

SECTOR: HEALTHCARE

HSS105-NQ 2013: Immunization

NVEQF Level 1 (CLASS IX)

STUDENT WORKBOOK



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Preface

The National Curriculum Framework, 2005, recommends that children’s life at school must be linked to their life outside the school. This principle makes a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home, community and the workplace.

The student workbook on “**Immunization**” is a part of the qualification package developed for the implementation of National Vocational Education Qualification Framework (NVEQF), an initiative of Ministry of Human Resource Development (MHRD), Government of India to set common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, Colleges and Universities. It is envisaged that the NVEQF will promote transparency of qualifications, cross-sectoral learning, student-centred learning and facilitate learner’s mobility between different qualifications, thus encouraging lifelong learning.

This student workbook, which forms a part of vocational qualification package for student’s who have passed Class VIII or equivalent examination, was created by a group of experts. The Healthcare Sector Skill Council (HSSC) approved by the National Skill Development Corporation (NSDC) for the healthcare sector developed the National Occupation Standards (NOS). The National Occupation Standards are a set of competency standards and guidelines endorsed by the representatives of Healthcare Industry for recognizing and assessing skills and knowledge needed to perform effectively in the workplace.

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent of National Council of Educational Research and Training (NCERT) in association with Healthcare Sector Skill Council (HSSC) has developed modular curricula and learning materials (Units) for the vocational qualification package in Healthcare sector for NVEQ levels 1 to 4; level 1 is equivalent to Class IX. Based on NOS, occupation related core competencies (knowledge, skills, and abilities) were identified for development of curricula and learning modules (Units).

This student workbook attempts to discourage rote learning and to bring about necessary flexibility in offering of courses, necessary for breaking the sharp boundaries between different subject areas. The workbook attempts to enhance these endeavours by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups and activities requiring hands-on-experience. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy of Education (1986).

The success of this effort depends on the steps that school Principals and Teachers will take to encourage children to reflect their own learning and to pursue imaginative and on-the-job activities and questions. Participation of learners in skill development exercises and inculcation of values and creativity is possible if we involve children as participants in learning, and not as receiver of information. These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table would be a necessity to maintain the rigour in implementing the activities and the required number of teaching days will have to be increased for teaching and training.

ABOUT THE WORKBOOK

This workbook is to assist you with completing the Unit of Competency **HSS105-NQ2013: Immunization**. You should work through the workbook in the classroom, at the workplace or in your own time under the guidance and supervision of your teacher or trainer. This workbook contains sessions which will help you to acquire relevant knowledge and skills (soft and hard) on various aspects of the unit of competency. Each session is small enough to be easily tackled and digested by you before you move on to the next session. Animated pictures and photographs have been included to bring about visual appeal and to make the text lively and interactive for you. You can also try to create your own illustrations using your imagination or taking the help of your teacher. Let us now see what the sections in the sessions have for you.

Section1: Introduction

This section introduces you to the topic of the Unit. It also tells you what you will learn through the various sessions covered in the Unit.

Section 2: Relevant Knowledge

This section provides you with the relevant information on the topic(s) covered in the session. The knowledge developed through this section will enable you to perform certain activities. You should read through the information to develop an understanding on the various aspects of the topic before you complete the exercise(s).

Section 3: Exercise

Each session has exercises, which you should complete on time. You will perform the activities in the classroom, at home or at the workplace. The activities included in this section will help you to develop necessary knowledge, skills and attitude that you need for becoming competent in performing the tasks at workplace. The activities should be done under the supervision of your teacher or trainer who will guide you in completing the tasks and also provide feedback to you for improving your performance. To achieve this, prepare a timetable in consultation with your teacher or trainer and strictly adhere to the stipulated norms or standards. Do not hesitate to ask your teacher or trainer to explain anything that you do not understand.

Section 4: Assessment

The review questions included in this section will help you to check your progress. You must be able to answer all the questions before you proceed to the next session.

