If the patient is unable to consent for whatever reason, a responsible family member must be asked to do so. Therefore, the healthcare provider must document all explanation in accordance with facility-specific policies (Sutton et al., 2020). Occasionally, premedication is used to prevent the recurrence of transfusion reactions in patients who have already experienced symptoms associated with BT, such as chills and fever. However, prophylactic premedication is a part of the institution's routine care (Da Silva Góis et a., 2021).

2.2.5.1.2 Intravenous (IV) access availability and patency

Blood components can be administered via a variety of central or peripheral venous access devices. Venous catheter should be large enough to allow flow of the blood components and suitable for patients age. However, the high pressure of the flow through the small-lumen catheter may result erythrocyte hemolysis (Kavaklioglu et al., 2017). Hence, compatible access route should be available because an incompatible access causes transfusion delays and the blood unit may exceed four hours; discarding the blood components (Mattia & Andrade, 2016). Nurses must guarantee that the patient primarily is well prepared for BT through placing patent cannula prior blood collection to ward (Hijji et al., 2012). Unluckily, previous study, aimed to assess nurse's knowledge level in Egypt, revealed that the majority of nurses did not knew they must apply IV access prior to blood collection from the bank and less than half of them checked the patency of the intravenous line with an appropriate solution; such actions lead to delaying the blood initiation (Hijji et al., 2012). Similarly; only 16.5% of participants, from Nepal, checked availability and patency of IV cannula by flushing with NS 0.9% prior initiation of transfusion (Sapkota. et al., 2018).

2.2.5.2 Blood pack collection

Safe transfusion needs a strict adherence to patient identification at all stages of transfusion chain and mainly during product collection from the blood bank (Frietsch et al., 2017). A fundamental moment in the delivery of blood products safely to patients is in the proper identification of the patient and collection of a cross-matched sample correctly identified. It has been indicated that the initial step preventing improper BT is to draw blood from the right patient and to ensure correct labeling (Hoffmeister& de Moura, 2015). For proper patient identification, at least two identifiers should be considered; patient's room number or bed number are not included (Kavaklioglu et al., 2017). In a study implemented by College of American Pathologists, the researches indicated that in some cases, patients were not correctly identified because of similarities in name, surname or birth date. Failure to identify patients receiving blood is a catastrophe and can lead to serious errors (Hoffmeister& de Moura, 2015). Such errors pose serious threat of patient life leading to disability and consequently need further medical intervention, prolonged hospitalization, morbidity and even death (Najafpour et al., 2017). Specimen labelling is a high-risk area; positive patient identification should be encompassed in education sessions. Specimens that do not meet the specimen acceptance criteria are said to be"40 times more likely to have a blood grouping

discrepancy (Sandhu et al., 2017). Thus, nurses assigned for collecting blood samples; must take the sample at the patient's bedside and identify patient correctly either by checking the wrist band or asking the patient to state his or her full name. The same staff who took the sample must label the sample precisely and quickly at the patient's bedside (Noor et al., 2021). Details must be compared with patient's record and even though in cases of patients were unconscious; nurses must have compared patients' identity band and sample labeling immediately and accurately at the patient's bedside (Lippi et al, 2017). Previous study emphasized the importance of patient's identity checks in the following situations: when the blood sample is taken, when the blood product is collected and when applying blood unit. The identification must be confirmed verbally and visually by inspecting the identification band and the patients must provide their full names which must correspond to the information on the identification band, the blood bag label and the patients' documentation (Sapkota et al, 2018).

Pre-transfusion blood sample are obtained for blood grouping and compatibility testing after physician write blood order. Compatibility tests are compulsory to prevent any transfusion reactions that may cause morbidity or mortality due to incorrect BT. Although it is vital to determine the recipient's blood type accurately and ensure that recipients receive safe blood products. Unfortunately, previous studies were indicated that majority of nurses had not mastered the basic A, B, O and AB (ABO) and Resus blood group system and most of them were unable to identify the compatible blood to be transfused to patient with known blood group (Kavaklioglu et al., 2017; lee et al., 2016; Mitra et al., 2014). Therefore, nursing staff should have a basic knowledge regarding blood group system in order to avoid unnecessary adverse reaction. Furthermore, the blood units should be examined for signs of leakage, lysis, contamination or an unusual appearance that indicated problem with the product's quality (Kavaklioglu et al., 2017). Consequently, nurses should be equipped with adequate knowledge in the basic system of blood groups and bring proper documentation to prove the patient's identity when collecting blood products from the storage site (Islami, 2018).

Blood packs collection is an important step in improving patient safety since it forms another high-risk area for errors when staff fails to check the labels attached to blood units with identification details; collecting incorrect blood unit (lee et al., 2016). Therefore, the nurse must ensure that patient's identification details are included on the collection slip and blood bag to prevent blood incompatibility. The patient's identity should be carefully verified

including patient's full name and donor, date of birth, code number, clinic, date and signature. Patient's details must be checked by blood bank staff before issuance the blood. Blood bank staff must also register the date and time of issue, details of the person who issues and the person who collects blood. The one who collects blood should also check the patient's details and blood bag before taking blood components from blood bank (Kotzé et al., 2015). Nurse must check blood bag well; return the unit if there a discrepancy. majority of nurses doesn't perform blood bank checks when have received blood unit (Kavaklioglu et al., 2017). therefore, training is urgency need to prevent such errors which can endanger patient lives.

2.2.5.2.1 Blood transportation and storage

Blood is a good medium for bacterial growth; therefore, it is stored in appropriate refrigerators at 2-6°C, where it has a shelf life of 35 days from donation. There are legal requirements for temperature regulation and alarm systems for storage of blood in the bank. It must never be stored in other refrigerators (Ajmani, 2020). Furthermore, the storage temperature must be monitored on a regular basis to ensure the viability of blood components (Noor et al., 2021). Blood should be detached, one unit at a time, from the blood bank refrigerator only when a transfusion is due to commence within 30 minutes. Blood bags should also be transported in a special validated box at proper temperature in order maintain the quality of the blood products (Sapkota et al. 2018). Personnel who are involved in blood product releasing from storage facility should record date and time in proper and clear way (Lee et al., 2016). Unfortunately, majority of nurses had no knowledge about the proper method to transport blood unit and only a few used boxes to transport blood packs from the blood bank to the ward (Sapkota et al., 2018). Finally, transfusion must be completed within 4 hours of removing the pack from the Blood Bank refrigerator to avoid the risk of bacterial growth (lee et al. 2016).

2.2.5.3 Nurses' activities prior initiation of transfusion

Licensed staff who are trained and accredited should handle blood products according to local policies (Hurrell, 2014). Prior administering blood, nurses have to obtain a baseline V/S. This should be done prior to obtaining blood units from storage sites in order to avoid any delay that would compromise the quality of blood products (Hurrell, 2014). Before initiating transfusion, nurse must pay greatest attention to these important measures; nurse should examine results of cross matching and screening for diseases as AIDS, the expiration

date of blood product, and the patient's file number in order to avoid any error and to ensure ABO compatibility. Hemolytic reaction evolving as a result of inadequate observance of pre-transfusion precautions constitutes the most important cause of transfusion-related deaths (Kavaklioglu et al., 2017).

2.2.5.3.1 Blood warming

Whole-blood and RBC are kept at a temperature ranging from 2°C to 6°C. In special clinical situations, massive transfusion is needed immediately and particularly in operating rooms and intensive care (Lee et al, 2016; Rao et al., 2013). Therefore. massive transfusion of cold blood can be risky, causing hypothermia which affects metabolism and result in coagulopathy, arrhythmia or cardiac arrest (Poder et al., 2015). Consequently, many nurses believe that blood is essential to be warmed before each transfusion. Blood unit is warmed closer to human body temperature before it is transfused to the patient in order to avoid dangerous complications (Poder et al., 2015). The blood warming procedure performed with a calibrated blood warmer machine and must not exceed 42°C because higher temperatures will cause lysis of the red cell membrane and threat patient's safety (Derek, 2013). Many practices are prohibited during blood warming such as: use running water, uncensored heat source, putting blood unit in hot water microwave or expose radiation. Moreover, blood product should not be re-cooled after warming; such practice may allow bacterial growth (lee et al.,2016). Previous studies indicated that nurses warm blood unit either by putting blood unit under patient's armpits or putting inside the patient's blanket or wrapping in clothes (Bayoumi, & El-Nagger, 2020; Sapkota et al., 2018; Hijji et al., 2010). Such ways are not recommended since they can lead to bacterial growth (Ramirez-Arcos et al., 2016).

2.2.5.3.2 Administration of medicines and fluids

It is crucial to highlight that NS solution is the only solution that can be used during blood transfusion. Hence, it is used to improve flow rate of red cell transfusion and remove reticulocyte from blood unit whereas dextrose 5% solution should not use concurrently with blood components nor ringer lactate because contained calcium could form blood clot which led to hemolysis (lee et al., 2016). In this context, previous study was conducted in turkey assessing nurse's knowledge regarding transfusion process highlighted that 75.4 %% nurses were aware that only NS solution can be used concurrently with blood transfusion (Enacan & Akin, 2019). In addition, medication should never be given directly with any blood

components. It makes impossible to determine the cause of the reaction if occurs. Thus, in case of the drug should be administered and the blood transfusion line is the only intravenous access available, blood transfusion must be stopped first and the tube should be flushed with 0.9% NS solution before and after injecting the medicine to prevent direct blood mixing with medication (Noor et al, 2021).

2.2.5.3.3 Blood administration sets

All blood components are sent with standard set because of the fibrin fragments and particles they contain (Encan &Akin, 2019). These sets' filters have pores with diameters ranging from 170-200 microns. The filter is designed to remove clots and particles that could be harmful to the patient. Large cells, cellular debris and coagulated proteins are captured by these filters (Lee et al., 2016).

2.2.5.4 Nursing activities after initiation transfusion

Nurses have to check doctor's orders for transfusion and any pre-transfusion medications ought to be given to the patient; bedside verification will be carried out. If any interruptions occur during the checks, the process must be started over (Noor et al, 2021). The final bedside checking must be performed by trained and competent personnel who will administer the blood products with collaboration with another trained personnel, either nurses or medical practitioners, as a counter-checker prior the blood transfusion (Hurrell 2014). The first 15 minutes of transfusion are considered dangerous and threating. Serious and life-threatening reactions can occur without warning and progress quickly; therefore, patients must be kept under constant observation (Sahu et al., 2014). Nurses must obviously note down the time of commencing transfusion, patient's vitals and conditions. This data certifies traceability and makes great help to the examination especially when patients develop undesired symptoms or reactions during blood transfusion (lee et al., 2016).

2.2.5.4.1 Time limits for infusion of blood components

Infusion of blood should begin within 10 to less than 30 minutes of blood bag removal from refrigerator (Hijji et al., 2012). The flow rate of a transfused unit should be adjusted to the duration of the transfusion, since bacteria can cultivate in blood when transfusion lasts more than four hours. For whole blood or packed red blood cells, increased room temperature and prolonged transfusion may also result in unit hemolysis (Kavaklioglu et al., 2017). Lee et al

(2016) indicated the majority of nurses were unaware of the reason for recommended duration of transfusion. They believe that patient could develop acute transfusion reactions, which is a highly improbable reaction to prolonged transfusion. In case of the transfusion of fresh frozen plasma, it should begin as soon as received from the blood bank and dissolved then completed according to tolerance of patient (Hijji et al., 2012). Initiation transfusion at slower or faster rate than recommended in guidelines may result either in a longer or a shorter duration transfusion duration with increased risk of bacterial contamination (Kavaklioglu et al., 2017).

2.2.5.4.2 Patient monitoring and surveillance of vital signs

The primary goal of monitoring patients during transfusion is to guarantee patient's safety. Close monitoring of patients undergoing transfusion is absolutely essential, since it facilitate early detection of unpredictably and quickly adverse reactions which can sometimes be fatal (Kavaklioglu et al., 2017). Staff frequently must remind patients to notify them about any uncomfortable feeling or any reaction; thus, patients should be monitored for any signs of reaction during transfusion (Noor et al, 2021). Reported data highlighted that more than 60% of reactions take place at the first 15-30 minutes; monitoring V/S in this time period is an essential component of basic nursing care for detecting any patient’s deterioration (Mok et al., 2015; Reis et al., 2016). Vital signs changes are primary predicators for patients experiencing adverse events either immediately or later post several hours before the events occur (Brekke et al., 2019). Though there was no evidence indicated V/S monitoring frequency to detect adverse events during transfusion, but it was suggested that it should be at three time points: at baseline, within 15 minutes of transfusion initiation and at transfusion completion. Thus, it may be effective in identifying signs and symptoms of transfusion reaction (DeYoung Sullivan et al., 2015). Monitoring V/S prior transfusion helps to determine any transfusion reaction. In the previous literature, study revealed that 10% of patients are at risk of ignoring the transfusion reaction due to failure to record the patient's V/S and symptoms during the pre-transfusion period (Kavaklioglu et al., 2017).

2.2.5.4.3 Documentation of transfusion process

Nursing documentation is the primary source of clinical information for meeting legal and professional requirements (Tasew et al., 2019). Proper documentation can prevent future costs resulting from malpractice claims. Therefore, nurses play an important role in ensuring full documentation about BT administration. Unfortunately, many studies have found deficiencies in the documentation practices among nurses over all the world (Sapkota et al., 2018; Lindo et al., 2016; Hijji et al., 2012). Documentation prevent future costs resulting from malpractice claim as cases of malpractice are frequently decided based on the documentation that occurred prevent future costs resulting from malpractice claim as cases of malpractice are frequently decided based on the documentation that occurred Safe blood administration must be accompanied by proper documentation of related tasks, particularly indications, time or durations and operators in order to ensure traceability and facilitate lookback procedures (Norfolk, 2013). Therefore, full documentation must be completed in the patient's clinical records at each stage of the blood transfusion. Subsequently nurses must accurately record the start time of the transfusion, as well as the patient's V/S and medical conditions. This information ensures traceability and aids investigations, particularly when patients experience unwanted symptoms or reactions during blood transfusion. Patients must also be reminded to immediately notify nursing staff if they feel un easy or have any reaction (Lee et al., 2016). Clinicians and nursing staff involved in blood transfusion should be educated on the significance of proper transfusion documentation. In addition, the hospital must implement clinical auditing strategies to monitor the documentation of the clinical BT process (Clark et al., 2012).

2.2.5.5 post-transfusion nursing activities

When transfusion is ended without any adverse symptoms; nurses must take last vital signs checkup and document it, then recorded total transfused volume and time of finishing and the blood tag attached must be duly filled out (McClelland, 2007). Respectively, plug the empty bag with the appropriate plug and place it in designated receptacles in the dirty utility room on each ward, keeping it there until all units have been transfused, then disposing them in the orange/yellow clinical waste bag. If offensive bags are not available, used blood bags can be disposed in offensive waste or clinical waste. Patients must be warned to be on the high alert for acute or delayed transfusion reactions that occur within or after 24 hours of the transfusion (Noor et al., 2021).

2.2.5.5.1 Nurses activities related to adverse reactions of Blood Transfusions

Blood is a high-volume, high-risk and high-cost process that must be used appropriately; thus, benefits and risks of BT must be carefully weighed (Delaney et al., 2016). Unnecessary and unsafe transfusion practices expose patients to risks of serious adverse reactions and getting transfusion-transmissible infections. Besides, it may reduce the availability of blood products for patients with limited resources and may impair blood product traceability (WHO, 2020). Adverse effects to transfusion have been documented particularly since the early 1990s, when many countries implemented hem-vigilance schemes (Wood et al., 2019). The occurrence of adverse events is one of the world's top ten causes of death and disability due to result of unsafe care (Slawomirski et al., 2017). A study, focusing on frequency and preventability of adverse events, was conducted in 26 hospitals in eight low- and middle-income countries found the adverse event rate was around 8%; 83% of them were preventable (WHO, 2019). However, preventable adverse events can occur when standards of care are not met (Frazier et al., 2017).

Transfusion reaction (TR) is an unintended reaction associated with BT that prolongs hospitalization, and increasing morbidity and disability or causes mortality (Sahu & Bajpai, 2019). TR may occur in up to 1% of transfusions. It can acute or delayed and range from slight to serious events; it seldom can be fatal. The occurrence of such fatal reactions varies from 1 in 0.6 million to 2.3 million (Castillo, 2018). Payande, et al. claimed that among 6238 blood unit transfused to the patient, 59 cases of BT reactions happened since 2010 to 2012, This pattern could be minimized by engaging nurses with proper training. Though each TR occurs differently, the most frequently observed manifestations are: pain, anxiety, hypotension, hematuria, fever, headache, pruritus, rash or hives, nausea and respiratory difficulties (AABB, 2017; Bachowski et al, 2017; Miller-Hoover, 2018). As mentioned above, the transfusion process is dominated by nursing-related responsibilities; therefore, the role of nurses is very crucial in identifying TR and recognizing measures to be taken in response in order to save patient’s life (Bradbury et al., 2017). Unluckily, several studies reported that nurses had not enough knowledge about transfusion complications that may take place during BT or the early signs of a potential complication (Saif Al-Nasr et al., 2016; Ibrahim, 2012: Aslani et al., 2010). In this context, a study was carried out in So Paulo university hospital in Brazil aimed to delineate nurses practice level regarding BT. The study reported that not all professionals who work in hemotherapy are able to act in the transfusion

process or in cases of adverse reactions (De siliva et al., 2017). Nurses must be attentive for any TR. Since failure of nurses to recognize TR and continuing instillation of blood may lead to catastrophic outcomes (Hornis et al., 2018). So, the nurse must follow hospital guidelines, if reaction was suspected and symptoms were mild, the clinicians' professional judgment allow them to resume transfusion. However, if symptoms were severe, transfusion must be stopped immediately, keep an open IV access with 0.9% NS, notify the physician, remove the blood products and tube and collect blood sample. Samples and blood units are sent to laboratory for testing along with completed transfusion reaction report form. Nursing staff must make a clerical check for the patient's identity against the blood units to rule out incorrect blood transfusion (Saif Al-Nasr et al., 2016). The patient's vital signs should be monitored and recorded at 15-minute intervals. The blood bank generally completes additional testing and clerical checks to rule out an incompatible transfusion (Armstrong et al., 2020). Treatment of precise transfusion reactions is most often supportive such antihistamines can be given for a mild allergic reaction, or an antipyretic can be given for a non-hemolytic febrile transfusion reaction (Antibiotic therapy, fluid management, respiratory supporting).

2.2.5.5.1.1 Acute Transfusion Reactions

Acute transfusion reactions are temporarily reactions related to blood product transfusion and takes places within 24 hours of transfusion. It can be ranged from mild allergic reactions to severe fatal anaphylactic shock (Vamvakas & Blajchman, 2009). Nursing interventions differ from slowing the blood flow rate or warming the patients to immediate blood cessation, opening NS widely, notifying the physicians and administering emergency medication (Bradbury et al., 2017). In cases of mild allergic reaction to a foreign protein in the donor product or mild anaphylactic reaction can occur among patients with immunoglobin A (Ig A) deficiency when receives IgA-containing blood products.; nurse must slow the rate of infusion, report findings and be ready to give antihistamine (Suddock & Crookston, 2021). While in case of febrile non-hemolytic reaction as a result of releasing cytokines by blood donor white blood cells, the nursing interventions are stoppage of infusion, start saline, check vital signs and report findings (Watson & Denison, 2014). In case of infusing contaminated blood with bacteria or bacterial byproducts (such as endotoxin); septic will be the result (Erony et al. 2018). Thus, nurse must stop infusion, start saline, report findings and drawn blood culture, and administer antibiotic as prescribed (Sahu

et al., 2014). However, acute hemolytic reactions are caused due to transfusion incompatible blood patient. It is worth to mention that another form of non-immune reactions is possible and occur when RBCs are damaged prior to transfusion by improper heating or incorrect osmotic conditions (Harewood et al, 2021). The first step is always to stop the transfusion. then ensure the patient has good intravenous access, infuse saline at rapid rate, call for assistance, administer oxygen as described and be ready to administer emergency drugs (Lister et al., 2021). From another aspect, Transfusion-associated circulatory overload (TACO) occurs when the volume of the transfused component causes hypervolemia (volume overload), nurse should stop the transfusion, administer oxygen and diuretics as required. Finally, when the antibodies in the donor product reacting with antigens in the recipient, Acute lung injury (TRALI) is the result. The recipient's immune system reacts by releasing mediators that cause pulmonary edema. The prompt action for nurse is stopping transfusion, assess V/S, call for help, administer oxygen as prescribed be ready to administer emergency drugs (Sahu et al., 2014).

2.2.5.5.1.2 Delayed transfusion reactions

It takes place after 24 hours and may be observed up to 30 days' post transfusion (Vamvakas & Blajchman, 2009). In cases Transfusion-Associated Graft-Versus-Host Disease (GVHD), the patient may experience signs of fever, rash, diarrhea, impaired liver functioning and bone marrow aplasia. If symptoms occur, Doctor should be notified, administer IV fluid and give corticosteroids as physician order (Watson & Denison, 2014).

