Çankırı Karatekin University
Graduate School of Health Sciences

Master of Science Thesis

ASSESSMENT PRIMARY SCHOOL TEACHER KNOWLEDGE TOWARD MUMPS DISEASES AT DIWANIYA CITY

Noor Hussein Noor NOOR

Advisor

Prof. Dr. Azize Serap TUNÇER

Çankırı 2022

ASSESSMENT PRIMARY SCHOOL TEACHER KNOWLEDGE TOWARD MUMPS DISEASES AT DIWANIYA CITY

BY

Noor Hussein Noor NOOR

The Institute of Health Sciences

The Department of Nursing

The Degree of Master of Science

ADVISOR

Prof. Dr. Azize Serap TUNÇER

Çankırı 2022

ACCEPTANCE AND APPROVAL

Noor Hussein Noor NOOR, the graduate student of The Institute of Health Sciences with the student number of 208205245, has successfully presented her thesis entitled "Assessment Primary School Teacher Knowledge Toward Mumps Diseases At Diwaniya City" before the jury whose signatures are below, after fulfilling all of the requirements determined by the relevant regulations for the degree of Master of Science in Nursing.

Advisor **:** Prof. Dr. Azize Serap TUNÇER

Examining Committee Members:

Chairman **:** Prof. Dr. Azize Serap TUNÇER .....
Faculty of Health Sciences, social work
Çankırı Karetekin University

Member **:** Assoc. Prof. Dr. İlknur GÖL .....
Nursing Department
Çankırı Karetekin University

Member **:** Asst. Prof. Dr. Fatma KORKMAZ .....
Department of Management Sciences
Yozgat Bozok University

Approved for the Graduate School of Health Sciences

Prof. Dr. ÖZCAN ÖZKAN
Director of Graduate School

ETHICS STATEMENT

The thesis entitled “Assessment Primary School Teacher Knowledge Toward Mumps Diseases At Diwaniya City” which was prepared and presented as a thesis, was written by myself and in accordance with the scientific, academic rules and ethical conduct. The idea/hypothesis of my thesis solely belongs to my supervisor and to me. The research pertaining to the thesis was conducted by myself and therefore, all of the used sentences and interpretations within the work belongs to me.

I declare the aforementioned issues to be correct.

Signature

Date

Noor Hussein Noor NOOR

ABSTRACT

ASSESSMENT PRIMARY SCHOOL TEACHER KNOWLEDGE TOWARD MUMPS DISEASES AT DIWANIYA CITY

Noor Hussein Noor NOOR
Master of Science in Nursing
Advisor: Prof. Dr. Azize Serap TUNÇER
2022

Background: Mumps is an acute disease caused by a single serotype virus (paramyxovirus) that primarily affects adolescents and children. Mumps is a contagious disease that can be spread through saliva

Objective: Determine primary school teachers' knowledge about Mumps diseases. Because schools play such an essential role in improving children's and society's health, we can raise knowledge of mumps in schools to treat the condition better and prevent its transmission.

Methods: From January 14 to April 30, 2022, a descriptive study was conducted in 40 primary schools in Al-Diwaniyah to assess teachers' knowledge about mumps. The sample included 355 male and female teachers with at least one year of experience.

Results: The results of the research showed that the majority of the teachers who participated in the study sample were aged 41 and over, with a percentage of (40.8%), The study also showed that the number of female participants in the study sample is more than males, at a rate of (56.9%), The study also showed a relationship between the level of knowledge of teachers, the training course and the number of years of experience.

Conclusion: In general, the results of teachers' evaluation of mumps in schools indicate a poor level of general knowledge; they need an intensive educational program and training courses to increase teachers' awareness and knowledge about mumps disease

Key Words: Assessment, Primary School, Teachers, Mumps, Knowledge

ÖZET

DİWANİYAH ŞEHRİNDEKİ İLKOKUL ÖĞRETMENLERİNİN KABAKULAK HASTALIKLARINA YÖNELİK BİLGİLERİNİN DEĞERLENDİRİLMESİ

Noor Hussein Noor NOOR
Hemşirelik, Yüksek Lisans
Tez Danışmanı Prof. Dr. Azize Serap TUNÇER
2022

Giriş: Kabakulak, tükürük yoluyla yayılabilen bulaşıcı bir hastalık olup başta ergenleri ve çocukları etkileyen tek bir serotip virüsün (paramiksovirüs) neden olduğu akut bir hastalıktır.

Amaç: Okullar, çocukların ve toplum sağlığının iyileştirilmesinde önemli bir rol oynadığı için ilkokul öğretmenlerinin kabakulak hastalıkları ile ilgili bilgi düzeyleri büyük önem taşır. Çalışmanın amacı bu konudaki bilgi düzeyinin belirlenmesi ve hastalığın bulaşmasını önlemek ve daha iyi bir şekilde tedavi edilmesine destek olmak için okullardaki kabakulak bilgisine dair farkındalığın artmasına katkı sağlamaktır.

Yöntem: 14 Ocak- 30 Nisan 2022 tarihleri arasında Al-Diwaniyah'taki 40 ilkokulda öğretmenlik görevi yapan hocaların kabakulak hakkındaki bilgilerini değerlendirmek amacıyla tanımlayıcı bir çalışma yapılmıştır. Örneklemde en az bir yıllık deneyime sahip 355 erkek ve kadın öğretmen yer almaktadır.

Bulgu: Araştırma sonuçları, çalışma örneklemine katılan öğretmenlerin çoğunluğunun yüzde (40,8) ile 41 yaş ve üzeri olduğunu göstermiştir. Ayrıca, çalışma örneğindeki kadın katılımcı sayısının erkeklerden daha fazla olduğu (% 56.9) ve öğretmenlerin bilgi düzeyi ile eğitim kursu ve deneyim yılı sayısı arasında ilişki olduğu saptanmıştır.

Sonuç : Genel olarak bakıldığında sonuçlar, okullarda öğretmenlerin kabakulak hakkındaki genel bilgi düzeylerinin düşük olduğunu göstermektedir. Öğretmenlerin kabakulak hastalığı hakkında farkındalıklarını ve bilgilerini artırmak için yoğun bir eğitim programına ve eğitim kurslarına ihtiyaçları vardır.

Anahtar kelimeler: Değerlendirme, İlkokul, Öğretmenler, Kabakulak, Bilgi

PREFACE AND ACKNOWLEDGEMENTS

First, I want to express my gratitude to God Almighty for allowing me to finish this project. I want to express my gratitude to my supervisors (Prof. Dr. Azize Serap TUNÇER) for their excellent direction, encouragement, constructive criticism, and general kindness and support during my research and writing.

the Institute, and the entire faculty of the Institute of Health Sciences are all to be thanked for their generous assistance throughout this study. Last but not least, a heartfelt thank you to my family for the great love and hope they have given me; I would like to thank all of my colleagues at the University of Çankırı for their continuing encouragement and support.

Noor Husseın Noor NOOR

Çankırı-2022

CONTENTS

LIST OF ABBREVIATIONS

AMOH	Australia Ministry of Health
MOH	Ministry of Health
WHO	World Health Organization
CDC	Centers for Disease Control and Prevention
ELISA	Enzyme-Linked Immunosorbent Assay
ESR	Erythrocyte Sedimentation Rate
GADA	Glutamic Acid Decarboxylase Antibody
HPS	Health Promoting School
SPSS	Statistical Package For The Social Science
ANOVA	Analysis Of Variance
HPE	Health Promoting School
HSE	Health Service Executive
IBM	International Business Machines
MMR	Measles, Mumps, Rubella
PCR	Polymerase Chain Reaction
PCC	Pearson Correlation Coefficient
RCT	Randomized Controlled Trial
RT-PCR	Reverse transcription-polymerase chain reaction
TEM	Transmission Electron Microscopy
TSH	Thyroid Stimulating Hormone
UNESCO	United Nations Educational Scientific and Cultural Organization

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTİON

Mumps is an acute disease caused by a single serotype virus (paramyxovirus) that primarily affects adolescents and children. Mumps is a contagious disease that can be spread through saliva. When infected with the mumps virus, one-third of those infected do not experience any symptoms. Many people with glandular and nerve tissue issues are impacted and manifest clinical symptoms. Increased size of the parotid glands and an abnormally high body temperature are the most common signs and symptoms of this condition. Meningoencephalitis, epididymal-orchitis, cranial nerve involvement (particularly damage inside the eighth cranial nerve due to poor hearing), mastitis, myocarditis, oophoritis, and pancreatitis are all possible complications during this period. In laboratory work involving urinary testing, it is common to discover impaired kidney function. As a result, the mumps virus may affect the kidneys. The presence of one or more problems may occur in specific situations despite the absence of parotid gland irritation (Mourez and Dina 2018).

The school health effort has been effective in assisting students in developing health literacy, encouraging healthy habits, and improving their overall health status. In contrast, some developing countries with limited resources favor the health of children in school (Shrestha *et al*. 2016).

Every aspect of a Health Promoting School (HPS) is designed to make school life more enjoyable for everyone, including students, teachers, staff, and guests. An atmosphere where students, parents, and school staff may thrive and thrive academically and healthily should be a top priority for every school community member (HSE of Ireland 2015).

Several illnesses are spread regularly among Iraqi students, faculty, and the wider school community due to inadequate sanitation and a lack of comprehensive health maintenance and disease prevention programs. Add to this a general lack of understanding and awareness of the hazards of infectious diseases. This is due to a rise

in the danger of developing an infectious illness and an increase in the degree of infection control inside the school environment, which has reached unprecedented levels. Teachers, students, and the whole school community are being protected in Iraq as part of an effort to build and extend procedures based on medical ethical, and legal principles. It has become necessary to distinguish between infectious diseases that pose a significant risk to both teachers and students, as well as to increase teacher knowledge, particularly among those who teach health-related topics, in order to distinguish between infectious diseases that pose a significant risk to both teachers and students (Faraj and Khalifa 2014).

Several studies have been conducted on the influence of mumps and other viral illnesses on children and their academic performance. Many academics are now exploring if there is a relationship between the health of students and their ability to succeed in school. Much research shows a correlation between student health and academic success; thus, it is essential to promote children's health at all stages of development. Shaw (2015) found that sick children are more likely than healthy children to have problems at school, according to his findings in his research. Those who live in deplorable circumstances are more likely to have poor academic performance, drop out of school, and have trouble remembering information in their lessons. The link between academic accomplishment and student health continues to be a difficult one to understand (Shaw *et al*. 2015).

An Edwards study conducted in 2016 on the relationship between illness and the family revealed that families play a vital role in ensuring the safety and well-being of their children, as parents bear the responsibility of increasing their children's immunity against disease by closely monitoring them. It is necessary to incorporate vaccine schedules, such as those for the MMR vaccination. In primary care, addressing parental reluctance to get a vaccine involves several practical strategies, including starting early, introducing vaccination as the default approach, building trust by being honest about side effects, providing reassurance that the vaccine safety system is robust, and focusing on child and community protection, storytelling, and pain management. In addition,

information that doctors may find helpful in vaccination-related interactions is provided (Edwards *et al*. 2016).

Several viewpoints are centered on schooling. The importance of teachers in the preparation of correct questionnaire information in order to get the needed information is recognized since instructors spend most of their time in the classroom, allowing them to diagnose and know the specifics of a large number of student situations (Murray *et al*. 2019).

Increasing primary school teachers' knowledge of mumps' signs and symptoms, its consequences, and how to deal with infected children makes it feasible to make earlier diagnoses and send sick children to a hospital as soon as possible. Possible. This resulted in a drop in illness prevalence among the remaining students after the outbreak (Obeng-Gyasi 2018).

Mumps, for example, is a contagious virus that can potentially harm the lives of millions of people living in poor regions of the globe. In a low-income community, an increase in the occurrence of infectious diseases might result in a crisis, which can have a detrimental influence on people's quality of life (Moore 2017).

Societal opinions of health-care services in Iraq and the rapid dissemination of negative news through the country's television, social media, and other media. People are afraid and concerned as the epidemic spreads across the country. Example: When the Ministry of Health declared two cases of hemorrhagic fever in Al Diwaniyah Governorate, inhabitants in most regions of Iraq avoided eating meat due to the fear of contracting the disease (Al Jazeera 2018).

1.1. Importance of the Study

Both children and adults are susceptible to infection by the mumps virus. Infected individuals transmit this virus by speech, sneezing, or coughing, which causes tiny

droplets of infectious agents to circulate in the air. People in the vicinity may be exposed to air droplets. Transmission of the illness may occur via contact with infected hands, tissues, and other unclean items, as well as through impacted mouth, throat, or nasal secretions. Additionally, direct contact with the saliva of an infected individual might result in mumps virus transmission (Amoh 2018).

Schools, for example, are believed to have a higher risk of spreading the mumps than other places. Many schools were forced to close due to a lack of control over the spread of the illness. Mumps cases were more often recorded in children in elementary school (Orenstein *et al*. 2018).

The prevalence of mumps infection among adults was 95 percent before establishing comprehensive vaccination programs. This was true even though the peak of infection occurred during childhood. The mumps vaccination was first made available in the United States in late 1960; consequently, the incidence of sickness exposure has dramatically decreased since then. Later, in the 1980s, it became exceedingly evident what the reasons for the depression were, as shown by the documentation. Mumps was practically eliminated by 2001, with less than 0.1 cases per 100,000 persons recorded in the United States. Compared to the pre-vaccination period, this statistic reflects a 99.9 percent reduction in the incidence of sickness. Other countries that used the vaccine found it had the same success in lowering mumps occurrence (Rubin *et al*. 2015).