SESSION 1: DIFFERENTIATE BETWEEN VARIOUS TYPES OF IMMUNITY

Relevant Knowledge

The immune system is your body's way of helping to protect you from infection. When your body is infected by viruses, bacteria or other infectious organisms (e.g. a fungus or parasite), it undergoes a process of fighting the infection and then healing itself.

As a result of this, the next time your body encounters the same organism, you will be 'immune' to this infection. This means that you are less likely to get the same disease again, or if you do, the infection will be less severe. This is the principle behind vaccination.

How does immunity work?

Whenever your body encounters a foreign organism, like bacteria or a virus, a complicated set of responses are set in motion. Your body has two sets of defensive mechanisms, one called 'innate immunity' and another called 'adaptive immunity'.

Innate Immunity

Innate immunity describes your body's barriers to infection that are in-built (or innate). This includes:

- your skin
- the acid in your stomach
- saliva
- tears
- mucus in your mouth and nose
- cells in your blood stream that can destroy bacteria.

All of these systems are extremely important as a first line of defence to prevent you from becoming infected, and for getting rid of the infections that you do get.

These innate systems do not change with multiple exposures to the same infection; there is no 'learned' response no matter how many times your body is exposed to the same organism.

Adaptive Immunity

Your body's more complicated second line of defence is called **adaptive immunity**. By adapting to fight infections from particular bacteria or viruses, your body can become immune to infections caused by the

same organism in the future. This adaptation by your body to prevent infection is the basis of immunization.

Certain types of blood cells can learn from exposure to an infection. This means that the next time they encounter that infection they can remember it and mount a faster and stronger response.

For example:

- **antibodies** are made by the body in response to an infecting organism. They can recognise specific types of viruses or bacteria. They work by attaching themselves to the organism, and preventing them from infecting your body.
- **macrophages** are specialised blood cells that can directly attack and destroy an infecting organism, digesting them so they can not produce disease.

Vaccines trigger the adaptive immune system by stimulating the body to make antibodies, so that it can prepare for a potential infection in the future.

Passive immunity is acquired through transfer of antibodies or activated T-cells from an immune host, and is short lived, usually lasting only a few months, whereas **active immunity** is induced in the host itself by antigen and lasts much longer, sometimes lifelong.

Exercise

Prepare a presentation on “How does immunity works?”

Assessment

Short Answer Questions.

1. Answer the following questions:

a) What is immunity?

b) State the difference between innate immunity and adaptive immunity?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

- Define immunity.
- State the difference between innate immunity and adaptive immunity.

Part B

Discussed in class the following:

- (a) What is immunity?
- (b) What are the differences between innate immunity and adaptive immunity?
- (c) What is virus?
- (d) What is bacterium?

Part C

Performance Standards

The performance standard may include, but not limited to:

Performance standards	Yes	No
Differentiate between passive and active immunity		

SESSION 2: UNDERSTAND IMMUNIZATION SCHEDULE

Relevant Knowledge

What is Immunization?

Immunization protects children (and adults) against harmful infections, before they come into contact with them in the community. Immunization uses the body's natural defence mechanism, the immune response, to build resistance to specific infections. Nine diseases can be prevented by routine childhood immunization - diphtheria, tetanus, whooping cough, poliomyelitis (polio), measles, mumps, rubella, haemophilus influenzae type b (Hib) and hepatitis B. All of these diseases can cause serious complications and sometimes death.

Immunization is given as an injection or in the case of polio vaccine, taken as drops by mouth. Immunization helps children stay healthy by preventing serious infections.

Immunization and vaccination

Technically 'vaccination' is the term used for giving a vaccine, that is, actually getting the vaccine injected or swallowing the drops. 'Immunization' is the term used for the process of both getting the vaccine and becoming immune to the disease as a result of the vaccine. Most people use the terms 'vaccination' and 'immunization' interchangeably but their meanings are not exactly the same because immunity follows vaccination in most, but not all, cases. For the purposes of this workbook, we have always used the term 'immunization' because this is the expression most commonly used in the community.

