

**MASTER OF PUBLIC HEALTH
(IMPLEMENTATION SCIENCE)**

**Addressing the knowledge gaps in the prevention of HIV
transmission from mother to newborn in Tripoli University
Hospital, Libya: An Implementation Research Study**

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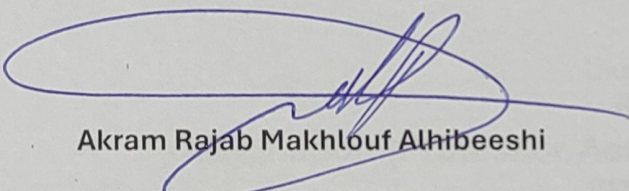
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TO WHOMSOEVER MAY CONCERN

This is to certify that Dr. Akram R. Alhibeeshi, a student of the Master of Public Health (Implementation Science) The program offered by IIHMR University, Jaipur has undergone Practicum Training at Tripoli University Hospital from the date Dec 17th /20223 to Agu 15th /2024

The Candidate has successfully carried out the study designated to his during practicum training and her approach to the study has been sincere, scientific and analytical.

The practicum training fulfills the course requirements.

I wish him success in all his future endeavors.

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Dr. Monira A. Dakheel



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Abstract

Mother-to-child transmission (MTCT) of HIV remains a significant public health challenge, especially in regions affected by political instability and conflict. This study aims to identify gaps in the prevention of HIV transmission between mothers and newborns at Tripoli University Hospital in Libya. This country has faced considerable disruption in its healthcare services due to ongoing internal conflicts. Despite global efforts to reduce MTCT rates, the prevalence of HIV among children remains alarmingly high, particularly in settings where healthcare infrastructure is compromised.

The objectives of this study were to assess mothers' knowledge regarding HIV transmission, design and implement a targeted training strategy, and evaluate the impact of this intervention on their knowledge and behavior. The study was conducted in three stages: a pre-intervention assessment, an intervention phase, and a post-intervention evaluation. The pre-intervention assessment involved a questionnaire administered to two groups of mothers those attending the Pediatrics Infectious Diseases Department and those visiting the Obstetrics and Gynecology Department at Tripoli University Hospital. A total of 300 mothers participated, including both HIV-positive and HIV-negative individuals.

The findings revealed that the majority of mothers (52%) were between 20-30 years old and had moderate educational levels, with 56% unaware of the basic definition of HIV. However, 67.3% of participants were aware of the causes of HIV, and 58.7% demonstrated a satisfactory level of knowledge overall. The study also found significant relationships between knowledge levels and factors such as age, education, employment status, and access to antenatal care.

An intervention program was implemented, comprising educational sessions and awareness campaigns, which resulted in a marked improvement in the participants' knowledge about HIV transmission, as evidenced by pretest and posttest evaluations.

This research highlights the critical need for ongoing education and awareness programs to reduce the MTCT of HIV in Libya, particularly in conflict-affected regions. The findings underscore the importance of integrating HIV prevention into maternal healthcare and suggest that targeted interventions can significantly enhance knowledge

and practices, contributing to the broader goal of controlling the HIV epidemic in the country.

Keywords: Mother-to-child transmission (MTCT), HIV, Libya, Public Health Implementation Science, Training Strategy, Prevention of HIV, Maternal healthcare, Tripoli University Hospital.

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Abbreviations

HIV Human Immunodeficiency Virus

PLHIV People living with HIV

WLWH Women Living with HIV

ADIS Acquired Immunodeficiency Syndrome

MTCT Mother-to-child transmission

PMTCT Prevention of mother-to-child transmission

ART Antiretroviral Therapy

RNA Ribonucleic Acid

EID Infant HIV diagnosis

IDUs Injecting drug users

MSM Men who have sex with men

FSW Female sex workers

TMC Tripoli Medical center

TUH Tripoli University Hospital

MENA The Middle East and North Africa

WHO: World Health Organization

UNAIDS: Joint United Nations Programme on HIV/AIDS

UNICEF: United Nations International Children's Emergency Fund

Chapter One

1.1 Introduction

This chapter presents a brief introduction to the main study. In particular, the chapter focuses on the study's importance, the study, the theoretical framework of the study, the study questions, and the study's aims.

1.2 Background

Transmission of HIV occurs from mother to child, or vertical transmission of HIV occurs when the virus is passed from a mother to her child during pregnancy, childbirth (labor and delivery), or breastfeeding (breast milk)

According to the annual reports, of (UNADIS, 2021), 1.7 million children under the age of 15 are infected with HIV. According to reports (WHO, 2023), mother-to-child transmission represents more than 90% of these infections among children, given that about 1.3 million pregnant women and girls infected with HIV give birth to children with a transmission rate ranging from 15% to 45%. in the absence of prevention intervention.

According to reports (UNICEF, 2023), which indicated a significant decrease of 52% in new HIV infections among children between the ages of 0 and 9 years since 2010, however, the statistical figures indicating transmission of infection are still large and frightening. (Cohen, Smith , Muessig, & Hallett, 2013) indicated that mother-to-child transmission of HIV is the main source of HIV infection in children.

The human immunodeficiency virus (HIV) is a serious health problem, especially in many developing countries, and military conflicts and political instability are reasons for the increased HIV problem (Sallam M, Alabbadi , Abdel-Razeq , Battah , & Malkawi , 2022 Jan 10)

Libya is considered the second largest country in Africa and has the longest coastline in the Mediterranean basin. Since 2011, it has witnessed a major devastating armed conflict, which has caused the continuous interruption of health care services and the internal displacement of large numbers of the population. The number of internally displaced people was approximately 1.5 million people in Libya Out of a total population of 6 million people.

In the period from 1998 to 2007, Libya witnessed one of the largest cases of HIV infection in children as a result of the involvement of five Bulgarian nurses and a Palestinian doctor who were working at Al-Fateh Children's Hospital in the city of Benghazi. They were accused of injecting more than 400 Libyan children with blood contaminated with the AIDS virus. (Gary Maartens, Connie , & Lewin, 2014) The epidemic spread is associated with segments of society of high risk, such as prisoners and drug users. (MA, 2017 Jun;7).

Many studies, including a study (Salha, 2024) indicated that pregnant women have a low level of knowledge about HIV, so it is necessary to develop programs and studies that aim to make them aware of the causes of this disease, and how it is transmitted from mother to child, which can enhance their behavioral change.

A study (NajlaElyounsi, 2023) concluded that the spread of HIV among Libyan patients is increasing and that ongoing intervention programs for the burden of HIV disease and efforts to evaluate and work to eliminate the factors causing HIV infection are important and necessary elements in the effective response to the HIV epidemic in Libya.

Through this, we realize that public health programs in Libya should pay great attention to developing awareness programs for mothers about the danger of HIV infection. Hence, it is important to conduct this current study.

1.3 Significance of the Study

This study represents a pioneering effort by the researcher to address the knowledge gaps surrounding the prevention of HIV transmission from mother to newborn in Libya. The significance of this research lies in its targeted approach to improving maternal knowledge and awareness, which is crucial for preventing HIV transmission during pregnancy, childbirth, and breastfeeding. By focusing on the maternal population, this study aims to contribute to a vital area of public health, particularly in regions with limited healthcare infrastructure and ongoing socio-political challenges, such as Libya.

The findings of this study are expected to inform health policymakers within the Ministry of Health, healthcare professionals at Tripoli University Hospital, and other relevant institutions about the critical need for comprehensive education and intervention programs targeting mothers. Given that the majority of HIV prevention efforts are managed by public health institutions, this study emphasizes the importance

of integrating educational programs into maternal healthcare services to enhance HIV prevention.

Furthermore, this research aims to influence future healthcare policies and practices by demonstrating the importance of ongoing education and support for mothers at risk of HIV. By raising awareness among mothers about HIV transmission and prevention, the study seeks to improve maternal and newborn health outcomes. The researcher anticipates that this work will contribute to the development of more effective strategies to reduce mother-to-child transmission (MTCT) of HIV and highlight the need for continued public health efforts in this area.

The study's findings are particularly significant in light of the limited research on maternal knowledge and HIV prevention in Libya. It will help bridge the existing gaps by providing evidence-based recommendations for healthcare providers, policymakers, and maternal healthcare programs, ensuring that mothers are better equipped with the knowledge needed to protect their newborns from HIV transmission.

1.4 Problem Statement

Given the ongoing internal conflicts in Libya, this study serves as a crucial intervention to raise awareness among pregnant mothers about the life-threatening risks of HIV transmission.

Drawing from previous clinical experience in public health research, HIV testing for pregnant women and all HIV-exposed infants within six weeks of birth has been recommended for over a decade. However, there remains a significant lack of knowledge regarding the transmission of HIV from mothers to newborns and the grave danger this poses to children's lives.

1.5 Implication of the study on Health Care System Improvement

The training program at Tripoli University Hospital in Libya, aimed at preventing HIV transmission from mother to newborn, plays a vital role in enhancing the healthcare system. By focusing on increasing mothers' knowledge and awareness, this approach empowers them with the understanding needed to take preventive measures against HIV transmission. This approach not only improves the mothers' ability to protect their

newborns but also strengthens the overall response to HIV prevention in maternal and neonatal care within the hospital and beyond.

1.6 Aims of the Study

The present study aims to:

- 1- Assess the mother's knowledge of HIV transmission from mother to newborn.
- 2- Designed a training module for HIV-infected mothers and examined pregnant mothers.
- 3- Conduct the new training module
- 4- Evaluate the impact of the new training module on the mother's knowledge of HIV transmission from mother to newborn.