2.2.5.5.1.3 Transfusion errors

Several measures have been implemented in recent years in order to improve blood product safety and process itself. However, errors are still continuously reported at all stages of the transfusion process (Noor, et al., 2021). Therefore, transfusion errors are considered a significant financial burden on the health care system, since errors often cause serious problems for recipient, morbidity or even mortality (Bealer, 2016). It is estimated that they were approximately one error occurs in every 13,000 patients undergoing BT (Bolton-Maggs,2019). Major contributing factors for errors are problems related to transportation from blood bank to wards, lack of bedside checking practice and lack of regular patient's monitoring through transfusion process (Sapkota et al., 2018). As mentioned above, errors can occur at any stage of transfusion. Therefore, nurses' failure to commit to the final pre-

transfusion checking would result in infusing wrong blood to wrong patient; it is a catastrophic error led to patient morbidity or mortality (Apelseth et al., 2012). Errors are primarily caused by inadequate processes, insufficient training and procedural steps that are not performed correctly or are omitted. Faults were significantly increased during administration multiple units for different patients at the same time in clinical area (Tetteh, 2015). Inadequate training and lack of experience are strongly linked to increased errors (Saillour-Glénisson, 2002). More than 84% of reported errors can be prevented through proper training, education, redevelopment of transfusion protocols, collaboration among health care providers and adequate knowledge (Freixo et al., 2017; Bolton-Maggs, 2019; Gray et al., 2008). From another aspect, technology innovations such as bar coding and of hand-held computers are operative methods to decrease errors. However, focusing on knowledge and training of the staff is still key solution (Noor et al., 2021; Tetteh, 2015)

2.2.5.6 Policy and guidelines of Blood transfusion

Different countries have standard guidelines and policies. Hence, 72 % of reporting countries had a national blood policy while 64 % of reporting countries had specific legislation covering the safety and quality of blood transfusion (WHO, 2020). Health care facilities frequently unite standards of practice that reveal recent evidence to improve patient outcomes and reduce hospital costs; therefore. transfusion should be done in accordance to these standards (Hurrell, 2014). Clinical guidelines are systematically derived statements that help practitioners to make decisions about care in specific clinical circumstances (McGuinness et al., 2016). Guidelines have a significant impact on improving patient care when properly implemented (Althoff et al., 2019). These guidelines describe protocols and explain major process regarding transfusion practice such as donor blood screening for infectious diseases, determining the need for transfusion, ABO compatibility tests and patient identification. Moreover, providing a transfusion standardized approach can minimize potential errors, maximize administering effectual blood products and promote safety. Furthermore, education on standard practices guidelines is crucial to improve the quality of nursing care and ensuring patient safety during BT (Melnyk & Fineout-Overholt. 2015). Numerous guidelines have been internationally developed in order to optimize blood transfusion practice in a variety of ways. Though, the importance of nurse's role in the process; nurses had better to adhere with guidelines regarding BT procedures in order to prevent any possible errors that could be potentially life-threatening at any step of procedure

chains (Althoff et al., 2019). Commitment to the guidelines should be from prescription of request, sampling, labeling, laboratory testing collection blood pack and finally with infusing blood product (Mole et al., 2007). A previous study had demonstrated that nurses did not have sufficient knowledge concerning BT standards particularly in prevention of possible reactions and safe BT practices (Aslani et al., 2010). In the same line, a second study highlighted lack of knowledge of nurses regarding presence of transfusion policy in their hospitals (Henedy et al.,2017). Therefore, it was recommended that all hospital staff involved in transfusion process should receive proper education and ongoing training about guidelines and protocols (Henedy et al, 2017).

2.2.6 Sociodemographic and Extraneous Variables

Sociodemographic variables are those related to social and demographic conditions of nurses such as age, sex, level of education, years of experience in nursing, work setting and the number of blood units performed by nurses. Previous studies indicated there are significant variation between age and Knowledge and practices scores (Abd Elhy & Kasemy, 2017; Lee et. al., 2016). Noor et al., (2021) showed a strong relationship between the scores for inaccurate knowledge and the low number of transfusion interventions. Similarly, Dubey et al. (2013), reported that knowledge among those with more experience was significantly higher than those who have less experience. From a different aspect, nurses' knowledge about BT may vary according to the type of work setting. One study found a statistically significant relationship between nurses' knowledge in terms of the work setting and the type of qualifications (Hijji et al., 2013). However, other studies reflected absence of significant relationship between the level of the health care workers' knowledge and the variables such as the number of transfusions performed daily, length of service, and course participation (Reza et al., 2009). In more details, nurses clinical experience was reported as an insignificant factor affecting the nurses' knowledge regarding BT (Abd Elhy & Kasemy, 2017; Lee et. al., 2016), which is incongruent with Dubey et al. (2013) and Saillour-Glénisson et al. (2002).

Chapter Three

Methodology

3.1 Study design

The researcher used a triangulated, descriptive, cross- sectional design in order to assess the levels of knowledge and practice among nurses working at the governmental hospitals in the Gaza Strip related to BT. A self-administered questionnaire and an observational checklist were used for the quantitative part of the study and Key Informants Interviews (KII) for the qualitative part. A descriptive study is one in which at least one or more variables is described regardless of any causal or other hypothesis (Aggarwal & Ranganathan, 2019). In a cross-sectional study, the investigator simultaneously measures the outcome and the exposures in the study participants (Setia, 2016). The cross-sectional design is characterized by being practical, simple, not costly, not time-consuming and easy to use (Polit & Beck, 2018).

In this study, methodological triangulation would provide a combination of quantitative and qualitative paradigms to validate findings from one method to another and to improve the understanding of the facts on the ground (Polit & Beck, 2018). Furthermore; the use of both quantitative and qualitative approaches not only overcomes the disadvantages of each approach, but also strengthens the design and the research results. However, triangulation could be time-consuming since collecting more data requires greater planning and organizational resources (Polit & Beck, 2018).

3.2 Study settings

The researcher selected, purposefully, three hospitals from the 13 GH that provide BT services. These hospitals are: Alshifaa ' Medical Complex, Ar-rantisy hospital and Nasser Medical Complex. It is worth to mention that these selected hospitals are considered among the largest governmental hospitals and therefore; many blood units are transfused in these medical centers. Alshifaa ' Medical Complex and Nasser Medical Complex are two major hospitals that serve two different geographical areas and provide almost all health care services, while Ar-rantisy hospital is a specialized hospital that provides different services to children and oncology patients. It is the only hospital in the GS that provides oncology

care for pediatric and adults and kidney dialysis for pediatric patients. Finally, it is very common to provide BT in most of the departments in these three hospitals. In June 2020, approximately 2440 units of blood were transfused in the three hospitals: 1430 units in Alshifaa ' Medical Complex, 430 units in Ar-rantisy, and 580 units in Nasser Medical complex.

3.3 Study Period

The study was conducted over 18 months; from July 2020 till the end of October 2021. After the acceptance of the proposal, ethical approval and other administrative procedures were obtained. In April 2021, pilot study was conducted then data were collected until the end of June.

3.4 Study population

3.4.1 Population for the Quantitative Data

There are approximately 2612 nurses and 277 midwives (with a total of 2889) working at the GH in the GS (MoH, 2020).

3.4.2 Population for the Qualitative Data

Key Informants Interview as well as blood bank directors and hospital directors in the targeted three hospitals were the target population for the qualitative part of the study.

3.5 Sampling and Sample Size

In this study, three samples were drawn from the three selected hospitals in several steps; two convenience samples for the quantitative data and a third purposive one for the qualitative data. A convenience sample, which is called also accidental or incidental sample, involves choosing readily available people for a study. Unfortunately, there is no definite way to determine their representativeness. However; it has probably been the most frequently used sampling method in nursing research since it saves time and money (Nieswiadomy & Bailey, 2017).

The first convenience sample was used to assess nurses' knowledge regarding BT by completing a self-administered questionnaire. This sample included 400 nurses. The

researcher used a size calculator to determine the sample size for assessing nurses' knowledge of BT, and the following parameters were taken into accounts: the confidence level at 95% and the power of 80 %. The suggested sample size of cases was 340, but the researcher selected 400 participants for more representativeness (Annex 2). The 400 participants were divided almost proportionally; based on the number of nurses and the number of blood units transfused in each hospital. Therefore, the sample consisted of: 235 from Alshifaa ' Medical Complex, 70 from Ar-rantisy hospital and 95 participants from Nasser Medical complex. Table no. (3.1).

The second convenience sample included 100 nurses and was selected to assess their practice related to BT by filling an observational checklist by the researcher and another two data collectors. Both of these subjects were observed from: medical, surgical, obstetric, hematology, ICU, OR, Burn, IER and the dialysis departments; most of BT procedures are done there. Outpatient clinics and emergency departments were excluded at the beginning of the study, but due to the Covid-19 pandemic BT was allowed there; therefore, medical emergency departments were included in the study later. These departments were selected because most of the BT process are carried out there. The sample was divided using the same method as the 400 participants who were evaluated for their knowledge of BT. The 100 observations were divided into three groups: 58 from the Alshifaa ' Medical Complex, 18 from Ar-rantisy hospital and 24 from NMC. The distribution of the samples through the hospitals is shown in Table (3.1).

In addition to the previous two samples, a non-probability, purposive sample of twelve main managers was selected to dig more deeply and explore the theory-practice gap among nurses regarding BT and to determine barriers against optimal practice. Moreover, the presence of a local protocol for BT and the degree of adherence to it were assessed. The sample included: hospital directors, nurses' managers, blood bank directors and senior nurses in the three selected hospitals (four from each hospital).

Table (3.1): Distribution of Study samples over the targeted hospitals

Hospital Name	No. of questionnaires	No. of observational checklists	No. of Key Informants
Alshifaa' Medical Complex	235	58	4
Ar-rantisy Hospital	70	18	4
Nasser Medical Complex	95	24	4
Total	400	100	12

3.6 Eligibility criteria

3.6.1 Inclusion criteria for quantitative sample

Nurses and midwives who are qualified to participate in this study met the following criteria:

1. A minimum of an associate's degree in nursing or midwifery.
2. Working at one of the following departments/units at the chosen three hospitals:
   a. Medical departments which include (Internal Emergency Department (IED), Hematology, Thalassemia surgical, Internal Department, Intensive Cardiac Care Unit, Dialysis)
   b. Obstetric departments (Cesarean Department, Gynecology. Obstetric Intensive care unit, Neonatal Intensive unit)
   c. Surgical departments (Operating Room (OR), Burn, Orthopedic, Intensive care unit (ICU), General Surgical Department and Special Surgical departments)

3.6.3 Inclusion criteria for Qualitative part

Participants of the qualitative part of the study selected from the hospital directors, nurses' managers, blood bank directors and senior nurses in the selected departments at the targeted selected hospitals.

3.7 Study instruments

The researcher used both quantitative and qualitative approaches for data collection. Instruments used for the quantitative part included: a) a modified version of Routine Blood Transfusion Knowledge Questionnaire (RBTKQ) which was developed by Hijji (2012) and b) an observational checklist was developed by the researcher for assessing nurses' practice regarding BT based on WHO guidelines. Key Informants interviews were conducted for the qualitative part of the study.

3.7.1 Routine Blood Transfusion Knowledge Questionnaire (RBTKQ)

Questionnaires are unquestionably one of the most important sources of data collection. However, when creating a questionnaire, the researcher must ensure that it is valid, reliable and unambiguous (Zohrabi, 2013).

The researcher adopted the Routine Blood Transfusion Knowledge Questionnaire (RBTKQ) instrument, which was developed by Hijji (2012), to assess nurses' knowledge about BT. The instrument was modified and translated into Arabic to eliminate language barriers; two bilingual health care providers did the translation in addition to a professional translator. Then, it was back translated by another two bilingual health care providers to verify accuracy. The instrument was divided into two sections. The first section included ten items covering the demographic data: hospital, department, age, gender, qualification, specialization, years of experience, history of and need for training related to BT and frequency of BT during the last six months. The second section contains 67 questions designed to assess the knowledge among nurses about BT. In this section, a five-point Likert scale was used, where: 1= strongly disagree, 2= disagree, 3= don't know, 4= agree and 5= strongly agree. The section was divided into six domains: patient's preparation (9 items), blood pack collection (8 items), pre-transfusion initiation nursing responsibilities (10 items), post transfusion nursing responsibilities (17 items), nursing procedures associated with complications related to BT (17 items) and lastly policy related issues (6 items). For the Arabic and English versions of the instrument, please see Annex (4).

3.7.2 Direct Observational Checklist

Direct observation is a popular method for evaluating medical/health trainees and it is especially important in today's age of competency-based medical education (Andolsek &

Simpson, 2017). Direct observation of procedural skills identifies performance gaps and provides structured feedback (Lagoo & Joshi, 2021). Checklists are extremely useful tools. They are used as a clinical decision support system to organize important criteria and to help recall key steps and action items for specific situations and procedures. Checklist application has been shown to improve patient safety in medicine and nursing by standardizing procedures and ensuring that critical measures are not overlooked (Hale & McNab, 2015).

For this study, an observational checklist was developed by the researcher to assess the practical part based on international guidelines. The instrument was divided into two sections. The first section included ten items covering the demographic information of the participants; the same demographic data in the RBTKQ. The second section contained 46 items designed to assess the practice among nurses related to BT. The checklist divided the BT procedure into six domains: pre-transfusion (31items), during transfusion (6 items), actions to be done during transfusion reaction (6 items) and post-transfusion (3 Items); all designed to ensure safety of BT practice. The checklist is found in Annex (5).

3.7.3 key Informants Interviews

In Key informants Interviews ask a certain number of specific questions, but additional probes are encouraged using both closed and open-ended questions (Nieswiadomy & Bailey, 2017). This method enables the researcher to investigate participants' thoughts, feelings and believes about a specific topic and delve deeply into personal experience (DeJonckheere, & Vaughn, 2019). KII were conducted by the researcher with four key persons from each selected hospital for the qualitative part. The selected key managers at the targeted GH were interviewed in order to provide more detailed information regarding blood transfusion services, theory practice gap among nurses regarding BT, challenges facing nurses and any complications that might happen. This is besides assessing the presence and clarity of any protocols about the blood transfusion process. The researcher first collected demographic information about the participants and then asked about 10 open-ended questionnaires to assess the above-mentioned domains. Annex (6) shows guiding questions used in the interviews. Such collected data are compared across all responses in the study.

3.8 Scientific Rigor

3.8.1 Validity

Validity of an instrument "*concerns its ability to gather the data that it is intended to gather."* (Nieswiadomy & Bailey, 2017; p. 169). The more valid the instrument, the more the researcher is confident that it will answer the research questions. Instrument's validity can be tested from four aspects: face, content, construct and criterion (Nieswiadomy & Bailey, 2017).

3.8.1.1 Face and content validity

Face validity is achieved if the initial examination of the instrument reveals that it is adequate mean to obtain the needed data; so, it measures what supposed to measure (Nieswiadomy & Bailey, 2017). The goal of content validation is to assess the relevance of each domain of questions, the importance of each specific item and to determine whether the contents of the questions appear appropriate to the intended purpose and overall goal or not, as well as to ensure statistical consistency and the ability to properly analyze data*" It determines."the number and type of items adequate to measure the concept or construct of interest*." (Nieswiadomy & Bailey, 2017, p.196).

In this study, the researcher sent the modified translated RBTKQ and the checklist, as well as the study objectives, to ten different academic and senior nurses to validate the content of the instruments (Annex 8). Comparisons were made between their evaluations and recommended changes were done. Most comments were about the translation and the language rather than the content relevancy. Therefore, the estimate computed Content Validity Index (CVI) was 10. It worth to mention that the original RBTKQ instrument was in the form of multiple-choice questions; Six of the expert panel advised the researcher to change to a – point Likert scale.

The purpose of the content validity for Key Informants guiding questions is to determine the relevance and appropriateness of guiding questions (DeJonckheere & Vaughn, 2019). Health experts' feedback and comments were incorporated into a revised version of the guiding questions.

3.8.1.2 Criterion related validity

Internal consistency of the questionnaire is measured by a scouting sample, which consisted of six questionnaires, through measuring the Pearson's correlation coefficients between each paragraph in one field and the whole filed.

3.8.2 Reliability

Reliability of an instrument is *"the degree of consistency with which it measures the attributes it is supposed to measure*" (Niswiadomy & Bailey, 2017; p169). The normal range of Cronbach's coefficient alpha value is between 0.0 and + 1.0, where a higher value reflects a higher degree of internal consistency. If reliability coefficient was above 0.7, it is considered satisfactory, between 0.5 and 0.7 it is considered moderate and if less than 0.5 it is considered poor (Koo & Li, 2016). Cronbach's Alpha coefficient method was used to measure the reliability of the RBTKQ questionnaire between each field and the mean of the whole fields of the questionnaire. The Cronbach's Alpha score for the domains ranged from 0.530 to 0.949 whole instrument was 0.885. This range is considered high; this result ensures the consistency of the participant's responses. Table 3.3 shows the results of the reliability.

Table (3.2): Distribution of Cronbach Alpha Coefficient of the RBTKQ

No	Knowledge domains	No. of items	Cronbach's alpha
1.	Patient preparation for blood transfusion	9	0.630
2.	Blood pack collection	8	0.669
3.	Nursing activities pre transfusion initiating	10	0.601
4.	Nursing activities after initiating transfusion	17	0.800
5.	Transfusion complications	17	0.815
6.	Blood transfusion policy	6	0.939
7.	All	67	**0.885**

3.9 Ethical considerations

Prior to conducting this study, the researcher has obtained a permission from the original researcher (Annex 8). the researcher followed Al-Quds University's protocols for obtaining

approval to conduct this study. The researcher received approvals from the Helsinki Committee and the Palestinian Ministry of Health (Annex 3). The purpose of the study was explained to each participant prior to data collection and they were asked to sign consent forms before participating in the study. The researcher explained to the participants that a part of them will be observed later in the study; verbal consents were obtained. Participants were assured that their participation is entirely voluntary, that data would be reported anonymously and that confidentiality would be maintained. Because the questionnaire was anonymous, the data were saved on the researcher's personal laptop with assigned password. Participants were informed by data collectors that there would be no personal benefits or risks to participate in the study. Participants were assured about their right to refuse to answer any question or to withdraw from the study at any time without penalty. In addition, participants were assured that refusing to take part in the study would not jeopardize their employment.

3.10 Pilot Study

After translating the modified RBTKQ instrument and testing it for validity and before data collection, it was given to 40 nurses (selected randomly) who met the eligibility criteria in order to evaluate its clarity and to determine whether it was user-friendly and easy to understand or not. The following were investigated in the pilot study: (1) the length of time required to complete the questionnaire, (2) the easiness with which the instrument was used, (3) the clarity of the items as well as (4) suggestions and comments for change. Those nurses were excluded from the sample for the final data collection. There were no negative comments nor suggestions reported by the participants and the average time for completing the questionnaires was 15 minutes.

3.11 Data Collection

To ensure high quality data collection, two data collectors were trained on interviewing skills and on how to ask every question in order to standardize and harmonize the process of data collection.

3.11.1 The Quantitative Data: The RBTKQ Questionnaire

Self-administered RBTKQ questionnaires were distributed to nurses who met the inclusion criteria in the targeted departments of the selected hospitals over several shifts. Nurses were

asked to participate in an anonymous study on their own volition. All participants were informed about the study aim and were assured about confidentiality and anonymity. After agreement, they were provided with the questionnaire to complete it at their convenient time. The questionnaires were delivered to nurses without any identifiable labels to ensure anonymity. The researcher explained the questionnaire and clarified any ambiguities for the target group. If a nurse was unable to complete the questionnaire due to a heavy workload or was unavailable, the researcher and other data collectors returned to the department one or more times to encourage participation.

3.11.2 The Quantitative Data: Direct observation checklist

To assess the level of practice regarding BT among the participants, the researcher and two assistants were involved in direct observation of 100 nurses during BT process. In order to determine which departments are currently transfusing blood, the laboratories, in each hospital, were contacted in order to inform the researcher and her assistants about any current BT procedure. However, all participants were informed and consent that they may be observed in any time, so they will not change their behaviors during the BT process if they feel that they were observed. When the observed nurses was known he is under observation. The observers used the demographic data in the self-administered questionnaires to fill the demographic data in the checklists for the nurse who is observed during blood transfusion.

3.11.3 The Qualitative Data Collection: Key Informants Interview

After completing the quantitative data collection and analysis, qualitative data were collected to identify issues that arise from the findings (Polit & Beck, 2018). The interviews were conducted privately, using the Arabic language, in a convenient time and place to the interviewees. Each interview lasted between 30 and 60 minutes. During the interviews, notes were taken. All interviews were digitally recorded (after taking a permission from the interviewee) and then transcribed into verbatim.

3.12 Data Entry

3.12.1 Data entry for Quantitative Data

The data entry was done only by the researcher to her secured personal computer and were performed on daily basis. Before data entry, the questionnaires and checklists were coded

and were examined for any error or illogic values. Every questionnaire and checklist were assigned a serial number; so that, in case of doubt in data entry, the researcher can recheck the serial number again. After finishing the data entry, the researcher randomly choses 5% of the questionnaires and the checklists and double checked the accuracy of data entry. Furthermore, before data analysis, data were cleaned for any errors or illogic values.

3.12.2 Data entry for qualitative data

The audio-recorded interviews were firstly translated and then transcribed. Each interview was transformed into a word document to facilitate inferring the themes and subthemes. All data were entered to the researcher's personal computer of the researcher which is secured by password.

3.13 Data Analysis

3.13.1Quantitative Data Analysis

SPSS Statistical software version 23 was used for data analysis. Several tests were used for both descriptive and analytical statistics. Before analyzing the collected data of the questionnaires; the departments were recoded into three departments; medical, surgical and obstetric. The five-point Likert scale was transformed into correct or incorrect answers. All strongly agree and agree were considered correct and assigned value =1, otherwise (neutral, disagree and strongly disagree) were considered incorrect answers and assigned value = 0; some items were reversed. Similarly, in the checklist, the observed item was assigned the value = 1, while that wasn't observed was assigned value =0.

The questionnaire's validity and reliability were tested by the correlation coefficient and Cronbach alpha orderly. Descriptive analysis, in the form of measures for central tendency for continuous variables (such as age, years of experience and the number of BT done during the past six months) such as standard deviation and variances were used. Categorized data, such as gender, qualification, specialty, etc., were tabulated according to frequency distribution and percentage. For exploring correlations between continuous variables e.g., age and years of experience, Person correlation test was done.

ANOVA and t- test were used for analyzing relationship between categorical variables through the cross-tabulation method. Finally, correlation was used to examine the relationship between the total score of knowledge and practice.

3.13.2 Qualitative Data Analysis

The transcribed data were thematically coded and analyzed in order to discover emerging patterns and themes. Data from interviews were classified into four levels based on the type of participant. The data were then coded in order to identify themes and key findings for each level. Themes from each level were used to create an overall evaluation of transfusion process.