However, after these historic years of significant decreases in the incidence rate of mumps infection, sporadic mumps outbreaks started to arise worldwide, affecting many individuals who had previously had a mumps vaccine (Rota *et al*. 2009).

Compared to predictions, the vaccine's efficiency has fallen less than expected, and the advent of new viruses resistant to vaccination has been linked to a reduction in the immune response. As a result of a case of meningitis connected to a vaccine strain delivered outside of the United States, some people are concerned about the efficiency and safety of vaccinations, which has prompted some concern. The withdrawal or cessation of mumps vaccine distribution in some cases happened as a consequence, as

was the case in Japan, which is considered one of the industrialized nations with the most significant prevalence of mumps infection. According to the CDC, mumps vaccination was removed from the national immunization program due to an estimated 1 million mumps reported each year (Nagai *et al.* 2007).

According to the grounds of disagreement in this research topic, the mumps virus is a highly infectious disease agent with a high transmission rate. Mumps, on the other hand, is preventable by vaccination, yet outbreaks continue to occur worldwide. It affects people of all ages, and there is no particular therapy for it. A person could ask why this study is necessary and what it has to do with issues relevant to the community. As a result of the lack of publishing of epidemiologic research and inadequate documenting of clinical cases, measles is a neglected public health concern that may affect the general population. As a result of a lack of publication of epidemiologic studies and inadequate documentation of clinical cases, the disease is most prevalent in the middle- and lower-income countries, such as Iraq, and mumps is a neglected public health issue that may affect the general public. Mumps is a neglected health issue because it is not widely known to the general public. Look at the most recent World Health Organization data, which showed the rate of mumps incidence in the same time as previous years, and compare it to the rates in Iraq's neighboring countries. You will see that there is a statistically significant difference in Iraq. By the end of 2015, there had been a total of about 12,957 mumps cases reported. Seventy-three thousand nine hundred nineteen incidents occurred in 2016, compared to 14 incidents in Saudi Arabia, 84 incidents in Syria, 168 incidents in Jordan, 318 incidents in Kuwait, and 344 incidents in Turkey (Baiee and Hatif 2017).

This investigation demonstrated that the teachers had a thorough comprehension of the situation. Increasing teachers' knowledge of mumps can improve their ability to recognize many cases of the illness in its early stages, identify issues, and send the patient to the hospital as quickly and safely as possible. As a result of this research, data will be generated that can be used to gain more insight into the problem of increasing mumps awareness among primary school teachers. It is also anticipated that this study would catalyze more research into the prevention and control of infectious diseases. We

also conducted this research in Al-Diwaniyah because of the large number of primary school students there compared to the small number of schools in the area.

1.2. Problem Statement

Assessment of Primary School Teacher Knowledge Toward Mumps Diseases At Diwaniya City In Iraq.

1.3. Research Question

1. Are there a relationship between teachers' knowledge of mumps and the number of years of experience?
2. Are there a relationship between teachers' knowledge of mumps and demographic characteristics?
3. What is the level of knowledge of teachers about the signs and symptoms of mumps?

1.4. Objectives of the Study

4. Determine the level of knowledge primary school teachers have about mumps diseases.
5. Because schools play such an essential role in improving children's and society's health, we can raise knowledge of mumps in schools to treat the condition better and prevent its transmission.

1.5. Limitations

1. Some teachers refused to participate in the study sample

2 . The large number of primary schools scattered inside and outside the city, and the difficulty of moving from one school to anothe

2. LITERATURE REVIEW

Mumps has been known to humans from the beginning of time. Thousands of years ago, in the fifth century B.C., a Greek physician named Hippocrates wrote about the clinical picture of mumps for the first time in his book on epidemics (Gardner 2018). In addition to the swelling around the ears on one side or both, the researchers discovered additional indicators of outbreaks in males that appear at some point, such as swelling and discomfort in one or both testicles, which correspond to Orchitis and Parotiditis, and identified the causes of these symptoms (Rubin 2018).

Mumps was first described scientifically in 1790 by the British physician Robert Hamilton, who published his findings in a book in which he seems to have discovered the involvement of the central nervous system for the first time. (Guerrant *et al.* 2011). The original term for mumps is unknown. However, it has been related to the English verb (mumble), which may refer to the slurred speech that may occur in severe instances of the disease. Epidemic parotitis is characterized by the swelling of one or both parotid glands, which is an obvious indication of the disorder. (Plotkin *et al*. 2013). Because it was one of the primary causes of disability among military men during the First and Second World Wars, mumps has been particularly important in military mobilization (Samal 2011).

Mumps was first discovered in 1934 by Johnson and Goodpasture. They established that it could be transmitted from ill persons to rhesus monkeys and caused by a filterable agent found in saliva after multiple futile efforts to prove the contagiousness of the disease had failed. After further investigation, it was revealed that this agent was a virus. (CDC 2015). It was discovered for the first time in chick embryos in 1945 and was recognized as the world's first attenuated vaccination by the World Health Organization (WHO) in 1967 (James 2017).

2.1. Developing the knowledge of mumps

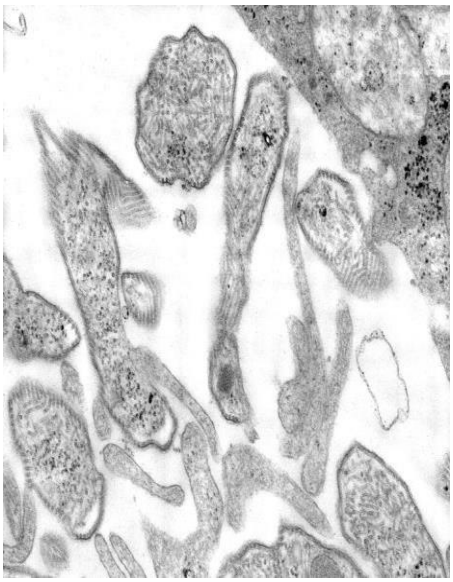
For those unfamiliar with the history, here is a quick rundown: The three-part Mumps education program is divided into three sections. One of the first steps was to investigate natural epidemics, which provided valuable information on the status of infectious diseases and their spread over a wide area. Hirsch's collection of 150 outbreaks from 1714 to 1859 revealed that the ailment was widespread from Alaska to Polynesia and from Iceland to Egypt, indicating that it had spread worldwide. (Feldman 2013). In the early nineteenth century, evidence acquired on the spread of sickness showed numerous epidemiologic aspects of the disease, including the presence of mumps. In particular, boarding schools, prisons, orphanages, and ships are among its favorite places. The knowledge of mumps characterizes the second stage of development was gained via the efforts of a group of French army physicians involved in elucidating further clinical aspects of the disease. The third stage started with the development of practical investigations on mumps and the discovery of the specific infectious agent responsible for the disease (Evans 2013).

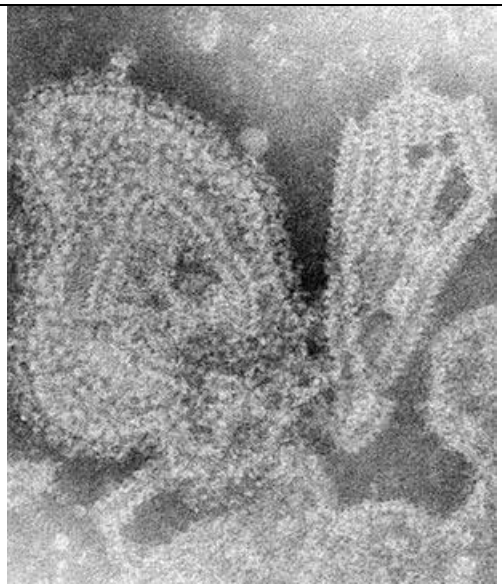
2.2. Nature of pathogen

It is most frequent in children and adolescents. Mumps is a severe viral infection that has a systemic impact on the body and is transmitted by saliva. It is commonly limited due to the particular sign of swelling in the parotid glands that occurs in this condition. (Fields *et al.*2019). Although the exact origin of the mumps is unknown, it is most likely connected to the English term (mump), which means to speak incoherently or indistinctly. (Gershon 2011). Although the initial infection is restricted to humans, the disease is widespread around the globe and may be found in a range of environments. The virus in question is a member of the Paramyxoviridae family of viruses. (James 2017). Mumps particles may generally be described as particles encapsulated with diameters in a region of around 200 nanometers or less.

Toss the glycoproteins out of the virus's outer cover, which protects the helical nucleus, composed of linear RNAs and nucleoproteins, and into a trash can. It is a parasite that

flourishes inside humans since they are their natural hosts. Aside from that, mumps is a contagious disease that may be transmitted between animals of different species. It is possible to grow the mumps virus in the laboratory using other mammalian cells and fresh chicken eggs. (Gnann 2012). According to the study, there are 12 different genotypes of the measles virus, spanning from A to L, each having a different geographic distribution. There is just one serologic type, despite specific investigations showing that mutual neutralization across genotypes may not be completely effective (James 2017).





This image, taken in 1977 through thin-section transmission electron microscopic (TEM), depicted the ultrastructural details exhibited by particles of mumps virus grown in a Vero cell culture.

Figure 2.1. Images courtesy of CDC/A Harrison and F A Murphy.

2.3. Epidemiology of mumps

Mumps sickness is common in many parts of the globe, with outbreaks happening every two or three years among unprotected people. Mumps is a contagious illness that may

be spread by saliva or salivary glands. (Sane *et al*. 2014).

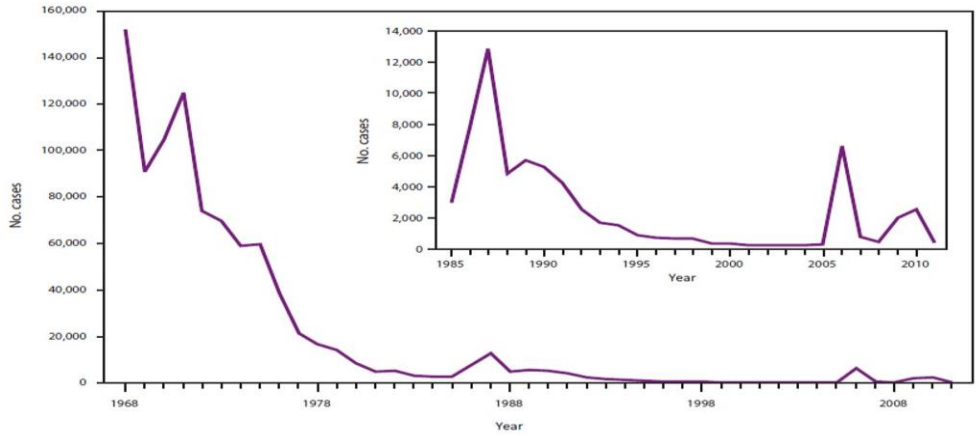
A good result was seen in the majority of positive blood serum tests for the presence of the mumps virus in children aged fourteen to fifteen years that were performed during the pre-vaccine era (Gupta *et al*. 2005).

Mumps outbreaks continue to occur from time to time, even in countries where children are regularly immunized against the virus. However, the virus's epidemiology has changed due to the vaccine's administration. (Cui *et al*. 2017).

Epidemics have a propensity to affect certain groups of people, such as those who attend boarding schools, serve in the military, or work in other institutions (Onyema *et al*. 2020).

Vaccination rates in the United States have been declining, while outbreaks have risen due to non-vaccination rates increasing. In 1941, the United States saw the greatest number of incidences, with 250 illnesses per 100,000 people at that time. As a result of the vaccine's approval for clinical use in 1968, the infection rate has dropped to 76 cases per 100,000 people (Beleni, and Borgmann, 2018).

Even in 1985, when only 2,982 instances were reported, the prevalence rate dropped to 1.1 per 100,000 persons, representing a 98 percent reduction from the number of cases documented in 1967. From 1968 to 2011, the number of mumps cases in the United States is shown in Figure 2.2 (McLean *et al*. 2013).



This figure provides the number of mumps cases in the United States from 1968 through 2011. Reported cases of mumps decreased steadily after the introduction of live mumps vaccine in 1967 and the recommendation in 1977 for routine vaccination.
Reference: (CDC and McLean , 2013)

Figure 2.2. Show the number of mumps cases in the U.S from 1968 to 2011 after the introduction of the live mumps vaccine

There are many reasons why the MMR vaccine was more successful the first time around. However, perhaps the most significant is that in 1989 the US Centers for Disease Control and Prevention (CDC) recommended that every child be given a second dose of the MMR vaccine (which protects against measles, mumps, and rubella) (Marin *et al*. 2018).

After announcing in 2003 the lowest year total of mumps infections ever recorded (with just 231 cases), the United States Centers for Disease Control and Prevention (CDC) announced that the disease epidemic series will return in 2005-2006 (Cecil *et al*. 2012).

In New Jersey, there are Jewish schools, and in New York, over 1500 diseases were recorded in 2009, with the ages of the guys who contracted the illnesses ranging from 7 to 18 years old. They observed that 88 percent of the patients who had a known vaccination got the first dose of the vaccine but that the majority of them failed to respond to this dose for various reasons, the most common of which was a deficiency in the primary immune response (Marin *et al*. 2018).