1.7 Definition of Terms

- HIV Transmission

refers to the process by which the Human Immunodeficiency Virus (HIV) is spread from one person to another. This can occur through various means, including unprotected sexual contact, sharing of needles, or from mother to child during pregnancy, childbirth, or breastfeeding. The researcher defines HIV transmission operationally in the context of this study as the transfer of HIV from a mother to her newborn, focusing on the mechanisms and risk factors associated with this form of transmission.

- Mother-to-child transmission (MTCT)

The transmission of HIV from an HIV-positive mother to her child during pregnancy, childbirth, or breastfeeding. Without intervention, the transmission rate is between 15% and 45%.

- Implementation Program

"An organized set of learning activities designed to enable a student to develop knowledge, understanding, skills, and attitudes relevant to the student's individual needs" (Educational Program Definition: 288 Samples | Law Insider, n.d.).

Operationally, the researcher defines an educational program as a systematically planned, organized, and executed teaching activity with specific objectives aimed at enhancing mothers' knowledge regarding HIV transmission.

- Knowledge

"Knowledge is awareness, understanding, or information that has been obtained by experience or study, and that is either in a person's mind or possessed by people generally"

Operationally, the researcher defines knowledge as the level of understanding measured by the total scores obtained from mothers' responses to HIV transmission checklists.

- Research Design

This study will employ a quantitative research design, as it is fundamentally concerned with collecting numerical data to explain specific phenomena. certain research questions are inherently suited to quantitative methods. Accordingly, this approach will be used to evaluate mothers' knowledge of HIV transmission.

- Procedures

The following steps were taken to conduct the current study:

- i. Official permission was obtained to survey the Infectious Department at the University Hospital - Tripoli/Libya.
- ii. Relevant studies and literature were reviewed.
- iii. The initial version of the questionnaire
- iv. was developed and after discussion was finalized.
- v. The final questionnaire was distributed to the Tripoli University Hospital, Libya study sample.
- vi. Data was collected, results were analyzed, and recommendations were formulated based on the results.

- Public Health

Public health is the science and art of preventing disease, prolonging life, and promoting health through organized efforts and informed choices of society, organizations, public and private sectors, communities, and individuals. Operationally, the researcher defines public health as the collective efforts and strategies aimed at improving the health and well-being of populations, with a specific focus on preventing HIV transmission from mother to newborn.

- Training Module

A structured educational program designed to increase the knowledge and skills of mothers regarding the prevention of mother-to-child transmission (PMTCT) of HIV. In this study, the training module focuses on delivering comprehensive information about HIV transmission, prevention strategies, and the role of antiretroviral therapy. It includes interactive sessions, discussions, and practical applications aimed at improving maternal awareness and behavior change to reduce the risk of HIV transmission to newborns. The module is delivered through a combination of in-person workshops, hospital-based consultations, and digital platforms like WhatsApp and Zoom for continued support and learning.

- Healthcare System

The healthcare system refers to the organization of people, institutions, and resources that deliver healthcare services to meet the health needs of target populations.

Operationally, the researcher defines the healthcare system as the network of public and private sector organizations involved in providing care and implementing policies related to the prevention of HIV transmission, particularly from mother to newborn.

- Antiretroviral Therapy (ART)

A combination of drugs used to treat HIV infection.

- Stigma

Negative attitudes, beliefs, and behaviors associated with HIV.

- Antenatal Care

Medical care is provided to pregnant women before and during pregnancy.

Chapter Two

2.1 Review of Literature

The risk of HIV transmission from an untreated mother living with HIV to her child ranges from 15% to 45% depending on the presence and duration of breastfeeding.

Three main steps needed to reduce mother-to-child transmission include early identification of HIV-infected pregnant women, treatment of HIV-infected pregnant women with efficacious antiretroviral therapy (ART), and prophylaxis for HIV-exposed infants. A recent study shows that when a collective community effort is focused on these activities, the rate of transmission drops to less than 1%. (Sallam M, Alabbadi , Abdel-Razeq , Battah , & Malkawi , 2022 Jan 10)

The proportion of pregnant women living with HIV who received efficacious ART doubled in the 22 priority countries from 37% in 2009 to 77% in 2014. Countries that provided more efficacious regimens had also adopted the 2023 World Health Organization Consolidated Guidelines on the Use of Antiretroviral Drugs for Treatment and Preventing HIV Infections. (WHO, 2023)

2.2 Structure of human immunodeficiency virus (HIV)

The human immunodeficiency virus (HIV) is grouped to the genus *Lentivirus* within the family of *Reoviridae*, subfamily *Orthoretrovirina*. Based on genetic characteristics and differences in the viral antigens, HIV is classified into types 1 and 2 (HIV-1, HIV-2) (WHO, Report, 2018)

The immunodeficiency viruses of non-human primates (simian immunodeficiency virus, SIV) are also grouped into the genus *Lentivirus*. Epidemiologic and phylogenetic analyses currently available imply that HIV was introduced into the human population around 1920 to 1940. HIV-1 evolved from non-human primate immunodeficiency viruses from Central African chimpanzees (SIVcpz) and HIV-2 from West African sooty mangabeys (SIVsm) (S, Soliman , Kassak , Oraby , & El-Khoury , 2009 Jul 1)

HIV is a human-specific pathogen, the infection that leads to the depletion and death of mature peripheral CD4⁺ T cells (hCD4⁺) and immature hematopoietic progenitor cells in the organs and tissues responsible for their production, HIV-1 is transmitted by percutaneous, perinatal, and sexual routes, while 80% of adult infection cases become infected through the exposure of mucosal surfaces to the virus (Jung, Dlamini , Cui , & Cha , 2022 Nov 14;)

All retroviruses share a similar overall morphology, but there is variation in detail. Lentiviruses contain a diploid, single-stranded RNA genome within a protein core. Each HIV - 1 virion measures approximately 120 nm in diameter and has a condensed cylindrical core surrounded by a lipid membrane. The inter-relationship of the genomic RNA, core proteins, and surrounding viral envelope is schematic. (Alsamarrai & Abdulla , 2016)

The viral core is a complex made up of RT (p55/66), endonuclease or integrase (IN; p32), protease (PR; p10, p12 or p151), and nucleocapsid proteins (NC; p6 and p7) and two copies of positive-strand viral RNA, all of which is surrounded by an icosahedral capsid protein (CA; p24). The MA isolated matrix protein (MA; p17) lies just below the lipid bilayer that surrounds the virion. Embedded within the lipid bilayer are the viral envelope glycoproteins: the external surface glycoprotein (SU; gp 120) and the transmembrane glycoprotein (TM; gp41) (Gökengin, Doroudi , Tohme , Collins , & Madani , 2016)

2.3 Knowledge of pregnant women regarding HIV testing

A study by Ambia and Mandala (2016) assessed the sources of knowledge about HIV/AIDS testing among pregnant women. The findings revealed that 28.2% of the women gained their knowledge from the Internet, 23.7% from radio and television, 21.9% from magazines, and 19.1% from family. Only 7.2% of the participants reported acquiring their knowledge from school (Ambia & Mandala, , 2016)

2.4 Prevalence and Transmission of HIV in Libya

The Middle East and North Africa (MENA) region has the world's lowest HIV prevalence, under 0.1%. Despite this, new infections are rising, with an estimated 20,000 new cases in 2019, a 25% increase since 2010. AIDS-related deaths in the region were 9,800 in 2018. (WHO, report, 2023)

Libya, known for its conservative stance, was initially thought to have no HIV cases. Early studies, including a 1988 report screening 2,064 Libyans and a 1991 study of 10,000 specimens, found no HIV infections (UNAIDS, 2014). However, by 1998, HIV became a public issue when five Bulgarian nurses and a Palestinian doctor were accused of deliberately infecting over 400 children with HIV at a Benghazi hospital, leading to the establishment of the National AIDS Programme (NAP) in 2002. (WHO, report, 2023)

Despite efforts supported by an eight million Euro grant and consultancy from the Liverpool School of Tropical Medicine, the development of a national strategy has been delayed due to the 2011 Libyan Civil War. Although a temporary peace was achieved, ongoing political instability has continued to hinder HIV response efforts. The 2015 Country Progress Report noted minimal progress and outdated data. (Yah & Tambo, 2018)

Recent research indicates that HIV prevalence in Libya has been low but increasing. Studies from 2004 to 2020 show a rise in prevalence from 0.13% in 2004 to 0.2% in 2019 (Elgalib et al., 2021). Registered cases also fluctuated: 10,557 in 2000, 10,700 in 2002, and 10,450 in 2007, with a total of 8,486 cases reported from 1993 to 2017. (Kurtay & Hussein , 2022)

The number of Women Living with HIV (WLWH) has steadily increased. From 1993 to 1997, 22.3% of 975 cases were female, and from 2013 to 2017, 22.3% of 2,147 cases were female (Oraby, 2021)

Data collection remains challenging due to limited and outdated reports. Discrepancies in case numbers are noted, with varying reports stating 6,000 to 12,000 cases over the years (Alavian, 2016; Musarandega et al., 2017). By 2018, HIV cases reportedly rose to around 10,000, with women comprising 25-30% of the cases. In November 2020, the number was approximately 6,000, with women making up 35-40%. (WHO, report, 2023)

AIDS-related mortality data are also scarce. The 2022 Libya Country Report revealed a near doubling of AIDS-related deaths from 2016 to 2019 (n = 121), attributed to the conflict's impact on the health system and antiretroviral medicine shortages. (Elsheikh, Crutzen , Adam , Abdelraheem , & Van den Borne , 2023)

2.5 Risk Factors and Trends in HIV Transmission in Libya

Over the years, the mode of HIV transmission in Libya has evolved. Initially, between 1993 and 1997, most people living with HIV (PLHIV) were infected through blood or blood products. By 2007. However, there were no new cases linked to blood transmission (Beynene & Mogas, 2018)