Chapter Four

Results and Discussion

4.1 Descriptive Analysis of Samples

4.1.1 Demographic and Professional characteristics of Participants for Knowledge Assessment

A total of 400 questionnaires were distributed; all of them were completed and returned with a response rate of 100%. Table 4.1 displays socio-demographic and professional information about respondents. The study showed that more than half of the participants were from Al-Shifa hospital (226; 56.5%) followed by those from Nasser Medial Complex (99; 24.8%), while the lesast participants were from Ar-rantisyhospital (75; 18.7%). The mean respondents' ages were 31 years with a standard deviation (SD) of 6.8 years. It ranges from 20 to 58 years old. These findings are similar to the results of several previous studies but younger than what had been found two studies from Western Kenya and Malaysia where the participants' means of age were 35.2 years ± 6.7 and 33.2 ± 8.4 (Kipkulei & Lotodo, 2021; Noor et al., 2021), and older than the mean age of the sample of Akyol (2019). Moreover, almost half of the paricipants (52.3%) were below 30; contrary to Abd Elhy & Kasemy (2017). This difference of results regarding age is justified, since Gaza society is considered a young one and it is congruent with the mean years of experience of the sample. The mean of the total years of experience was 6.5 (± 5.6) years; it ranges from 1 to 30 years. It is similar to the results of (Abd Elhy & Kasemy; 2017) but higher than results of Panchawagh et al. (2020) who indicted that around half of participants in their study had less than 1 year of experiences. Also, this result is much lower than the findings reported by Louw et, al, (2021) and Hendy et al., (2017), who reported means of 10 and 15 years of experience respectively. Again, the mean age of the sample is consistent with the mean of years of experience.

Table (4.1): Distribution of the study participants according to the socio demographic and Extraneous variables

Variable	Character	Frequency	Percentage
Age in years	25 or less	86	21.5
	26-30	123	30.8
(20-58)	31-35	111	27.8
	More than 35	80	20.0
Years of Experiences	3 or less	152	38.0
(1-30)	4-6	99	24.8
	More than 6	149	37.3
Gender	Male	179	44.8
	Female	221	55.2
Hospital Name	Al-Shifaa Medical complex	226	56.5
	Ar-rantisy Hospital	75	18.7
	Nassar Medial Complex	99	24.8
Qualifications	Diploma	115	28.7
	Bachelor of nursing	242	60.5
	Master's degree	43	10.8
Departments	Medical	176	44
	Surgical	170	42.5
	Gynecology	54	13.5
Specialty	Nursing	355	88.8
	Midwifery	45	11.2

The present study displayed that more than half of the participants (221; 55.2%) were females while males were (179; 44.8%). This result is in the same line with Silva, et al (2016), but lower than what reported by (Kipkulei & Lotodo, 2019; Hendy et al .,2017; Akyol (2019); Abd Elhy & Kasemy, 2017; Lee et. al., 2016) where female formed almost 75%-96 of the sample. Globally, nursing profession was female dominated while men are increasingly joining nursing profession as previous studies had shown (Zamanzadeh et al.;2013). This result could be explained by the similar nursing male-to-female ratio in GS. In spite that females were around half of the sample; midwives form only 11.2 % (45) of the total number of the participants and the remaining 88.8% (355) of the sample were nurses. This is logically explained since midwives are employed only in the obstetric departments, and goes with the ratio of nurses: midwives in the GHs. Approximately 60.5% of participants (242) have a Bachelor degree and about one-third of nurses holding a Diploma degree (115; 28.8%), while the remaining 10.8% (43) holding a Master's degree. This result is in agreement with (Louw, et al., 2021; Akyol (2019); Hijji et al.,2013), but not with studies

conducted in Malaysia, Nepal and Egypt which stated that the majority of participants were holder of Diploma degree (Noor et al., 2021; Abd Elhy & Kasemy, 2017; Saif -Alnasr et al, 2016). This is reasonable since the sample is in line with the percentage of Bachelor's and Diploma's holders in the GS (MoH, 2020). In addition, it is known that people in Gaza struggle for education as a tool for occupation resistance. In addition, the MoH tend to recruit bachelor degree more than diploma; especially that most wards in the study need highly qualified staff. More than 86 % of the total sample consisted of nurses from surgical and medical wards where blood transfusion is actively performed.

4.1.1.1 Participant's characteristics related to dealing with blood transfusion and training programs

Table 4.2 shows that the mean of frequency that nurses performed a blood transfusion during the last 6 months was 18.3 times ±26.7 and ranged from 5 to 300. These results are higher than the results of Bediako et. al., (2021) who reported that most of the participants had performed blood transfusion 6 -12 times in the last six months. Increasing blood transfusions usage is very expected due to the GS's political, social and economic conditions along with the prevalence of chronic and hematological disorders that need many blood transfusions monthly.

The findings of study illustrated that the majority of participants (315: 78.8%) had never received any training programs and only 85 (21.2%) nurses had participated during the last year in training programs related to blood transfusion. These results are congruent with (Bediako et al., 2021, Hijji et al., 2013). On the same line, several previous studies around the world (Noor et al., 2021; Panchawagh et al., 2020) reported deficiency in training related BT among their samples. However, Akyol (2019) claimed that 75% of their study participants attended training courses about blood transfusion; which was reflected in satisfactory blood transfusion practice.

The training programs received by almost all the participants (82; 96.5%) were conducted inside the hospital, 2.3% (2) nurses received training outside the hospital and only nurse (1.2%) had the chance to receive training in another country. This is explained by the 14-year-long siege imposed on the GS, where most Gazans were unable to travel abroad. Furthermore, the nature of work shifts and the poor economic situation make it difficult for nurses to attend courses outside their working areas. From another aspect, the results

revealed that higher domain (261;40.4%) nurses want to be trained in is the adverse reactions while the lower domain was sampling (57: 8.8%). This result differs than Louw et. al., (2021), who revealed the 81.7 % of nurses reported need for more training regarding the handling of RBCs and platelets. Moreover, analyzing the questionnaire reflected knowledge deficiency among nurses working at the GH related to blood transfusion complications; which explains this result. Inversely, the results of the questionnaire analysis are incongruent with the finding of the interviews. There was almost census about presence of on job training courses and programs for nurses related to the BT. However, there was inconsistency about the continuity of such courses and current existence. Some reported dependence of on job training, some negate presence of any current training courses. One of the nursing directors insisted that all the staff had received training about BT and the new protocol. But more than one interviewee reported discontinuity of such courses due to the Covid-19 pandemic. "Majority of nurses were received training concerning BT; there are several courses tailored for nurses and designed about BT. Some of these held here and some of them are held in a different hospital. However, courses stopped because of the emergency situation due to covid 19.".

Table (4.2): Distribution of participant's characteristics related to dealing with blood transfusion and training programs

Variable	Character	Frequency	Percentage
Frequency of transfusion during last six years (5-300)	Less than 10	277	69.2**%**
	10 or more	123	30.8**%**
Training	Yes	85	21.3
	No	315	78.8
Number of training program (1-5)	One	72	84.7**%**
	More than one	13	15.3**%**
Site of Training	Inside the hospital	82	96.5
	Outside the hospital	2	2.3
	Abroad	1	1.2
Specific area for further training	Sampling	57	8.8
	Collection of blood bag	99	15.3
	Administration of blood	61	9.4
	Adverse reactions	261	40.4
	Nursing care before, intra and post transfusion	74	11.4
	Others	95	14.7

Honestly, attention paid for BT related training was affected passively by the Covid-19 pandemic. The priority of the MoH and hospital management was shifted to confine the pandemic. This besides the emergency situation of duties where nurses working for continuous 24 hours, in addition to nurses shifting within the departments, make the training as a complementary task.

4.1.2 Descriptive Analysis of Qualitative sample

From the selected twelve managers and directors as well as supervisors and senior managers who were approached by the researcher for interviews, only 9 responded with a response rate of 75%. The sample consisted seven males and only two females, with age ranged from 42-56 year. The experience of the participants in the managerial positions range between 5-17 year. Three of them hold doctoral degree, five had master degree and only one had a high diploma. Among the respondents; three nursing managers, four supervisor and one blood bank director; one of them was the head of the BT safety committee Nasser Medical Complex.

4.2.1 The overall knowledge of nurses about blood transfusion

Based on previous studies, knowledge scores were divided into three categories: less than 50% indicates poor knowledge, 50%–74.9% indicates fair knowledge while scores of 75% and above (≥ 75 %) indicate good knowledge (Abd Elhy & Kasemy, 2017). The study results demonstrated that the overall mean score of nurses' knowledges was in all domains which considered a fair level; 43.5% of nurses had good knowledge in the all domains, 51.8% had fair knowledge and only 4.7% had poor knowledge. This is too much better than the level of knowledge of Egyptian nurses where 61.2% of them had poor knowledge (less than 50%) (Abd Elhy & Kasmey, 2017).

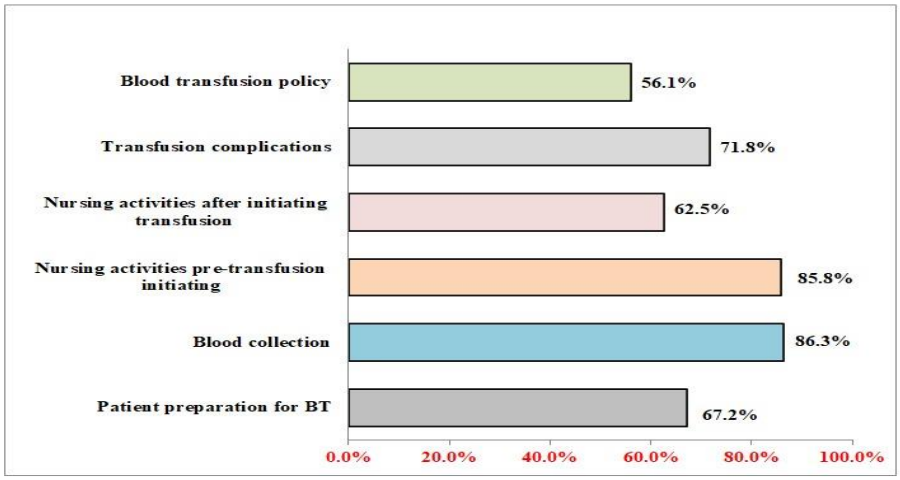

Figure (4.1): Distribution of study population according to knowledge Domains

The findings show that nurses' knowledge about blood collection had the highest score answers with a mean 86.3 ± 16.6 (350; 87.5% had good knowledge, followed by nurses' knowledge about nursing activities pre-transfusion initiating with a mean of 85.8 ± 19.1 (352: 88% had satisfactory knowledge). Knowledge about blood transfusion complications comes third, where the mean was 71.8± 15.3 (234; 58.5% had good knowledge) and then knowledge that attributed to the patient's preparation (128: 32%) with a mean of 67.2 ± 11.7. The lowest two scores were associated with knowledge regarding nursing activities after initiating transfusion (106: 26.5% had good knowledge) with a mean of 62.5± 13.5 and knowledge related policy (189; 47.3% had good knowledge) with a mean 56.1 ± 42.3.

The figure (4.2) verifies that nurses working at GH in the GS had fair to good knowledge regarding BT phases.

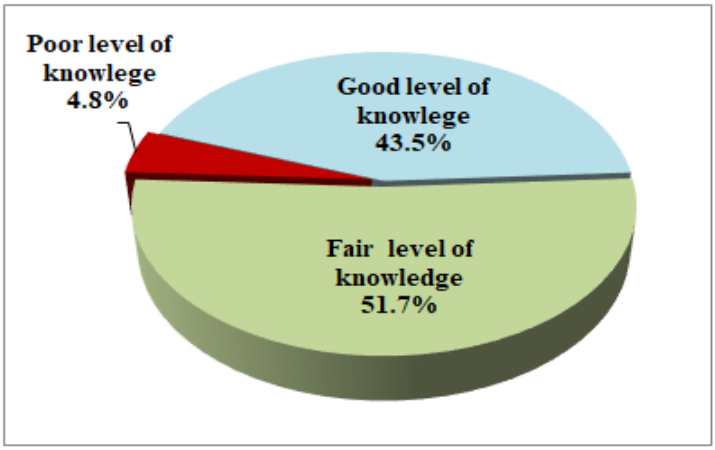

Figure (4.2): Distribution of study population according to knowledge levels

This implies that Gazan nurses had at least basic knowledge of how to perform routine blood transfusion procedure. This is consistent with several previous studies which revealed that nurses had moderate to good knowledge regarding BT (Noor et al., 2021; Encan &Akin,2019; Kavaklioglu et al.,2017; Lee et al., 2016).On contrary, several other previous studies, conducted over the world, have shown that nurses had poor knowledge regarding overall blood transfusion process (Abd Elhy & Kasemy, 2017; Hendy et al., 2017; Da Silva et al., 2017; Dubey, et al.,2013; Duarte et al., 2017;Tavares, et al., 2015; Hijji et al., 2010). Moreover, the results are higher than what had been reported by Panchawagh et al. 2020, except the domain of patient preparation where Panchawagh et al. reported that 66.7 % had good knowledge.

This result is not satisfying as what did the nurses' managers ascertain during the interviews. Almost all of interviewee expressed their satisfaction about the level of knowledge regarding BT among the staff. All of the nursing managers, supervisors and senior managers assigned very good to excellent. "My staff are knowledgeable about BT basics and about the signs and symptoms of reaction. In terms of knowledge, they are excellent."

Though, the mean of the general level of knowledge is considered fair to good, it may need to be improved to reach a higher level of 80%. Especially the domains in which knowledge levels were low, such as nurses' knowledge about patients' preparation for blood transfusion, nurses' knowledge associated with nursing activities after initiating transfusion and nurses' knowledge of nursing related to blood transfusion policy; need more attention.

4.3.1 Issues related patient preparation prior blood packs collection

This domain highlights the importance of preparing patients prior to blood collection, availability of intravenous access line, the appropriate time for assessing and recording (V/S), patient's consent and assuring of going of right blood to the right patient. The results, seen in table 4.3, revealed that highest scores of correct answers were devoted for the items related to measuring and recording the basal V/S 30 minutes before blood arrival and using large gauge cannula (381:95.73%; 380: 95% respectively). This results the degree to which nurses aware of the patient preparation, in terms of importance of measuring the V/S as base for comparison later when administering the blood and after finishing the infusion. However, in reality, 87% of nurse checked the basal temperature. only but less than 20% assessed the remaining V/S. Also, it shows their awareness about the technical part associated with large gauge cannula so that blood will flow smoothly without delaying or clotting. However, the

lowest scores of the correct answers went to the items about bringing the blood before administering prescribed premedication and the need for checking the IV patency before blood bag collection (31:7.8%; 46: 11.5% orderly). In reality, only 63% of the observed nurses checked the patency of the IV line using NS. Incongruently, Noor et al., (2021) and Hijji et al. (2012) reported that 53% of nurses said they would check the availability and patency of intravenous access lines after blood bag collection and 67% of them administer a prescribed premedication after blood delivery to the ward.

Table (4.3) Distribution of issues related patient preparation prior blood pack collection

No.	Issues related to patient preparation prior blood collection	Correct		Incorrect		Mean	SD	Rank
		freq.	%	freq.	%			
1.	Nurse must Check patency of IV access after blood bag collection*	46	11.5	354	88.5	0.12	0.32	8
2.	The nurse has to use large Gauge cannula to keep patent without complication	380	95	20	5	0.95	0.22	2
3.	Administration of prescribed drug should be given after Blood collection from blood bank*	31	7.8	368	92.2	0.08	0.27	9
4.	The nurse refuse to collect and administer Packed RBC IV due to incomplete blood order.	200	50.8	194	49.2	0.51	0.5	6
5.	The nurse should inform the patient reasons for transfusion	375	94.7	21	5.3	0.95	0.22	3
6.	The nurse must explain risks of transfusion for patient prior blood transfusion	360	90.9	36	9.1	0.91	0.29	5
7.	The nurse should explain side effects of blood transfusion for patient prior transfusion	37	93.5	26	6.5	0.93	0.25	4
8.	written or verbal consent must be obtained from patient prior initiating blood transfusion.	255	65.4	135	34.6	0.65	0.48	7
9.	The baseline vital signs be recorded before initiating the blood transfusion within 30 minutes	381	95.7	17	4.3	0.96	0.2	1
Weighted mean of responses						**67.2**	**11.7**	

*** Reversed items**

Nurses don’t pay a lot of attention for the issue of time here; they don’t recognize that changing of obstructed cannula or infiltrated one nor administering medication may postpone the blood infusion. Moreover, very high scores of correct answers were devoted for the responsibility of nurses to inform the patients about the reasons and expected risks of blood transfusion (375: 94.70%; 360: 90.91% orderly). This reflects how much nurses communicate with patients and keep them well informed about nursing procedures.

In order to administer blood safely, doctors should provide clear instructions or medical orders in order to appropriately address the patient’s needs. In event of an ambiguous order, the nurse must not collect and administer the blood or blood products but should seek for clarification. In our study, half of participants (50.76) would refuse to carry on an incomplete order for transfusion; which is better than other studies where 87-87.5 % of nurses would act on an incomplete blood transfusion request (Khetan et al., 2018; Hijji et al., 2012).

In terms of consent form, 65.38 % of participants (255) agreed that obtaining informed consent prior to a transfusion is important. This is lower than the result reported by Kavaklioglu et al. (2017) and Whitmore (2014) as 97% and 93.47% respectively. But it is too higher than Kafando et al. (2017) where only 5 % of the paricipants agreed necessity to obtain the patient’s consent before beginning the procedure. Based on the researcher’s experience at the GH no consent never been obtained before BT in the past. However, the interviewee in some hospitals, particularly, in Nasser Medical Complex, insisted that consent was recently introduced before BT. One of the BT Safety Committee’s members reported: "Recently we develop a new protocol about BT and we inform all the staff about it. Consent is an essential nursing responsibility before any BT procedure."

During her observation for the nurses’ performance, the researcher noticed that only 17% of them obtained patient’s consent before the BT procedure. Since the protocol is not activated in the three hospitals, it is expected to find a moderate portion of nurses are still unaware of the consent’ importance. But a gap between nurses’ knowledge and practice is tangible.

In summary, participants in the current study had a mean score of 67.2 ± 11.7 for patients’ preparation before blood transfusion, while only 32% had good knowledge. This go in the same line with Abd Elhy & kasemay (2017), but is lower than reports of Noor et al (2021) and lee et. al. (2016). On contrary, Hijji at (2012) all and Lehlimi et al. (2015) results indicated poor knowledge among Emirati and Moroccan nurses regarding patient

preparation before blood collection among most of participants. The results call the attention of decision makers for mor focusing on the issues consent form and obligation to check the IV-line patency, as well as administering of premedication before bringing the blood from the bank to the department. In addition, refuse to carry on incomplete order must be emphasized among nurses.

4.3.2 Issues related nurse's knowledge about blood packs collection

A glance to table 4.4 lightens nurse's knowledge regarding blood back collection which was comprised of 8 items. Almost all participants (384: 96.24%) indicated that the nurse should draw blood sample from the patient and correct matching with patient's information then send to laboratory (highest score), followed by 95.5% (381) emphasized the importance of comparing the patient's identification information with the written data on the blood request form and that are matched with the received unit (2^{nd} highest one). Unfortunately, all observed nurses in the study had remote check for the patients' information with the blood unite, but only 61% checked it at the bedside. However, the item about using validated blood transport box to transport blood from blood bank to the ward had the lowest score, as only 68% (272) of nurses answered it correctly, followed by the item about necessity of checking the blood unit by two nurses in the physician's absence; only 310 (78.1%) answered it correctly.

Table (4.4): Distribution of issues related nurse's knowledge about blood packs collection

No.	Issues related nurse's knowledge about blood collection	Correct		Incorrect		Mean	SD	Rank
		freq.	%	freq.	%			
1.	The nurse must prepare blood request in which physician request for intended transfused unit*	322	80.5	78	19.5	.81	0.4	6
2.	The nurse draws blood sample, identify patient information correctly, and sends it to laboratory	384	96.24	15	3.8	0.96	0.19	1
3.	The nurse must recognize the required type of blood products to administer to the patient, e.g., Whole blood, red blood cells, plasma and platelet)	374	93.7	25	6.3	0.94	0.24	4
4.	Nurse must cross match patient information with blood unit label and written blood request when blood unit was received to guarantee the right unit for the right patient	381	95.5	18	4.5	0.95	0.21	2

Table (4.4a): continued

5.	Nurse use a validated blood transport box to transport blood from blood bank to ward	272	68	128	32	0.68	0.47	8
6.	The physician should cross match blood unit label with blood request to ensure compatibility	377	94.3	23	5.7	0. 94	0.23	3
7.	In case of absence doctor, two nurses can cross match blood unit before it was given.	310	78.1	87	21.9	0.78	0.41	7
8.	In case of receiving (A+) blood unit for patient from blood bank, nurse notice the received blood unit was (A-). In this case, nurse must inform doctor and wait for his instructions.	331	83.6	65	16.4	0.84	0.37	5
Weighted mean of responses						**86.3**	**16.6**	

*** Reversed items**

In practice, no one brought the blood in a special box from the blood bank. Additionally, 374 respondents (93.73%) agreed that physician should check the blood unit information with blood request to ensure compatibility for the patient. Considering the blood group and Rhesus compatibility, our result showed high rate of correct answers regarding blood compatibility, 83.59% of participants (331) gave correct answered. This result is in contrast to the results of Lee et al. (2016) and Hijji et al., (2010). The current study showed that 87.5% of nurses have good knowledge with a mean of 86.3 ± 16.6 related to blood pack collection, which comprise method used to transport blood from blood bank, knowledge of basic ABO terminology and information needed to ensure collecting right blood from the blood bank. This result was in the same line with Abd Elhy & kasemay (2017), and Lee et al., (2016) who reported higher levels of knowledge among participants about blood pack collection; however, this study reflected too much better results. Incongruently, Hijji et al. (2013) reported poor knowledge in this domain especially regarding the blood group and Rhesus factor. It seems nurses working at the GH in the GS still have fresh information; they are still young and some of them had upgraded their study.