How does immunization work?

All forms of immunization work in the same way. When someone is injected with, or swallows, a vaccine, their body produces an immune response in the same way it would following exposure to a disease but without the person getting the disease. If the person comes in contact with the disease in the future, the body is able to make an immune response fast enough to prevent the person getting sick.

What is vaccine?

A **vaccine** is a biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism, and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins. The agent stimulates the body's

immune system to recognize the agent as foreign, destroy it, and "remember" it, so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters.

Vaccines may be prophylactic (example: to prevent or ameliorate the effects of a future infection by any natural or "wild" pathogen), or therapeutic (e.g. vaccines against cancer are also being investigated).

The term *vaccine* derives from Edward Jenner's 1796 use of *cow pox* (Latin *variola vaccinia*, adapted from the Latin *vaccīn-us*, from *vacca*, cow), to inoculate humans, providing them protection against smallpox.

How long do immunizations take to work?

In general, the normal immune response takes several weeks to work. This means protection from an infection will not occur immediately after immunization. Most immunizations need to be given several times to build long lasting protection. A child who has been given only one or two doses of diphtheria-tetanus-pertussis vaccine (DTPa) is only partially protected against diphtheria, pertussis (whooping cough) and tetanus, and may become sick if exposed to these diseases. How long do immunizations last? The protective effect of immunizations is not always life-long. Some, like tetanus vaccine, can last up to 30 years, after this time a booster dose may be given. Some immunizations, such as whooping cough, give protection for about five years after a full course.

Is everyone protected from disease by immunization?

Even when all the doses of a vaccine have been given, not everyone is protected against the disease. Measles, mumps, rubella, tetanus, polio and Hib vaccines protect more than 95% of children who have completed the course. Three doses of whooping cough vaccine protects about 85% of children who have been immunized, and will reduce the severity of the disease in the other 15% of children (who have also been immunized), if they do catch whooping cough. Booster doses are needed because immunity decreases over time. Three doses of hepatitis B vaccine protect over 95% of children.

Why do children get so many immunizations?

A number of immunizations are required in the first few years of a child's life to protect the child against the most serious infections of childhood. The immune system in young children does not work as well as the immune system in older children and adults, because it is still immature. Therefore, more doses of the vaccine are needed. In the first months of life, a baby is protected from most infections by antibodies from her or his mother which are transferred to the baby during pregnancy. When these antibodies wear off, the baby is at risk of serious infections and so the first immunizations are given before these antibodies have gone.

What are the side effects of immunization?

Common side effects of immunization are redness and soreness at the site of injections and mild fever. While these symptoms may concern you and upset your child at the time, the benefit of immunization is protection from the disease. Paracetamol might be required to help ease the fever and soreness. Other side effects are very rare but if they do occur, a doctor should be consulted immediately.

What is the importance of Immunization

Each year, vaccines prevent more than 2.5 million child deaths globally. An additional 2 million child deaths could be prevented each year through immunization with currently available vaccines.

- **Immunization saves a child's life:** Immunization helps to protect your child against various diseases.
- **Immunization is safe and effective:** All vaccines that are given to children are completely safe and effective, as various medical professionals have tested them. The only discomfort can be pain, redness or tender feeling among few.
- **Immunization prevents spread of diseases:** If a person is immunized, there is little to risk of an epidemic. Thus, it also prevents spreading of the disease.
- **Immunization saves time and money:** A prolonged illness can take a toll on your finance as well as your precious time. Immunization is a good investment, as it saves time, money and promotes good health.
- **Immunization protects future:** Immunization has helped to eradicate polio to some extent. If we keep on practicing immunization, in near future we will be able to eradicate all these diseases completely.
- **Immunisation has reduced mortality rate**
- **Immunisation has made children more healthy and fit.**
- **Immunisation promotes long life span.**

National Immunization Schedule Chart

Let us now read through the National Immunisation schedule for Infants, Children and Pregnant Women to understand the importance of immunization against various diseases.