In 2003, the Ministry of Health reported that over 90% of HIV infections were due to contaminated needles, with Sub-Saharan African lorry drivers and immigrants identified as the primary carriers and transmitters of the virus. Despite this, there is limited data on

the epidemic among African immigrants in Libya and its impact on Libyan nationals (Akunzirwe, Bakeera-Kitaka , Kalyango , Zalwango , & Sema, 2022)

The HIV prevalence among injecting drug users (IDUs) in Libya has risen significantly over time. From 1993 to 1997, the prevalence was 20% (n=195), and it increased to over 50% from 2008 to 2017 (n=963). In 2012, the prevalence among IDUs reached an alarming 87% (n=328), the highest rate recorded globally (Lette, 2019)

Although reliable data on Libya's HIV epidemic is scarce, experts generally believe that injecting drug use is the primary mode of transmission. However, government sources indicate a rising trend towards sexual transmission. This is supported by a spatiotemporal analysis and epidemiological study, which found that cases linked to sexual activities increased steadily, reaching 40% (n=858) between 2013 and 2017 (Yeshaneh, Abebe , Tafese , & Workineh , 2023)

A study focusing on HIV prevalence among men who have sex with men (MSM) and female sex workers (FSW) found HIV prevalence rates of 3.1% in MSM and 15.7% in FSW. The study also noted the potential for cross-infection into the general population (Chandisarewa, Stranix-Chibanda , Chirapa , Miller , & Simoyi , 2007)

In a sample of 227 MSM and 69 FSW in Tripoli, only 21% of MSM reported using a condom during their last anal intercourse. Regular condom use was reported by 63.4% of FSW with one-time clients and 56.8% with regular clients. However, only 12.1% of MSM and 49.2% of FSW knew how to use condoms correctly. Additionally, 68.5% of MSM had sexual intercourse with a female partner in the past, and 53% had done so in the last six months (Cherie, Workie , Kassie , Bitew , & Samuel , 2022)

Another study found that only two-thirds of the 75 IDUs who reported sexual activity in the past month used condoms. A separate study of final-year university students revealed that only 39% (156 of 400) believed condoms were important for HIV prevention (Ibrahim, Borgy , & Mohammed, 2014)

Research on HIV-related hospitalizations found that among 227 people hospitalized with HIV, most female patients were either married (57.5%, n=23) or widowed (22.5%, n=9), with 87.5% (n=35) identifying marital sexual relations as a mode of HIV transmission. A 2012 study on HIV prevalence in Libyan prisoners highlighted concerns about potential cross-infection through needle sharing or sexual activity (Yaya, Oladimeji , & Bishwajit, 2019)

HIV transmission in Libya has been linked to the use of blood products, sexual contact, and mother-to-child transmission during pregnancy, childbirth, or breastfeeding. Various economic, demographic, and political factors contribute to the spread of HIV in the region (WHO, Report, 2020). High-risk groups, such as prisoners and drug users, are particularly affected. Political instability can exacerbate the spread of infectious diseases, including HIV, with approximately 40% of new HIV cases occurring among young people globally (Woldesenbet, Jackson , & Lombard , 2015)

A recent study conducted at the National Center for Diseases Control (NCDC) in Tripoli, Libya, aimed to assess HIV prevalence. The study found an 18.37% prevalence rate. This relatively high rate may be due to increased movement, diverse social and religious cultures among immigrants, and other factors contributing to the higher risk of HIV spread among young Libyans (Stein, Koen , & Donald , 2015)

From 2019 to 2021, HIV cases in Tripoli varied: 256 cases in 2019 (18.47% prevalence), 236 cases in 2020 (17.03%), and 132 cases in 2021 (21.15%). The decline in new infections over time may be attributed to improved HIV detection, increased public awareness, and better access to testing and counseling services (Zar, Barnett , & Myer , 2015)

2.6 Services for Infants at High Risk of HIV Acquisition

When women start antiretroviral therapy (ART) late in pregnancy or do not initiate it at all, vertical transmission rates of HIV can exceed 30%. The World Health Organization (WHO) identifies several high-risk groups for HIV acquisition among infants.

- i. Infants born to women with established HIV infection received less than four weeks of ART before delivery.
- ii. Infants born to women with established HIV infection and a viral load greater than 1000 copies/mL in the four weeks before delivery.
- iii. Infants born to women who acquired HIV during pregnancy or breastfeeding.
- iv. Infants who are first identified as HIV-exposed during the postpartum period, regardless of prenatal HIV testing results (Thomas, Kuo , & Cohen , 2017)

Because maternal HIV antibodies are passed to the fetus and can persist for months after birth, newborns should be screened using HIV nucleic acid tests. Programs with the capacity for early infant HIV diagnosis (EID) at four to eight weeks and strong links to pediatric HIV treatment services should consider adding HIV testing at birth. Although birth testing is not routinely implemented in most public health settings, South Africa

has adopted universal birth testing for all HIV-exposed infants. This approach helps address the challenge of missed in-utero infections, as targeted testing for "high-risk" infants alone may fail to identify 20% to 25% of cases (Barnett, Brittain , & Sorsdahl , 2016)

While birth HIV testing shows promise, it could potentially disrupt routine EID testing at four to eight weeks for infants who initially test HIV-negative. Therefore, birth HIV testing programs must include strategies to maintain and support follow-up EID services after an initial negative test. Point-of-care assays for EID might facilitate the integration of birth testing, but service delivery models may need further refinement (Barnett, Brittain , & Sorsdahl , 2016)

Infants who test positive for HIV at birth must be urgently linked to HIV services. Early initiation of ART in infants significantly reduces morbidity and mortality and is associated with more rapid viral suppression and a smaller viral reservoir. To achieve these outcomes, the necessary infrastructure, including appropriate antiretroviral formulations for newborns, must be in place (Sibanda, Hakim , & Weller , 2013)

Newly diagnosed HIV-positive women should begin ART immediately, as maternal virological suppression improves maternal health and reduces the risk of vertical HIV transmission. For infants at high risk of HIV acquisition, prophylactic antiretroviral treatment provides additional coverage during the critical period between the start of maternal ART and the achievement of maternal viral suppression. The WHO currently recommends six weeks of daily nevirapine prophylaxis for breastfeeding infants born to HIV-positive mothers on ART, based on numerous clinical trials demonstrating its efficacy (Johnson, Newell , & Stinson , 2012)

For infants at very high risk of HIV transmission, dual prophylaxis with twice-daily zidovudine and daily nevirapine is recommended for the first six weeks. This may be followed by an additional six weeks of dual prophylaxis or continued daily nevirapine, totaling 12 weeks for breastfeeding infants (Kankasa, Briggs , & Carter , 2009)

In cases of extreme risk, a "presumptive treatment" regimen comprising three drugs (e.g., zidovudine, lamivudine, and Raltegravir) may be considered while awaiting the results of a birth HIV test. However, at least one diagnostic specimen should be collected before starting presumptive treatment to avoid potential impacts on viral assay performance. Studies on the large-scale implementation of enhanced presumptive treatment strategies are still lacking (Barron, Pillay , & Doherty , 2013)

2.7 Libyan Policy on Prevention of Mother-to-Child Transmission of HIV (PMTCT)

Libya's approach to preventing mother-to-child transmission (PMTCT) of HIV has been shaped by international guidelines, primarily those issued by the World Health Organization (WHO). However, political instability and ongoing conflicts have posed significant challenges to the consistent implementation of national PMTCT programs.

Currently, the Ministry of Health in Libya, in collaboration with international organizations, has adopted the following key strategies to prevent MTCT:

- i. **Antenatal HIV Testing and Counseling:** Pregnant women are encouraged to undergo HIV testing as part of their routine antenatal care. Counseling services are provided to those who test positive, ensuring they understand the importance of treatment and the available options for preventing transmission to their child (WHO, guidelines, 2021) Consolidated guidelines on HIV prevention, diagnosis, treatment, and care for key populations, (UNICEF, Report, 2022) (UNAIDS., 2023)
- ii. **Provision of Antiretroviral Therapy (ART):** HIV-positive pregnant women are provided with ART throughout their pregnancy, during labor, and while breastfeeding. ART has been proven to reduce the risk of transmission from mother to child to less than 5% when administered correctly. (LMoH Libyan Ministry of Health, 2023), (UNAIDS., 2023)
- iii. **Safe Delivery Practices:** HIV-positive women are offered guidance on safe delivery options, including the possibility of cesarean delivery, which can reduce the risk of HIV transmission during childbirth. (LMoH Libyan Ministry of Health, 2023)
- iv. **Infant Prophylaxis and Safe Feeding Practices:** HIV-exposed infants are given prophylactic ART for a defined period after birth to reduce the risk of infection further. Mothers are counseled on safe infant feeding practices, with breastfeeding recommendations depending on access to clean water and alternative nutrition options.
- v. **Capacity Building for Healthcare Workers:** Continuous training and capacity building for healthcare providers, particularly those working in maternal and child healthcare settings, have been emphasized to ensure the effective delivery of PMTCT services.