4.3.3 Issues related pretransfusion initiation nursing activities

Table 4.5 covers 10 items of the domain related to nurses' knowledge regarding pre-transfusion-nursing activities. The table shows importance of warming blood in certain situations and its methods as well as the importance of patient's identification after the blood pack collection. The highest score of correct answers were given to the item addressing the patient's identity verification as"the most important issue prior starting transfusion.", since

362 respondents (91.9%) answered it correctly and 32 (8.1%) respondents answered incorrectly. Other items regarding patient's identification before initiation the blood was answered correctly by 89% of the participants. This is not far away from the reality; all the nurses did the remote check at the station. However, only 61% repeated the check at the bedside before initiating the blood. As mentioned earlier, patients' verification prior transfusion is very essential to curtail risk and avoid errors. Incorrect patient's identification is the most common cause of incorrect transfusions; increasing blood transfusion-related mortality or morbidity (Harris et al. 2009). Therefore, nurses tolerate full responsibility for patient's identification as a core competency. The results showed that patients' identification occupied the highest priority among respondents. This result is higher than Bediako et al. (2021) who reported that only 62% from participants cross check patient identity in proper manner. Contradictorily; (Hijji et al. 2012; Saillour-Glénisson et al. 2002; Parris and Grant-Casey 2007) reported nurses' failure to complete patient identification task.

Table (4.5) Distribution of issues related Pre-transfusion initiation nursing activities

No.	Issues related Pretransfusion initiating nursing activities	Correct		Incorrect		Mean	SD	Rank
		freq.	%	freq.	%			
1.	Blood unit must warm in certain cases such as exchange blood transfusion in infants	359	89	40	10	0.9	0.3	**6**
2.	The blood unit must be warmed at designated device	364	91.5	34	8.5	0.91	0.28	**2**
3.	Blood unit must be warmed in emergency blood transfusion	261	66.1	134	33.9	0.66	0.47	**10**
4.	Nurse should warm blood unit in hypothermic patient	334	85.6	56	14.4	0.86	0.35	**7**
5.	When blood unit arrives at 4 p.m., the most appropriate time for blood transfusion is 4:10 p.m.	308	78.6	84	21.4	0.79	0.41	**9**
6.	The nurse start transfusion immediately after blood bag collection in the ward	334	84.1	63	15.9	0.84	0.37	**8**
7.	The most important issue is to verify patient identity prior starting transfusion	362	91.9	32	8.1	0.92	0.27	**1**
8.	The nurse patient identifies correctly prior initiating blood transfusion by asking the patient to tell his or her name if possible	355	89.2	43	10.8	0.89	0.31	**5**
9.	Steps are taken to identify patient's identity, the nurse matches patient's identification information with blood unit label, the identification band and the request form at bedside checkup.	356	89.4	42	10.6	0.89	0.31	**4**
10.	The suitable filter size of transfusion set is (170-200 micron).	356	89.7	41	10.3	0.90	0.30	**3**
Weighted mean of responses						**85.8**	**(19.1)**	

***Reversed Items**

The second highest rank of correct answers was devoted for the item talking about warming blood using a specific device with correct answers of 91.5 % (364). Other items related to warming blood were answered correctly with percentages of 89%, 85% and 66%. This is satisfactory, since increasing risk of bacterial proliferation is a recurring theme in this phase. However, the findings showed that knowledge regarding" blood unit must be warmed in emergency blood transfusion." was the lowest rank as evidenced by (261: 66.1%). This is expected; most nurses don't use any special device for warming blood in the departments. Special devices are available only in the ICUs. Several studies revealed inconsistent results as nurses had poor knowledge (25-36%) regarding warming blood (Jogi et al., 2021; Noor et al., 202; Louw et al., 2021; Japheth et al.,2020). Moreover, Louw et al (2021) and Hijji et al (2012) indicated that nurses warmed blood by invalid techniques by wrapping either in clothing or standing at room temperature before transfusion. Though these methods of warming are not recommended because they may promote bacterial growth. Nurses should never use hot water or microwave to warm blood since this can cause hemolysis which may be fatal (Hijji et al., 2012).

The second lowest score was the item regarding the best time to administer blood is 10 minutes after its arrival; which was answered correctly only by 308 (78.6%) (Table 4.5). Unluckily; only 63% of nurses administered blood within 10-30 minutes after its arrival to the department. Usually, the work burden on nurses in Gaza keep them busy; initiation of blood may be delayed. From a different aspect, 89.7% (356) of participant reported their ability to detect the suitable filter size of the blood infusion set: unlike the only 36% Malaysian nurses who were able to do that (Noor et al., 2021). Again, our nurses are relatively young and still have fresh theoretical background related to patient preparation before BT. In summary, the mean score of this domain was 85.8 ± 19.1, where 88% of nurses have good knowledges. This is higher than Lee et. al. (2016).

4.3.4 Issues related to nurses after initiating blood transfusion

Table 4.6 reflects the results of the domain regarding nurses' activities after initiating blood transfusion' which contains 17 items. From the initiation of BT to the end, key nursing.

Table (4.6) Distribution of knowledge of nurses after initiating blood transfusion

No.	Knowledge nursing activities after initiating transfusion	Correct		Incorrect		Mean	SD	Rank
		freq.	%	freq.	%			
1.	The nurse routinely must set up flow rate of blood (regulating the infusion rate)	357	89.70	41	10.30	0.90	0.3	4
2.	The nurse must document information related blood unit initiation and patient's vital signs on patents record	373	93.7	25	6.3	0.94	0.24	1
3.	The nurse primes transfusion set with normal saline solution	253	64.1	142	35.9	0.64	0.48	12
4.	The flow rate of blood unit was regulated by manual or electronic infusion pump	307	77.9	87	22.1	0.78	0.42	7
5.	The initial rate of blood unit infusion for adult do not exceed 120 ml/ hour	15	3.9	374	96.1	0.04	0.19	17
6.	Maximum duration for completing blood transfusion is not exceed 4 hours	307	77.9	87	22.1	0.78	0.42	8
7.	The rate of transfusion for adult patient should not exceed 50 ml/hour throughout transfusion process*	55	14	339	86	0.14	0.35	15
8.	In case of continuous transfusion, the maximum duration for blood transfusion set usage is 4 hours	302	76.5	93	23.5	0.76	0.42	9
9.	Blood transfusions should be administered slowly for cardiac and severe anemic patients	357	90.8	36	9.2	0.91	0.29	3
10.	Normal saline 9% solution could safely mix with blood unit during transfusion	280	71.4	112	28.6	0.71	0.45	10
11.	Ringer lactate solution could safely mix with blood transfusion unit*	155	39.7	235	60.3	0.40)	0.49	13
12.	Morphine 0.1mg / mL may be given with blood transfusion unit	144	36. 5	250	63. 5	0.37	0.48	14
13.	The blood unit transfusion started at 2:00 PM and completed at 5:00 PM. The recorded of the patient's vital signs should start in the first hour at 2:05 and 2:15*	321	81.3	74	18.7	0.81	0.39	5
14.	The blood unit transfusion started at 2:00 PM and completed at 5:00 PM. The recorded of the patient's vital signs should start in the second hour 3:15	318	80.3	78	19.7	0.80	0.40	6
15.	The blood transfusion started at 2:00 PM and complected at 5:00 PM. The recorded of the patient's vital signs should start in the first hour at 4:15	253	64.2	141	35.8	0.64	0.48	11
16.	the nurse should observe the patient for any possible blood transfusion reaction in the first 10-15 minutes	366	92.4	30	7.6	0.92	0.26	2
17.	In case of 4-month-old infant, the rate the first 15 minutes should not exceed 100 ml/kg/hour*	34	8.7	358	91.3	0.09	0.28	16
	Mean of responses					**0. 62**	**(13.5)**	

***Reversed items**

activities include: regulating the flow rate of blood, documenting relevant information such as V/S and monitoring patients for the transfusion reaction. Of the correct answers, the highest score went to the item addressing the importance of documenting patient's information particularly V/S (373: 93.7%), followed by the responsibility for patients' monitoring for any complications during the first 10-15 minutes (366: 92.4%). Evidence highlighted the importance of patients' monitoring during transfusion, as it allows for early detection and correction of pathophysiological effects and severe transfusion reactions, such as acute hemolytic reaction and (TRALI) (Reis et al.,2016). As mentioned above, 81.27%, 65.66% and 64.47% of participants respectively knew the frequency of V/S's measurement during the transfusion process. These results are lower than Kipkulei &Todto (2019) 80% of the sample gave correct answers but away from Hijji et (2012) al where 90% of the participants were unsure about the frequency of recording V/S for transfused patient. More after, best transfusion practices recommend that the patient's V/S should be observed before starting the transfusion, as soon as the transfusion is started, 10-15 minutes after the onset of transfusion, at least every 30 minutes during transfusion, on completion of transfusion and four hours after completing the transfusion. Moreover, it was realized that approximately one-third of participants did not recognize the time for measuring V/S after initiating blood transfusion; congruently with (Sapkota et al., 2018; Lee et al,.2016; Hijji, et al.,(2010). Our results contrast the results of Dos Santos et al., (2021), as the study findings showed that none of the Brazilian nursing professionals complied with the recommendations on patient follow-up within the first ten minutes of blood component infusion nor checked or recorded his/her V/S as recommended. Despondently; only 19% only of nurses in the real situation checked the V/S and not more than 3% remained with the patient during the first 15 minutes. However, some head nurses emphasized that nurses check all the V/S periodically during the BT and stay with the patient till the first 15 minutes pass without any problem. In spite of that nurses in GS have good knowledge regarding keeping at the bedside during the first quarter of hour and measure the V/S after 15 minutes, most of them don't comply with standards. This is rationalized; nurses' shortage where two nurses caring for more than 30 patients making this matter is impossible. This reflects a kind of huge gap between knowledge and implementation.

Moreover, 90.8% (384) of nurses knew that blood transfusions should be slow in patients with heart disease and severe anemia. Unluckily, only 15 nurses (3.9%) answered the item about the maximum initial regulating rate for adults correctly, and just 34 (8.75) knew the

initial infusion rate for infants (The lowest scores). Another worse score was associated with regulation of blood rate through the whole process (55: 14%). The findings reflected knowledge deficiency among nurses regarding the initial drop rate and the regulation of the blood till the end. Although 71.4 % of the nurses (280) knew that normal saline could be mixed by blood safely. Practically, none of the observed nurses in this study ensured NS as main line. Both results are too lower than results gotten by Noor et al., (2021), where 91.5% identified normal saline as safe fluid to be mixed with blood. In addition, only 39.7% (155) figured that ringer lactate couldn't be mixed with blood absolutely. The item addressing nurse's knowledge about possibility of mixing morphine 1.0 mg / ml in saline with a unit of blood transfusion was among the lowest rank, as only 36.5% of nurses (144) answered it correctly.

Away from that, nurses showed a huge deficiency of their knowledge regarding the regulation of the blood for both adults and infants, as well as the fluid and medication compatible with blood. These results shed the light on the areas than nurses need more training in it. In addition, equipping the department with electronic infusion pumps may help nurses to regulate the blood at proper flow rate initially and through the whole procedure; nurses may find it difficult and time consuming to regulate the blood manually.

The current study revealed 26.5 % of study sample had good knowledge concerning nursing activities after transfusion initiation while 56.5 % had fair level and only 17% of nurses had inadequate knowledge with a mean of 62.5±.13.5, the result is relatively similar to Noor et al., (2021). However, it is better than findings of Bediako et al (2021) in which the mean score of correct answers was only 18% amongst registered nurses with respect to knowledge with regard to nursing responsibilities after initiation of blood transfusion. Efforts are required to improve the nurses' level in this domain particularly.

4.3.5 Issues related to transfusion adverse reactions

To lessen the risk of a transfusion reactions, the nurse must administer compatible blood within 4 hours of receiving it from the blood bank, avoid transfusing incompatible solutions with blood and immediately stop transfusion if signs and symptoms of any reaction are observed. Table 4.7 illustrates the results of the 17 items related to the transfusion complications domain. The highest scores of correct answers were associated with the immediate actions if allergic reaction occurs including: blood stoppage with notifying the physician, calling the physician with preparing emergency equipment and measuring of V/S

after stoppage the blood (365; 91.71%, 352; 89.11%, 351; 88.9% of participants answered correctly in order). In addition, 88.7% of nurses (352) agreed that administering compatible blood unit could minimize the risk of developing reaction. This appears consistently with the clinical observation and with the reports of the interview.

Table (4.7) Distribution of issues related to transfusion adverse reactions

No.	Issues related to related transfusion adverse reaction	Correct		Incorrect		Mean	SD	Rank
		freq.	%	freq.	%			
1.	Administration compatible blood unit could minimize the risk of developing reaction	352	88.7	45	11.3	0.89	0.32	4
2.	Starting blood transfusion after 20 minutes after receiving from blood bank to minimize the risk of developing reaction*	51	12.8	347	87.2	0.13	0.33	17
3.	Administering blood unit to the patient within 4 hours after collection could reduce risk of acute transfusion reaction	306	77.3	90	22.7	0.77	0.42	13
4.	Not combining drugs or solutions that are incompatible with blood minimize the risk of developing reaction	341	85.9	56	14.1	0.86	0.35	6
5.	Tachycardia indicates patient is developing hemolytic transfusion reaction	325	82.1	71	17.9	0.82	0.38	8
6.	Chest pain indicates patient is developing blood transfusion reaction	343	86.8	52	13.2	0.87	0.34	5
7.	Hypotension indicates patient is developing blood transfusion reaction	317	80.3	78	19.7	0.80	0.40	9
8.	Nausea and vomiting indicate patient is developing blood transfusion reaction	315	80.2	78	19.8	0.80	0.40	11
9.	The Immediate measures to be taken in the event of symptoms allergic reaction is to stop blood immediately and take vital signs	351	88.9	44	11.1	0.89	0.31	3
10.	Keep vein open with 0.9% normal saline in case of blood transfusion reaction	267	68.1	125	31.9	0.68	0.47	14
11.	In serious hemolytic reaction occurs during a blood transfusion, the nurse must write an Incident Report.	335	84.2	63	15.8	0.84	0.37	7

Table (4.7a): continued

12.	The nurse must inform the physician in case of blood transfusion reaction and prepare emergency medication and give as doctor instructions	351	88.9	44	11.1	0.89	0.32	2
13.	Due to an emergency situation, a unit of blood collected at 8.00 PM was kept in the nurses‟ station until 9:30 pm nurse start transfusion immediately and finish within 2 ½ hours *	59	14.9	337	85.1	0.15	0.36	16
14.	Urticarial rash is the expected usual complaint of a patient with mild allergy of a blood transfusion	318	80.3	78	19.7	0.80	0.40	10
15.	In severe allergy reaction of a patient receiving blood, the first nursing response stop the blood transfusion and inform the doctor.	365	91.7	33	8.3	0.92	0.28	1
16.	The most common cause of the most fatal transfusion reactions is an error in patient identification.	315	79.5	81	20.5	0.80	0.40	12
17.	If the nurse knows the patient clearly administer blood without check patient's details at the bedside. *	100	25.2	297	74.8	0.25	0.43	15
Mean of responses						0.71	0.15	

***Reversed items**

At observation, 85.7% complied perfectly with the previous standards to intervene when BT reaction exists. According to the reports of one of the head nurses: Nurses and midwives in my department know very well how to act in case of adverse reaction happiness. They know to stop blood, open NS widely, call the Dr and to return the unit to the bank. ". On the other hand, the lowest scores of correct answers were associated with the time of administering blood after arrival. Only 51 participants (12.8%) agreed that administering blood after 20 minutes minimizes complications occurrence (lowest score). In addition, only 14.9% (49) refused to administer blood after being kept at the nursing station for one and half hour (2nd least). The 3rd low-scored item was about administering blood without checking the patient's details at the bedside, in case the nurse knows the patient clearly; only 25.4% (100) answered

correctly. The item "Keep vein open with 0.9% normal saline in case of blood transfusion reaction." was answered correctly by 267 nurses (68.7%) only.

The current study highlighted that almost two third of respondents (58.5%) had good knowledge regarding complications related to blood transfusion; 33 % had fair level and only 8.5% had poor knowledge. Actually, adverse reactions and complications, as reported by nurses, got the highest score as they would like to receive more training in; 20.9 % of nurses. In the same line, a study found that a majority of their participants had satisfactory knowledge of appropriate transfusion monitoring and required action in the event of transfusion reaction (Yaghoobi et al., 2014). On the other hand, our finding is inconsistent with (Bediako et al., 2021; Abd Elhy & Kasemy, 2017; Lahlimi et al 2015; Nunes da Silva (2017) who demonstrated approximately 58%,70% of study participants had inadequate knowledge about appropriate nursing care in the event of a transfusion complication (orderly). It is worth to mention that half of nurses refused to keep the blood at the nursing station for a long time; inconstantly with Lehlimi et al. (2015). Clearly, keeping blood unit at the station helps bacterial reproduction. Nurses act as safety valves for the patients; patients' safety during BT relies mainly on nurses' theoretical and clinical competence. Being inadequately knowledgeable regarding complications related to blood transfusion, would jeopardize patient's safety. Moreover, nurse who is capable of recognizing and successfully managing an emergent hemolytic transfusion reaction make a difference in a patient's life. Thus, focusing on BT reactions as priority areas for more training is crucial.

4.3.6 Issues related transfusion policy

Table 4.8 displays knowledge regarding BT policy; the domain consists of six items. The results showed that the item about presence of a written policy for BT in the hospital had the highest correct responses (252: 63.3%), followed by the items about availability of administrative follow-up to monitor the implementation of the policy in both the hospital and the departments; both got the same rank with 56.57% of responses (224). However, the nurse's knowledge about availability of written policy in the ward regarding BT got the least score of correct answers (207: 52.67%). The findings revealed that 47.3 % of nurses have good knowledge regarding policy for blood transfusion, while 13.3% had fair knowledge with a mean score 56.1% ± 42.7. Our results, which is similar to Bediako et al (2021) it terms of awareness of the policy presence, but only 7% of nurses there had read the policy.

Table (4.8) Distribution of Issues related to blood transfusion policy

No.	Knowledge related to blood transfusion policy	Correct		Incorrect		Mean	(SD)	Rank
		freq.	%	freq.	%			
1.	There is a written policy for blood transfusion in the hospital	252	63.3	146	36.7	0.63	±0.48	1
2.	I have read and familiarized with the policy of the hospital regarding blood transfusion	223	56.3	173	43.7	0.56	±0.5	2
3.	Administrative follow-up is available to monitor the implementation of the hospital policy on blood transfusion	207	52.7	186	47.3	0.53	±0.5	6
4.	There is written policy in the ward regarding blood transfusion	218	54.9	179	45.1	0.55	±0.5	4
5.	I have read and familiarized with the policy of the ward regarding blood transfusion	223	56	175	44	0.56	±0.5	3
6.	Administrative follow-up is available to monitor the implementation of the ward policy on blood transfusion	211	53.3	185	46.7	0.53	±0.5	5
Weighted mean of responses						**561**	**42.7**	

The results are lower than findings of several studies (Noor et al., 2021; Lee et al.,2016; Hijji et al. 2012), where 75%-90% of nurses were aware of availability of blood administration policy in their wards and hospital, but higher than and Hendy et al., (2017) where 92% and 63% of participant were unaware of the availability of policy in hospital or didn't read it if present. Policy is produced to state standards, manage risks and improve the quality of care to patients in relation to blood products transfusion. Hall (2014) argued that the BT policy aims to inform and guide healthcare professionals who are involved in the transfusion process of safe transfusion practice. Nurses who are aware of their ward's blood administration policy perform significantly better than those who aren't aware. This may indicate that nurses are aware of the importance of the main purpose of blood transfusion policy which ensuring that the right patient receive the right blood component at the right time. Mohammed (2014) asserted lack of awareness about the importance of such issues due to lack polices in the hospital. The findings of the interviews showed a kind of contradictory among the reports of respondents regarding presence of BT related policy. The nursing managers and head nurses from one hospital asserted presence of BT- related policy. The nursing manager at one hospital said:"Two months ago, we distributed a written policy regarding BT in every department. We met head nurses and explain the policy in detail with

them. The policy is comprehensive and covers every aspect in the process; it tackles how to deal with BT request, the issue of double check and how to behave in case of reaction. It insists also to contact the blood bank in each case of reaction and to return the blood unit for them. We emphasized the importance of checking all the V/S. Any one doesn't adhere to the policy will be penalized.

4.4 Differences of Knowledge based on Nurses' Characteristics

In this part, the researcher explored any differences in the nurses' level of knowledge due to nurses' characteristics. The results in table 4.9 revealed that there was no significant difference of knowledge level in terms of gender (p value = 0.126), specialty (p=0.344) qualification level (p value = 0.156), different hospitals (p value = 0.095), different departments (p value= 0.265) and number of received training programs (p value = 0.344). In addition, the results denied any statistically significant effects of age, years of experience and number of blood transfusion done during the last 6 months (p value= .34; p= .355; p value = .268) orderly. Remarkably, exposure to previous training was significantly associated with better knowledge (p = 0.013). Moreover, the findings showed that the demographic information of the participants had no effect on knowledge, except having previous training programs. These results agree with Panchawagh et al. (2020) who denied any effect of age on the nurses' knowledge but disagree with (Noor et al. 2021; Abd Elhy & kaseamy 2017). Regarding the negative effect of years of experience on the level of knowledge among nurses working at the GH, the findings are more likely to previous studies (Noor et al., 2021; Bediako et al., 2020; Reza et al., 2009), but not to the result of Dubeyet al., (2013) who reported that knowledge among those with more experience was significantly higher than those who have less experience. Although **(**Panchawagh et al. 2020; Roe et al., 2013) reported a significant effect of experience on the level of knowledge; more precisely best knowledge was observed among nurses with experience 1-5 years only. After a long time of experience; nurses may tend to forget some of the basic information. More clearly, under normal circumstances the more years of service corresponds to a greater age, and years of service are comparable to experience level**.**

Table (4.9) Distribution of Knowledge level based on Nurses Characteristics

Categorical independent variable	freq.	Mean	SD	t	f	P-value
Age (years)				-	1.12	0.34
25 or less	86	0.71	± 0.09			
26-30	123	0.70	± 0.10			
31-35	111	0.72	± 0.13			
More than 35	80	0.72	± 0.11			
Experience in years				-	1.038	0.355
3 or less	152	0.71	± 0.10			
3-6	99	0.70	± 0.14			
More than 6	149	0.72	±0.10			
Number of BT during last 6 months				1.110	-	0.268
Less than 10	277	0.72	±0.11			
10 or more	123	0.70	±0.11			
Hospital name					1.5	0.095
Al-Shifaa hospital	226	0.71	±0.79			
Al-Rantsei Hospital	75	0.71	±0.10			
Nasser Medial Complex	99	0.71	±0.15			
Departments						
Internal medicine	176	0.70	±0.12		1.3	0.265
Surgical	170	0.73	±0.11			
Gynecology	54	0.70	±0.09			
Gender						
Male	179	0.72	±.10	0.016	-	0.126
Female	221	0.7	±0.12			
Qualification						
Diploma	115	0.69	±0.13		1.5	0.156
Bachelor degree	242	0.72	± 0.10			
Master degree	43	0.71	± 0.11			
Nursing Specialty						
Nursing	355	0.71	±0.11	1.1	-	0.344
Midwifery	45	0.7	± 0.10			
Training program related to blood transfusion						
Yes	85	0.74	± 0.1	4.6	-	0.013*
No	315	0.71	±0.11			
Number of training programs nurses have participated during the last year						
One	72	0.75	± 0.08	0.800	-	0.344
Two and more	13	0.78	± 0.7			

From a different aspect, Lee et al, (2016) and Akyol (2019) agreed with our result regarding absence of significant relationship between number of BT performed and the knowledge level; however, Noor and colleagues (2021) as well as Abd Elhy & kaseamy (2017) claimed that nurses who performed (1-4) blood transfusions in last six months had significantly higher blood transfusion knowledge scores. Considering the negative effect of gender difference on the nurses' knowledge; the result is consistent with Dubey et al., 2013) but not with (Abd Elhay & Kaseamy, 2017).