National Immunization Schedule for Infants, Children and Pregnant Women				
Vaccine	When to give	Dose	Route	Site
For Pregnant Women				
TT-1	Early in pregnancy	0.5 ml	Intra-muscular	Upper Arm
TT-2	4 weeks after TT-1*	0.5 ml	Intra-muscular	Upper Arm
TT- Booster	if received 2 TT doses in a pregnancy within last 3 yrs*	0.5 ml	Intra-muscular	Upper Arm
For Infants				
BCG	At birth or as early as possible till one year of age	0.1ml (0.05ml till 1mth age)	Intra-dermal	Left Upper Arm
Hepatitis B	At birth or as early as possible within 24 hours	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
OPV-0	At birth or as early as possible within the first 15 days	2 drops	Oral	Oral
OPV 1,2 & 3	At 6 weeks, 10 weeks & 14 weeks	2 drops	Oral	Oral
DPT 1,2 & 3	At 6 weeks 10 weeks & 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Hep B 1, 2 & 3	At 6 weeks 10 weeks & 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Measles	9 completed months-12 months.	0.5 ml	Sub-cutaneous	Right upper Arm
Vitamin-A (1stdose)	At 9 months with measles	1 ml (1 lakh IU)	Oral	Oral
For Children				
DPT booster	16-24 months	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Measles 2nd dose	16-24 months	0.5 ml	Sub-cutaneous	Right upper Arm
OPV Booster	16-24 months	2 drops	Oral	Oral
Japanese Encephalitis**	16-24 months	0.5 ml	Sub-cutaneous	Left Upper Arm
Vitamin-A***				
(2nd to 9th dose)	16 months. Then, one dose every 6 months up to the age of 5 years.	2ml (2 lakh IU)	Oral	Oral
DPT Booster	5-6 years	0.5 ml.	Intra-muscular	Upper Arm
TT	10 years & 16 years	0.5 ml	Intra-muscular	Upper Arm

*Give TT-2 or Booster doses before 36 weeks of pregnancy. However, give these even if more than 36 weeks have passed. Give TT to a woman in labour, if she has not previously received TT.

** JE Vaccine, in select endemic districts after the campaign.

*** The 2nd to 9th doses of Vitamin A can be administered to children 1-5 years old during biannual rounds, in collaboration with ICDS.

TT – Tetanus Toxoid, OPV – Oral Polio Vaccine, BCG – Bacillus Calmette Guerin, DPT – Diphtheria Tetanus Pertussis

Exercise

Prepare a sample immunization schedule chart for a child.

Assessment

Short Answer Questions.

a) What is immunization?

b) What is vaccine?

c) What is the importance of immunization?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

- Define immunization.
- Define Vaccine
- Describe the importance of immunization

Part B

Discussed in class the following:

- (a) What is immunization?
- (b) What is vaccine?
- (c) Why immunization is important?
- (d) Why should we prepare an immunization schedule?

Part C

Performance Standards

The performance standard may include, but not limited to:

Performance standards	Yes	No
Prepare a immunization schedule chart		

Relevant Knowledge

Universal Immunization Program, popularly known as UIP, gained momentum in 1985 and it was implemented in a phased manner to cover all districts in India by 1989-90. Immunization is one of the key areas under National Rural Health Mission of Government of India. Since 1997, immunization activities have been an important component of National RCH Programme.

Certain diseases may require universal immunization of a population to control them. Such efforts usually target infants in the first year of life so that immunity is completed as early as possible before the risk of infection, (e.g., diphtheria-pertussis-tetanus, polio). Others may require immunization of only selected high risk groups (e.g., at risk elderly for Pneumococcus). In some cases the target group may not be the group that the vaccine is designed to protect (e.g., rubella vaccination of all children and females of child bearing age in order to protect the fetus). Since there are regional differences in infection rates and severity of every disease, the choice of vaccine and dosage regimen will vary with the local epidemiology of the disease, specific target population, and health system. The effectiveness of the healthcare delivery system can also vary with different vaccines, vaccine efficacy, and organization of the local health care service organization. Care must be taken to ensure the balance of risks and benefits, where cost constraints or logistical limitations make continuous universal immunization impossible.