2.8 Mandatory HIV Testing Policies

In Libya, HIV testing is mandated for several key situations to ensure public health and safety. The following are the primary contexts in which HIV testing is required:

- i. **Marriage Certificate:** An HIV test is compulsory before issuing a marriage certificate, aimed at informing both partners of their HIV status and preventing transmission.
- ii. **Driving Licenses:** Individuals must undergo HIV testing as part of the application process for driving licenses to maintain public health standards.
- iii. **Hospital Admissions:** HIV testing is required for individuals seeking admission to hospitals, ensuring that healthcare providers are aware of patients' HIV status for appropriate care and infection control.
- iv. **Antenatal Care (ANC):** Pregnant women are required to undergo HIV testing as part of routine antenatal care to prevent mother-to-child transmission and to facilitate early intervention if needed.
- v. **Prison Admissions:** HIV testing is mandatory for individuals entering the prison system, aiming to manage and prevent the spread of HIV within correctional facilities.
- vi. **Employment:** Prospective employees must complete an HIV test before securing employment, helping to ensure workplace health and safety.
- vii. **Foreign Workers:** Foreign nationals applying for work in Libya must undergo HIV testing as part of their work permit process, aligning with national health regulations.
- viii. **Healthcare Worker Clearance:** All healthcare workers are required to undergo HIV testing to protect both patients and staff, ensuring a safe healthcare environment.

Chapter Three

Methodology

3.1 Conceptual framework

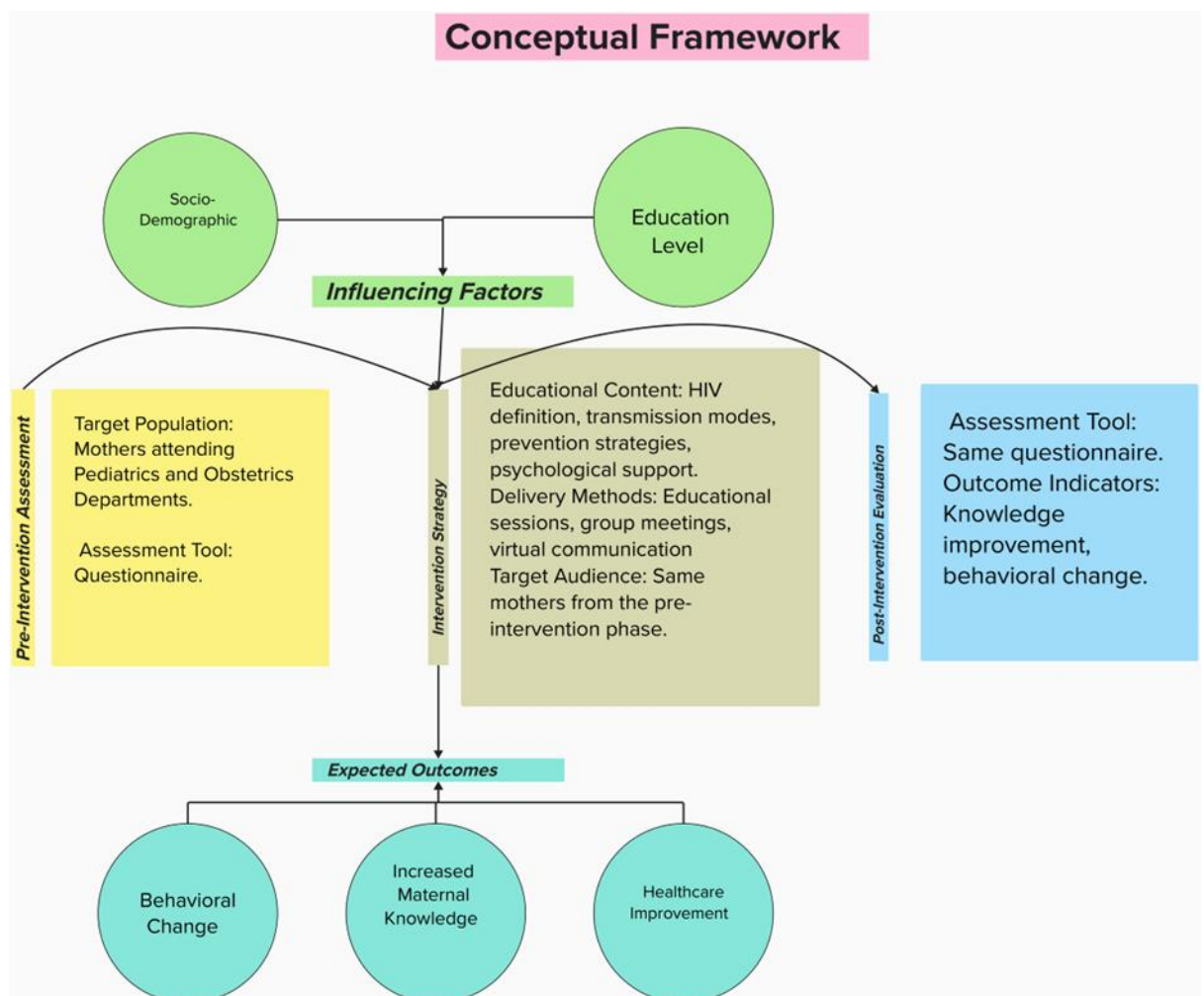


Figure 1 Diagram of Conceptual framework (self-developed model)

Figure (1) The diagram represents the logical flow of our research process. It starts with assessing the current situation, then conducting training as part of the implementation strategy to address the knowledge gap, identifying issues, and finally evaluating the success of that intervention while considering external factors that might affect the outcomes. The expected outcomes are the ultimate goals of our study, demonstrating the

potential impact of the intervention on improving knowledge, behavior, and healthcare systems in the context of HIV transmission prevention.

3.2 Setting:

This study was conducted at the University Hospital in Tripoli, Libya

The University Hospital in Tripoli, Libya, formerly known as “Tripoli Medical Center (TMC)”, is one of the largest and most prominent healthcare institutions in the country. Established in the 1970s, it has served as a key medical facility in Libya, providing a wide range of healthcare services to the population.

Located in the capital city of Tripoli, the hospital is equipped with various specialized departments, including surgery, internal medicine, pediatrics, obstetrics and gynecology, and emergency care. It also hosts advanced diagnostic and treatment facilities, making it a central hub for medical care in the region.

In addition to its role as a healthcare provider, the hospital is affiliated with the University of Tripoli, serving as a primary teaching hospital for medical students, residents, and healthcare professionals. This academic connection enhances its role in medical education and research, contributing to the development of the healthcare sector in Libya.

Over the years, the hospital has faced challenges, particularly due to the political instability and conflict in Libya. Despite these difficulties, it remains a crucial institution for healthcare delivery in the country, continuing to operate and serve patients under challenging circumstances. The hospital's commitment to providing medical care and training the next generation of healthcare professionals underscores its importance in Libya's healthcare landscape.

3.3 Time plan

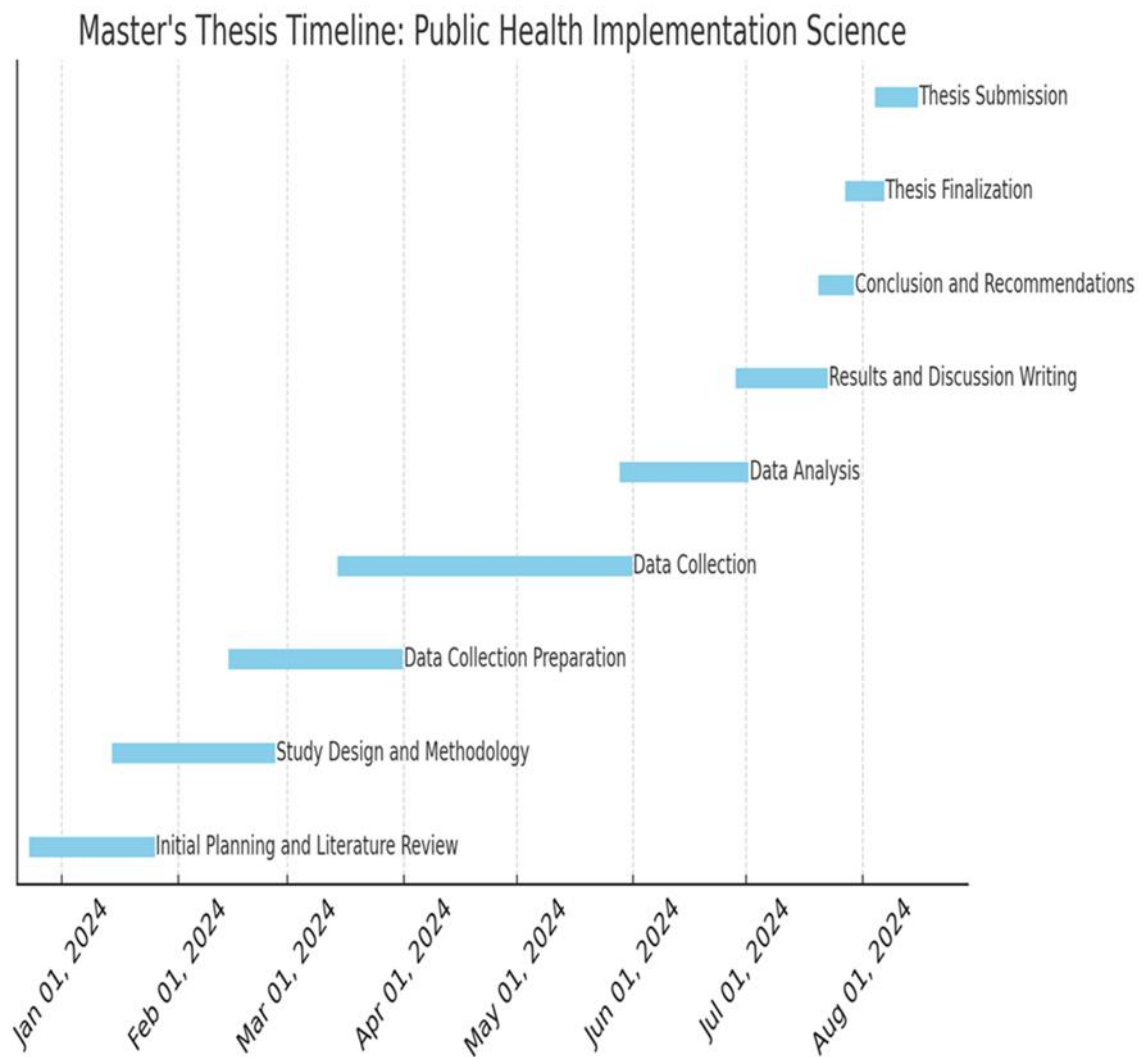


Figure 2 Timeline

Figure (2) is the visual timeline for the study. It outlines the key stages and their corresponding timeframes from the start of the project on December 25, 2023, to the final submission on August 14, 2024.