A higher level of education usually indicates more knowledge (Abd Elhay & Kaseamy,2017). However, in the current study and the study conducted by Lee et al; (2016), this is not the case. This may be interpreted because of good academic preparation offered at nursing colleges in the GS at the lowest level of qualification, and that most participants are still young and have ability to memorize information.

As mentioned above there was no statistically significant differences in the level of knowledge among nurses working in the different three hospitals or in the different departments. This goes with Noor et al (.2021). However, it doesn't go with Hijji et al., (2013) who found different level of knowledge associated with the hospital variable and with Panchawagh et al. (2020) who reported a significant difference in the level among nurses working in different departments; nurses working at the ICU departments had a significant higher level of knowledge more than counterpart's nurses. Interestingly, nurses who got training programs have better knowledge than those who didn't receive any training (p= 0.013). This is very logical result. Noor et al. (2021), Akyol (2019) and reported a noticeable enhancement in the level of nurses; knowledge about BT after training programs. However, Bediako et al. (2020) denied any effect of training on the nurses' knowledge related to BT.

Precisely, this study reflected that only 43.5% of nurses had good knowledge related BT and 51.8% had a fair level. Reversely, Hendy et al reported that 70% of Egyptian nurses had unsatisfactory level while Bediako et al (2020) claimed that the more than half nurses responded below the mean which was 29. In addition, Lahlimi et al (2015) and Goodnough et al., (2013), revealed that only one-quarter Australia and Moroccan nurses had adequate knowledge about transfusion reaction manifestations. Thus, nurses working at the GH in the GS got better knowledge; with some attention and efforts from the MoH and the academic institutions, nurses' BT associated knowledge could be improved to an excellent level.

4.5 Nurses' Peri Blood Transfusion Practices

The table 4.10 summarizes the frequency distribution and weight means for all domains of practice. The obtained scores of nurses' practice was ranged from zero to one; one equal 100%. The results showed that nurses' scores ranged from 40% % to 83%. Results demonstrated that no one reached perfect performance. Based on previous studies, the researcher was divided practice scores into three categories: less than 50 % indicates poor.

Table (4.10): Distribution of nurses' Peri Blood Transfusion Practices

Practice of nurses	Min	Max	Mean	SD	Satisfactory75% and higher		Fair50% - 74.9%		Poor Less than 50%		Rank
					freq.	%	freq.	%	freq.	%	
1. Pre-procedure	29	90	57.4	.14	25	25.00	38	38.00	37	37.00	3
2. Intra-procedure	33	83	57.8	.15	0	0.00	45	45	55	55.00	4
3. Intra-procedure with reaction	00	100	85.7	.37	6	85.7	0	0	1	14.3	1
4. Post-procedure	33	100	59.7	.24	19	19.00	40	40.00	41	41.00	2
Total mean of all domains	40.0	82.5	57.4	10.2	9	9	60	60	31	31.00	

practice, 50% - 74.9% indicates fair practice and 75% and more relates to positive practice (Hendy et al., 2017). Two thirds of nurses (60%) working at the GH in the GS reflected fair practice; only 9% showed a satisfactory level of performance related BT. The total mean of performance was 57.4%. This result is much better than the results got by Hendy et al (2017) and Saif- Alnasr and his colleagues (2016) where 80% and 73.9% of Egyptian nurses (respectively) showed unsatisfactory performance. It is also greater than Bediako et al (2021), Majeed at al., (2020), Sapkota et al., (2018) and Hijji et al., (2010) where the nurses' practice during BT was poor. Hijji et al (2010) emphasized that three quarters of nurses scored below the 50% level. Nevertheless, this is not the picture reflected by the selected senior nursing mangers at GH in the GS. Most of them insisted that the nurses' performance is perfect and may be better than knowledge level.

One of nursing directors declared: "My staff, here in the oncology department, are well trained. We have several experiences. We detected some mistakes of the blood bank and we

checked with them any unclear labels or information. They are well knowledgeable. My staff are excellent in knowledge and perfect in practice."

Again, the objective data the researcher got differs than the subjective reports of the interviewee. It seems that head nurses and nursing manager relies on their personal opinions rather that a scientific measurable tool in their judge, there are several essential steps omitted by nurses and jeopardize the correction of the procedure and may negatively affect the patient's safety during BT.

4.5.1Nurses' practices regarding pre blood transfusion

A glance to Table 4.11 displays that the domain of nurses' practice before BT was comprised of 31 items. The results revealed weight mean of 57.4 ± .14. The researcher observed that all the nurses reflected satisfactory practice in terms of patients' identification, checking the order and checking the result of hemoglobin level. Almost all of observed nurses (97%) checked IV availability before bringing the blood, while 63% checked patency of access. These results are congruent with the results of nurses' knowledge assessment related these issues.

These findings are better than the results of Majeed et al. (2020) where only 30% of nurses checked the availability of IV access and 37.5% checked its patency in order. In addition, this study disagrees with Sapkota. et al. (2018), where only 16.5% of nurses in Nepal did that. However, "Ensure Normal Saline as mainline IV." And "Transport blood pack to the ward with special box."; those two items got zero score. These items also got bad score in the knowledge assessment. The researcher observed no special boxes for blood transfer from the bank, Moreover, patients' relatives are mainly responsible for bringing blood from the bank. In the same line, (Majeed et al., 2020; Sapkota. et al. 2018; Hijji et al., (2010) claimed that mostly, patients' relatives brought blood with bare hands without any box or cover; only 14% of nurses reported by Majeed brought blood in a special box. In more details, participants' performance was very poor in the areas of: patients' assessment for history of allergy during previous BT, obtaining a consent for transfusion, check for patients' blood group and assess the reason for BT were performed in a percentage lower than 20%. On the same line, Khetan et al., (2018) claimed that minority of nurses took the patients' consent, however Majeed reported the opposite results.

Unfortunately, not more than 63% of nurses washed their hands and only 12% of them done gloves before the administration. This study agrees with Henedy et al., (2017) and Hijji et al., (2010) who stated that the majority of Egyptian and Emiratis nurses had insufficient practice scores in terms of aseptic hand washing and wearing sterile gloves before

transfusion, as well as Fernandez et al., (2014). However, (Majeed et al; 2020; Göktaş Baltac et al. 2017; Hafez, 2012) reported that 60 % of the nurses washed their hands before the transfusing blood and 74 % wore gloves.

Table (4.11): Distribution of Nurses' practices regarding pre blood transfusion

No.	Pre- transfusion procedure	Done		Not done		Rank
		freq.	%	100	%	
1.	Identify the patient	100	100	0	0	1
2.	Check for Physicians order for type of blood unit	100	100	0	0	1
3.	Check for patient ID	100	100	0	0	1
4	Check the result of level of Hemoglobin	100	100	0	0	1
5.	Assess for any history of allergy during previous blood transfusions	19	19	81	81	24
6.	Obtain consent for blood transfusion/blood products	17	17	83	83	27
7.	Check for patients' blood group	18	18	82	82	26
8.	Assess the reason for blood transfusion	16	16	84	84	28
9.	Assess patient's understanding of procedure and reason for blood procedure transfusion	80	80	20	20	11
10.	Assess patient's understanding of signs and symptoms to report (i.e., rash, itchiness, chills)	79	79	21	21	12
11.	Perform hand hygiene,	63	63	37	37	13
12.	Put on clean gloves	12	12	88	88	29
13.	Check IV line's availability	97	97	3	3	7
14.	Verify patent IV line with flushing normal saline 0.9%	63	63	37	37	13
15.	Get and record the patient's baseline vital signs, If the patient is febrile, which means that the temperature of the patient is higher than 37.8°C. notify the health care provider before starting the transfusion.	84	84	16	16	10
16.	Ensure Normal Saline as mainline IV	0	0	100	100	30
17.	Transport blood pack to the ward with special box	0	0	100	100	30
18.	Obtain blood product for transfusion from blood bank just prior to transfusion	100	100	0	0	1
19.	Performing remote checks at nurses' station	100	100	0	0	1
20.	Blood administered within more than 10 to 30 minutes following removal from blood bank fridge	63	63	37	37	13
21.	Confirm the following with another nurse prior to starting blood infusion bedside checkup (checking blood product label with patient information): Pt's name	61	61	39	39	16
22.	Pt's ID number	61	61	39	39	16
23.	Blood group and type	61	61	39	39	16
24.	Expiration date	61	61	39	39	16
25.	Blood inspected for clots	61	61	39	39	16
26.	Obtain baseline vital signs 30 minutes prior starting transfusion: Measure Temperature	87	87	13	13	8
27.	Count Heart rate	22	22	78	78	22
28.	Measure respiratory rate	21	21	79	97	23
29.	Measure Blood pressure	19	19	81	81	24
30.	Have emergency equipment at your bedside (oxygen, suction, etc.)	87	87	13	13	8
31.	Documentation pre transfusion activities	27	27	73	73	21
Total		57.4		42.6		

This weakness in practice could be due to work overload, lack of equipment, inadequate nurses' understanding about commitment to universal standards, lack of infection control training courses or lack of supervision (Fernandez et al., 2014). Nurses may place a greater emphasis on hand washing after rather than before any interaction. This result is incongruent with the reports of nurses' manger. "All nurses relatively perform aseptic techniques when deal with patients and there are many training courses regarding infection control targeted heath workers in hospital; particularity nurses who are engaged in patient's care. However, in my opinion, any inadequacy is due to lack of resources."

This incongruence between the reality and the managers' report reflects inadequate supervision and follow up from the nursing managers, in addition to lack of evaluation of effectiveness of training courses.

In spite of the major risk associated with BT, only 17% of nurses obtained the patient's consent. It is well known that patients were not asked to sign a consent in the near past. In this study Recently, after establishing the BT safety committee, consent form becomes a necessity and essential part of the BT process. Physicians are required to explain for the patients the benefits, risks and alternatives of BT. Any misunderstanding or missed information are clarified by nurses who are responsible to act as advocate and witness the signing of the consent. However, consent form usage was observed in NMC but not in the other hospitals. One key informant declared:" There is a new consent form considering the blood transfusion as any other invasive or surgical procedures. We ask the patient or his guardians to sign a consent after providing complete explanation about the advantages, disadvantages and alternates."

Regarding obtaining baseline V/S 30 minutes before starting the transfusion; 87% of participants measured temperature while 19 to 22% only monitoring the remaining V/S; consistently with Hijji et al (2010). This result differs than other studies where Majeed claimed that majority of nurses measured all the V/S but Rais et al. (2016) reported lack of V/S assessment and Dos Santos et al. (2021) observed none of the nursing professionals followed the guidelines regarding V/S measurement frequency. Vital sign recording is a fundamental aspect of routine care that nurses were expected to adhere to; in accordance with both hospitals' blood transfusion policies. The researcher attributed this result to high workload and staff shortages. From a different point of view; inaccurate knowledge may be a cause. Nurses think that temperature is the most important V/S and it is the only vital sign

affected by BT reactions; they usually assess temperature compared with the other V/S. However, nurse's managers' claimed nurses' commitment with measuring V/S on time. The results are lower than what nursing mangers approximately said that all their nurses are committed in taking V/S taking basic V/S prior transfusion in right way. Again, head nurses interviewed insisted that nurses measure blood according to a schedule and they are committed to it.

Through 10 to 30 minutes following removal blood from the bank fridge, 63% of nurses performed in a satisfactory manner which is congruently with Hijji et al (2010); unlike Majeed et al (2021) where only 34% performed well. Literature revealed that majority of nurses start blood transfusion two hours and more after arrival of blood to the ward (Sapkota et al., 2018). About rechecking the patients' identity, the researcher observed that 61% of nurses identifying correctly the patient and blood product whereas, 39 % of nurses did not perform double checkup and matching. Congruently, 80% of the participants in Majeed et al (2021) study did. The results are inconsistent with Hijji et al (2010) who observed that 29% nurses compared the information on the blood bag and the patient's wristband. It seems that Gazan nurses rely on remote checks performed at the nursing station (100%). However, this reflects poor practice which could have resulted in catastrophic consequences at times. Inadequate checking of patient identity prior to initiating the transfusion is generally imprecise and prone to errors. However, 87% of nurses had available emergency equipment at bedside just un any emergency situation.

In regards to documentation, the study findings pointed to unsatisfactory practice concerning pretransfusion documentation as manifested by 73% of participants who didn't document pre transfusion nursing activities. On contrary, Sapkota. et al. (2018) showed that approximately 95 % of various transfusion products such as blood bag number, types of blood product, and blood volume was recorded.

Based on the interviewee reports; a new protocol and policy emphasized the importance of documentation of every step of blood transfusion. It starts with charting the education provided to the patient and taking the patient consent, followed by documenting V/S 30 minutes before the initiation of blood transfusion, and continues with every stage till several hours after the BT with monitoring the patient for any complications. However, the observation of the researcher reflected deficiency in the issue of documentation. Moreover, nurses are interested to chart the infusion itself but not the other issues.

Moreover, human errors are largely result from noncompliance with standards. In BT, nurse's role begins before collecting blood from the blood bank because they must positively identify the patient to avoid errors caused by incompatibility. Nurses' inadequate knowledge and work overload may be behind omitting of rechecking patients' identity, measuring all V/S and documenting all steps. In addition, it seems that all GH lacked a specially designed blood transport box; that may reflect inadequate policy and equipment in the hospital. Again, this domain revealed 38% of participants had fair practice and only 25% had satisfactory level in practice. This is consistent with (Majeed et al; 2020; Saif Alnasr et al., 2016; Hijji et al., 2010) and lower than Hendy et al (2017) where 53-80% of nursed performed in a satisfactory manner in the pretransfusion and pt.'s identification domain.

4.5.2 Nurses' practices during blood transfusion

The table 4.12 summarizes the frequency of nurses' practice during BT, determined by 6 items. The weight mean of the total was 43% making it in the bottom in terms of the satisfaction of nurses' performance. The table revealed that the optimal nurses' practice was in the domains related to infusing the blood no longer than four hours and starting transfusion very slowly (no more than 25-50 mL in first 15 minutes); 945% and 91% orderly.". Congruently, 93.5% of participants in the study of Majeed et al. (2020) did well. Despite availability of electronic infusion pumps in the hospitals, where blood is regulated electronically, nurses tend to rely on manual regulation.

Table (4.12): Distribution of Nurses' practices during blood transfusion

No	Intra-procedure	Done		Not done		Rank
		Freq.	%	Freq.	%	
1.	Start transfusion very slowly (no more than 25-50 mL in first 15minutes)	91	91	9	9	3
2.	Stay with the patient for the first 15 minutes	3	3	97	97	6
3.	Recheck vital signs	19	19	81	81	5
4.	Assess for any signs of reaction (fever, hypotension, tacky cardia)	42	42	58	58	4
5.	Infuse rest of transfusion as per MD orders, over no more than 4 hours (risk of bacterial contamination)	94	94	6	6	2
6.	Documentation	98	98	2	2	1
Total		57.8		42.2		

At the beginning of any BT, the blood flow rate should be kept slow either for adults or pediatrics. However, only three nurses (3%) stayed with the patient for the first 15 minutes of the transfusion. This is less than what Majeed et al. and Sapkota at al got where 16.5% and 21.4% of nurses remained with patients during the first 15 minutes (orderly). Furthermore, no more than 19 nurses rechecked V/S and only 45 assessed for any signs of transfusion reaction. More time, this is completely different than what head nurses' reports; one of them said: "After proposing the protocol all nurses stay with patient for the first 15 minutes and checked the V/S after this period."

The results are similar to what found among Egyptian participants in the studies of Majeed and his colleagues and Hendy et al., (2017) as well as with Harris et al., (2013) who revealed that only 2% of studied nurses measure vital signs on administration of blood component in Paris. In contrast, Sapkota. et al observed that the percentage of V/S recording during the transfusion procedure was high ranging from 76.5 to 83.5 %. In addition, Atterbury and Wilkinson (2014) demonstrated that more than half of participants were recording V/S after 15 minutes then 30 minutes, and then hourly until the transfusion is completed. All of these performance inadequacies among Gazan nurses may be associated with the work overload and heavy tasks nurses are required to do. A nurse may be assigned for several patients simultaneously. Moreover, more over half of nurses in this study had not assessed patients for adverse reaction. These results are consistent with Henedy et al., (2017) in which the majority of nurses had inadequate practice in assessing V/S such as fever, tachycardia, hypotension, or tachypnea. In researcher opinion, nurses believe physical examinations are only performed by physicians and are not the responsibility of nurses. Nurses may be not fully familiar with the danger of BT complications and how to detect these complications and manage it; as this was among the most reported needs for more training.

As mentioned above, 94% of nurses infused the blood over no more than four hours.; which is better than results of Saif Al Nasr and Majeed and colleagues where less than half of nurses transfused the blood over four hours. This result is much higher than what nurses reported as only 76% of them agreed that blood must be finished within four hours. In terms of documentation, almost all nurses documented the transfusion.

Unluckily, none of nurses performed in satisfactory manner in this domain; 45% of them act in fair manner and the remaining 55% reflected poor performance; which is worse than results of Saif Al-Nasr et al (2016) but better than Hendy et. al (2017).

4.5.3 Nurses' practices during blood transfusion reaction

Table 4.15 shows encouraging results regarding practice of nurses during blood transfusion reaction. It shows that nurses' performance was optimum in this domain consisted of six items with a mean 86%; it had the top rank. Majority of nurses were exposed to this experience showed satisfactory performance; 85.7% reacted properly in case of BT reaction. All nurses, except one, did what they should to do to intervene when blood transfusion reaction occur. This result is on different line with Hendy et al. (2017) and Saif Al Nasr et al (2016) where 92.6% of nurses had unsatisfactory performance regarding blood transfusion reactions. The transfusion reaction was happened in the researcher's view of point, due to rapid initiation of unit in most cases, but in one case because nurses didn't not ask if the patient had previous history of allergy.

In the questionnaire, nurses' knowledge related to BT reactions was not satisfactory as their practice. This may be interpreted that nurse with time get experience to do several tasks however they don't have enough theoretical information regarding its details. Also, may.

Table (4.13): Distribution Nurses' practices during blood transfusion reaction

No	During transfusion reaction	Done		Not done	
		Freq.	%	Freq.	%
1.	Reaction of nurses when transfusion reaction occurred: Stop infusion immediately	6	85.7	1	14.3
2.	piggyback N/S into the line (closest port to patient) or change IV tubing to N/S only	6	85.7	1	14.3
3.	Call physician immediately	6	85.7	1	14.3
4.	Remain with patient, check vital signs q 5 min, observe for signs and symptoms	6	85.7	1	14.3
5.	Prepare to administer meds (antihistamines, vasopressors	6	85.7	1	14.3
6.	Prepare to administer oxygen if needed as Dr ordered	6	85.7	1	14.3
Total		85.7		14.3	

be with the stress of work, some information may be lost. Another explanation may be that nurses' answers didn't reflect their real knowledge; some of them may answer the questions haphazardly or by chance because of lack of time and heaviness of duties.

All of the interviewee reported very strict clear guidelines to be followed in case of adverse reaction existence. The available guidelines are science and evidence based, and covers all the proper actions begging with blood cessation, notifying the physicians, administering NS, checking V/S and contact the blood bank and return the unit for more investigation.

Despite of this satisfactory results, there is a gap in nurses collaborate with the laboratory technician when transfusion occur especially when reaction exist. A blood bank director in the 3rd hospital said that no nurses contact with them or return the blood unit. He said: "As I am one of safe transfusion committee. During monthly meeting we insist that nurses' mangers should call us in case of blood transfusion reaction. Unfortunately, when reaction occur nurses do not contact with lab to notify them about the reaction and do not return the blood unit to the lab in order to make extra investigation. they get rid of the unit."

4.5.4 Post transfusion nurses' practices

Table 4.14 shows that the domain of nurses' practice post blood transfusion was determined by 3 items and got the second rank. Among the four domains. The table reveals that only 38% of nurses monitored the V/S after the blood transfusion. However, mangers as mentioned above; all nurses measure V/S post transfusion. All the nurses got rid of the blood transfusion set in a safe manner (in a yellow bag) according to the agency policy. However, only 41% of observed nurses made full documentation for the procedure. This result is similar to Hijji et al (2010).