While 75 percent of those who received the second vaccine failed it, the reason for this could have been a deficiency in immune response; as a result, a new management

strategy was recommended, which could include either extending the duration of the vaccine to boost protection or recommending a new vaccination program that focuses on the children of adults (Gnann 2012).

The period 1967 to the present, the occurrence of mumps on an annual basis in the United States has been continuously declining. Mumps outbreaks, on the other hand, have been seen all over the globe, including in the United States, even in communities that have received the recommended second dose of the measles-mumps-rubella (MMR) series (Litman 2015).

When illnesses arise among persons who have been heavily vaccinated, it is often due to the vaccine's ineffectiveness and poor absorption, which allows the spread of the virus. Although the immunity induced by vaccination may wane over time, the nature of the illness results in lifelong protection (Lewnard and Grad 2018).

The first and second doses of MMR were administered on many college campuses, and those who had received each recommended dosage of the immunization, including the first and second doses of MMR, had symptoms. Since the United States declared the mumps outbreak a problem for young people in 2010, efforts should be made to create the third dose as a practical technique for curbing the spread of this illness among this age group (Gershon 2011).

2.4. Progression of mumps in Iraq

Throughout Iraq's history, it has been subjected to a slew of financial sanctions and conflicts, as well as continuous wars, which have caused the level of public health and health services to decline. As a result of the prolonged shortage of medicines and other supplies, as well as the disruption of essential health services, the country has become plagued by mumps and other infectious diseases (MOH 2010).

Displaying data on vaccine-preventable illnesses such as mumps and other diseases acquired from the Department of Health Statistics between 2000 and 2016, as well as a curve depicting the incidence rates of all diseases, is crucial. According to the publicly available mumps data, there has been relative stability for almost ten years, from 2005 to 2014, and then a peak in 2016. This is seen in Figure 2.3 (Lafta and Hussain 2018).

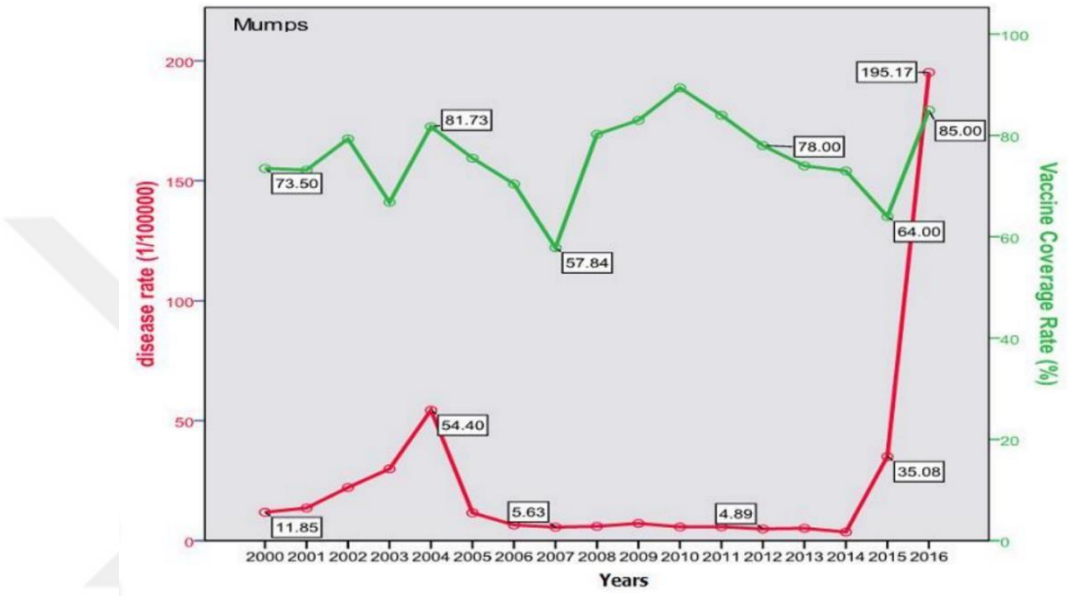


Figure 2.3. The indication of vaccine coverage in Iraq and mumps infection A Person's (2000-2016)

A steady incidence of mumps infection has been seen since 2004, with 1500-2500 cases yearly) an estimated incidence of 5/100000 may be reduced by the provision of Rubella, Mump, and Measles immunization in addition to other preventative measures. Compared to Jordan or Saudi Arabia, where fewer than 200 cases were recorded annually, with rates shifting throughout that period, this figure is considered high (WHO 2019).

Despite progress in disease prevention and management in Iraq, communicable diseases remain among the top causes of illness and death. Measles and other illnesses continue to be the most prevalent ailments reported from healthcare facilities, according to the Ministry of Health's Centre for Infectious Disease Control (Alwan 2004).

The trend indicates that mumps is an epidemic in Iraq; the rate in 2004 was 54.4/100000, or about 13000 cases, and the epidemic ended in the years 2015-2016 with a rate of 195/100,000 or roughly 74,000 cases. In all epidemics that arose during the period of instability in the security state, inconsistencies in vaccination programs were to blame. The epidemics affected a female to male ratio of 2:3, and the age range of the most afflicted was 5 to 15 years. When it comes to children, mumps is usually a mild illness. However, it has been linked to significant complications, including meningitis, orchitis, and eighth cranial nerve involvement, which may result in deafness in around 15 percent of cases (Lafta and Hussain 2018).

The following table shows the documented instances of mumps infections according to the Iraq health observatory data repository of the World Health Organization.

Table 2.1. Global Health Observatory data repository: Iraq, Mumps cases

Years	Cases	Years	Cases
1999	25554	2009	2265
2000	18720	2010	1862
2001	2780	2011	1944
2002	No document	2012	1482
2003	No document	2013	1809
2004	15256	2014	1295
2005	3243	2015	12957
2006	1865	2016	73939
2007	1612		
2008	1876		

Note that Iraq has seen mumps outbreaks in 2004 and 2016, and although the country could not determine the cause of the outbreaks, poor vaccination coverage and a high failure rate of vaccines probably were to blame for the outbreaks (Zhao *et al*. 2019). The failure rate of vaccinations in Iraq was 66 percent, owing to inefficient administrative processes, a failure to maintain the cold chain, improper vaccine handling, and other issues related to the vaccine and the host. Some of these factors may be linked to the deteriorating infrastructure during the Iraq conflict (Jasem *et al.* 2012).

2.5. The Outbreaks of Mumps

Mumps outbreaks are a severe problem that must be treated immediately. A massive quantity of research about the mumps epidemic has been gathered as a consequence, according to (Principi and Esposito 2018).

This article review aims to highlight what is now known about mumps outbreaks and the medicines available for mumps prevention and treatment. The researcher used PubMed data to search for all studies in the database that had been published over the preceding fifteen years, estimating that there were 1500 papers published in English using keywords in the database (mumps virus or mumps vaccine or mumps). It was discovered in the research that it is possible to sidestep the still-unsolved mumps problem. Immunization against measles is practical. However, its effectiveness reduces with time. Booster immunization doses are recommended to help control the pandemic, while it is unknown if they will be able to avoid it entirely. Because of the rapid decline in antibody levels, implementing the third dose in the recommended immunization schedule may be ineffective.

Furthermore, in the majority of cases, strains of viral mumps seem to be genetically different from those used in vaccinations, suggesting that vaccine escape may be a factor. The progression of the pandemic in this instance, on the other hand, has not been well explained. According to the research results, the specific reasons for the emergence of mumps outbreaks in communities with high vaccination coverage are not fully understood at this time. While the creation of vaccinations that include the evolving serotypes and the delivery of a booster dose are feasible alternatives to consider, each has its own set of downsides. More study is being carried out to better our knowledge of the immune system's response to mumps vaccines, which is currently underway. In order to produce effective long-term mumps immunizations and to prevent outbreaks, they must first be shown effective (Principi and Esposito 2018).

2.6. Pathogenesis of Mumps

Mumps pathology studies are less comprehensive than those for other illnesses because the disorder is infrequent and does not cause death. The infection that caused the pathogenesis was not appropriately identified (Lievano *et al*. 2012).

Despite experimental research on infected monkeys, which has shown that the infection may progress to parotitis, no animal model has been found to be equivalent to human

sickness. (Litman and Baum 2005).

When the virus replicates in the nasal or upper respiratory mucosal epithelium, it travels to the lymph nodes and eventually becomes present in the blood plasma of the infected individual (Louten 2016).

Many different physiological organs were engaged in this process, including the parotid glands, testicles, ovaries and liver, and the central nervous system (Denis 2018).

Once infected with mumps, the virus replicates in the respiratory epithelial tissue of the body. It spreads to the surrounding area through lymphatics between 2 and 3 days after infection, when primary viremia starts, followed by secondary viremia 3 to 4 days later and continuing up to 7 days after that (Cohen *et al*. 2017).

Infection with a virus causes prodromal symptoms, followed by symptoms caused by an immunologic reaction between the host antibody and viral antigens inside the capillary wall. Symptoms such as rash and fever are common (Demicheli *et al*. 2013).

2.7. Progression of Virus (Systemic spread)

MUV may move throughout the body regularly, as shown by the wide range of symptoms, which led to the hypothesis that after infecting upper respiratory mucosa, the virus goes to regional lymph nodes and infects the patient in the early acute phase of the illness (Fig. 2.4). However, despite the high incidence of respiratory symptoms, the virus is seldom detected in the blood (Mishra *et al.* 2013).

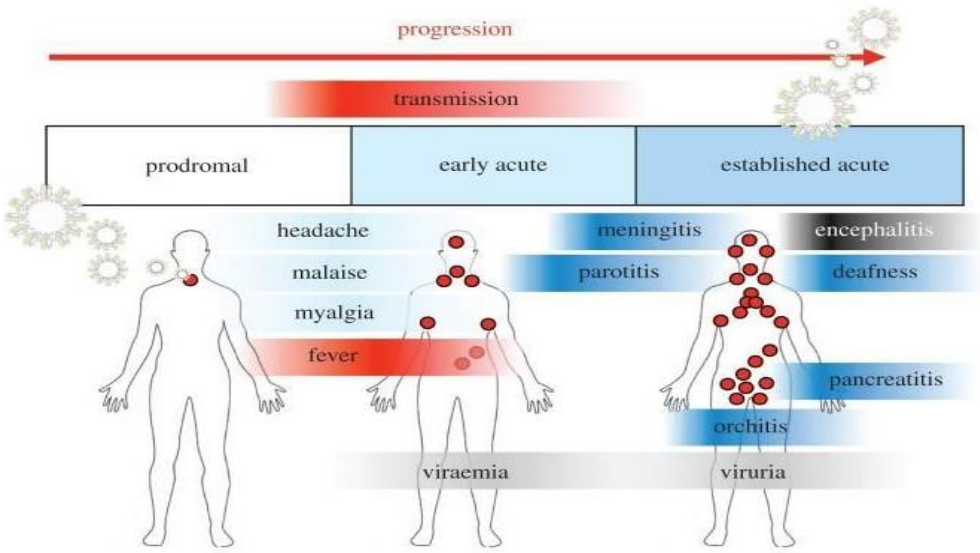


Figure 2.4. Progression of mumps virus and systemic spread

It is estimated that around half to one-third of mumps infections are asymptomatic or produce only minimal respiratory symptoms, which fever may follow in most cases. Mumps is defined by an expansion of the salivary glands, most notably the parotid glands, which is essential for the clinical diagnosis of the condition. Mumps is usually two-sided, begin 2-3 weeks after exposure, and last 2-3 days, though they can sometimes last a week or more. Mumps can affect the submandibular, sublingual, and submaxillary glands; however, this is rarely the primary symptom of the disease. The virus's replication in the parotid gland results in the infiltration of mononuclear cells into the perivascular and interstitial spaces and edema, hemorrhage, epithelial duct cells, and acinar necrosis in the gland. A rise in the amount of amylase in the blood and urine may be caused by inflammation. The virus is transmitted by saliva from approximately a week before to about a week after the onset of salivary gland enlargement. In addition, the mumps virus has been discovered in the saliva of patients who are not experiencing symptoms. This might explain some difficulties in managing the mumps epidemic, apart from the fact that the virus is released for up to a week before symptoms occur (Rubin *et al.* 2015).

Orchitis is the most common salivary gland symptom of mumps and usually affects just one side of the mouth. After puberty, it is responsible for around 10-20 percent of all infections in boys. In this study, MuV was detected in sperm and testicles, demonstrating that epididymal orchitis is caused by direct infection of testicular cells.

On the other hand, an indirect immunological mechanism has also been hypothesized. Leydig and germ cells have been implicated, and both have been associated with reduced levels of testosterone synthesis in the body (Clifford *et al*. 2010).

Testicular atrophy occurs in about half of all instances and has been associated with oligospermia and insufficient ovulation. However, infertility is rare in these circumstances. Mumps infections in women after adolescence are associated with mastitis and ovarian inflammation (which shows itself as pelvic pain) (Dayan *et al*. 2008).

In the germinal epithelium of the testicular seminiferous tubules, there is necrosis of epithelial and epithelial duct cells and epithelial duct cell necrosis. Orchitis is often accompanied by epididymitis and fever, which subside within a week after the onset of the illness (Rubin *et al*. 2015).