3.4 Sample

All available pregnant women who visit the Obstetrics and Gynecology Department at the University Hospital - Tripoli to follow up on their pregnancy, women with HIV infection who visit the Infections Diseases Department at University Hospital - Tripoli to follow up on their condition, or women who have children infected with HIV and are registered in the Infections Diseases Department at University Hospital - Tripoli were included in this study

3.5 Study Overview and Methodology

This study was conducted in three stages at Tripoli University Hospital, focusing on maternal knowledge and awareness concerning HIV, particularly among mothers in the pediatrics infectious diseases department and the obstetrics and gynecology department.

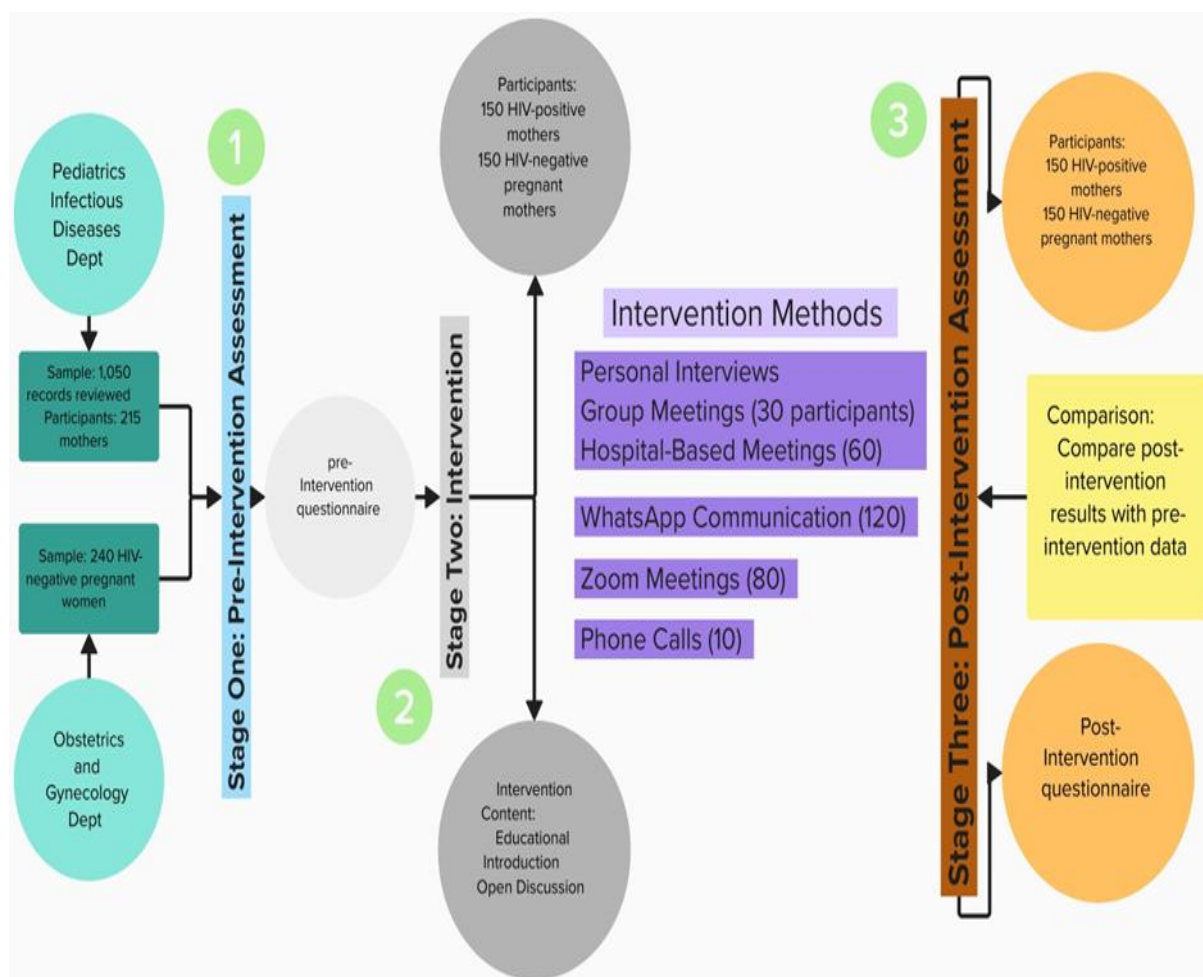


Figure 3 Study overview and stages

Figure (3) shows the three main stages which:

A. Stage One: Pre-Intervention Assessment

A pre-intervention assessment was conducted to evaluate baseline knowledge in the initial stage. This involved administering a questionnaire targeting two distinct groups:

i. Pediatrics Infectious Diseases Department:

Sample: A total of 1,050 records of mothers with HIV-infected children were reviewed.

Participants: Direct communication was established with 215 mothers, who either were currently pregnant or had been previously pregnant, and they consented to participate in the study.

ii. Obstetrics and Gynecology Department:

Sample: 240 pregnant women visiting the department, who were not infected with HIV, were included, regardless of their pregnancy or childbirth history.

B. Stage Two: Intervention

The intervention stage was designed to enhance maternal knowledge and awareness of HIV through targeted educational sessions. This stage included:

i. Participants:

- 150 HIV-positive mothers (either currently pregnant or previously pregnant)
- 150 HIV-negative pregnant mothers

ii. Intervention Content: The intervention was structured into two phases:

- Educational Introduction: Covering key topics such as the definition of HIV, symptoms, modes of transmission, prevention strategies, potential complications, stigma, and the importance of psychological support.
- Open Discussion: Facilitating dialogue and engagement among participants.

iii. Intervention Methods: The interventions were delivered through a combination of approaches:

1. Personal Interviews:

- Group Meetings: Conducted with 30 participants for one hour each.
- Hospital-Based Meetings: Conducted with 60 participants during their antenatal follow-ups, lasting 10 minutes each.

2. WhatsApp Communication:

- 120 participants were divided into five groups for ongoing discussion and support.

3. Zoom Meetings:

- 80 participants were divided into four groups for virtual meetings

4. Phone Calls:

- 10 participants received one-on-one phone consultations, lasting 10 minutes each.

C. Stage Three: Post-Intervention Assessment

In the final stage, a post-intervention assessment was conducted using a similar questionnaire to the one used in the pre-intervention stage.

Divided into two stages: immediate posttest and maintenance posttest

This aimed to measure the change in knowledge and awareness among the following groups:

Participants:

- 150 HIV-positive mothers (either currently pregnant or previously pregnant)
- 150 HIV-negative pregnant mothers

The results from the post-intervention assessment were compared with the pre-intervention data to evaluate the effectiveness of the intervention.

3.6 Study phases

The study was done in three phases

I. Phase1 (Pre-intervention): {The curriculum (content analysis) }

The mothers' knowledge using a self-administered questionnaire that covered: socio-demographic characteristics (e.g. age, sex, social class) and Standards for preventing the transmission of AIDS from mother to child.

Social score Socio-demographic status of the children and their families, a socio-economic score which contained social variables including fathers' education (score2—10), mothers' education and work (scores 1—10), and crowding index (scores 1—5). The total score calculation was a Score from 19 to 25 means high social class, a score from 12 to 18 means middle social class and a score below 12 means low social class

II. Phase 2 (Study Intervention):

The training package was designed according to the results of the baseline assessment, and it was implemented through scheduled sessions. The theoretical and practical training course was designed to include all the basic knowledge for preventing the transmission of AIDS from mother to child.

The training program was conducted over three consecutive full days; each day some guidelines were discussed followed by their practical application to be easier and more effective for mothers. PowerPoint presentation that showed the training outcomes.

Handouts were provided to all as an easy, simple, and organized source of basic for preventing the transmission of AIDS from mother to child knowledge.

III. Phase 3 (post-intervention assessment)

Assessment of the effect of the training package was done; immediately following the sessions. Two days after the training course, the mothers were assessed regarding their knowledge using the questionnaire.

3.7 Tools of data collection

Data was collected using the following:

Study design: Public Health (operations) research- interventional study- pretest-posttest design.

O1 X O2

I. O1: A pre-designed questionnaire designed and was written in the Arabic language to collect data regarding the following:

- Characteristics of the studied mothers: age, education, previous pregnancy, etc.
- Mother's knowledge related to HIV: This includes definition, causes, clinical manifestations, complications, and management.

Questions were in the form of multiple choices. The researcher's time to fill in the questionnaire for each mother was 15-20 minutes. Each questionnaire sheet was filled in on the spot individually. The total score level for the questionnaire sheet was "100" marks.

The mother's answers are categorized as follows:

- A score < 60 referred to unsatisfactory knowledge.
 - A score from 60 - 100 referred to satisfactory knowledge.
- II. X: The study intervention included a new training strategy that focused on behavioral changes and included theoretical and practical training for the mother.
- III. O2: Post-designed questionnaire assessment of mothers' knowledge and skills gained after the intervention.

3.8 Statistical Design

Data collected from the studied sample was revised, coded, and entire and tabulated using PC. Data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22.

3.9 Source of funding

Personal by the investigator.