Table (4.14): Distribution of Post transfusion nurses' practices

No	Post procedure	Done		Not done		Rank
		Freq.	%	Freq.	%	
1.	Monitor V/s after finishing Transfusion	38	38	62	62	3
2.	Dispose of blood container and tubing according to agency policy.	100	100	0	0	1
3.	Document post transfusion and during reaction if occur. Time, date, type of product & Blood group.	41	41	59	59	2
Total		59.7		40.3		

The current study revealed nurse dispose blood container and tube in correct way. This result is different than Louw et al., (2021) and Hendy et al (2017) where majority of observed nurses disposed incorrect way. In this domain, the practice of 41% of nurses was suboptimal performed, 40% did fair while satisfactory practice was observed in only 19%. Unlike Saif Al-Nasr et al (2016) who reported that 92.6% of participants made satisfactory in post transfusion. The overall nurses' performance at the post-transfusion stage came in the second rank among all the remaining domain. However, nurses' manager reported that nurses recheck rechecking the V/S after infusion and document each action. One of them said: "After finishing; nurses document infusing the blood and finally the V/S follow up."

4.6 Differences in practice of regarding blood transfusion based on nurses' characteristics

In this part, the researcher tested any statistically significant effects of nurses' characteristics and demographic data on their level of performance related to BT. The results in table (4.15) reveal lack of any significant differences of practice level in terms of gender, specialty, qualification level, different departments and receiving of training programs related to BT during the last year or not (p value = 0.603, p value =0.888, p value = 0.318, p value = 0.273 and p value = 0.989 respectively). However, Panchawagh et al (2020) claimed that nurse working at the hematology and oncology wards showed a significant more competency in the BT with Remarkably.

In addition, the results denied any statistically significant effects of age, years of experience and frequency of blood transfusion procedures done during the last 6 months (p= 0.309; P= 0.0217; p= .634) orderly).

Table (4.15): Differences in practice of regarding blood transfusion based on nurses' characteristics

Character	Freq.	Mean	±SD	t	F	P value
Age (years)						
25 or less	22	0.54	0.09			
26-30	30	0.58	0.10		1.214	0.309
31-35	19	0.59	0.12			
More than 35	29	0.59	0.10			
Experience years						
3 or less	34	0.55	0.09			
3-6	26	0.59	0.11		1.554	0.217
More than 6	40	0.59	0.10			
Frequency of blood transfusion last 6 month						
Less than 10	61	0.57	0.10	0.227		0.634
10 or more	39	0.58	0.10			
Hospital names						
Al-Shifaa hospital	60	0.60	0.10			
Al-Rantsei Hospital	19	0.53	0.08		6.470	0.002*
Nasser Medial Complex	21	0.53	0.11			
Gender						
Male	40	0.57	0.11	0.521		0.603
Female	60	0.58	0.10			
Nursing specialty						
Nursing	90	0.58	0.11	0.141		0.888
Midwifery	10	0.57	0.05			

Table (4.15a): Continued

Qualifications					1.159	0.318
Diploma	33	0.56	0.09			
Bachelor of nursing	49	0.58	0.11			
Master's degree	18	0.60	0.11			
Departments						
Surgical	44	0.59	0.12		0.682	0.273
Medical	44	0.57	0.09			
Obstetrics and Gynecology	12	0.56	0.06			
Training						
No	68	0.58	0.11	0.015		0.989
Yes	32	0.58	0.10			

This result goes with Panchawagh et al (2020). however, they reported a significantly higher mean of transfusion practice score in the 20–24 years' age group. Unfortunately, there is a scanty in the studies focusing on nurses' practice regarding BT.

4.6.1 Differences in practice of regarding blood transfusion based on Hospital name

The findings revealed, nurses working in different hospitals exhibited various level of performance with a significant statistical effect (p= 0.002) as shown Annex (9). The post hoc test as shown in Annex (9) that the nurses working at Al-Shifa hospital had the highest mean compared with those working at NMC or Al Rantisy hospitals (mean orderly). This may be explained because Al- Shifa is the oldest and largest hospital in the GS; it serves a large number of patients. Therefore, nurses work there may have better experience than others.

4.7 The relationship between the overall Level of knowledge and overall level practice among nurses

The correlation test showed that there is a significant statistical positive correlation between the total level of knowledge and the total level of practice among nurses working at the governmental hospitals in the Gaza Strip; the p value was 0.002 (table 4.18). This means that nurses having more knowledge related to BT exhibited better performance. This result was supported by the findings of (Nemati et al.,2019; Saif Al-Nasr et al., 2016; Purfarzad et al, 2012) but not by Hendy et al (2017) who denied any significant statistical correlation between knowledge and practice. This is a very logical result (figure 4.3) having more

knowledge helps nurses to perform better, avoid mistakes and know how to intervene if any adverse reactions or any complications occur.

Table (4.16): Correlation between the practice and knowledge

	Knowledge	
	R	**P-value**
Practice (n=100)	0.308	0.002**

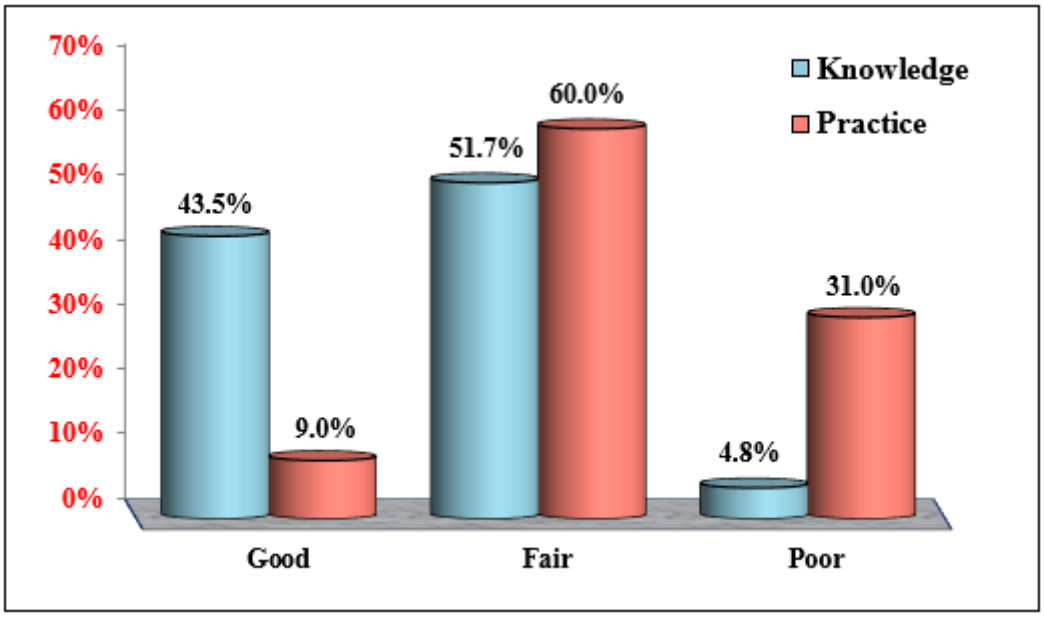

Figure (4.3): Distribution of study population according to total knowledge and practice levels

Scientific rational makes easier for the nurses to adhere with the clinical guidelines and standards. Being updated with evidence- based knowledge can guarantee perfect performance.

Our result calls the attention of all of the policy and decision makers in the MoH and the academic field to do their best to improve the level of knowledge related to BT among nurses working at the GH; thus, should be reflected on the level of practice. Another several steps can be taken by nurses' managers, hospital directors to provide a suitable environment with basic equipment and sets for the BT procedure. Without a clear written available policy regarding BT, all of the previous steps will not be successful.

4.8 Knowledge- practice Gap regarding Blood Transfusion

Regardless that the level of knowledge was almost good, practice level among nurses working at GH in the GS was frankly worse. In the researcher's view of point, the low percentage of nurses (just only 9%) reached optimal practice could be attributed to several factors: work overload and nurses being assigned to care for more than four patients at the same time, lack of adherence to procedure guidelines, knowledge inadequacy in specific areas, lack of equipment and lack of clear accessible policy. For example, 68% of nurses agreed the importance of availability of a special box to transfer blood from the bank to the department. However, no one did that because of unavailability of such box. Here, patients' relatives usually bring the blood without any device directly from the laboratory to the word. Another example is related to the frequency of V/S measurement during and after the BT process; the reported knowledge is better than the real practice. Nurses may know the proper action but are faced by several challenges due to the work over load and furthermore, poor practice is likely to increase morbidity and mortality associated to BT.

The presence of knowledge practice gap among nursing profession is well documented. The findings of analyzing the quantitative data confirmed this gap, the difference between the total knowledge level (71 %) and the total level of practice (57%) was clearly noticed. However, some of the mangers and head nurses denied its presence in relation to BT. They asserted that nurses are well competent int theoretical and practical aspects. On the other hand, some nursing managers were more objective in their opinions and discussed this issue. Some of the expected rational of this gap were attributed to: staff shortage, work overload, lack of equipment and deficiency in practical preparation for the nurses when they were students. A nursing supervisor reported: "Many nurses are obligated not to adhere to the standards and not to apply the ideal practice. In the universities, students taught the ideal, but they can't apply it here. We have a great shortage in the staff, huge number of patients and a lot of work overload. In addition, most of the clinical instructors training students are not specialized; this forms a gap and weakness in the clinical skills among the students."

The previous quote, regardless of it contradictory, besides the findings of quantitative analysis insisted the presence of theory-practice gap among nurses regarding BT. Such gap must call the attention of both academic and managers in the hospitals and the clinical field for the importance of cooperation between them and diagnosing the issue objectively.

Academic are called to pay more attention for the practical preparation of the future nurses in a simulated environment.

4.9 Thematic Analysis of Key Informants interviews

The analysis of the interviews showed that medical, oncology, hematology, CS and surgical departments are the most consuming ones of blood. Certainly, the need or BT becomes more vigilant during emergency and Israeli attacks. The interviews also reflected incongruency between the results of the quantitative data analysis compared with the results of the qualitative data from one aspect, and among the interviewee themselves. For example, the nursing managers and supervisors in almost all the three hospitals expressed their satisfaction regarding the levels of knowledge and practice regarding BT among the staff. However, the general score of the knowledge level was highly moderate and for the practice was fair. Another example of contradictory reports was related the presence of written policy. The researcher noticed contradictory reports between the nursing managers and supervisors. The nursing manager in one hospital insisted the availability of BT related policy and as a part of the guideline and policy booklet. Unfortunately, the head nurse of the major department there denied the presence of any policy. More examples had been reported above. In details, the following themes were derived from the interview analysis.

4.9.1 Importance of Blood transfusion

Blood transfusion is very critical issue; it plays a primary and essential role in saving life. Hospitals in GS are in a greater need for BT than other areas because of the political condition as well as the hereditary blood diseases such as Thalassemia. However, it is associated with a lot of risks and danger that may be fatal. Blood transfusion is very costly; the cost of each blood unit may be several hundreds of dollars. Another important issue is related to scarcity of specific blood groups with negative Rh factor. Thus, very careful handling of blood units is required. the head of the committee declared:"BT likes organ transplantation; it can save life or threaten it. It is very expensive procedure; cost effectiveness must be assured. For this reason, we establish committee not also to provide this service safely but also to save blood and prevent unnecessary BT and any complications in case of transfusion. We are on our way to establish a protocol for the physicians to help them deciding which type of blood products to be infused to which type of patients."

Cost effectiveness of blood transfusion must be considered from the moment of making the order till the last moment several hours after the infusion to warrant safety. Moreover, wise use of BT is essential so we can offer all types of blood and its product when needed. All health care providers involved in the BT process are responsible. The physician must order blood only when he is sure that the benefits overweigh the risks. In the laboratory, lab technician, after testing the blood and be certain that blood is safe, separate the blood unit to its components so maximum number of patients can benefit from it. A blood bank director reported: "The net cost of each blood unit is more than $50, this besides the machinery cost and the salaries of each health personnel participate in the process. Here in the lab, after testing it for blood born disease and check the blood group and Rh factor separated the blood unit into its main components: packed RBCs, Plasma and cryoprecipitate."

4.9.2 Transfusion safety

There are several strategies and steps are taken in the three hospitals in order to guarantee safety of the blood transfused to the patients. Since BT is a multidisciplinary process, each partner should adhere to the safety rules based on his/her roll. Such safety insurance can be achieved through the following subthemes:

4.9.2.1 Blood Transfusion Safety Committee

A "Blood Transfusion Safety" committee is established in each hospital. It involves: hospital directors, physicians, nursing managers, head nurses and lab technicians. However, the interviews reflected differences in the commitment and effectiveness of such committee among hospitals. In two hospitals, the committee is active and productive; however, in the third one it is inactive. Furthermore, in one hospital regular meetings are held to ensure monitoring and follow up of the BT process. There are statistics for all BT procedures, follow up for cases, and close monitoring from the head nurses. In spite of that, this is not the exact picture in the other hospitals. A head nurse in one hospital said: "I'm a member at the BT safety committee here in the complex. Monthly, we have a meeting. We try to keep ourselves and the staff updated regarding the BT issue. We try and do our best to enhance the BT process, avoid any weak point and improve the care as much as possible."

4.9.2.2 Safety standards within the Laboratory

According to the blood bank director, there are strict rules and standards that control the blood preparation process. The lab technicians and the staff there are committed to the Standard Operation Procedures (SOP), WHO and the American Association of Blood Bank (AABB) guidelines. Such standards and rules are essential to guarantee blood safety. The followed standards emphasize double check for each step making it is almost possible for any errors. Additionally, a third checkup is done by testing the cross match. There is complete dependence on the computerized system to ensure proper documentation and data base. Besides, barcode system is used for more control of the safety issue. Blood bank Director said: "Here in the lab, we have zero error. We double check each process and make some reverse check for the blood compatibility using "forward and reverse blood group." For more control, there is a rule to send the blood request attached with a complete blood count (CBC) sample for the same patient. This could avoid any mismatch between the request and the CBC result. All of the previous rules can limit any BT adverse reaction to the allergy or biological matte. However, post blood transfusion allergy is usually seen in patient receiving blood for several times or frequently. More honestly, patient receiving blood once or twice are not susceptible for allergic or adverse reaction. The blood bank director added: "In the past nurses asked use to rely on previous CBC result for the patient when prepare the blood. Now, we insist to send a new CBC sample with each blood request to avoid any chance of errors."

Also, he claimed that nurses are the source of errors, if occur. Mislabeling and mismatching in addition to incomplete blood request are the underlying cause of any mistake.

4.9.2.3 Blood Transfusion related Errors

When asked about BT related mistakes; most nurses in managerial positions denied any mistakes or errors in the last two years, particularly after establishment of the BT safety committees. The check of patient- blood unit compatibility is the most common area for errors and mistakes. But with the new strict rules and protocols; such errors almost have disappeared. A nursing manager answered: "In the last two years we didn’t have any error. Before that yes, we had several accidents and even death. It was related to mismatch and blood incompatibility."

More than one interview reported several methods to avoid errors. Such method starts with assigning BT for senior nurses holding bachelor degree, close monitoring during and after the transfusion process by the head nurse and reporting each case of BT.

4.9.2.4 Blood transfusion Monitoring

Most nurses and head nurses reported continuous monitoring using several tools. Based on this monitoring they expressed excellent evaluation of the nurses' information, practice and adherence to the protocol. Their evaluation is really far from the reality, the actual scores the findings got are lower than what they expressed. One nursing manager said: "I use several tools. I go in field visits, check the data base and the reports of BT procedures monthly and ask the head nurses. All of these tools helping me to monitor the nurses." It was clearly that most monitoring and follow up is done in the filed without any written checklist or validated tool. All of the supervisors and head nurses rely on field visit and situational monitoring and feedback. They believe that keep reports of each case of BT is enough tool for monitoring. However, some of them encourage developing of checklist. A nursing supervisor said: "We depend on field observation; the head nurse closely observes the nurse during BT. Honestly we don't have a specific tool or checklist."

The researcher observation reflected specific deficiency in the nurses' performance. The gap between what the researcher herself had observed and what reported by managers and head nurses calls for our attention. Several factors may explain this gap. Managers and head nurses don't rely on a specific monitoring tool for evaluation the staff performance regarding BT. They depend on occasional field observation with an objective standardized tool as checklist. In addition, they feel comfortable with not accidents or adverse reactions. But, absence of any incidents doesn't guarantee perfect performance.

4.9.3 Obstacles and Barriers against Nurses' Competency in Blood Transfusion Process

Despite most of the participants advocated satisfactory performance among nurses in relation to BT, some of them addressed several challenges that interfere with excellent performance. The major obstacle is due to the very poor nurses- patients ratio; 1:15 in most cases. This ratio and the consequent very work overload make it impossible for nurses to perform ideally. A head nurse said: "Most times we have two nurses and 30 patients; couple of them need BT. This means if each nurse works with one patient needs BT and stay with her the

first 15 minutes and apply all the standard interventions, no one will work with the reimaging patients."

4.9.4 Recommendation to enhance nurses' performance related to Blood Transfusion

The respondent suggested several recommendations in order to enhance both knowledge and performance related to BT. Some suggestions focused on the preparation of an integrated "Nursing Procedures Manual and Booklet." and distributed in all the hospitals. Other called for developing policy and orienting all the staff about it. Among the suggested recommendation was accrediting continuous training to keep nurses updated related to the BT as well as developing a strategy for monitoring and supervision to enhance the performance and avoid any errors. A head nurse said: "We prepare for a manual procedure. We wait for its accreditation. We hope if it is ready".

In a summary, KIIs showed some fragmentation among hospitals and inside the hospital itself. It was clearly that Nasser Medical complex in its way to be the best in terms of BT safety. In general, a problem in communicating the policy was observed. There are a lot of efforts done but more is still needed.

Chapter Five

Conclusions and Recommendations

5.1 Conclusions

The study was carried out to assess the level of knowledge and practices about BT among nurses working at Gaza Governmental Hospitals. The study was a triangulated, cross sectional descriptive study, as it contained both quantitative and qualitative parts. For the quantitative part, a questionnaire and an observational checklist were used to identify participants knowledge and practices about BT to specify areas of gaps. For the qualitative part, KIIs were conducting for more probing about some certain issues related to blood transfusion services.

The study concluded more than half of study participants have a moderate to good level of knowledge and around third of them have fair knowledge about BT. However, less tenth of nurses have satisfactory level of practices while sixty percent of them performed BT in a fair manner.

Results of study indicated majority of studied samples had high knowledge level related to blood pack collection, (which include method used to transport blood from blood bank, Knowledge of basic ABO terminology, Information to ensure collecting the right blood from blood bank). Then the results lightened eightieth of nurses had good knowledge regarding to Pre-transfusion initiation nursing activities as (Patient identification, indications for blood warming, best time to start the transfusion, steps for patient identification, suitable filter size of transfusion set), also results stated that two thirds of participant had good knowledge related to blood transfusion adverse reaction. Meanwhile, the findings stated that sixtieth of participants had fair knowledge related to nursing responsibility post blood transfusion as (activities routinely performed by nurses after starting the blood transfusion., the Maximum duration of using a blood administration set for continuous multiple transfusions, maximum duration for completing a unit of blood, agents compatible with blood, vital signs recording after starting a transfusion. Meanwhile, the lowest scores were related to ‘patient preparation for blood transfusion’ followed by ‘blood transfusion policy’. On the other hand, the results have shown nurses’ practice was optimum in transfusion reaction, then the ’Intra-procedure

'domains received lower score, then followed by ‘Post procedure’ domain; the lowest score of practice was related the intra procedure.

Inferential Statistics results revealed that there was statically significance difference in knowledge and receiving training program P value =0.013, as showed nurses have received training program, have better knowledge regarding BT. The findings also found absence of any statistically significant differences in the overall level of knowledge nor practice in relation to gender, age, departments, specialty, qualification, years of experience and number of BT during the last six months. It reflects standardization in blood transfusion in target department in the selected hospitals. In addition, there was a statistically significant difference in the level of practice among nurses working in the different hospitals P value =0.002. Moreover, nurses working in Al-Shifa hospital performed better than others. This study finding revealed that there was a statistically significant correlation between total score of nurses' knowledge and practice. Nurses having more knowledge related to BT exhibited better performance.

Qualitative results were inconsistent with quantitative findings in general. KIIs talked about their evaluation for blood transfusion services from their point of view.

5.2 Recommendations

In light of the findings came from this study, the researchers propose the following recommendations:

5.2.1 For Decision Makers:

1. Developing a written Arabic and English policy and practical guidelines which contains a checklist about blood transfusion technique, interventions for blood transfusion complications which should be available at each hospital and each department.

5.2.2 For Hospital Directors and Nursing Managers

1. Establishing a committee for BT in each hospital to oversee all related issues.

2. Conducting a need assessment to identify areas that needs emphasis during in-service training which will increase nurses' knowledge and performance related to blood transfusion.
3. Providing nursing staff with well-planned, useful, continuous in-service training programs and perform regular follow-up of the effectiveness of these training sessions.
4. Developing a simplified and comprehensive booklet including guidelines about nursing management of patients undergoing blood transfusion.
5. Ensuring availability of needed equipment such as gloves, Infusion devices and sufficient number of qualified nurses in each shift for improving efficient quality of care needed to patients undergoing transfusion.
6. Auditing and close supervision for blood transfusion process and application of universal standards are needed to ensure that quality of care is provided by nurses while managing patients undergoing blood transfusion.

5.2.3 For Academics

1. Emphasizing the theoretical and practical preparation for nursing students regarding blood transfusion either in the classes, labs or the clinical areas.
2. Preparing adjacent courses focusing on blood transfusion; responsibilities and complications.
3. Assigning highly qualified clinical instructors, with experience related to blood transfusion, to teach the students and train them in the clinical areas.

5.2.4 For Researchers

1. Repeat the current study in different settings with large random sample.
2. Conducting further studies to assess any other factors that may affect nurses' competency regarding blood transfusion such as job satisfaction, job description and leadership styles.
3. Conducting further studies to evaluate the reflection of in-service training programs regarding management of patients undergoing blood transfusion on nurses' performance and consequently on the patients' outcome.
4. Develop a longitudinal study to explore the impact of training programs on the theoretical and practical competency of nurses related to blood transfusion.
5. Conducting comparison studies between governmental and non-governmental hospitals.