The presence of immune complex deposition, infiltration, and fibrosis of interstitial mononuclear cells, as well as edema and injury to localized tubular epithelial cells, is shown by a renal biopsy or postmortem examination under such conditions (Prasad *et al*. 2018).

Pancreatitis, characterized as acute epigastric soreness and tenderness, was found in around 4% of those who underwent the study (Boxall *et al*. 2008).

There have been several contradicting results about the association between pancreatitis, mumps, and diabetes, and it is unclear whether or not a causal relationship exists (Goto *et al*. 2008).

It has been suggested that Vitis is associated with infertility and early menopause; however, these are very unusual events. As demonstrated by the high virus incidence during the acute phase of the illness, the virus often goes to the kidneys throughout the disease (Fig. 2.4). The distal tubules, calyces, and epithelial cells of the ureters seem to

be the primary sites of viral replication in the human body. Mumps infection of the kidney is generally considered to be innocuous; nonetheless, severe interstitial nephritis has been documented in some instances of the illness (Rubin *et al*. 2015).

2.8. Signs and Symptoms of Mumps

After being exposed to the virus for 14 days, people with mumps have a low-grade fever, anorexia, malaise, and headaches. In most instances, parotitis occurs soon after, resulting in swelling of the parotid glands, earache, and facial discomfort. Figure 2.5 shows the swelling of the parotid gland in a young child who has had mumps (Ferri 2009).

Figure 2.5. Hallmark swelling of the parotid gland in a child with mumps Photo courtesy of CDC/NIP/Barbara Rice.

Other possible mumps manifestations include orchitis, epididymitis, prostatitis, oophoritis, hepatitis, pancreatitis, thyroiditis, deafness, aseptic meningitis, or moderate encephalitis; and a large proportion of mumps infections lack recognized symptoms or indications (Smith and Gemmill 2011).

The proportion of clinical manifestations of mumps infection is shown in table.2.2.

Table 2.2. Clinical presentations of mumps infection reference: (hviid *et al*. 2008)

	Cases (%)
Clinical symptoms	60–70% of infections
Parotitis	95% of patients with clinical symptoms
Epididymo-orchitis	15–30% of adult men with infection
Bilateral orchitis	15–30% of epididymo-orchitis cases
Oophoritis	5% of adult women with infection
Meningitis	1–10% of infections
Encephalitis	0·1% of infections
Death	1·5% of encephalitis cases
Permanent unilateral deafness	0·005% of infections
Spontaneous abortion	27% of first-trimester pregnancies after mumps infection
Pancreatitis	4% of infections

2.9. Diagnosis of mumps

2.9.1. Clinical results

Mumps diagnosis is usually based on two factors: the first is asking the patient about their illness history, and the second is performing a physical examination to look for swelling and tenderness in the parotid glands, as well as other symptoms such as malaise and fever. Mumps is a viral illness that affects the parotid glands and the salivary glands. As a result, when the swelling in the parotid glands is painful, severe, and bilateral, and there has been no prior exposure to infection, the diagnosis becomes obvious (Abdel Razek and Mukherji 2012).

It is important to note that there are a variety of causes of infection that may affect the parotid gland, some of which are infectious and others that are noninfectious. This might be confused with acute parotid edema caused by a mumps infection, which is more serious (Gershon 2011).

It is possible to use viruses such as the adenovirus, influenza A virus, Epstein Barr virus, coxsackievirus cytomegalovirus, parainfluenza virus, or lymphocytic choriomeningitis virus to differentiate between various illnesses, such as the mumps. All of them were associated with an expansion of the parotid gland. An enlargement of the parotid gland may occur in AIDS patients, especially in children and adolescents (Kesson 2012).

As a consequence of suppurative (with pus) parotitis, an acute bacterial infection of the parotid gland, such as staphylococcus aureus, may develop, as can non-infectious causes such as sarcoidosis, Sjogren's syndrome, amyloidosis, iodine sensitivity, thiazide ingestion, salivary duct obstruction, or tumors. A clear differentiation should be made during the examination between parotid inflammation and lymphadenopathy (Gnann 2012).

2.9.2. Laboratory diagnosis

2.9.2.1. Blood abnormalities

Serum amylase levels are typically increased in mumps patients; around 30% of those who have elevated amylase levels in their blood will develop pancreatitis or parotitis as a result of their illness; the source of the amylase may be determined by identifying pancreatic lipase or by doing an isoenzyme analysis on the samples collected. After the symptoms of parotid inflammation have subsided, the amylase level remains increased for two to three weeks (Xu 2017).

Although peripheral white blood cells (WBCs) and differential counts are often normal,

mild leukopenia with relative lymphocytosis may be seen. It is possible to develop a polymorphonuclear predominance leukocytosis in patients suffering from epididymal orchitis, pancreatitis, or signs of meningitis after being exposed to specific pathogens. (Kesson 2012).

2.9.2.2. Serology

In some instances of infection, contact with a laboratory is necessary because it becomes more challenging to determine if the patient is safer from third parties on one side or whether the symptoms manifest themselves in organs other than the parotid gland. Identifying virus-specific IgM and IgG levels in the laboratory may be utilized as confirmation in certain situations (Denis 2018).

Mumps was diagnosed by detecting immunoglobulin antibodies (IgM) using the enzyme-linked immunosorbent assay (ELISA), which provides more evidence of recent infection than other methods of detection (Didel *et al*. 2017).

As an alternative, mumps immunoglobulin antibody titers in convalescent serum and acute serum might be examined to demonstrate a four-fold increase in diagnostic sensitivity. Confirmation of the diagnosis may be accomplished by using fixation of complement, suppression of hemagglutination, or neutralization assays (Kanbayashi *et al.* 2018).

2.9.2.3. Virology

It is necessary to obtain laboratory confirmation of unusual clinical presentations, such as meningitis or orchitis without parotitis, which can be accomplished through viral isolation (Adjei 2016).

It is generally agreed that the viral isolation approach is the final line of defense in confirming a mumps infection diagnosis. The virus may be isolated from a patient's

saliva, pharynx, cerebrospinal fluid, and maybe urine using swabs taken from these areas (Jerome 2016).

Confirmed meningitis in a mumps patient is established by obtaining a sample of cerebrospinal fluid and evaluating the protein levels in the fluid. RT-PCR results showing the presence of the mumps virus can be obtained directly from clinical samples such as CSF or pharyngeal swabs, or they can be obtained indirectly from RT-PCR results (Adjei 2016).

2.10. Treatment of mumps

When it comes to mumps, there are no specific anti-viral medications available. Instead, treating a patient with mumps consists of ensuring that the patient receives adequate hydration, symptom relief, and nutritious nourishment while ensuring that they recover within days, even if complications arise; neither the treatment nor the prevention of mumps is affected by mumps immunoglobulin. Testicle discomfort may be relieved by using a cold compress and moderate scrotum support. When orchitis occurs, it is believed to be a response to corticosteroid therapy in certain instances. Breast binders and cold packs are effective in the treatment of mastitis (Donahue *et al*. 2017).

2.11. The complications of mumps infection

The mumps virus is responsible for a wide range of illnesses that are either directly related to the virus's reproduction in a particular organ or are the result of the emergence of phenomena in immunological pathology due to the virus's replication (Zamir et al. 2015).

Because of its ability to multiply in epithelial, glandular, and neurological tropisms, this virus can also be transmitted through the respiratory system by droplets infected with contaminated saliva and then transmitted to the target organs through the bloodstream mumps virus is only occasionally detected in the blood (Kitano *et al*. 2017).

2.11.1. Parotitis

When it comes to mumps, parotitis is the most prevalent symptom, which is also the most painful. It is present in sixty to seventy percent of infections and ninety-five percent of cases with symptoms. The presence of parotitis in ninety percent of mumps patients has been documented in the literature. (WHO 2012). Each of the three primary pairs of salivary glands (parotid, sublingual, and submandibular) is responsible for a specific function. The parotid glands are the most common site of mumps infection; however other glands are seldom affected for a diagram of the main salivary glands) (D'Epiro 2015).

Because of the enlargement of the parotid gland, the earlobes are elevated, and the lower jaw (mandible) is obstructed for two to three days up to a week, depending on the severity. The degree of discomfort and suffering associated with the development of inflammation in the parotid gland is directly proportional to the degree of inflammation (Haiyan and Mengbo 2018).

A large number of sculptures depict the opening of the duct (Stensen's duct) as erythematous and oedematous in appearance. The enlargement of the parotid gland that occurs due to this condition is common and may linger for many days. When the symptoms have been addressed, the body's temperature may increase briefly before returning to its usual level. It is unusual to have problems from parotitis; nonetheless, Sialectasia has been linked to recurrent (sialadenitis) salivary gland irritation (Gnepp and Simpson 2020).

The swelling of the bilateral glands, which occurs in combination with parotitis, is more common and presents in more cases than the swelling of the sublingual and

submandibular glands, which occurs in association with parotitis but is less common. Mumps virus may be found in saliva either before or after the beginning of parotitis (parotitis is the inflammation of the mouth) (Hviid *et al*. 2008).

2.11.2. Orchitis

The most common sign of infection during or after puberty is testicular inflammation (orchitis), which manifests as testicular inflammation (Davis *et al*. 2010).

Orchitis is uncommon in children under ten, although mumps complications are most common in men after puberty and joint with twenty to thirty percent of the population and about ten to thirty percent of the population in bilateral form, respectively. Orchitis is usually associated with parotid gland inflammation that lasts one to two weeks (Clemmons *et al*. 2018).

Testicular atrophy affects around 30 - 50% of the testicles that have been infected (Choi *et al*. 2020).

Only a few days after infection, the virus assaults the testicular glands, causing lymphocyte accumulation between the arteries, seminal tube dissection, and parenchymal inflammation to manifest themselves. A buildup of fluid in the tunica albuginea is followed by an increase in intratesticular pressure, which results in testicular atrophy as a consequence of the increased intratesticular pressure (Masarani *et al*. 2006).

Most patients showed anomalies in spermatogenesis after three months of recovery, with abnormalities in motility, morphology, and sperm quantity found in almost half of them. A three-year study of 298 patients determined that 38 percent of teens and 24 percent of adults had lower sperm quality. The study's results also indicated a significant association between the severity of orchitis and this aberration in sperm quality (Koenig *et al*. 2016).

Hormonal alterations may account for both spermatogenesis failure and testicular atrophy in some instances (Jiang *et al*. 2017).

In addition to the association between mumps and testicular inflammation (orchitis), severe testicular disorders included partial or complete infertility, testicular atrophy, and an increased chance of testicular cancer (Koenig *et al*. 2016).

2.11.3. Oophoritis

Unlike orchitis, the inflammation that occurs in the ovary (Oophoritis) is far less joint and hence less well understood. In acute appendicitis, the clinical symptoms and state of the ovaries are similar to those observed in acute appendicitis because the ovaries are located in a hidden location (Malaiyan *et al*. 2017).

Mumps virus infection usually results in oophoritis, which impairs ovarian function and may result in female infertility; as a consequence, mumps infection is associated with early ovarian failure in women who are pregnant (Yan *et al*. 2015).

It is feasible to extract the virus from the vaginal secretions without further processing. Recent animal studies have shown that mumps virus infection reduces ovarian steroidogenesis and, as a result, assists in the death of cells in the ovarian granular cells, which are considered to be the significant component of the ovary (Wang *et al*. 2016).

In addition, mumps infection is the most prevalent illness related to early menopause (Okeke *et al*. 2013).

2.11.4. Mastitis

Mammary gland inflammation, also known as mastitis, may affect the anatomical structures of the breast as well as intramammary tissues, such as the milk ducts, mammary areolas, nipples, and cervix among other things (Hughes and Watson 2018).

An infection produced by the causal agent of mumps may result in inflammation of the inner and exterior parts of the breast. Therefore, the development of mastitis may have a variety of effects on the process of nursing a newborn baby. Early weaning is considered to be the primary cause of early weaning because it modifies the composition of milk and diminishes milk supply. This condition is detrimental to the growth and development of children. (Contreras *et al*. 2011).

2.11.5. Pancreatitis

Pancreatitis is a disorder characterized by pancreatic inflammation; it is also considered an uncommon consequence of mumps infection (Vaidya *et al*. 2016).

It is characterized by an increase in amylase and other pancreatic enzymes such as lipase and elastase-1, as well as enlargement of the pancreatic head as seen on abdominal computed tomography (Taii *et al*. 2008).

Pancreatitis causes stomach discomfort, which may sometimes develop into severe pain, as well as sensitivity when palpating, which can persist anywhere from 3 to 7 days in most situations. Temporary thyroid malfunction and pancreatic mumps were found in certain patients (Ghosh *et al*. 2016).

2.11.6. Subacute thyroiditis

Thyroiditis worsening mumps is a rare occurrence that generally manifests itself one week after the onset of parotitis. Although subacute thyroiditis is not a common ailment, it may occur due to discomfort and is suspected of causing painful thyroiditis in some instances. Because of the nature of the sickness, it is considered that viral infection causes it, and the culprit in question is the mumps virus. As a result, it is believed that abnormal thyroid function is caused by a viral infection and the inflammatory process, and multiple cases have been associated with the mumps virus (Mo *et al*. 2016).