3.10 Ethical considerations

All the included mothers were treated according to the Helsinki Declaration of Biomedical Ethics. Verbal consent from each mother was obtained after proper orientation of the mother regarding the objectives of the study, the data confidentiality, as well as the impact of the study

given according to their level of understanding, and physical and mental readiness to gain cooperation.

Chapter Four

Results

The results of the study were presented in the following parts:

- i. Part I: Characteristics of the Studied Mothers.
- ii. Part II: Knowledge of the Studied Mothers about the prevention of HIV transmission between mother and newborn in Tripoli University Hospital.
- iii. Part III: Relation between Studied Mothers' Characteristics and their Knowledge about the Prevention of HIV Transmission between Mothers and Newborns in Tripoli University Hospital.
- iv. Assessment of the intervention program's effect on the prevention of HIV transmission between mother and newborn

Part I: Characteristics of the Studied Mothers

Table 1 number and percentage distribution of studied mothers according to their characteristics (n=300)

Mother's Characteristics (n=300)					
	HIV (n=150)		Non-HIV (n=150)		Total %
	Number	%	Number	%	(N=300)
Age in years					
Below 20 Year	9	6%	21	4.6%	10%
20-30 Year	83	55.3%	73	48.6%	52%
30-40 Year	36	24%	41	27.3%	25.6%
Above 40 Year	22	14.6%	15	3.3%	12.3%
Level of education					
Illiterate	37	24.6%	1	0.6%	12.6%
Primary Education	31	20.6%	7	4.6%	12.6%
Moderate Education	64	42.6%	100	66.6%	54.6%
Highly Educated	18	12%	42	28%	20%
Working state					
Work	58	38.6%	112	74.6%	56.7%

Where:

- Primary Education = Read and write

- Moderate Education = secondary level or Intermediate institute
- Highly Educated = University or higher institute

As regards mothers' characteristics, it was found that Table (1) reveals that, most mothers in the study are aged 20-30 years (52%) and have a moderate level of education (54.6%). A notable 12.6% of mothers are illiterate or have only basic literacy, with a higher proportion of HIV-positive mothers in these categories. Most mothers are employed (56.7%), but a significant number of HIV-positive mothers (43.3%) are not working. Additionally, 20% of the mothers are highly educated, with fewer HIV-positive mothers in this group

Table 2 Distribution of the studied mothers according to their previous history of pregnancy (n=300)

Previous history of pregnancy (n=300)					
	HIV (n=150)		non-HIV (n=150)		Total %
	Number	%	Number	%	(n=300)
Frequency of Pregnancies					
One	67	44.6%	12	8%	34.3%
Two	43	28.6%	51	34%	28.3%
Three	35	23.3%	65	42%	33.3%
Four and more	5	3.3%	22	14.6%	9.9%
Antenatal care					
Gets A.C	98	65.3%	144	96%	80.6%
Problems during pregnancy					
Suffered	119	79.3%	100	66.6%	73%
Previous children mortality					
Had	38	25.3%	7	4.6%	15%

Regarding the frequency of pregnancies, Table (2) reveals that the majority of mothers have had three pregnancies (33.3%), followed by two pregnancies (28.3%). HIV-positive mothers are more likely to have had only one pregnancy (34.3%), also A high percentage (80.6%) of mothers received antenatal care, with HIV-negative mothers being more likely to access this care, moreover A significant 73% of mothers reported experiencing problems during pregnancy, with HIV-positive mothers being more likely

to have faced complications. While 85% of mothers did not experience child mortality, 15% did, with a higher prevalence among HIV-positive mothers.

Table 3 Number and percent distribution of the problems during follow-up on antenatal care

Problems during follow-up	HIV (n=150)		non-HIV (n=150)		Total % (n=300)
	Number	%	Number	%	
Diabetes	44	29.4%	32	21.4%	25.30%
Anemia	102	68%	110	73.4%	70.60%
High blood pressure	78	52%	56	37.4%	44.60%
Prepartum haemorrhage	14	9.4%	9	6%	7.60%
Preeclampsia	7	4.6%	2	1.4%	3%
Heavy vaginal discharge	99	66%	89	59.4%	62.60%
Cat disease	3	2%	0	0.0%	1%
Others	48	32%	23	15.4%	23.60%

Regarding the problems among mothers during follow-up table (3) shows the most common problems among mothers during antenatal care follow-up are anemia (70.6%), heavy vaginal discharge (62.6%), and high blood pressure (44.6%). HIV-positive mothers tend to report these issues more frequently than HIV-negative mothers. Other problems such as preeclampsia, prepartum hemorrhage, and cat disease are relatively uncommon.

Table 4 Number and percentage distribution of the studied mothers according to their children`s characteristics (n=300)

Children's Characteristics (n=300)					
	HIV (n=150)		non-HIV (n=150)		Total % (n=300)
	Number	%	Number	%	
Child ranking					
First	67	44.6%	12	8%	26.3%
Second	55	36.6%	13	8.6%	22.6%
Third	21	14%	89	59.4%	36.6%

Fourth or more	7	4.6%	36	24%	14.3%
Child caregivers					
Relatives	31	20.6%	46	30.6%	25.6%
Nursery school	24	16%	83	55.4%	35.6%
Mother herself	95	63.4%	21	14%	38.6%

As regards children's characteristics, Table (4) reveals that Third-born children represent the largest group, making up 36.6% of the total, with a majority being HIV-negative (89) and fewer being HIV-positive (21). Additionally, mothers themselves are the primary caregivers for 38.6% of the children, with a higher proportion of HIV-positive children (95) compared to HIV-negative children (21).

Part II: Knowledge of the Studied Mothers about prevention of HIV transmission between mother and newborn in Tripoli University Hospital

The majority of mothers, 70% of whom did not respond adequately about their knowledge of HIV/AIDS, require an interventional study to raise their awareness of this disease and how it is transmitted from them to their children

Table 5 Number and percentage distribution of studied mothers according to their knowledge of prevention of HIV transmission (n=300)

Knowledge of HIV transmission (n=300)					
	HIV (n=150)		non-HIV (n=150)		Total % (n=300)
	Number	%	Number	%	
Definition of HIV Known	69	46%	63	42%	44%
Causes of HIV Known	99	66%	103	68.6%	67.3%
Signs and symptoms of HIV Known	81	54%	74	49.4%	51.6%
Early complications of HIV Known	101	67.4%	47	31.4%	49.3%

Concerning knowledge of the studied mothers toward HIV, Table (5) shows that 56% of the participants are unaware of the definition of HIV, with 81 HIV-positive and 87 HIV-

negative mothers falling into this category. And the majority of participants (67.3%) are aware of the causes of HIV, with more HIV-positive (99) and HIV-negative (103) mothers knowing this information, additionally, Knowledge of the signs and symptoms of HIV is fairly evenly split, with 51.6% aware and 48.3% unaware. Among those aware, there are 81 HIV-positive and 74 HIV-negative mothers, moreover, Knowledge about early complications is also nearly evenly distributed, with 49.3% aware and 50.6% unaware. Among those aware, there are more HIV-positive mothers (101) compared to HIV-negative mothers (47).

Table 6 Cross-tabulation "Education level by knowledge"

Education level by knowledge of prevention of HIV transmission (n=300)		
Definition of HIV Known		
Education Level	Number	Total %
Illiterate	17	5.7%
Primary Education	17	5.7%
Moderate Education	72	24%
Highly Educated	26	8.7%
Causes of HIV known		
Illiterate	26	8.7%
Primary Education	26	8.7%
Moderate Education	110	36.7%
Highly Educated	40	13.3%
Signs and Symptoms of HIV known		
Illiterate	20	6.7%
Primary Education	20	6.7%
Moderate Education	85	28.3%
Highly Educated	30	10%
Early Complications of HIV known		
Illiterate	19	6.3%
Primary Education	19	6.3%
Moderate Education	81	27%
Highly Educated	29	9.7%

In table (6) Most of the studied mothers with moderate education have a better understanding of HIV's definition. At the same time, Awareness of HIV causes is highest among those with moderate education, followed by the highly educated. Also, the distribution of knowledge about HIV signs and symptoms is relatively balanced among the education levels. Moderate education individuals show a slight lead in understanding, additionally, Awareness about early complications of HIV is fairly even across education levels, though moderate education levels again show a slight advantage in knowledge.

Table 7 Number and percentage distribution of the studied mothers according to their knowledge of sampling of HIV (n=300)

knowledge of sampling of HIV (n=300)					
Items	HIV (n=150)		non-HIV (n=150)		Total % (n=300)
	Number	%	Number	%	
Sampling Known	14	9.4%	21	14%	11.6%
Sampling important known	53	35.4%	69	46%	40.6%
Sampling time Known	32	21.4%	18	12%	16.6%
Methods of Investigations Known	100	66.6%	78	52%	59.3%
Follow up Known	87	58%	112	74.6%	66.3%

Concerning the knowledge of the studied mothers toward sampling for diagnosis of HIV, Table (7) shows that Only 11.6% are aware of the concept of sampling, with slightly more HIV-negative mothers (21) than HIV-positive mothers (14). also, 40.6% of the mothers understand the importance of sampling, with 53 HIV-positive and 69 HIV-negative, regarding the timing of sampling Knowledge about the timing of sampling is limited, with 83.3% of the mothers unaware, however More than half (59.3%) of the mothers are familiar with the methods of investigations, with a higher proportion of HIV-positive mothers (100) compared to HIV-negative mothers (78), additionally The majority (66.3%) of the mothers understand the importance of follow-up, with 87 HIV-positive and 112 HIV-negative mothers aware

Table 8 Number and percentage distribution of the studied mother according to their knowledge of treatment and prevention methods

Mother's knowledge	HIV (n=150)		non-HIV (n=150)		Total % (n=300)
	Number	%	Number	%	
Know about the treatment	144	96%	81	54%	75%
Know Prevention methods	115	76.6%	99	66%	71.3%

In table (8) The majority of mothers, regardless of their HIV status, are knowledgeable about both treatment and prevention methods, though a significant minority, particularly among HIV-negative mothers, lack this knowledge.