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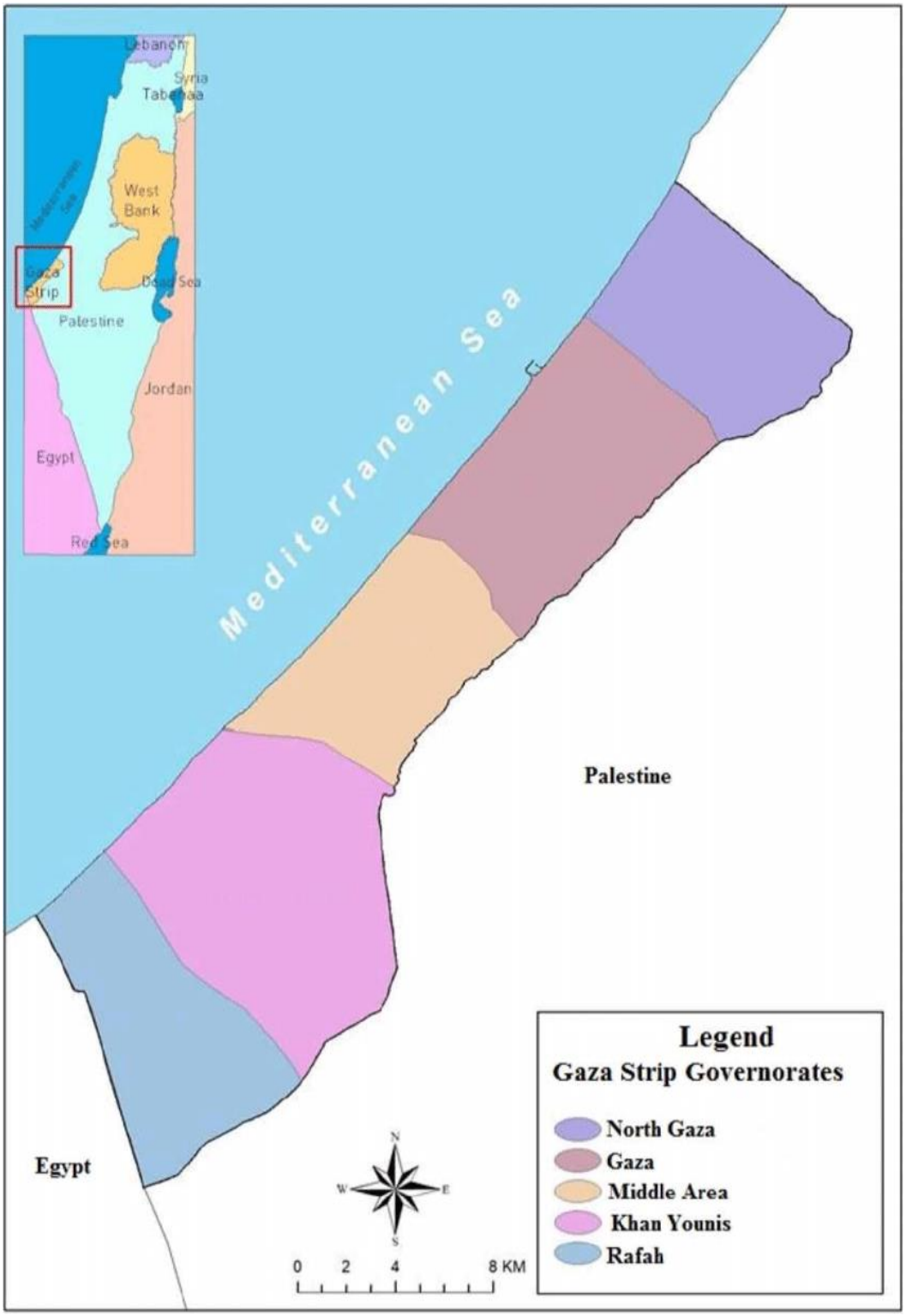
Annexes

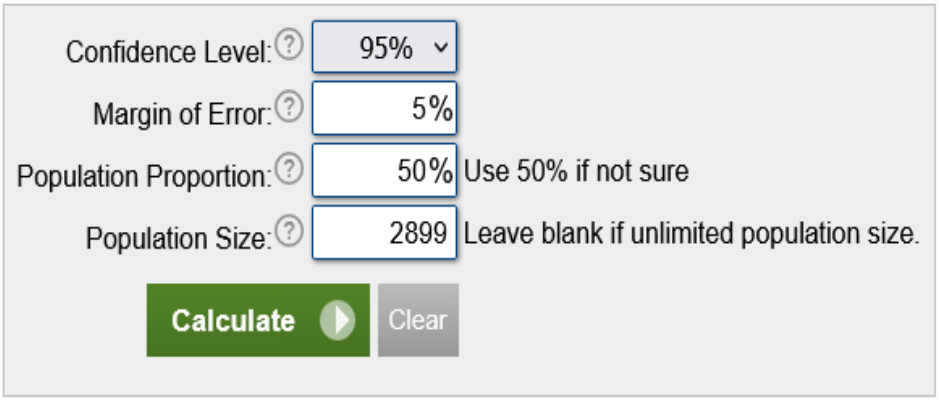
Annex (1) Gaza Governorates distribution map



(Abuzerr, S. 2019)

Annex (2) Sample size calculation

This means 340 or more measurements/surveys are needed to have a confidence level of 95% the real value is within ±5% of the measured/surveyed value.



Annex (3) Helsinki Approval

Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

التاريخ:2020/12/5

حضرة الدكتور/ رامي العبادلة المحترم
مدير عام تنمية القوى البشرية–وزارة الصحة

تحية طيبة وبعد،،،

الموضوع: مساعدة الطالبة هبه أحمد أبو ندى

نشكر لكم دعمكم الدائم لمسيرة العلم والتعليم وخصوصاً دعم كلية الصحة العامة وطلابها، ونود أعلامكم بأن الطالبة المذكورة أعلاه تقوم بعمل بحث كمتطلب للحصول على درجة الماجستير في الصحة العامة–مسار إدارة صحية بعنوان:

"Nurses' Knowledge and Practices about Blood Transfusion in Gaza Governmental Hospitals "

وعليه نرجو من سيادتكم التكرم بالموافقة على تسهيل مهمة الطالبة في إنجاز هذا البحث حيث أن الفئه المستهدفة هم الطاقم التمريضي العاملين في بجمع ناصر الطبي ومجمع الشفاء الطبي ومستشفى الشهيد عبدالعزيز الرنتيسي التابعة لوزارتكم الموقرة.

و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد
منسق عام برامج الصحة العامة
فرع غزة

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ص.ب. 51000 القدس

Annex (4) RBTKQ (Arabic version)

الرقم التسلسلي: ----------

استبانة

الأخ/ت الممرض/ة..... السلام عليكم ورحمة الله وبركاته

تقوم الباحثة بإجراء بحث علمي كمتطلب للحصول على درجة الماجستير في الصحة العامة مسار إدارة صحية بعنوان

."Nurses' Knowledge and Practices about Blood Transfusion in Gaza Governmental Hospitals."

نرجو منكم التكرم بتعبئة الاستبانة المرفقة. نؤكد على كامل أحقيتكم في حرية الموافقة أو الرفض للمشاركة أو الإجابة عن أي سؤال والاحتفاظ بحقكم في الانسحاب في أي وقت. كما نؤكد على سرية المعلومات واستخدامها فقط لأغراض البحث العلمي...ان مشاركتكم الكريمة في تعبئة الاستبانة لن تعود عليكم بالفائدة المباشرة، الا أنها ستسهم في تحسين الأداء التمريضي في عمليات نقل الدم والحد من المضاعفات والأخطاء المحتملة في هذا المجال، مما ينعكس ايجابا على تقليل مضاعفات نقل الدم للمرضى.

التوقيع: ----------, التاريخ: ----------

لمزيد من المعلومات والاستفسار، يرجى التواصل مع الباحثة هبة أبو ندى على جوال رقم 0599097096

ملاحظة: يرجى وضع دائرة حول الإجابة (الإجابات) التي تقوم/ى باختيارها. يرجى عدم استخدام علامة √

القسم أ: البيانات الديموغرافية والتدريب

1. **اسم المستشفى الذي تعمل به:** أ. مستشفى الشفاء ب. مستشفى الرنتيسي ج. مجمع ناصر الطبي

2. **القسم: .....**

3. **النوع الاجتماعي:** أ. ذكر ب. أنثى

3. **العمر بالسنوات: ..... سنوات.**

4. **التخصص**: أ. التمريض ب. قبالة

4. **المؤهل العلمي:**

أ. دبلوم ب. بكالوريوس ج. ماجيستير د. دكتوراة

6. **منذ متى وأنت تعمل/ين في القسم (الأقسام) التي يتم فيها إجراء نقل الدم؟ ..... سنوات ..... شهور.**

7. **خلال الستة أشهر الأخيرة، ما هو عدد المرات التي قمت بإجراء نقل الدم تقريبا؟ .....**

8. **هل سبق لك المشاركة في أي برنامج تدريبي يتعلق بإجراء نقل الدم وذلك خلال الفترة التي عملت فيها في القسم التي يتم فيها عملية نقل دم؟**

أ. نعم. ب. لا

9. **إذا كانت الإجابة بنعم، كم عدد البرامج التي شاركت فيها خلال العام الماضي؟**

أز.....؟ أين؟ .....

10. **ما هي المجالات العملية المتعلقة بإجراء نقل الدم والتي تشعر/ين أنك بحاجة إلى مزيد من التدريب/التعليم فيها؟ (يمكنك اختيار أكثر من خيار).**

أ. أخذ عينات الدم ب. تجهيز وحدة الدم ت. عملية تركيب وحدة الدم

د. الرعاية التمريضية قبل واثناء سريان الدم

ه. الأخطار والمضاعفات الخطيرة و. لا شيء

ي. غير ذلك، اذكرها.....

القسم ب: قياس المعرفة المتعلقة بإجراء نقل الدم

يرجى قراءة العبارات التالية، بدقة واختيار الراي الذي يعبر عنك.

الرقم	العبارة	أوافق بشدة	أوافق	لا أدري	أعارض	أعارض بشدة
أولا: قضايا تتعلق بتحضير المريض قبل البدء بنقل الدم						
.1	يجب على الممرض/المسؤول عن رعاية المريض الذي يحتاج نقل الدم أن يتحقق من توافر وسلامة ابرة الوريد (الكانيولا) بعد احضار الدم إلى القسم.					
.2	يجب استخدام ابرة وريديه ذات مقاس كبير تساعد على سريان الدم دون معيقات او توقف.					
.3	يجب إعطاء الأدوية التحضيرية بعد احضار وحدة الدم الى القسم.					
.4	أذا طلب الطبيب إعطاء وحدة دم مركزة (Packed RBCs) وريديا، والطلب غير مكتمل. يجب علي الممرض ان يرفض احضار الوحدة وعدم تنفيذ الأمر.					
.5	يجب على الممرض/ة شرح أسباب نقل الدم للمريض قبل الشروع في عمليه نقل الدم.					
.6	يجب على الممرض/ة توضيح مخاطر نقل الدم للمريض قبل البدء بعملية النقل.					
.7	يجب على الممرض/ة توضيح الأعراض الجانبية المتوقعة لعملية النقل قبل البدء بنقل الدم					
.8	يجب الحصول على موافقة خطية من المريض قبل البدء نقل الدم.					
.9	يجب قياس وتدوين العلامات الحيوية الأساسية خلال نصف ساعة قبل البدء بنقل الدم					
ثانيا: إحضار وتجهيز وحدات الدم						
.1	يجب على الممرض تجهيز طلب نقل الدم الذي يطلب فيه الطبيب الوحدة المراد نقلها.					
.2	يقوم الممرض بسحب عينه دم من المريض مع التأكد من البيانات الخاصة به وارسالها الى المختبر.					
.3	يجب على الممرض/ة معرفة نوع الدم المطلوب (دم كامل، كريات دم، بلازما وغيرها من مشتقات الدم) نقله للمريض.					
.4	يجب على الممرض/ة التأكد من مطابقة معلومات المريض التعريفية والمعلومات المكتوبة على وحدة الدم ونموذج طلب الدم عند استلام الوحدة لضمان إحضار وحدة الدم السليمة للمريض المحدد.					
.5	يجب على الممرض/ة إحضار وحدة الدم من بنك الدم للقسم في صندوق نقل دم محكم الغلق.					
.6	يجب على الطبيب تدقيق معلومات وحدة الدم للتأكد من ملاءمتها للمريض.					
.7	في حال عدم وجود الطبيب يقوم اثنان من التمريض بتدقيق وحدة الدم قبل اعطائها					

الرقم	العبارة	أوافق بشدة	أوافق	لا أدري	أعارض	أعارض بشدة
.8	عند استلام وحدة دم من بنك الدم لمريض كانت فصيلة دمه A موجبة، لاحظت أن الوحدة A سلبية، في هذه الحالة عليك ابلاغ الطبيب وانتظار تعليماته					
ثالثا: الاجراءات التمريضية ما قبل عملية نقل الدم:						
.1	يجب على الممرض/ة تدفئة الدم قبل نقله للمريض في حالات معينة مثل نقل الدم للأطفال					
.2	يستخدم جهاز خاص مصمم لتدفئة الدم					
.3	يجب تدفئة وحدة الدم في حالات نقل الدم الطارئة					
.4	على الممرض/ة تدفئة الدم للمرضى الذين يعانون من انخفاض الحرارة					
.5	عند وصول وحدة الدم إلى القسم الساعة الرابعة مساءً، فإن الوقت الأنسب لعملية نقل الدم هي 4:30 مساءً					
.6	يبدأ الممرض/ة نقل الدم فور وصول وحدة الدم الى القسم					
.7	أهم إجراء يتعلق بالمريض قبل البدء بعملية النقل، هو التحقق من هوية المريض					
.8	من الخطوات التي يجب على الممرض/ة اتباعها للتأكد من هوية المريض الصحيحة قبل بدء نقل الدم هي الطلب من المريض ذكر اسمه إذا أمكن.					
.9	من الخطوات التي يجب على الممرض/ة اتباعها للتأكد من هوية المريض الصحيحة أن تكون بيانات المريض التعريفية مطابقة لوحدة الدم وسوار التعريف ونموذج الطلب.					
.10	الحجم المناسب لمنقى الدم هو (170-200 ميكرون).					
رابعاً: الإجراءات التمريضية بعد بدء نقل الدم						
.1	من الإجراءات التمريضية الروتينية التي يجب على الممرض/ة القيام بها بعد نقل الدم مباشرة وحتى الانتهاء منه ضبط معدل تدفق الدم					
.2	يجب على الممرض/ة تدوين المعلومات المتعلقة بنقل وحدة الدم والعلامات الحيوية للمريض في ملف المريض					
.3	يجب على الممرض/ة غسل جهاز نقل الدم من الداخل باستخدام محلول ملحي 9%					
.4	يتم تنظيم معدل تدفق الدم عن طريق جهاز التقطير اليدوي أو الإلكتروني					
.5	يجب ألا يتجاوز معدل تدفق الدم للبالغين 120 مل/ساعة في بداية نقل وحدة الدم.					
.6	أقصى مدة يجب أن تستغرقها عملية نقل الوحدة بشكل كامل هي 4 ساعات.					
.7	يجب ألا تتجاوز سرعة تدفق نقل الدم للمريض 50 مل/ ساعة طوال عملية نقل الدم					
.8	أقصى مدة لاستخدام جهاز نقل الدم هي 4ساعات في حال نقل عدة وحدات دم للمريض.					

الرقم	العبارة	أوافق بشدة	أوافق	لا أدري	أعارض	أعارض بشدة
.9	ينبغي مراعاة نقل الدم ببطء لمرضـــى القلب وفقر الدم الحاد					
.10	يمكن مزج المحلول الملحي بـأمـان 0.9% مع وحـدة الدم المنقولة					
.11	يمكن مزج محلول رينجر لاكتيت (Ringer Lactate) مع وحدة الدم المنقولة بأمان.					
.12	يمكن اعطـاء مورفين 1.0 ملغم /مل في محلول ملحي مع نقل وحدة الدم					
.13	تم البدء بنقل وحدة دم الساعة 2:00 مساءً ومن المتوقع انتهاءها السـاعة 5:00 مسـاءً. يجب البدء بتسـجيل المؤشـرات الحيوية للمريض في السـاعة الاولى عند 2:05 و 2:15					
.14	تم البدء بنقل وحدة دم الساعة 2:00 مساءً ومن المتوقع اكتمالها الساعة 5:00 مساءً. يجب تسجيل المؤشرات الحيوية للمريض في الساعة الثانية عند الساعة 3:15					
.15	تم البدء بنقل وحدة دم الساعة 2:00 مساءً ومن المتوقع اكتمالها السـاعة 5:00 مسـاءً. يجب البدء تسـجيل المؤشـرات الحيوية للمريض في، السـاعة الثالثة عند الساعة 4:15					
.16	يجـب على الممرض/ة مراقبـة المريض اول 10-15 دقيقـة تحسـبـاً لحـدوث أي تحسـس (Blood transfusion reaction) محتمل لعملية نقل الدم					
.17	من أجل بدء نقل الدم ببطء لرضـيع يبلغ من العمر 4 أشهر، المعدل الذي سوف تبدأ به خلال الـ 15 دقيقة الأولى يجب ألا يتجاوز 100 مل/كجم/ساعة.					
خامسا: الاجراءات التمريضية المتعلقة بالآثار الجانبية لعملية نقل الدم						
.1	يمكن التقليل من مخـاطر تعرض المريض لرد فعل حاد لنقل الدم عن طريق نقل دم مطابق لدم المريض المتلقي					
.2	من التـدخلات التـي تقلـل من تعرض المريض لمضـاعفات نقل الدم، بدء نقل الدم خلال 20 دقيقة من إحضار وحدة الدم من بنك الدم					
.3	نقل وحدة الدم للمريض خلال 4 سـاعات من إحضـار الدم من بنك الدم، من شـأنه ان يقلل مخاطر تعرض المريض لرد فعل حاد ناتج عن نقل الدم.					
.4	عدم إعطـاء أدويـة أو محـاليل لا تتوافق مع الدم أثنـاء عمليـة النقل، يسـاهم في الحد من مخـاطر تعرض المريض لمضاعفات نقل الدم.					
.5	شـعور المريض بتسـارع نبضـات القلب أثناء نقل الدم يشير إلى أنه يعاني من تحسس وانحلال دموي					
.6	شعور المريض بألم في الصدر أثناء نقل الدم يشير إلى أنه يعاني من تحسس دموي					
.7	انخفاض ضـغط المريض أثناء نقل الدم يشـير إلى أنه يعاني من تحسس دموي					
.8	شـعور المريض بالغثيان/القيء اثناء نقل الدم يشـير إلى أنه يعاني من تحسس دموي					

الرقم	العبارة	أوافق بشدة	أوافق	لا أدري	أعارض	أعارض بشدة
.9	من ضـــمن الاجراءات الفورية التي يجب اتخاذها في حـال ظهور أعراض انحلال دموي حـاد نـاتج عن التحسس من نقل الدم وقف نقل الدم.					
.10	في حـال ظهور أعراض تحســس دموي يجب إبقـاء الوريد مفتوحا وتركيب محلول ملحيُ 0.9%.					
.11	في حال حدوث انحلال دموي حاد أثناء عملية نقل الدم، يجـب على الممرض/ة كتـابـة تقرير بـالحـادثـة (Incident Report).					
.12	في حـال ظهور اعراض انحلال دموي، يجـب على الممرض إبلاغ الطبيب والبدء بإعطاء أدوية الطوارئ وفقاً لتعليمات الطبيب					
.13	بسبب حالة طارئة، تم إحضـار وحدة دم السـاعة 8:00 مساءً ووضعها في محطة التمريض حتى الساعة 9:30 مساءً. في هذه الحالة عليك ببدء النقل مباشــرة واكماله خلال نصــف ســاعة الى ساعتين.					
.14	الطفح الجلـدي هو الشــكوى المعتـادة المتوقعـة من المريض الذي يعاني من حساسية طفيفة نتيجة نقل الدم					
.15	في حال حدوث حســاســية طفيفة عند المريض المتلقي للدم، فإن الإجراء التمريضــي الأول الذي يتوجب عليك القيام به هو إيقاف عملية نقل الدم وإبلاغ الطبيب					
.16	الخطأ في تحديد هوية المريض يعتبر الســبب الأكثر شــيوعًا لحـدوث تفـاعلات نقـل الـدم الأكثر خطورة والمؤدية للوفاة غالباً					
.17	معرفـة الممرض التـامـة بـالمريض هي الحـالـة الوحيدة التي يمكن فيها عدم التـأكد من معلومـات المريض قبل البدء بعملية نقل الدم					
سادساً: القضايا المتعلقة بإجراءات وسياسات نقل الدم						
.1	هناك سياسـة مكتوبة في المشـفى فيما يخص عملية نقل الدم					
.2	قمت بقراءة سياسة المشفى المتعلقة بنقل الدم والاطلاع عليها					
.3	هناك متابعة إدارية لمراقبة تطبيق سياسـة المشـفى فيما يتعلق بعملية نقل الدم					
.4	هناك سـياســة مكتوبة في القســم فيما يخص عملية نقل الدم					
.5	قمت بقراءة سـياسـة القسـم المتعلقة بنقل الدم والاطلاع عليها					
.6	هناك متابعة إدارية لمراقبة تطبيق سـياســة القسـم فيما يتعلق بعملية نقل الدم					

شاكرة لكم حسن تعاونكم

Annex (5) English version

Section A1: Socio-demographics and nurses characteristics related to Blood Transfusion

1. **Hospital Name:**

a. Al-shifaa Medical Complex b. Nassar Complex hospital c. Ar-rantisy hospital

2. Gender:

a. Male b. Female

3. Nursing qualification:

a. Diploma b. Bachelor of nursing c. master's degree d. Ph.D of Nursing

4. **Specialization**

a. Nursing b. Midwifery

5. Age (……...) years

6. Department: .....

7. How long have you been working on ward(s) where blood transfusion is performed?

Years --------months----------

Section A2: nurses issues related to training bout blood Transfusion

8.**Over the past 6 months, what was the approximate number of times you performed a blood transfusion**? _____

8.**Have you ever participated in any in-service training program in relation to blood transfusion within the period you have worked for the ward, in which blood transfusion is performed**?

a. Yes……. b. No…….

-If yes, how many programs have you participated in during the last year?