According to the clinical signs, the disorder is associated with severe discomfort that is often located in the front area of the neck and may radiate to the ear or jaw. In addition, when the thyroid gland is palpated, there is typically soreness as well as a small goiter. Thyroid dysfunction is characterized by fatigue, low-grade fever, elevated erythrocyte sedimentation rate (ESR), elevated thyroid-stimulating hormone (TSH), symptoms of mild thyrotoxicosis, and a lack of absorption, or hypothyroidism, among other clinical and laboratory abnormalities (Alfadda *et al*. 2014).

Acute thyroiditis has occurred in epidemic form, as shown by the presence of circulating anti-mumps antibodies in the blood of persons with subacute thyroiditis who were detected during a mumps epidemic despite the absence of clinical signs of mumps (Desailloud and Hober 2009).

2.11.7. Nephritis

According to the correlation between the onset of nephritis and the development of mumps and the immunofluorescent demonstration of mumps antigen in the glomeruli, mesangial nephropathy developed after the mumps infection. Molecular evidence for MuV molecules in the cytoplasm of tubular epithelial cells was revealed in a study of diseased anatomical nephrons created for recipients suffering from bilateral parotitis associated with acute nephritis. Even though viral detection in the urine occurs during the first two weeks of infection, the illness is typically asymptomatic throughout this period (Park *et al*. 2008).

however, nephritis has been reported as a consequence of the mumps on rare occasions (Gouma *et al*. 2016).

2.11.8. CNS infections

It is possible to develop meningitis in older newborns and children who have been infected with the mumps virus, either alone or in combination with parotitis. A precise

diagnosis is made mainly based on epidemiologic and laboratory data since, in most cases, no distinguishing clinical symptom can be used to identify a particular infection is seen (Rajma and Arun 2017).

Mumps virus meningitis, like enterovirus meningitis, is often non-lethal, heals spontaneously, and only in rare cases may there be deaths or long-term ramifications. Meningitis symptoms include fever, vomiting, neck stiffness, fatigue, and headache, all of which subside within two days after the onset of the illness.

On the other hand, clinical signs have been recorded to last up to 10 days. Infection in adults rather than children results in encephalitis, which may be accompanied or unaccompanied by meningitis. Encephalitis is rare, although it is more frequent when infection occurs in youngsters. The central nervous system infection caused by the mumps is the most common salivary-gland manifestation infection (Mehta *et al*. 2020).

Some research has shown that the flow of CSF from infected mononuclear cells via the choroid plexus may be linked to meningitis and encephalitis in humans; some of the neurological effects of MuV infection include transverse myelitis, Guillain-Barré syndrome, cerebellar ataxia, flaccid paralysis, and facial paralysis (Irani 2008).

2.11.9. Deafness

In children, mumps is often associated with unilateral sensorineural hearing loss. The salivary glands, on the other hand, are generally affected. It is common for deafness to be unilateral, to have an immediate onset, to be permanent, and to be profound (Morita *et al*. 2017).

The incidence rate differed greatly between studies because the persons studied are not homogenous; it varies by age, gender, and vaccination coverage in certain nations. It might range from 0.5 / 100,000 to 1 / 1,000 (Hashimoto *et al*. 2009).

Hearing loss arises 4 to 5 days after the beginning of other clinical indications. It is not related to the risk of other manifestations (parotitis syndrome or influenza-like syndrome), except for the development of meningitis and encephalitis (Donahue *et al*. 2017).

Mumps virus seldom causes bilateral hearing loss (Katsushika 2018).

The virus causes hair cell shrinkage in the stria Vascularis and the Corti organ and myelin sheath deterioration surrounding the auditory vestibule nerve in both the adult and the pediatric brain (Kanra *et al*. 2002).

2.12. Immune response

It is not known if a cell-mediated immunological or humoral response is required in order to eradicate the Mumps virus from a large number of persons who have been exposed to it. Both have a role to play, but it does not seem that one is required for good infection management while the other is not (Yoo *et al*., 2010).

An immune response to the virus was verified 11 days after the first exposure, and the presence of virus-restricting antibodies was shown to be sufficient to remove the virus. Furthermore, when immunoglobulin A in a salivary fluid is examined, it indicates that the release of infectious mumps virus in saliva has been stopped (Mahy and Van 2010).

Although the exact time at which mumps virus reactive cytotoxic T cells initially arise is uncertain, it has been shown in blood samples taken from individuals who have received immunizations or developed a spontaneous infection. It is not known when the first mumps virus reactive cytotoxic T cells develop in the body. A genetic relationship may be established between the efficiency and magnitude of this response and the host of origin for human leukocyte antigen (HLA). Because of the virus's predilection for B and T cells, forming a cell-mediated immune response is difficult (Rouse and Sehrawat 2010).

While the virus replicates effectively in activated T lymphocytes, it does not do so in the central nervous system or in resting T cells throughout an infection. The exposure of the fetus to MuV via the placenta did not seem to result in any fetal tissue infection, according to the findings. It was discovered that compared to the time of immunosuppression associated with measles, it was less severe and shorter (Webster *et al.* 2013).

While this is not always the case, it can cause aberrant immune responses, a lousy prognosis when the mumps virus is present, and issues in multiple organs. 90% of symptomatic instances of salivary gland parotitis (unilateral or bilateral) are caused by this condition. Mastitis affects 15% of females and is caused by a virus in breast milk. The presence of oophoritis, meningitis fever/vomiting, mononuclear pleocytosis in CSF in 40–60 percent of cases, and meningitis infection are all possible outcomes. A virus has attacked the epithelium, and brain encephalitis affects 2 percent of the population (Mahy and Van 2010).

2.13. Mumps risk factors

A risk factor for mumps includes exposure to or living near someone infected with the Rubulavirus. Another risk factor is traveling outside of the country, especially to nations with no mumps vaccination program. Those who have not been vaccinated and do not exhibit symptoms of robust immunity may also be at risk of contracting the disease (Gibson and Lakshmi 2019).

The chance of having mumps increases in those who haven't been vaccinated or who don't have proof of immunity to the disease. A larger risk exists for people who have only received one MMR vaccine compared to those who received two doses or those born before 1957. Mumps vaccinations are not completely successful in preventing the disease, so even those who have gotten two doses of the vaccine are still at risk, Additionally, living or working close to Rubulavirus or other virus-infected individuals lowers immunity in addition to the previously listed factors. Traveling internationally is risky, particularly if you are going to a country that does not have a mumps vaccination

program. Another issue is that children between the ages of two and twelve are particularly susceptible (CDC 2019).

The risks of contracting the mumps virus while pregnant While every virus has the potential to be harmful to a pregnant woman, the data supporting the notion that mumps increases the risk of fetal loss during pregnancy is limited and of low quality. During the first trimester of pregnancy, there seems to be an increased chance of fetal loss, while there is no evidence of an increased risk of congenital disabilities. According to recent research, mumps infection and endocardial fibromyalgia, or heart disease, may be linked with some instances. According to case studies, prenatal infection is also connected with dyspnea and thrombocytopenia, among other symptoms (PHE 2008).

2.14. Prevention of mumps

As one of the most significant side effects of mumps, permanent sensorineural hearing impairment or loss might result. This condition occurs in the late stages of the disease and has a prevalence incidence of around 1 in every 2000 states of infection (Kanra *et al*. 2002).

Although most instances of mumps-induced deafness are unilateral, there have been reports of substantial deafness on both sides of the body, needing cochlear implantation. Individuals infected with the mumps virus and suffering from encephalitis, on the other hand, may have hemiplegia, facial paralysis, optic atrophy, or behavioral abnormalities. Hydrocephalus is an uncommon complication of the mumps virus-induced aqueductal obstruction and epididymitis (Bale 2014).

Prevention can be accomplished by (1) community protection through health education and (2) health promotion through a vaccine to reduce the number of instances of mumps infection.

2.14.1. Health education

Mumps is a paramyxovirus maintained by respiratory transmission but is less transmissible in household settings than in other environments. Some studies have shown that people's immune systems rapidly deplete after receiving the mumps vaccine; this fact must be considered when assessing the overall degree of natural immunization among the general public. Mumps is not a very dangerous illness, but it may have severe effects on children in some circumstances (Yu *et al*. 2018).

Decreasing vaccination coverage may increase morbidity rates throughout the population due to the more extended infectious period for the elderly. This is because mumps is less damaging in children (and in men due to testicular inflammation) than in adults. When the vaccine was first introduced in the United States, the number of Mumps alerts dropped by more than ninety-five percent. From 1987 to 1994, the United States experienced a pandemic of a similar nature. As a result of the vaccine's introduction in the United States (the final vaccine license was granted in 1967, and in 1977 it was recommended to be introduced to children all over the world), mumps warnings have been reduced by more than 95%, a reduction that is significantly greater than the vaccine's effectiveness and product coverage. As a result, they provide an excellent indicator of protection indirectly (Fine *et al* 2018).

2.14.2. Health promotion

Healthy living can be promoted by employing vaccination, which is the process of artificially inducing immunity or providing protection against disease. Immunization can be classified into two types (active and passive immunization):

A. Active immunization is inducing the body to develop antibodies and other immune responses in response to a specific stimulus. (e.g., cell-mediated immunity) through administering a vaccine or toxoid (Strikas *et al*. 2018).

This kind of immunization (Active) for mumps happened when people vaccinated with the live attenuating mumps virus produce antibodies that protect them against infection and prevent up to 95% of the infection from occurring. The vaccination, administered subcutaneously, may be given to children older than one year. However, it is not suggested for children less than this age due to the possibility of interruption with passive antibodies from the mother. The immunization is commonly given in a combination form, with vaccinations for rubella and measles administered at the same time when the kid is 15 months old, with the other dose administered later throughout childhood. Vaccination against mumps is not recommended for patients receiving corticosteroids or for other immune-compromised hosts such as pregnant women; however, it is highly recommended for adolescents and older children who have not been immunized or have been infected with mumps infection in the recent past. In 2006, there was a return of the mumps epidemic, and at this time, there was a two-dose vaccine failure. It was determined that it was necessary to sustain the immunization by administering booster vaccinations. These new regulations did not, however, apply to any existing data (Barskey *et al*. 2009).

B. Passive immunization is the delivery of premade antibodies generated from people or animals, which results in the supply of temporary immunity. The passive mumps vaccine is not available and is ineffective in most cases (Strikas *et al*. 2018).

2.15. Infection of mumps in schools

The school environment is one of the most important factors affecting children's health since the time spent in school provides considerable potential for infection at a high level (Al-Tuhafee and Al-Taee 2012).

After receiving the first and second doses of the Mumps vaccination (MMR), a person is regarded to have received protection against the mumps virus. On the other hand, the current mumps outbreaks have the potential to impact communities with high coverage of immunization, including two doses of the MMR vaccine. During a mumps epidemic

at a school in the United Kingdom, the team in charge of controlling the outbreak recommended that the MMR vaccine be given to all pupils whose families agreed to it, regardless of whether they had previously received it. This study was conducted on 103 students who were given additional MMR vaccines, which included third doses in about 73.8 percent of them, with their parents' consent, and the results showed that it was feasible to administer the intervention at the appropriate time with the assistance of the local public health center. The administration of an extra dose of measles, mumps, and rubella vaccine to all at-risk individuals may be regarded as an appropriate method to manage mumps outbreaks in schools, notwithstanding the high incidence of immunization in these institutions of higher learning. More data, however, is required to determine this strategy's effectiveness, safety, and acceptability (Aasheim *et al*. 2014).

Since mumps are transferred by saliva or nasal secretions, the school environment is a common source of infection among students. Infectious illnesses may spread in schools because of the large number and proximity of students of all ages who are constantly nearby and meeting during play and break time. In addition, students may not have healthy habits or immunity to various diseases. Understanding the transmission methods of different infectious illnesses enables the use of the most effective preventative measures possible (Ryan *et al*. 2014).

Seasonal infectious and Pandemic illnesses, as well as other diseases, may have a detrimental impact on the health of the population and the economy. Some non-pharmaceutical intervention techniques, such as school closures, may be adopted rapidly as the first line of defense against the spread of the disease and are thus recommended. These interventions aim to reduce the adequate amount of communication and meeting between individuals in the community; however, school closings have been shown to be effective in reducing the transmission of disease; however, school closings have also been shown to have significant economic consequences for caregivers who must stay at home to care for their children (Ridenhour *et al*. 2011).

Mumps prevention precautions proposed by the Health Protection Surveillance Center included the need that students be adequately inoculated with the first and second doses

of the MMR vaccination, which protects against mumps, measles, and rubella. If a case of infection is discovered, a connection should be established with your local department of Public Health, which may recommend contacting the parents of students in the same category to recommend that they have their children vaccinated against the MMR vaccine if they have not received the first and second doses. After touching secretions from the throat or nose, it is critical to wash one's hands often. Following the appearance of swelling, the individual in question (student or employee) should be granted mandatory leave for five days. The swelling appears (Ryan *et al*. 2014).