Table 9 Number and percentage distribution of the studied mothers according to their total knowledge levels (n=300)

Total knowledge levels (n=300)					
Score of Knowledge					
	HIV (n=150)		non-HIV (n=150)		Total % (n=300)
	Number	%	Number	%	
Satisfy	91	60.6%	85	56.6%	58.70%

Where:

- Satisfactory Knowledge: Refers to the proportion of mothers who have a satisfactory level of knowledge about HIV transmission prevention.

As regards the total knowledge levels of the studied mothers, Table (9) shows that A majority of mothers (58.7%) have a satisfactory level of knowledge about HIV. This group includes 91 HIV-positive and 85 HIV-negative mothers.

Part III: Relation between Mother's Characteristics and Their Knowledge of HIV

Table 10 Relation between mothers' Age and their knowledge of HIV

Age	Knowledge				X2	P-value
	Satisfied		Unsatisfied		8.87	>0.032
	Total Number	Total %	Total Number	Total %		
<20years	20	6.60%	10	3.30%		
20-30 years	99	33%	57	19%		
30-40 years	42	14%	35	11.60%		
Above 40	15	5%	22	7.30%		

Where:

- Satisfactory Knowledge: Indicates that a certain proportion of mothers in each age group have a satisfactory level of knowledge.
- Not Satisfactory Knowledge: Indicates the proportion of mothers in each age group with insufficient knowledge.

As regards the relation between mothers' age and their knowledge about the prevention of HIV transmission between mother and newborn, Table (10) shows that 52% of them were at the age of 20- 30 years and had a satisfying level of knowledge of the prevention of HIV transmission between mother and newborn. The table suggests that there is a significant relationship between age and satisfaction with knowledge. Specifically Younger age groups (<20 years) show lower satisfaction compared to the 20-30 years group, which has a higher proportion of satisfied individuals. (P is greater than 0.032)

Table 11 Relation between mothers' level of education and their knowledge in the prevention of HIV transmission between mother and newborn

Level of Education	Knowledge				X2	P-value
	Satisfy		Unsatisfied		63.3	**<0.0002
	Total Number	Total %	Total Number	Total %		
Illiterate	8	2.60%	30	10%		

Read and write	12	4%	26	8.60 %		
Moderate Education	101	33.6	63	21%		
Highly education	55	10%	5	1.60 %		

Where:

- Satisfactory Knowledge: The mother's answers were a score of 60 - 100, which referred to satisfactory knowledge.
- Not Satisfactory Knowledge: The mother's answers are A score < 60 referred to unsatisfactory knowledge.

As regards the relation between mothers' level of education and their knowledge in the prevention of HIV transmission between mother and newborn, Table (11) shows that more than one quarter (33.6%) of them had moderate education and had satisfying knowledge level in the prevention of HIV transmission between mother and newborn. In addition, Table (12) reflects that there is a clear and highly significant association between education level and satisfaction with knowledge. Specifically: Individuals with higher education levels tend to be more satisfied with their knowledge, ($p < 0.0002$).

Table 12 Relation between mothers' working state and their knowledge in the prevention of HIV transmission between mother and newborn

Working State	knowledge				X2	P-value
	Satisfied		Unsatisfied		29.4	<0.0001
	Total Number	Total %	Total Number	Total %		
Working	123	41%	47	15.6%		

Where:

- Satisfactory Knowledge: The mother's answers were a score of 60 - 100, which referred to satisfactory knowledge.

As regards the relation between mothers' working state and their knowledge in the prevention of HIV transmission between mother and newborn, Table (12) shows that more than two-fifths (41.0%) of them are working and have a satisfying level of knowledge in the prevention of HIV transmission between mother and newborn. In addition, it shows a clear and significant association between working status and knowledge satisfaction. Individuals who are working are significantly more likely to be satisfied with their knowledge compared to those who are not working. ($p < 0.0001$).

Table 13 Relation between mothers' knowledge in the prevention of HIV transmission between mother and newborn and their previous pregnancies

Items	Knowledge				X2	P-value
	Satisfy		Unsatisfied		12.5	<0.014
	Total Number	Total %	Total Number	Total %		
Pregnancy frequency						
One	45	15%	34	11.3%		
Two	54	18%	40	13.3%		
Three	68	22.6%	32	10.6%		
Four or more	9	3%	18	6%		
Antenatal care					12.3	<0.0005
Yes	154	51.3%	88	29.3%		
No	22	7.3%	36	12%		
Problem during pregnancy					6.37	*<0.012
Yes	138	46%	81	27%		
No	38	12.6%	43	14.3%		

Where:

- Satisfactory Knowledge: Reflects the knowledge levels of mothers with varying numbers of pregnancies and antenatal care.
- Not Satisfactory Knowledge: Indicates the levels of insufficient knowledge.

As regards the relation between mothers' knowledge in the prevention of HIV transmission between mother and newborn and their previous pregnancy, Table (13) reflects that there were Pregnancy Frequency and Problems During Pregnancy both show statistically significant relationships with knowledge satisfaction, though the association is stronger for antenatal care. Additionally, Antenatal Care has the most robust relationship with knowledge satisfaction, suggesting that receiving antenatal care is strongly linked to higher satisfaction with knowledge.

Table 14 Relation between mothers' knowledge in the prevention of HIV transmission between mother and newborn and previous children's mortality

Items	Knowledge				X2	P-value
	Satisfied		Unsatisfied			
	Total Number	Total %	Total Number	Total %		
Previous children mortality					2.08	0.149
Yes	22	7.3%	23	7.6%		

Where:

- Satisfactory Knowledge: Represents mothers with a satisfactory knowledge of HIV prevention and their history of child mortality.
- Not Satisfactory Knowledge: Indicates mothers with insufficient knowledge.

As regards the relation between mothers, knowledge in the prevention of HIV transmission between mother and newborn, and previous children mortality, Table (14) shows that 51.3% of them have a satisfying level of knowledge about the prevention of HIV transmission between mother and newborn and no history of previous children mortality. In addition, Table (14) reflects that there was no statistically significant difference between mothers, knowledge in the prevention of HIV transmission between mother and newborn, and previous children mortality.

Part VI: Assessment of the intervention program's effect on the prevention of HIV transmission between mother and newborn

Table 15 Knowledge percent scores in the pretest and post-test among the focused group

Knowledge items	Pre-test (P1)				Post-test (P3)				P values	
	HIV		non-HIV		HIV		non-HIV		P1	P3
	Median	IQR	Median	IQR	Median	IQR	Median	IQR		
Definition of HIV	68.1	(36.4-100)	75	(50.2-100)	99	(98-100)	89	(75.0-100)	<0.04	0.001
Causes of HIV	43.8	(12.4-100)	67	(34.3-100)	98	(96-100)	92.1	(76.9-100)	<0.03	0.002
Signs and symptoms of HIV	46.2	(25.8-66.6)	33.3	(12.3-66.6)	66.6	(33.6-100)	76	(66.6-100)	<0.007	0.03
Early complications of HIV	70.1	(40.2-77)	55.2	(10.0-65)	80	(60.0-80)	80	(60.0-80)	<0.05	0.009
Methods of	66.6	(33.2-100)	74	(48.6-100)	96.9	(66.6-100)	91.4	(66.6-100)	<0.009	0.06

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The analysis is conducted using the Wilcoxon signed-rank test, in Table (15) There is a significant improvement in all knowledge items from the pretest to the posttest. The p-values indicate that these changes are statistically significant, with p-values consistently less than 0.05 for each item, showing that the observed improvements are unlikely due to chance.

Both groups showed significant improvements in knowledge from the Pre-test to the post-test. This is evident from the P values, which are consistently less than 0.05 for all knowledge items in both groups, while both groups improved, there were some differences in the magnitude of improvement. For example, the HIV group had higher median scores and smaller IQRs (indicating less variability) compared to the non-HIV group for most knowledge items, suggesting that the intervention might have had a more pronounced effect on the HIV group.

Table 16 Comparison of total knowledge Pre-intervention and Post-intervention among (HIV and non-HIV)

HIV Status	Total Knowledge (Pre-Intervention)	Total Knowledge (Post-Intervention)	% Change
HIV- Negative (non-HIV)	Mean: 53.2 $\pm$ SD: 2.8	Mean: 76.1 $\pm$ SD: 9.3	43.05%
HIV- Positive (HIV)	Mean: 44.2 $\pm$ SD: 2.1	Mean: 66.4 $\pm$ SD: 11.3	50.23%

Regarding the total knowledge about HIV transmission prevention before and after an intervention, separated by HIV status Table (16) shows both groups demonstrated significant knowledge gains, but those with HIV-positive status experienced a greater percentage increase in their knowledge compared to those with HIV-negative status.

Context Analysis

The political and economic instability in Libya has had a profound impact on the health sector, particularly concerning HIV/AIDS prevention and treatment. The ongoing conflict has led to the disruption of healthcare services, shortages of essential medicines,

and a breakdown in the healthcare infrastructure. This environment has exacerbated the challenges faced by HIV patients, including stigmatization, inadequate access to antiretroviral therapy (ART), and limited public health awareness.

Stigma remains a significant barrier to accessing HIV services. Fear of discrimination prevents many individuals from seeking testing, treatment, and counseling. The lack of resources and trained healthcare professionals further complicates the situation, leading to insufficient care for pregnant women and inadequate prevention of mother-to-child transmission (PMTCT) of HIV.