Diseases prevented through vaccines used in the Universal Immunization Program (UIP)

Presently, the Universal Immunization Program in India provides vaccines mainly to children below 5 years of age and pregnant women for the following preventable diseases:

1. Tuberculosis
2. Poliomyelitis
3. Diphtheria
4. Pertussis (whooping cough)
5. Measles
6. Tetanus
7. Hepatitis B
8. Japanese encephalitis (in endemic districts)

Vitamin A is not a vaccine, but a nutritional supplement which prevents many deficiencies related conditions. However, administration of Vitamin A is also a part of the Universal Immunization Program.

Some other diseases have combined vaccines so as to avoid multiple shots, for example DPT for Diphtheria, Pertussis and Tetanus. This is also called a triple antigen. A pentavalent vaccine (5 vaccines together) is also being considered for introduction in the UIP. This will include DPT+ Hepatitis B vaccine+ vaccine for Haemophilus B.

Key Components of Universal Immunization Programme

As a Patient Care Assistant, one would be responsible for all aspects of program management that would lead to the desired program output. The different aspects of program management include:

1. Human resource
2. Micro planning
3. Capacity Building
4. Logistics management
5. Supervision and monitoring
6. Data for action
7. Social mobilization
8. Financial resources
9. Coordination and work environment
10. Linkages with other maternal and child health interventions

Exercise

Prepare an Immunization schedule for a baby born on 12th June, 2013.

Assessment

Short Answer Questions.

- a) What is universal immunization?

- b) What are the key components of universal immunization?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

- Define universal immunization.
- State the key components of Universal Immunization Programme.

Part B

Discussed in class the following:

- (a) What is universal immunization?
- (b) What are the different key components of universal immunization programme?
- (c) What is the importance of Universal Immunization Programme?

Part C

Performance Standards

The performance standard may include, but not limited to:

Performance standards	Yes	No
Enlist the diseases covered in UIP.		
Identify the various components of UIP		

SESSION 4: PULSE POLIO IMMUNIZATION PROGRAMME

Relevant Knowledge

Pulse Polio is an immunization campaign established by the government of India in 1995-96 to eradicate poliomyelitis (polio) in India by vaccinating all children under the age of five years against polio virus. This project deals with the ways to fight poliomyelitis through a large scale immunization programme, co-operating with various international institutions, state governments and Non governmental organization.

In India, vaccination against Polio started in 1978 with Expanded Program in Immunization (EPI). By 1984, it was successful in covering around 40% of all infants, giving 3 doses of Oral Polio Vaccine (OPV) to each. In 1985, the Universal Immunization Program (UIP) was launched to cover all the districts of the country. UIP became a part of child safe and survival motherland program (CSSM) in 1992 and Reproductive and Child Health Program (RCH) in 1997. This program led to a significant increase in coverage, up to 95%. The number of reported cases of polio also declined from 28,757 during 1987 to 3,265 in 1995.

In 1995, following the Polio Eradication Initiative of World Health Organization (1988), India launched Pulse Polio Immunization Program along with Universal Immunization Program which aimed at 100% coverage. In 2012, India was declared free of polio by WHO.

Importance of Pulse Polio Programme

The Polio viruses are three related enteroviruses: type 1, 2 and 3. All three types cause paralysis. Type 1 causes paralysis most frequently. Polio is highly communicable having incubation period of 7-10 days. Transmission is primarily person-to-person via the faecal-oral route; i.e. the poliovirus multiplies in the intestines and is spread through the faeces. The virus is intermittently excreted for one month or more after infection. Communicability of infected children is highest just prior to the onset of paralysis and during the first two weeks after paralysis occurs. Protective immunity against poliovirus infection develops by immunization or natural infection.