2.16. The Health environment of schools in Iraq

As shown by studies conducted by Iraqi experts and specific official assessments, the status of Iraqi schools is in a terrible state. Approximately 70% of schools, according to the Ministry of Health and the Environment, suffer from environmental difficulties, the most serious of which is a lack of basic hygiene for children and water acceptable for human use. Others include overloading students in public schools, particularly primary school classrooms that negatively affect ventilation, visual perception, and understanding of courses; caravan schools with improper learning environments; and a lack of funding for public education in general. As a result, private schools are seen as a viable option by a significant portion of the community (Mansoor and Hussein 2020)

There have been and continue to be significant problems with school construction projects in Iraq, including an excess of students compared to the norm, an incorrect method of student distribution across areas and regions, as well as problems with the design and construction of schools that impede the performance of their functions in an environment where there is no valid and consistent evaluation of this type of project. According to Alraie's 2018 study, which examined the reality of school buildings in ten governorates in the southern and central regions of Iraq, there was a significant shortage of secondary and primary schools, a lack of buildings, and their work was second or third; this means that two or three schools were housed in the same building, resulting in the schools failing to meet the specifications that maintain the health of students, such as the required ventilation and lighting, the right acoustics, and the proper acoustics (Alraie and Breesam 2018).

Other Iraqi academics examined the criteria for physical environmental health in elementary schools and compared them to the World Health Organization's requirements for the school's surroundings. According to the findings, eighty percent of schools are close to pollution sources, and half of the schools are near a major thoroughfare or highway. Ninety-two percent of schools do not have enough bathrooms for the number of students. Sixty-four percent of schools lack adequate sanitary conditions, and seventy-two percent lack functioning faucets. Only twenty-four schools have gardens, according to the agreement. However, it was discovered that only twenty percent of classrooms are acceptable, twenty-four schools do not have enough lighting, and twenty-eight schools do not have adequate ventilation, according to the findings (Al-Tuhafee and Al-Taee 2012).

3. METHODOLOGY

3.1. Study design

The current research is a descriptive study used to assess teachers' knowledge of mumps disease in primary schools in Al-Diwaniyah in Iraq.

3.2 Administrative and ethical arrangements

Administrative and ethical arrangements depend on the selected methods for collection of data and the nature of the research project; many steps may be taken before the beginning of any research project, such as getting ethical approval from the university before research is carried out and arranging for approval to interview the participation in the study.

1. The ethical approval committee approved the research of Cankiri University / Turkey (Appendix A).
2. Approval of the thesis by the Research Committee of the Diwaniyah Health Department / Training and Development Unit (Appendix B).
3. Issuing a letter facilitating a task from the Diwaniyah Health Department / Training and Human Development Unit.
4. Issuing a letter to facilitate a task from the General Directorate of Diwaniyah Education to the schools where the samples were collected.

3.3. The study setting

The study was carried out in 40 primary schools out of the total number of primary schools in the city center of Al-Diwaniyah, which includes 167 primary schools, according to the Directorate of Education in Al-Diwaniyah Governorate, as shown below.

Table 3.1. Study Setting distribution based on selected schools

No	Name of the primary school	Name of the primary school	No
1	Al-Thawwar Primary School	Al-WatanAl-Mafda Primary School	1
2	Al Nawras Primary School for Girls	Al-Albab Primary School	2
3	Jinan Primary School	Al-Hafsa Primary School	3
4	Khawla Bint Al-Azwar School	Khadija Primary School for Girls	4
5	Al-Firdaws prep school for girls	Al-Sabtain Primary Mixed School	5
6	AlYaqoot Elementary School for Boys	Al-Abed Primary School	6
7	El Orouba Primary School	Al Tasafi Primary School	7
8	Zubaida Primary School	Al-Tahdheeb Primary School for Boys	8
9	Ibrahim Khalil Primary School	Hajar Primary Girls School	9
10	Banafseg Primary School for Girls	Al Madaen Primary School for Girls	10
11	Al Izdihar Primary School	Al Diwaniyah Boys Primary School	11
12	Al-Thawra Primary School	Al-Watan Al-Arabi Primary School	12
13	Al-Shahba Mixed Elementary School	Al Mithaq Primary School for Boys	13
14	Haidariya Primary School	Al Nahrain Primary School	14
15	Ibn Al Skeet Primary School for Boys	Degla Primary School for Boys	15
16	Morocco Primary School	Al-Baqi Imams Primary School	16
17	Safi Al-Din Al-Hilli Primary School	Al-Khwarizmi Primary School	17
18	Al-Fayhaa Primary School for Girls	Balad Al Khair Primary School	18
19	Al-Rasoul Primary School	Amerli Primary School	19
20	Ashtar Primary School for Boys	Basra Primary School	20

3.4. The study sample

A non-probability (purposeful) sample of 355 teachers from forty primary schools out of 167 schools within the Diwaniyah Education Directorate distributed over different areas within Diwaniyah, knowing that the total number of teachers is 4592, and the sample was calculated according to the Robert Mason equation.

$$n = \frac{M}{\left[\left(S^2 \times \left(M-1\right)\right) \div pq\right] + 1}$$

Table 3.2. Sample size disterbution based on selected schools

No	School	Frequency	Precent
1	Al-Thawwar Primary School	**9**	**9%**
2	Al Nawras Primary School for Girls	**8**	**8%**
3	Jinan Primary School	**8**	**8%**
4	Khawla Bint Al-Azwar School	**9**	**9%**
5	Al-Firdaws prep school for girls	**9**	**9%**
6	Al Yaqoot Elementary School for Boys	**11**	**11%**
7	El Orouba Primary School	**6**	**6%**
8	Zubaida Primary School	**9**	**9%**
9	IbrahimKhalil Primary School	**7**	**7%**
10	Banafseg Primary School for Girls	**13**	**13%**
11	Al Izdihar Primary School	**9**	**9%**
12	Al-Thawra Primary School	**9**	**9%**
13	Al-Shahba Mixed Elementary School	**6**	**6%**
14	Haidariya Primary School	**9**	**9%**
15	Al-Watan Al-Mafda Primary School	**11**	**11%**
16	Al-Albab Primary School	**6**	**6%**
17	Al-Hafsa Primary School	**9**	**9%**
18	Khadija Primary School for Girls	**10**	**10%**
19	Al Nahrain Primary School	**10**	**10%**
20	Al Mithaq Primary School for Boys	**8**	**8%**
21	Al-Watan Al-Arabi Primary School	**6**	**6%**
22	Al Diwaniyah Boys School	**7**	**7%**
23	Al Madaen Primary School for Girls	**11**	**11%**
24	Hajar Primary Girls School	**7**	**7%**
25	Al-Tahdheeb Primary School for Boys	**8**	**8%**
26	Al Tasafi Primary School	**8**	**8%**
27	Al-Abed Primary School	**6**	**6%**
28	Al-Sabtain Primary Mixed School	**8**	**8%**
29	Degla Primary School for Boys	**8**	**8%**
30	Al-Baqi Imams Primary School	**11**	**11%**
31	Al-Khwarizmi Primary School	**9**	**9%**
32	Balad Al Khair Primary School	**10**	**10%**
33	Amerli Primary School	**8**	**8%**
34	Basra Primary School	**13**	**13%**

35	Ibn Al Skeet Primary School for Boys	**10**	**10%**
36	Morocco Primary School	**12**	**12%**
37	Safi Al-Din Al-Hilli Primary School	**10**	**10%**
38	Al-Fayhaa Primary School for Girls	**8**	**8%**
39	Al-Rasoul Primary School	**12**	**12%**
40	Ashtar Primary School for Boys	**7**	**7%**
Total		**355**	**100%**

3.5. Sample criteria

3.5.1. Inclusion criteria

A. Teachers with at least one year of experience.
B. Male and female teachers.
C. Those who have different academic achievements**.**

3.5.2. Exclusion criteria

A. Teachers who have experienced less than 1year.
B. Teachers who did not agree to join within the research sample of the study.

3.6. Study instrument

In this study, A descriptive (quantitative) scale was used to assess teachers' knowledge of mumps disease in primary schools in Al-Diwaniyah city in Iraq. The author obtained the study tool (Mansour and Hussein, 2020). Permission was obtained from the author to use the questionnaire. The study tool will be a questionnaire that includes:

Part 1: Socio-demographic form; Age, gender, marital status, Specialization, level of education, Years of Employment, and Participation in training courses or workshops toward communicable diseases.
Part 2: It consists of six parts (36 questions)

Part2. A. Information on anatomy and physiology six questions)

Section B. General information about mumps (5 questions)

Section C. Information on Symptoms and Signs (7 questions)

Section D. Information on diagnosis and complications (6 questions)

Section E. Transmission Method Knowledge (6 questions)

3.7. The validity of the questionnaire

A panel of 11 academic experts determined the validity of the face valid with varied specialties, including medicine and nursing. All experts have a minimum experience of 12 years in specialty fields. They are (five) members of the University of Kufa. Two of them belong to the College of Nursing, University of Babylon. One of them belongs to the College of Medicine, University of Babylon. One member from Warith AL-Anbiyaa University and one from the College of Nursing, University of Baghdad. One member from Karbala University, College of Nursing. Each one of the experts has received a copy of the questionnaire to review and evaluate its content adequately. The result showed that the questionnaire is adequate, clear, relevant, and valid after considering experts' suggestions and recommendations and modifying the study instrument (see Appendix C).

3.8. The pilot study

a pilot study was conducted to decide on the reliability of the questionnaire and related factors and make appropriate modifications to the final version of the study. It also can be used to evaluate the subject's responses to the data collection method. (Nieswiadomy, 2002). This pilot study was conducted on 30 teachers from schools within the Diwaniyah Directorate of Education, from January 2, 2022, to January 10-2022. The used sample was excluded from the total sample of the study.

There are many objectives to carry out the pilot study, such as:

1. The reliability of a study instrument has been detected through a pilot study.
2. The adequacy of an instrument of study to identify through a pilot study and ensure the clarity and relevancy of contents.

A. To determine a suitable time to complete the collection of data.
B. To know the barriers or limitations the researcher may face through the study.

3.9. The Instrument reliability

Table 3.3. The Reliability – N=30

The Reliability statistics (Cronbach's alpha)			
Scale	**Actual score**	**Minimum accepted score**	**Assessment**
Knowledge	0.83	0.7	Pass

Table (3.3) shows results obtained through the Alpha Cronbach to obtain and determine the reliability and ensure a high level of internal consistency and stability in all parts and areas of research. The results from this tool have confirmed that they are well designed and reliable for the study.

3.10. Method of data collection

After figuring out the validity and reliability of the questionnaire, the data was collected using it and a structured self-administered technique with the subjects, using the Arabic version of the scale. The information about the subjects was gathered using a structured self-administered technique, with the Arabic version of the scale, and using the

questionnaire. Data collection started on January 14, 2022, and ended on April 30, 2022. The questionnaires (Appendix D). The questionnaire was given to each participant by the researcher.

3.11. Methods of Statistic

The SPSS (Statistical Package of Social Sciences) version 20 and Microsoft Excel (2010) were used to analyze the collected data of the study:

3.11.1. Descriptive approach

Statistical tables "Frequencies and percent" which are:

$$\% = \frac{Frequency}{Sample\ Size}\ x100$$

Mean of scores "M.s.."

The average score can be calculated by using the following:

$$M.S = \frac{\sum \text{ri} = 1\text{Fi x Si}}{\sum \text{ri} = 1\text{Fi}}\ x100$$

The test of standard deviation "S.d.."

$$\text{Standard deviation} = \sqrt{\frac{\sum(X - \bar{X})^2}{n-1}}$$

It uses a correlational coefficient "Cronbach alpha" used in estimating the internal consistency of the study tool, which can be calculated by using the following:

$$\alpha = \frac{K}{K-1}\left[1 - \frac{\sum_{i=1}^{K} \sigma_{ii}}{\sum_{i=1}^{K}\sum_{j=1}^{K} \sigma_{ij}}\right]$$

"K is the items number questions."

"σ_{ij} is the investigate covariance between the items"

"i and j. Note the σ_{ii} is the variance not the standard deviation of item I"

3.11.2. Inferential approach

1. t-test:

Independent t-test

To assess the significant difference between overall Family health nurses' services and nurses' demographic characteristics.

2. One Way ANOVA:

"Analysis of variance (ANOVA) for equality of Means (testing for coincidence when the mean's parameter is different)."

Source of variance	Sum of square	d.f	Mean square	F
Between Groups	$SS_B = \sum \frac{(\sum xP1)^2}{n} - \frac{(\sum xP)^2}{n}$	$df_B = K-1$	$\frac{MS\beta}{MS\beta}$	$\frac{MSB}{MSW}$
Within Groups	$SS_W = \sum (\sum xP1)^2 - \frac{(\sum xP)^2}{N}$	$df_w = N-k$	$\frac{SSw}{DFw}$	
Total	$SS_T = \sum (\sum xP1)^2 - \frac{(\sum xP)^2}{N}$	$df_1 = N-1$		

Shortcuts for measuring necessary compared to the level are used as follows:
NS: Non significantly at probability-value>0.05.
S: Significantly at probability-value <0.05.

4. RESULTS OF THE STUDY

This chapter extensively introduces the outcomes of the research in tables, and these refer to the objectives of this study, which are as follows:

Table 4.1. Descriptive Statistic of Socio-Demographic Characteristic of the Study Sample.