Drug abuse and the spread of sexually transmitted infections (STIs) are also critical issues in Libya, contributing to the increasing HIV prevalence. The migration and displacement of populations due to conflict have disrupted social and healthcare networks, making it difficult to reach vulnerable groups with necessary interventions

Stakeholder Mapping

Table 17 Stakeholder Mapping

stakeholder	Role	Interest	Influence Level
Ministry of Health (Libya)	Policymaking, regulation, and oversight of healthcare services.	Ensuring effective HIV prevention and improving maternal and child health.	High
Tripoli University Hospital	Primary healthcare provider for the study's subjects.	Improving patient outcomes, particularly in HIV-related care.	High
Healthcare Professionals	Providers of care, education, and support to patients.	Enhancing capacity to prevent and manage HIV transmission.	Medium
Non-Governmental Organizations (NGOs)	Support and advocacy for HIV patients, providing resources, education, and outreach.	Reducing stigma, improving access to treatment, and supporting vulnerable populations.	Medium to High
International Health Organizations	Provide guidelines, funding, and	Achieving global health goals, such as reducing	High

(WHO, UNICEF, UNAIDS)	technical assistance.	mother-to-child HIV transmission.	
Patients and Their Families	Beneficiaries of healthcare services.	Access to quality care, reduction of stigma, and health protection.	Low
Community Leaders and Religious Figures	Influence community norms and attitudes.	Promoting health within cultural and religious frameworks.	Medium to High

Chapter Five

Discussion

This study aimed to assess the knowledge and awareness of HIV transmission prevention between mothers and newborns at Tripoli University Hospital in Libya. The findings provide valuable insights into the current state of maternal knowledge on this critical public health issue and highlight the effectiveness of targeted interventions. Additionally, the results of this study align with and expand upon findings from previous research conducted in similar contexts, emphasizing the global importance of maternal education in preventing mother-to-child transmission (MTCT) of HIV.

Characteristics of the Studied Mothers

The demographic profile of the mothers in this study revealed that the majority were between 20-30 years old, with a moderate level of education. This age group also showed the highest level of awareness regarding HIV transmission prevention. Similar findings have been reported in studies conducted in other low- and middle-income countries. For instance, a study conducted in Ethiopia by Abtew et al. (2016) found that younger mothers with higher levels of education were more likely to have accurate knowledge about HIV transmission and prevention strategies. This suggests a consistent trend across different regions, where educational attainment plays a crucial role in enhancing health literacy among mothers.

Knowledge of HIV Transmission Prevention

The study found that more than half of the mothers lacked a basic understanding of HIV, with 56% unaware of the definition of the virus. This finding is consistent with research conducted in other parts of Africa. For example, a study in Nigeria by Ijadunola et al. (2017) reported that a significant proportion of pregnant women lacked adequate knowledge about HIV and its transmission, which could impede efforts to prevent MTCT. Moreover, the study highlighted gaps in awareness regarding the symptoms and early complications of HIV, a concern also noted in research conducted in Tanzania by Msuya et al. (2018). The Tanzanian study emphasized the need for comprehensive education on the clinical aspects of HIV, as understanding symptoms and complications is essential for early detection and management.

Relation Between Mothers' Characteristics and Knowledge

A significant relationship was found between the mothers' age, education level, and working status with their knowledge about HIV transmission. Younger mothers (20-30 years) with moderate education levels exhibited the highest levels of knowledge, while those who were illiterate or had only primary education were less informed. This finding is supported by a study conducted in South Africa by Peltzer et al. (2015), which found that maternal knowledge about HIV was strongly associated with higher levels of education and employment status. The South African study also highlighted the role of socioeconomic factors in shaping health knowledge, underscoring the need for public health interventions to address these disparities.

Effectiveness of the Intervention Program

The intervention program demonstrated a significant improvement in the mothers' knowledge about HIV transmission prevention. The post-intervention assessments revealed substantial gains in understanding, particularly in defining HIV, recognizing its causes, and understanding the importance of early diagnosis and follow-up care. This aligns with findings from a study conducted in Uganda by Bajunirwe and Muzoora (2005), where an educational intervention significantly increased the knowledge of HIV among pregnant women, leading to improved health-seeking behaviors and a reduction in MTCT rates. The success of the intervention in this study further validates the effectiveness of targeted educational programs in enhancing maternal knowledge and reducing the risk of HIV transmission to newborns.

Implications for Public Health Practice

The findings of this study have important implications for public health strategies aimed at reducing the MTCT of HIV in Libya. The clear association between education, employment, and HIV knowledge underscores the need for targeted educational programs that cater to the most vulnerable groups, particularly younger and less educated mothers. The consistency of these findings with previous studies conducted in other regions highlights the universal importance of maternal education in preventing MTCT. Furthermore, the success of the intervention program suggests that similar approaches could be scaled up across other regions to enhance maternal knowledge and reduce the risk of HIV transmission to newborns.

Challenges and Limitations

Despite the positive outcomes, the study faced several challenges. The ongoing political instability in Libya has severely impacted the healthcare infrastructure, making it

difficult to reach all potential participants and deliver consistent interventions. Additionally, the stigma associated with HIV remains a significant barrier to accessing healthcare services, which may have influenced the willingness of some mothers to participate fully in the study. Similar challenges were reported in a study conducted in Kenya by Wekesa and Coast (2014), which found that stigma and healthcare access issues significantly hindered the effectiveness of HIV prevention programs. Future programs should consider these challenges and work towards creating a more supportive environment for mothers affected by or at risk of HIV.

Conclusion

This study underscores the critical need for improved health education among mothers in Libya, particularly in the context of HIV transmission prevention. The findings suggest that targeted educational interventions can significantly enhance maternal knowledge and contribute to the reduction of MTCT of HIV. The consistency of these findings with previous research conducted in other regions emphasizes the global importance of maternal education in preventing HIV transmission. Public health efforts should continue to focus on increasing awareness and providing accessible information to all mothers, with particular attention to those in lower socioeconomic groups. By addressing these knowledge gaps, Libya can make significant strides in controlling the HIV epidemic and improving maternal and child health outcomes.

Recommendations

Based on the findings of the current study, the following recommendations are suggested:

- 1) Strengthen HIV Education and Awareness Programs:
 - Develop and implement targeted educational programs that focus on the causes, symptoms, and prevention methods of HIV, tailored to different educational levels.
 - Incorporate practical training sessions within antenatal care visits to ensure mothers understand how to prevent HIV transmission effectively.
- 2) Support for Working Mothers:
 - Collaborate with workplaces to integrate HIV prevention education into their health programs, reaching mothers who might otherwise miss out due to work commitments.
 - Provide flexible scheduling options for working mothers to attend educational sessions and antenatal care appointments.

3) Focus on Early Childhood Care:

- Offer training for caregivers who are responsible for children, including relatives and nursery school staff, to prevent HIV transmission and ensure better care practices.

4) Address Knowledge Gaps in HIV Sampling and Diagnosis:

- Launch awareness campaigns specifically addressing the importance of HIV sampling, the methods used for diagnosis, and the follow-up procedures.

5) Develop Educational Materials:

- Create educational materials tailored to different education levels, including pamphlets, posters, and digital resources that are easy to understand and widely accessible.
- Distribute these materials through community centers, healthcare facilities, and online platforms to reach a broader audience.

6) Conduct Further Research:

- Conduct larger studies to generalize the findings and gain a more comprehensive understanding of the factors influencing HIV knowledge and prevention practices among mothers in Libya.
- Explore the long-term impact of the intervention program on HIV transmission rates and maternal and child health outcomes.

7) Limitations and Considerations:

- Generalizability: The findings of this study may not be fully generalizable to other populations or regions with different cultural, social, and economic contexts. Further research is needed to assess the applicability of these recommendations in diverse settings.
- Sample Size: While the study included a reasonable sample size, a larger study could provide more robust evidence and enhance the generalizability of the findings.
- Study Design: The study design could be strengthened by incorporating a control group to isolate the specific impact of the intervention program.

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الرقم الاشرى.....

التاريخ...../...../.....م.

إلى السيد/ رئيس قسم الأطفال،
المستشفى الجامعي طرابلس
تحية طيبة وبعد،

الموضوع: الموافقة على إجراء أبحاث ونشرها حول مرضى نقص المناعة المكتسبة في قسم الأطفال.

بالإشارة إلى الطلب المقدم من سيادتكم، وكذلك من الدكتور أكرم رجب الحبشي ، بخصوص إجراء أبحاث علمية حول مرضى نقص المناعة المكتسبة في قسم الأطفال بالمستشفى الجامعي طرابلس، يحيطكم علماً بموافقنا على هذا الطلب. كما نشير إلى أهمية هذه الأبحاث في دعم المعرفة العلمية و تطوير استراتيجيات العلاج والوقاية في هذا المجال الهام. نؤكد التزامنا الكامل بجميع القوانين واللوائح المعمول بها فيما يخص أخلاقيات البحث العلمي، وضرورة الحصول على الموافقات اللازمة من جميع الأطراف المعنية، بما في ذلك موافقة أولياء أمور المرضى وتوفير أقصى درجات السرية والاحترام لخصوصية المرضى. نأمل أن يسهم هذا البحث في تحقيق نتائج علمية ملموسة تسهم في تحسين الرعاية الصحية المقدمة لمرضى نقص المناعة المكتسبة في ليبيا. وتفضلوا بقبول فائق الاحترام.....

رئيس قسم الشؤون الطبية

رئيس قسم الامراض السارية أطفال



|

مسودة الى

□ رابط القسم

□ الملف الإداري العام