Polio usually begins with common symptoms such as fever, headache, nausea, fatigue, and muscle pains and spasms and is followed by a more serious and permanent paralysis in one or more limbs. More than half of all polio cases occur in children under the age of five. Between 5 and 10 per cent of infected persons display only the most general symptoms while more than 90 per cent show no sign of illness at all.

Polio vaccine is highly effective in producing immunity to the poliovirus and protection from paralytic polio. Approximately 90 per cent or more of polio vaccine recipients develop protective antibodies to all

three poliovirus types after two doses, and at least 99 per cent are immune following three doses. **Dr. Albert Sabin developed Oral Polio Vaccine (OPV)**. Presently, almost all countries use OPV to achieve polio eradication target. The vaccine not only prevents pernicious infection in the person, but it also precludes transmission of the wild poliovirus to other person. Since polio virus cannot survive outside a host for more than two weeks, theoretically it would be wiped out, resulting in the eradication of poliomyelitis.

For those who infected by the polio virus, there is no cure as such but there is treatment to alleviate the symptoms. Besides this, the affected persons can also be rehabilitated with the help of modern mobility aids. Heat and physical therapy can help to stimulate the muscles of infected persons and antispasmodic drugs are prescribed to relax the muscles. While this can improve mobility, it cannot reverse permanent polio paralysis.

India launched the Pulse Polio Immunization (PPI) programme in 1995 as a result of the WHO Global Polio Eradication Initiative. Under this programme, all children under five years are given two doses of Oral Polio Vaccine (OPV) in December and January every year until polio is eradicated. The campaign proved to be successful, and the incidence of poliomyelitis in India has decreased dramatically.

The PPI was initiated with an objective of achieving hundred per cent coverage under OPV. It aims to reach the unreached children through improved social mobilization, plan mop-up operations in areas where poliovirus has almost disappeared and maintain high level of morale among the public.

Key components of Pulse Polio Immunization Programme

Polio has been eradicated from most of the world using several key strategies. Each of the following strategies is important components in the National Polio eradication programme:

- (a) Routine Immunization: Sustaining high levels of coverage with 3 doses of oral polio vaccine in the 0-1 year age group.
- (b) Supplementary Immunization Activities (SIAs): Simultaneous administration of oral polio vaccine to all children in the age group of 0-5 years, 4-6 weeks apart to interrupt wild poliovirus transmission and to increase immunity amongst children.
SIAs include:
 - ❖ National Immunization Days(NIDs) when the entire country is covered
 - ❖ Sub National Immunization Days (SNIDs) when some states or parts of states are covered.
 - ❖ Mop-ups are conducted, as soon as possible after identification of the virus as an end game strategy to interrupt transmission.
- (c) Surveillance and investigation of cases of acute flaccid paralysis (AFP)
 - ❖ Surveillance data is used to identify areas of wild poliovirus transmission and to guide immunization activities.

Exercise

- Volunteer a pulse polio immunization camp
- Prepare a checklist of the activities conducted at a pulse polio programme

Assessment

Short Answer Questions.

- a) What is pulse polio immunization?

- b) What are the key components of pulse polio immunization programme?

Checklist for Assessment Activity

Use the following checklist to see if you have met all the requirements for assessment activity:

Part A

- Define pulse polio immunization.
- State the key components of pulse polio immunization programme.

Part B

Discussed in class the following:

- (a) What is pulse polio immunization?
(b) What are the key components of pulse polio immunization?

Part C

Performance Standards

The performance standard may include, but not limited to:

Performance standards	Yes	No
Demonstrate the knowledge of the key components of the pulse polio immunization programme.		

GLOSSARY

Virus - A **virus** is a small infectious agent that replicates only inside the living cells of other organisms. Viruses can infect all types of life forms, from animals and plants to bacteria and archaea.

Bacteria - Bacteria are microorganisms too small to see with the naked eye that exists in virtually all environments in the world. They exist in dirt, water, caves and hot springs, organic materials like fallen trees and dead animals, and inside the bodies of virtually every living animal on earth.

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