Demographic Data	Groups	Freq.	%
Age in years	20-26	6	1.7
	27-33	59	16.6
	34-40	145	40.8
	41and more	145	40.8
	Total	355	100.0
Gender	Male	153	43.1
	Female	202	56.9
	Total	355	100.0
Marital Status	Single	93	26.2
	Married	262	73.8
	Total	355	100.0
educational level	Diploma	187	52.7
	bachelor's	153	43.1
	Higher Diploma and more	15	4.2
	Total	355	100.0
Number of years of experience in teaching	Less than or equal five year	98	27.6
	6-10	46	13.0
	11-15	46	13.0
	16-20	61	17.2
	More than 21 years	104	29.3
	Total	355	100.0
Specialization	Arabic	59	16.6
	Islamic	36	10.1
	Math's	55	15.5
	Science	96	27.0
	English	39	11.0
	History	41	11.5
	Geography	15	4.2
	Sport	14	3.9
	Total	355	100.0
Participation in a training course or workshop toward communicable Diseases	Yes	12	3.4
	No	343	96.6
	Total	355	100.0

(Freq.): Frequency, (%): percentage,

This table demonstrates the descriptive statistical analysis of teachers' socio-demographic information regarding frequencies and percentages. Teachers aged 41 and above made up 40.8 % of the total participants in this study out of (355) individuals.

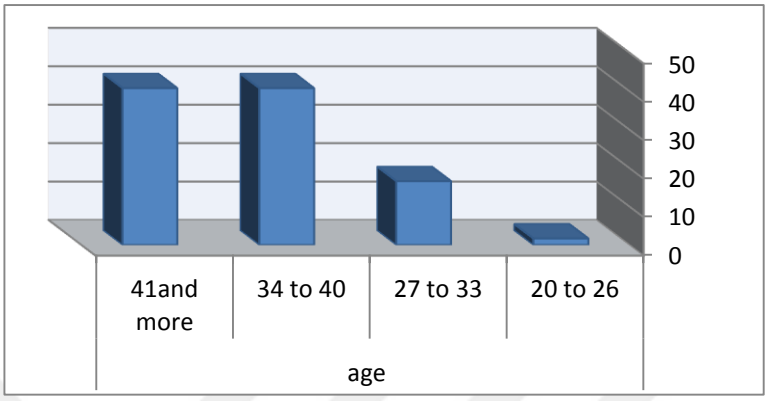


Figure 4.1. Distribution of Study Sample by their age

Regarding gender, female teachers predominated, accounting for over half of all teachers (56.9 %). According to the statistics, teachers were shown to be married and represented a higher percentage (73.8 %). According to the data, most of the research sample were Diploma graduates, making up (52.7 %). While (29.3 %) have more than or equal to 21 years of teaching experience. Finally, the findings reveal the distribution of the investigated sample based on Specialization, and the results demonstrate that most teachers (27 %) were Science specialized. Most research participants did not attend training courses or workshops on communicable illnesses, and they comprised (96.6 %).

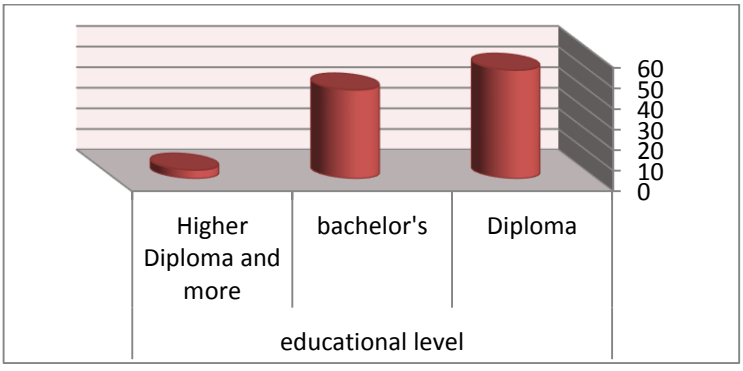


Figure 4.2. Distribution of Study Sample by their level of education

In the light of statistical analysis cut off point, this table illustrated that the teacher knowledge towards anatomy and physiological, the table shows that majority of study sample (58.3%) Not sure.

Table 4.2. Teachers' responses regarding anatomy and physiological knowledge.

Items	Rating	Frequency	Percent	m.s	Std.
Salivary glands include two types of glands: parotid and subcutaneous glands only.	No	103	29.0	2.08	.812
	Not Sure	119	33.5		
	Yes	133	37.5		
	Total	355	100.0		
The parotid gland is the smallest salivary glands.	No	73	20.6	2.17	.745
	Not Sure	148	41.7		
	Yes	134	37.7		
	Total	355	100.0		
The parotid gland does not secrete saliva but has a crucial role in enhancing immunity.	No	73	20.6	2.30	.790
	Not Sure	102	28.7		
	Yes	180	50.7		
	Total	355	100.0		
The parotid gland is located under the lower jaw and under the tongue.	No	111	31.3	2.20	.886
	Not Sure	63	17.7		
	Yes	181	51.0		
	Total	355	100.0		
Some cases of mumps spread swelling to the chest and cause health problems.	No	114	32.1	2.05	.831
	Not Sure	110	31.0		
	Yes	131	36.9		
	Total	355	100.0		
In mumps, there is no possibility that the rest of the lymphatic system will be affected.	No	108	30.4	2.04	.807
	Not Sure	124	34.9		
	Yes	123	34.6		
	Total	355	100.0		
Total anatomy and physiological	No	64	18.0	2.14	.388
	Not Sure	207	58.3		
	Yes	84	23.7		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

According to the statistical analysis cut-off point, this table (4-3) indicates the teacher's knowledge of General knowledge about mumps. The table demonstrates that most of the research sample (51.8 %) are not sure.

Table 4.3. Teacher responses regarding General knowledge about mumps.

Items	Rating	Frequency	Percent	m.s	Std.
A bacterial disease caused by bacteria called Mumps	No	98	27.6	2.20	.846
	Not Sure	87	24.5		
	Yes	170	47.9		
	Total	355	100.0		
Age is not considered a risk factor. All ages have the same chance of infection.	No	98	27.6	2.17	.834
	Not Sure	98	27.6		
	Yes	159	44.8		
	Total	355	100.0		
Taking some medications does not affect the rate of infection.	No	94	26.5	2.12	.800
	Not Sure	123	34.6		
	Yes	138	38.9		
	Total	355	100.0		
The particles of mumps live within particular organs (e.g., parotid glands) and do not spread to other organs through blood circulation or lymphatic systems.	No	83	23.4	2.18	.784
	Not Sure	126	35.5		
	Yes	146	41.1		
	Total	355	100.0		
There is no need to isolate the patient with mumps.	No	159	44.8	1.86	.863
	Not Sure	85	23.9		
	Yes	111	31.3		
	Total	355	100.0		
Total General knowledge about mumps	No	57	16.1	2.10	.413
	Not Sure	184	51.8		
	Yes	114	32.1		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

According to the statistical analysis cut-off point, this table (4-4) indicated the teacher's understanding of mumps symptoms and indications; the table demonstrates that the majority of the research sample (59 %) answered yes to knowledge.

Table 4.4. Teacher responses regarding mumps Symptoms and signs knowledge.

Items	Rating	Frequency	Percent	m.s	Std.
Mumps causes swelling and pains in the salivary glands that are located at the upper side of the jaw in front of the ear.	No	78	22.0	2.36	.820
	Not Sure	71	20.0		
	Yes	206	58.0		
	Total	355	100.0		
All patients with mumps have symptoms of swelling in the parotid glands.	No	90	25.4	2.28	.842
	Not Sure	77	21.7		
	Yes	188	53.0		
	Total	355	100.0		
Initial signs and symptoms include painful swelling of one or both of the parotid glands	No	62	17.5	2.36	.763
	Not Sure	103	29.0		
	Yes	190	53.5		
	Total	355	100.0		
The symptoms generally occur between the two days 5-7 days after exposure.	No	71	20.0	2.24	.763
	Not Sure	129	36.3		
	Yes	155	43.7		
	Total	355	100.0		
Symptoms disappear 7 to 10 days after infection.	No	74	20.8	2.25	.780
	Not Sure	117	33.0		
	Yes	164	46.2		
	Total	355	100.0		
The person becomes infectious after several days of onset of symptoms and is not considered infectious before the onset of symptoms.	No	86	24.2	2.23	.814
	Not Sure	102	28.7		
	Yes	167	47.0		
	Total	355	100.0		
Symptoms are more severe in children than adults.	No	75	21.1	2.34	.805
	Not Sure	85	23.9		
	Yes	195	54.9		
	Total	355	100.0		
Total teacher knowledge regarding Symptoms and signs of mumps disease	No	30	8.5	2.29	.448
	Not Sure	143	40.3		
	Yes	182	51.3		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

According to the statistical analysis cut-off point, this table (4-5) illustrates the teacher's knowledge of Diagnosis and complications, and the table shows that the majority of the study sample (61.4 %) are not sure.

Table 4.5. Teacher responses regarding Diagnosis and complications knowledge.

Items	Rating	Frequency	Percent	m.s	Std.
One condition for the diagnosis of mumps is the presence of symptoms.	No	80	22.5	2.31	.816
	Not Sure	86	24.2		
	Yes	189	53.2		
	Total	355	100.0		
When there is swelling in the parotid gland, the diagnosis is mumps and can be confirmed by palpation of the sublingual glands.	No	65	18.3	2.24	.741
	Not Sure	141	39.7		
	Yes	149	42.0		
	Total	355	100.0		
A blood test for antibodies (IgM) provides a final result of the diagnosis.	No	70	19.7	2.11	.701
	Not Sure	177	49.9		
	Yes	108	30.4		
	Total	355	100.0		
Meningitis of the brain is not considered a a complication of mumps.	No	63	17.7	2.15	.697
	Not Sure	175	49.3		
	Yes	117	33.0		
	Total	355	100.0		
Possible swelling in the ovarian or testicles in equal proportions.	No	81	22.8	2.08	.732
	Not Sure	163	45.9		
	Yes	111	31.3		
	Total	355	100.0		
The rate of infertility in females more than in males.	No	88	24.8	2.13	.783
	Not Sure	132	37.2		
	Yes	135	38.0		
	Total	355	100.0		
Total Diagnosis and complications knowledge	No	44	12.4	2.17	.355
	Not Sure	218	61.4		
	Yes	93	26.2		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

According to the statistical analysis cut-off point, this table (4-6) illustrates the teacher's knowledge of the Mode of transmission. The table shows that most of the study sample (57.2 %) are not sure.

Table 4.6. Teacher responses regarding transmission Mode knowledge.

Items	Rating	Frequency	Percent	m.s	Std.
Mumps infection can be controlled because it is a slow spread among people.	No	85	23.9	2.32	.836
	Not Sure	71	20.0		
	Yes	199	56.1		
	Total	355	100.0		
Mumps infection spreads in winter, spring, autumn and summer alike.	No	91	25.6	2.11	.782
	Not Sure	134	37.7		
	Yes	130	36.6		
	Total	355	100.0		
Mumps is transmitted from person to person Moreover, it can be transmitted from animal to human.	No	96	27.0	2.10	.796
	Not Sure	127	35.8		
	Yes	132	37.2		
	Total	355	100.0		
Human is not considered the only natural host to mumps.	No	79	22.3	2.08	.724
	Not Sure	167	47.0		
	Yes	109	30.7		
	Total	355	100.0		
Mumps infection is not transmitted through the the saliva of an infected person that sprayed in the air.	No	96	27.0	2.14	.812
	Not Sure	115	32.4		
	Yes	144	40.6		
	Total	355	100.0		
Mumps virus cannot survive on surfaces, so contact with infected objects is not considered dangerous.	No	96	27.0	2.09	.790
	Not Sure	131	36.9		
	Yes	128	36.1		
	Total	355	100.0		
Total Mode of transmission knowledge	No	67	18.9	2.15	.455
	Not Sure	203	57.2		
	Yes	85	23.9		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

According to the statistical analysis cut-off point, this table (4-7) illustrates the teacher's knowledge of prevention and treatment; the table shows that the majority of the study sample (64. 8%) are not sure.

Table 4.7. Teacher responses regarding Prevention and treatment knowledge.

Items	Rating	Frequency	Percent	m.s	Std.
After the infection with mumps disease, the a person has not acquired immunity against the disease for life.	No	110	31.0	2.10	.842
	Not Sure	101	28.5		
	Yes	144	40.6		
	Total	355	100.0		
There is a high probability of recurrent the infect of mumps in a previously infected person.	No	111	31.3	2.05	.819
	Not Sure	117	33.0		
	Yes	127	35.8		
	Total	355	100.0		
Mumps can be prevented by taking four doses of mumps vaccine.	No	84	23.7	2.10	.749
	Not Sure	153	43.1		
	Yes	118	33.2		
	Total	355	100.0		
Mumps vaccine is often given alone and is not combined with another vaccine.	No	82	23.1	2.10	.746
	Not Sure	154	43.4		
	Yes	119	33.5		
	Total	355	100.0		
The availability of mumps vaccine is not an an essential factor that affects on rates of infection.	No	97	27.3	2.05	.772
	Not Sure	143	40.3		
	Yes	115	32.4		
	Total	355	100.0		
There is a specific treatment for mumps that can be given for cure from disease.	No	87	24.5	2.20	.807
	Not Sure	110	31.0		
	Yes	158	44.5		
	Total	355	100.0		
Total Prevention knowledge	No	61	17.2	2.09	.369
	Not Sure	230	64.8		
	Yes	64	18.0		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

Overall, the Table (4-8) findings indicate that the (67.3 %) of teacher were Not sure knowledge related to mumps Disease, followed by those who are yes response (25.1 %), and followed by those who are no knowledge response (7. 6%).