When _____Where _____

9**. What specific area(s) relating to transfusion practice do you feel you would like further training/education? (You may choose more than one)**

a. Sampling b. Blood bag Collection c. Blood administration

e. Nursing care before, intra and post transfusion

f. Serious hazards g. Others**. Mention …….**

Section B: Issues related to nurses' knowledge About Blood Transfusion

No	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
First: Issues related to Patient preparation prior blood collection						
1	Nurse must Check patency of IV access after blood bag collection					
2	The nurse has to use large gauge cannula to keep patent without complication					
3	Administration of prescribed drug should be given after blood collection from blood bank					
4	The nurse refuse to collect and administer Packed RBC IV due to incomplete blood order.					
5	The nurse should inform the patient about the reasons for transfusion					
6	The nurse must explain risks of transfusion for patient prior blood transfusion					
7	The nurse should explain side effects of blood transfusion for patient prior transfusion					
8	written or verbal consent must be obtained from patient prior initiating blood transfusion.					
9	The baseline vital signs be recorded before initiating the blood transfusion within 30 minutes					
Second: Issues related to blood collection						
1	The nurse must prepare blood request in which physician request for intended transfused unit					
2	The nurse draws blood sample, identify patient information correctly, and sends it to laboratory					
3	The nurse must recognize the required type of blood products to administer to the patient, e.g., Whole blood, red blood cells, plasma and platelet)					
4	Nurse must cross match patient information with blood unit label and written blood request when blood unit was received to guarantee the right unit for the right patient					
5	Nurse use a validated blood transport box to transport blood from blood bank to ward					
6	The physician should cross match blood unit label with blood request to ensure compatibility					
7	In case of absence doctor, two nurses can cross match blood unit before it was given.					
8	in case of receiving (A+) blood unit for patient from blood bank, nurse notice the received blood unit was					

No	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
	(A-). In this case, nurse must inform doctor and wait for his instructions.					
Third: Issues related to Pre-transfusion initiation nursing activities						
1	Blood unit must warm in certain cases such as exchange blood transfusion in infants					
2	The blood unit must be warmed at designated device					
3	Blood unit must be warmed in emergency blood transfusion					
4	Nurse should warm blood unit in hypothermic patient					
5	When blood unit arrives at 4 p.m., the most appropriate time for blood transfusion is 4:10 p.m.					
6	The nurse start transfusion immediately after blood bag collection in the ward					
7	The most important issue is to verify patient identity prior starting transfusion					
8	The nurse patient identifies correctly prior initiating blood transfusion by asking the patient to tell his or her name if possible					
9	Steps are taken to identify patient's identity, the nurse matches patient's identification information with blood unit label, the identification band and the request form at bedside checkup.					
10	The suitable filter size of transfusion set is (170-200 micron).					
Fourth: Issues related nursing activities during blood transfusion						
1	The nurse routinely must set up flow rate of blood (regulating the infusion rate)					
2	The nurse must document information related blood unit initiation and patient's vital signs on patents record					
3	The nurse primes transfusion set with normal saline solution					
4	The flow rate of blood unit was regulated by manual or electronic infusion pump					
5	The initial rate of blood unit infusion for adult do not exceed 120 ml/ hour					
6	Maximum duration for completing blood transfusion is not exceed 4 hours					
7	The rate of transfusion for adult patient should not exceed 50 ml/hour throughout transfusion process					
8	In case of continuous transfusion, the maximum duration for blood transfusion set usage is 4 hours					

No	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
9	Blood transfusions should be administered slowly for cardiac and severe anemic patients					
10	Normal saline 9% solution could safely mix with blood unit during transfusion					
11	Ringer lactate solution could safely mix with blood transfusion unit					
12	Morphine 0.1mg / mL may be given with blood transfusion unit					
13	The blood unit transfusion started at 2:00 PM and completed at 5:00 PM. The recorded of the patient's vital signs should start in the first hour at 2:05 and 2:15					
14	The blood unit transfusion started at 2:00 PM and completed at 5:00 PM. The recorded of the patient's vital signs should start in the second hour 3:15					
15	The blood transfusion started at 2:00 PM and complected at 5:00 PM. The recorded of the patient's vital signs should start in the first hour at 4:15					
16	the nurse should observe the patient for any possible blood transfusion reaction in the first 10-15 minutes					
17	In case of 4-month-old infant, the rate the first 15 minutes should not exceed 100 ml/kg/hour					
Fifth: Issues related Nursing activities during adverse reaction						
1	Administration compatible blood unit could minimize the risk of developing reaction					
2	Initiation blood unit transfusion after 20 minutes after receiving from blood bank to minimize the risk of developing reaction					
3	Administering blood unit to patient within 4 hours after collection could reduce risk of acute transfusion reaction					
4	Not combining drugs or solutions that are incompatible with blood minimize the risk of developing reaction					
5	Tachycardia indicates patient is developing hemolytic transfusion reaction					
6	Chest pain indicates patient is developing blood transfusion reaction					
7	Hypotension indicates patient is developing blood transfusion reaction					
8	Nausea and vomiting indicate patient is developing blood transfusion reaction					

No	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
9	The Immediate measures to be taken in the event of symptoms allergic reaction is to stop blood immediately and take vital signs					
10	Keep vein open with 0.9% normal saline in case of blood transfusion reaction					
11	In serious hemolytic reaction occurs during a blood transfusion, the nurse must write an Incident Report.					
12	The nurse must inform the physician in case of blood transfusion reaction and prepare emergency medication and give as doctor instructions					
13	Due to an emergency situation, a unit of blood collected at 8.00 PM was kept in the nurses‟ station until 9:30 pm nurse start transfusion immediately and finish within 2 ½ hours					
14	Urticarial rash is the expected usual complaint of a patient with mild allergy of a blood transfusion					
15	In severe allergy reaction of a patient receiving blood, the first nursing response stop the blood transfusion and inform the doctor.					
16	The most common cause of the most fatal transfusion reactions is an error in patient identification.					
17	If the nurse knows the patient clearly, administer blood without check patient's details at the bedside.					
Sixth: Issues related to policy and guidelines						
1	There is a written policy for blood transfusion in the hospital					
2	I have read and familiarized with the policy of the hospital regarding blood transfusion					
3	Administrative follow-up is available to monitor the implementation of the hospital policy on blood transfusion					
4	There is written policy in the ward regarding blood transfusion					
5	I have read and familiarized with the policy of the ward regarding blood transfusion					
6	Administrative follow-up is available to monitor the implementation of the ward policy on blood transfusion					

Annex (6) Observational checklist

***Section A1: Socio-demographics and nurses characteristics related to Blood* Transfusion**

1. **Hospital Name:**

a. Al-shifaa hospital b. Nassar Complex hospital c. Ar-rantisyhospital

2. Gender:

a. Male b. Female

3. Nursing qualification:

a. Diploma b. Bachelor of nursing c. master's degree d. Ph.D. of Nursing

4. **Specialization**

a. Nursing b. Midwifery

5. Age (……...) years

6. Department: .....

6. How long have you been working on ward(s) where blood transfusion is performed?

Years --------months----------

Section A2: nurses issues related to training bout blood Transfusion

7.**Over the past 6 months, what was the approximate number of times you performed a blood transfusion**? _____

8.**Have you ever participated in any in-service training program in relation to blood transfusion within the period you have worked for the ward, in which blood transfusion is performed**?

a. Yes……. b. No…….

-If yes, how many programs have you participated in during the last year?

How many? _____Where _____

9**. What specific area(s) relating to transfusion practice do you feel you would like further training/education? (You may choose more than one)**

a. Sampling b. Blood bag Collection c. Blood administration

d. Adverse reactions e. Nursing care before, intra and post transfusion

g. Others

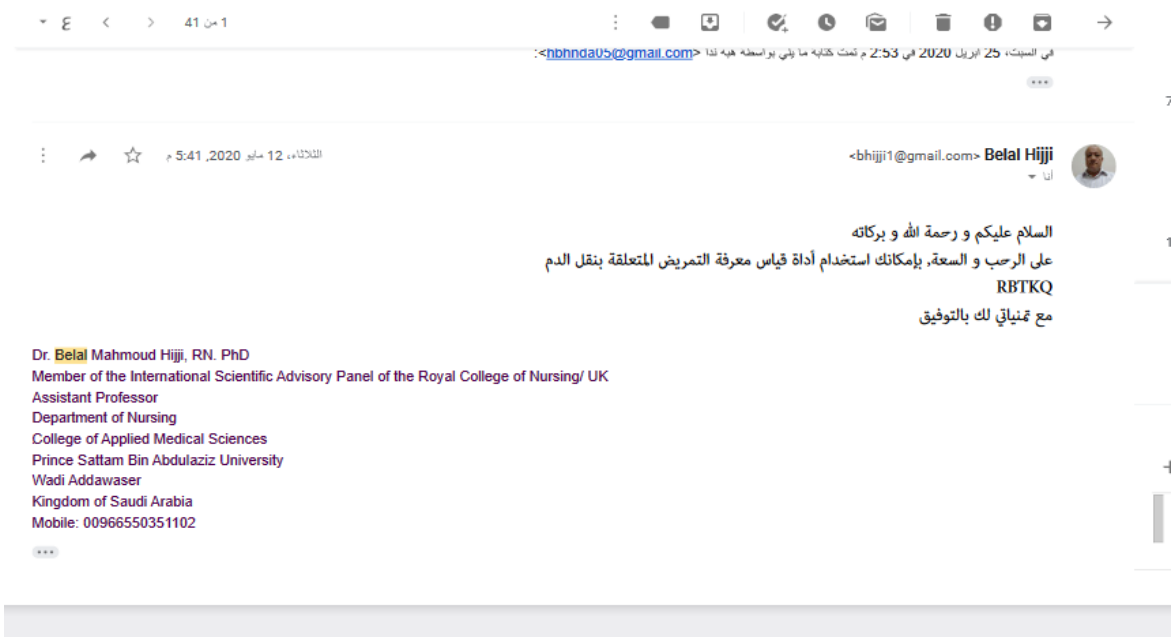
No	Sentence	Observed	Not observed
First: Issues related Pre-Transfusion preparation			
1	Identify the patient		
2	Check for Physicians order for type of blood unit		
3	Check for patient ID		
4	Check the result of level of Hemoglobin		
5	Assess for any history of allergy during previous blood transfusions		
6	Obtain consent for blood transfusion/blood products		
7	Check for patients' blood group		
8	Assess the reason for blood transfusion		
9	Assess patient's understanding of procedure and reason for blood procedure transfusion		
10	Assess patients' understanding signs and symptoms to report (i.e., rash, itchiness, chills)		
11	Perform hand hygiene,		
12	Put on clean gloves		
13	Check IV line's availability		
14	Verify patent IV line with flushing normal saline 0.9%		
15	Get and record the patient's baseline vital signs, If the patient's temperature is higher than 37.8°C. notify the health care provider before starting the transfusion.		
16	Ensure Normal Saline as mainline IV		
17	Transport blood pack to the ward in a special box		
18	Obtain blood product for transfusion from blood bank just prior to transfusion		
19	Performing remote checks at nurses' station		
20	Blood administered within more than 10 to 30 minutes following removal from blood bank fridge		
21	Confirm the following with another nurse prior to starting blood infusion bedside checkup (checking blood product label with patient information): patients name		
22	Patients ID number		
23	Blood group and type		
24	Expiration date		
25	Blood inspected for clots		
26	Obtain baseline vital signs 30 minutes prior starting transfusion: Measure Temperature		
27	Count Heart rate		
28	Measure respiratory rate		
29	Measure Blood pressure		
30	Have emergency equipment at your bedside (oxygen, suction, etc.)		
31	Documentation pre transfusion activities		
Second: issues related intra-transfusion activities			
1	Start transfusion very slowly (no more than 25-50 mL in first 15minutes)		
2	Stay with the patient for the first 15 minutes		

No	Sentence	Observed	Not observed
3	Recheck vital signs		
4	Assess for any signs of reaction (fever, hypotension, tacky cardia)		
5	Infuse rest of transfusion as per MD orders, over no more than 4 hours (risk of bacterial contamination)		
6	Documentation		
Third: issues related adverse reaction activities			
1	1. Reaction of nurses when transfusion reaction occurred: Stop infusion immediately		
	2. piggyback N/S into the line (closest port to patient) or change IV tubing to N/S only		
	3. Call physician immediately		
	4. Remain with patient, check vital signs q 5 min, observe for signs and symptoms		
	5. Prepare to administer meds (antihistamines, vasopressors		
	6. Prepare to administer oxygen if needed as Dr ordered		
Fourth: issues related post- transfusion activities			
1	Monitor V/s after finishing Transfusion		
2	Dispose of blood container and tubing according to agency policy.		
3	Document post transfusion and during reaction if occur. Time, date, type of product & Blood group.		

Annex (7): The guiding questions of interview

مسلسل	السؤال الرئيسي	أسئلة إضافية	توضيح واستفسار
1.	عرفنا على نفسك؟		المؤهل، الخبرة، التخصص، .....
2.	حدثنا عن خدمات نقل الدم في المستشفى الخاص بكم؟	هل يوجد عندكم قاعدة بيانات وتقارير بأعداد وحدات الدم وفيم تستخدم؟	عدد الوحدات المستخدمة، أكثر الأقسام استهلاكاً
3.	كيف تقيم مستوى الطاقم التمريضي المعرفي والعملي بما يتعلق بخدمة نقل الدم؟	هل أنت راضٍ عن هذا المستوى؟	كم النسبة المئوية أو التقدير الذي تمنحه لهم؟
4.	يوجد سياسة واضحة ومكتوبة خاصة بإجراء نقل الدم لديكم؟	هل تم توزيعها على الأقسام وتدريب الطاقم عليها؟ هل تابعتم تنفيذها مدى التزام الطاقم بذلك وما هي الوسائل المتبعة؟ هل تعتمدون نموذج موافقة المريض؟	هل بإمكان أي ممرض الوصول الى السياسة الخاصة بنقل الدم عن وجدت؟ اتحدث عن سياسة خاصة بالخطوات، التوثيق، قياس علامات الحياة وفق جدول زمني، التعامل مع الأعراض الجانبية إن حدثت
5.	ما هي إجراءات الأمن والسلامة التي تتخذونها لضمان مأمونية نقل الدم؟	هل تتوفر لديكم الأدوات الكافية والقفازات؟ هل لديكم أداة لمراقبة إجراء بنك الدم مثل قائمة مرجعية؟	فحص الدم، المطابقة، استخدام المحلول الملحي، التوثيق، مراقبة المريض خلال اول ربع ساعة وبعد نقل الدم؟
6.	هل يوجد أية برامج تدريبية للطاقم الموجود بخصوص عملية نقل الدم؟ الرجاء إعطاء لمحة عنها	هل تقومون بعمل تقييم لهذه البرامج لمعرفة مدى فعاليتها وتأثيرها على أداء الطاقم؟	أين تقام؟ وهل هي دورية؟
7.	كيف تتعاملون مع حالات نقل الدم التي تتعرض لأعراض جانبية؟	هل يوجد تعاون بين طاقم التمريض وبنك الدم في حالة حدوث مضاعفات؟ هل التمريض مؤهل نظرياً وعملياً للتعامل مع مثل هذه الحالات	هل يوجد تقارير مثبتة بها؟ كيف تتم متابعتها؟
8.	ما هي التحديات التي والصعوبات التي تواجه طاقم التمريض للوصول الى عملية نقل دم آمن ومثالي؟		من حيث الكفاءة او توفر الأدوات؟ توفر الوقت؟
9.	ما هي الإجراءات التي قمتم بها أو تنوون القيام بها لتذليل تلك التحديات؟		
10.	ما هي التوصيات والمقترحات التي ترغبون في تقديمها من أجل الرتقاء بخدمة نقل الدم؟		
11.	هل من شيء ترغبون في إضافته؟		

Annex (8): Permission of Original Tool Developer Permission of Original Tool Developer



Belal Hijji <bhijji1@gmail.com>

السلام عليكم و رحمة الله و بركاته
على الرحب و السعة, بإمكانك استخدام أداة قياس معرفة التمريض المتعلقة بنقل الدم
RBTKQ
مع تمنياتي لك بالتوفيق

Dr. Belal Mahmoud Hijji, RN. PhD
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College of Applied Medical Sciences
Prince Sattam Bin Abdulaziz University
Wadi Addawaser
Kingdom of Saudi Arabia
Mobile: 00966550351102

Annex (9) List of List of arbitrators

No.	Name	Workplace
1	Dr. Yehia Abed	Al-Quds University
2	Dr. Khitam Abu Hamad	Al-Quds University
3	Dr. Yusuf Aljeesh	Islamic University
4	Dr. Ashraf Aljidi	Islamic University
5	Dr. Abdelkarim Radwan	Islamic University
6	Dr. Nasser Abu Alnoor	Islamic University
7	Dr. Ahmad Nijjim	Al-Azhar University
8	Dr. Khaled Khadora	Al_Israa University
9	Dr Ezzat Askar	Al-Azhar University

Annex (10) Differences in practice based on Hospital name

Multiple Comparisons								
Tukey HSD								
(I) 1.Hospital		(J) 1.Hospital		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
dimension2	Shifa	dimension3	Rantisy	.06996*	.02525	.018	.0099	.1300
			Nasser	.07083*	.02432	.012	.0130	.1287
	Rantisy	dimension3	Shifa	-.06996-*	.02525	.018	-.1300-	-.0099-
			Nasser	.00088	.03037	1.000	-.0714-	.0732
	Nasser	dimension3	Shifa	-.07083-*	.02432	.012	-.1287-	-.0130-
			Rantisy	-.00088-	.03037	1.000	-.0732-	.0714
*. The mean difference is significant at the 0.05 level.								

عنوان الدراسة: معرفة وممارسات حول عمليات نقل الدم في مستشفيات غزة الحكومية

إعداد: هبة أحمد عبد الرحمن أبو ندى

إشراف: الدكتورة/ ميسون أبو النور

الملخص

نقل الدم هو إجراء شـــائع لإنقاذ الحياة. ولكن الأخطاء المرتبطة به يمكن أن تؤدي إلى المرض والوفاة لذلك، يجب أن يتم إجراؤها من قبل 'طاقم صـــحي مدرب تدريباً جيداً ومؤهل تأهيلا عاليا بسـبب المضـــاعفات المحتملة التي تهدد الحياة. تهدف هذه الدراســة الى تقييم مســتويات المعرفة والممارســة بين الممرضــين العاملين في المســتشــفيات الحكومية في قطاع غزة فيما يتعلق بنقل الدم. فقد اســـتخدم الباحث الأســـلوب المختلط لجمع البيانات لتحقيق هدف الدراسة. تم استخدام العينة الملائمة التي استهدفت 400 من الممرضين العاملين في اقسام الباطنة والجراحة والتوليد في المستشفيات الحكومية المستهدفة مكونة من 221 من الاناث و179 من الذكور بمتوسط عمري 31.0 ± 6. حيث أتم الممرضـــين المســـتهدفين تعبئة الاســـتبيان المعدل الذاتي." المعرفة الروتينية لنقل الدم." بمعدل اســـتجابة 100% وتم ملاحظة 100 من الممرضين فقط أثناء عملية نقل الدم باستخدام قائمة مرجعية مصممة خصيصًا لهذا الغرض. وتم اجراء مقابلات مع مصـــادر المعلومات الرئيســـة شـــملت كلا مدراء المســـتشـــفيات، مدراء التمريض، رؤســـاء الأقســـام التمريضية ومديري بنك الدم.

أظهرت نتائج الدراســـة الحالية أن المســـتوى المعرفي لدى معظم الممرضـــين حول نقل الدم تقريبا يتراوح من متوسط إلى جيد واشارت ان 43.5% يمتلكون مستوى معرفيا جيدا بينما يمتلك 4.85٪ مستوى معرفيا ضعيفا بمتوسط 1.1± 71بناءً على المقياس التالي: ضـعيف: من 50٪ فاقل، متوسـط: 50–74.9٪ و75٪ فأكثر تشير إلى مستوى جيد، وافادت الدراسـة بشـكل واضـح ان الممرضـين يمتلكون معرفة ضـعيفة في المجالات المرتبطة: بنقل الدم من بنك الدم، الوقت الأمثل لبدء نقل الدم بعد وصـوله إلى القسـم و بتدفق نقل الدم خلال 15 دقيقة الأولى، تجهيز الدم بمحلول ملحي والسـوائل المتوافقة معه. ومع ذلك، أظهرت الدراسـة ان 9٪ فقط من الممرضـين لديهم اداء مرضٍ من الممارسـة و31٪ كان أداؤهم سـيئ بمتوسـط 57.4 ± 10.2. وأظهرت النتائج وجود نقص ملحوظ في أداء التمريض بما يتعلق بارتداء القفازات، واسـتخدام محلول ملحي عادي كخط رئيسـي للسـوائل الوريدية، ونقل الدم في صـندوق خاص، وقياس العلامات الحيوية والبقاء مع المريض لمدة 15 دقيقة الأولى اثناء نقل الدم.

وقد كشـــفت نتائج الدراســـة عن عدم وجود أي فروقات ذات دلالة إحصـــائية في المســـتوى العام للمعرفة أو الممارسـة فيما يتعلق بخصـائص الممرضـين. ومع ذلك، فقد أثر تلقي البرامج التدريبية بشـكل كبير على مسـتوى معرفة الممرضـين، بينما للمستشـفى تأثير ذو دلالة إحصـائية على مسـتوى الممارسـة بين الممرضـات. علاوة على ذلك، كان أداء الممرضـين العاملين في مستشـفى الشـفاء أفضـل من غيرهم. تم الكشـف عن علاقة إيجابية بين مسـتويات المعرفة والممارســة. ومع ذلك، تم الكشــف عن فجوة بين معرفة الممرضــين والممارســة الفعلية. تؤكد هذه الدراســة على أهمية الدورات التدريبية أثناء الخدمة للمرضـين إلى جانب وضـع سـياسـة مكتوبة تتعلق بنقل الدم من أجل تحسـين معرفة الممرضين وممارستها وتجنب مضاعفات نقل الدم. لاستكشاف هذا الموضوع بشكل أعمق، يوصى بالدراسات الطولية والرصدية في أماكن مختلفة.

الكلمات الدالة: المعرفة، الممارسة، نقل الدم.