Table 4.8. Teacher responses regarding overall mumps disease knowledge.

Items	Rating	Frequency	Percent	m.s	Std.
Overall teacher assessment	No	27	7.6	2.16	.276
	Not Sure	239	67.3		
	Yes	89	25.1		
	Total	355	100.0		

N (200), cut-off point (0.66), NO (mean of score 1-1.66), I Do not Know (mean of scores (1.67-2.33), Yes (mean of score 2.34-3).

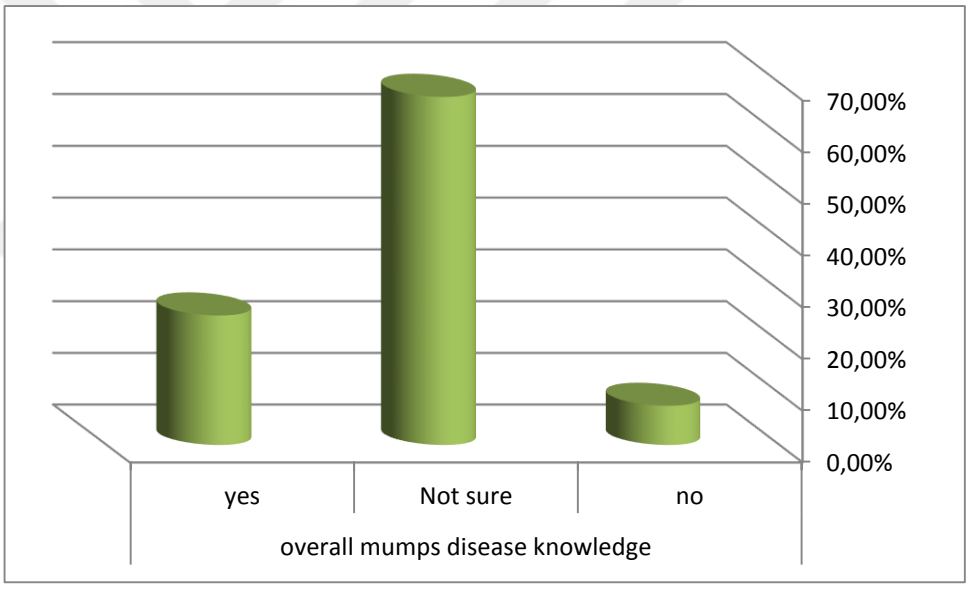


Figure 4.3. Distribution of Study Sample by their overall assessment regarding mumps disease knowledge.

This table (4-9) demonstrates that, at a p-value of 0.05 or below, there is no statistically significant relationship between teacher age, education level, Specialization, and an overall assessment of teacher knowledge regarding mumps illness. The table indicates a statistically significant relationship between the number of years of teaching experience, training courses, and an overall assessment of teacher knowledge regarding mumps.

Table 4.9. Mean Differences (ANOVA) between teachers' knowledge about mumps disease and their demographic characteristics.

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	34.499	48	.719	1.235	.150
	Within Groups	178.076	306	.582		
	Total	212.575	354			
Specialization	Between Groups	227.147	48	4.732	1.236	.149
	Within Groups	1045.913	306	3.418		
	Total	1273.059	354			
Level of education	Between Groups	16.475	48	.343	1.073	.353
	Within Groups	97.880	306	.320		
	Total	114.355	354			
Years of Employment	Between Groups	148.610	48	3.096	1.484	.049
	Within Groups	766.364	306	2.504		
	Total	914.975	354			

This table (4-10) demonstrates that, at a p-value of 0.05 or below, there is no statistically significant correlation between teachers' gender and their overall assessment of their knowledge of mumps disease.

Table 4.10. Mean differences (t-test) between teachers' knowledge about mumps disease and their gender.

Gender		N	Mean	Std. Deviation	t	df	Sig.
Overall assessment	Male	153	2.1701	.24579	.235	353	.814
	female	202	2.1631	.29846			

(n) number, (Std) stander deviation, (Ns): Non-significant, (S): significant, (T value): independent t-test, (pdf): degree of freedom

This table (4-11) demonstrates, at a p-value of 0.05 or less, that a statistically significant relationship exists between teachers' training courses and their overall assessment of mumps disease knowledge.

Table 4.11. Mean differences (t-test) between teachers' knowledge about mumps disease and their teachers' participation in training courses or workshops.

training courses		**N**	**Mean**	**Std. Deviation**	**t**	**Df**	**Sig.**
Overall assessment	Yes	12	2.1412	.26471	3.307	353	.001
	No	343	2.1670	.27738			

(n) number, (Std) stander deviation, (Ns): Non-significant, (S): significant, (T value): independent t-test, (df): degree of freedom

5. DISCUSSION OF THE RESULTS

5.1. Demographic characteristics of sample

The socio-demographic information of the teachers is shown in the form of frequencies and percentages in this table (4.1), which includes descriptive statistics of that information. There were 355 teachers who participated in the research, and those with an age of 41 or higher represented (40.8%) of the total number of participants. This conclusion is comparable to the one found by (Atshan *et al*. 2020), who found that the majority of teachers in their research were between the ages of 41 and 50.

Regarding gender, female teachers were the majority and made up more than half of the total. Compared to males, it makes up the majority of the total (56.9 %). These findings are consistent with those of the (Hussein and Fatah 2012) study, which found that most of the sample that took part in the study was comprised of female participants (84.9 %).

In terms of marital status, the results showed that teachers were the most likely to be married (73.8%). These results are similar to those of a study by (Labeeb *et al*. 2009), which found that most people in the study sample were married.

The results show that the majority of the teachers participating in the study were specialists in the science field, and they constituted (27%), according to the results. This result is similar to what was found by (Mansour and Hussein 2020), who chose the same field (science teachers) in their study.

The data show that diploma graduates comprise the bulk of the research sample, accounting for 52.7 %. Regarding academic accomplishment, these findings are consistent with those of (Yasir and Hussein 2018), who found that (60%) of the teachers in the research sample had a diploma.

While (29.3%) had more than or equal to 21 years of teaching experience, this result is in agreement with (Adil *et al*. 2021), who found that the average number of years of teaching experience was (37%).

Most of the research participants did not attend any training courses or workshops on mumps or infectious diseases, and they constituted the most considerable portion of the sample (96.6%). This result is consistent with (Khalifa and Farraj 2010), as about (28%) of the sample attended training courses on infectious diseases.

5.2. Level of teachers' knowledge about mumps diseases

Looking at the breaking point in statistical analysis, this table highlights the teacher's knowledge of anatomy and physiology; Table (4-2) shows that most of the study sample members answered (58.3%). Not sure, and Table (4-3), in light of the cut-off point of the statistical analysis, shows that the teacher of the majority of the study sample has general knowledge of mumps, as shown in Table (4-3) that (51.8%) is not sure. This study in the two tables above agrees with (Thumil and Naji 2016) in his study.

In light of the defining point of the statistical analysis, this table (4-4) shows that the teacher's knowledge of the symptoms and signs of mumps was positive; the table shows that the majority of the study sample (59%) answered yes, and this study agrees with (Aljehany 2016) the result of his study About the teachers' knowledge of the symptoms and signs of mumps, and the majority of their answers were yes, meaning they know the symptoms and signs of mumps.

This table (4-5) shows the teachers' knowledge of the diagnosis and complications, and the table shows that the majority of the study sample do not know the diagnosis and complications of mumps disease, and their answers (61.4%) are not sure, and in light of the specific point of the statistical analysis, this table shows (4 -6) Teachers also know the method of transmission of mumps disease. It appears that most of the study sample have no knowledge of the method of transmission and their answers (57.2%) are not

sure. In the two tables above, this study agrees with (Yasier and Hussein 2018) in his study that the majority of The study sample members do not know the diagnosis, complications, and mode of transmission of mumps disease.

In light of the cut-off point of the statistical analysis, this table (4-7) showed that the majority of the study sample showed the teacher's knowledge regarding prevention and treatment (64.8%) not sure, and this study is similar to the study (Al-Jurani 2014).

5.3. Relationship between teachers' knowledge and their demographic variables

Table (4-8) shows that there is no statistical significance between age and general assessment of teacher knowledge. However, there is a relationship (statistical significance) between training courses and the number of years of teaching experience for the teacher and the general public. Assessment of teacher knowledge of mumps disease. This study agrees with the study (Faraj and Khalif 2010). His study indicates no relationship between age and the general assessment of teacher knowledge. However, it indicates a statistical significance between the training courses, the number of years of teaching experience for the teacher, and the general assessment of the teacher's knowledge. There is another study that supports my study and agrees with it regarding the number of years of teaching experience (Al-Jubouri 2012), as it has been proven in his study that when a teacher has five or more years of experience, he has a high level of knowledge about communicable diseases.

Another study proves that there is no relationship (no significance) between the educational level, specialty, and the teachers' knowledge, as in the study (Hussein 2018).

About the relationship between gender and teachers' knowledge, as shown in Table (4-10), it was found that there is no significance between gender and teachers' knowledge, and it agrees with the study (Al-Jourani 2014).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

In general, teachers' evaluation of mumps disease in schools indicates a poor level of general knowledge.

1. We concluded that the number of participants in the study sample is mostly female
2. The majority of participants in the study sample have an institute certificate
3. Most of the teachers participating in the study sample did not participate in training courses related to communicable diseases in general and mumps disease in particular.
4. Concerning the relationship between the general assessment of teachers' knowledge of mumps disease and their demographic variables, there is no indication or relationship in terms of age, gender, educational level, and specialization. However, there is an indication of a relationship regarding years of experience in education and training courses.

6.2. The Recommendations

1. The following are some recommendations that can be made in light of the findings of the study:
2. The study focuses on the important role that school health plays in controlling and preventing the spread of mumps and other communicable diseases in the school community, including teachers, students, parents, and other school staff who do not teach. This is done by making people more aware of health issues and giving them chances to learn about health.
3. Supporting the cooperation of instructors in health education programs, namely programs that educate about communicable illnesses, reduces the likelihood of students contracting infectious diseases from one another.
4. The research suggests that the Ministry of Education and the Ministry of Health

should work together to produce a national plan on mumps and other communicable illnesses.

5. The findings of the study confirm the unique role that primary school teachers play in identifying and reporting cases of communicable diseases such as mumps. Because of this, increasing the knowledge held by teachers is critical to halting the spread of the disease among students while in school.
6. The research suggests publishing a pamphlet on mumps and other infectious diseases and then distributing it to the administrations of elementary schools in order to raise students' knowledge of these illnesses.

REFERENCES

Aasheim, E. T., Inns, T., Trindall, A., Emmett, L., Brown, K. E., Williams, C. J., & Reacher, M. 2014. Outbreak of mumps in a school setting, United Kingdom, 2013. Human vaccines & immunotherapeutics, 10(8), 2446-2449.

Abdel Razek, A. A. K., & Mukherji, S. 2017. Imaging of sialadenitis. The neuroradiology journal, 30(3), 205-215.

Adjei, E. A. 2016. Viral Agents in The Cerebrospinal Fluid Of Hospitalized HIV Patients With Meningitis At The Fevers Unit, Korle-Bu Teaching Hospital .(Doctoral dissertation, University of Ghana).

Al Jazeera. 2018. Fears of the expansion of hemorrhagic fever in Iraq. Retrieved December 27, 2020, from https://www.aljazeera.net/news/healthmedicine

Alfadda, A. A., Sallam, R. M., Elawad, G. E., AlDhukair, H., & Alyahya, M. M. 2014. Subacute thyroiditis: clinical presentation and long term outcome. International journal of endocrinology.p.p:2-6.

Aljehany, B. 2016. The impacts of a health education programme on primary school teachers' knowledge and attitudes towards type 1 diabetes mellitus in children in Saudi Arabia. University of Salford (United Kingdom).

Al-Jourani, K. R. 2014. Effectiveness of health education program on science teachers' level of awareness communicable diseases control in primary schools in Baghdad city. (Doctoral dissertation, University of Baghdad).

Al-Jubouri, M. N. 2012. Construction of an Educational Program for Primary School Teachers About Communicable Disease Control in Kirkuk Governorate. (MSc. Thesis, University of Mosul). p:2

Alraie, A. A., & Breesam, H. K. 2018. Evaluation of School Buildings Projects in Iraq. International journal of engineering research & technology. 7(13), 156-164

Al-Tuhafee, R. A. A., & Al-Taee, W. G. 2012. Assessment of physical environment of primary schools in Mosul city. Annals of the College of Medicine Mosul, 38(1), 54-58.

Alwan, A. D. 2004. Health in Iraq: The current situation, our vision for the future and areas of work. Baghdad: Ministry of Health, 24.

Atshan, R. S., Mohammed, A. Q., & Abbas, A. H. 2020. Impact of an Educational program on Teachers' Knowledge Toward Chickenpox Prevention at Primary Schools in Al-Najaf Governorate. Indian Journal of Forensic Medicine & Toxicology, 14(3), 279.

Australia Ministry of Health [AMOH]. 2018. Notifiable conditions. the law requires doctors and laboratories to report some infections or diseases to SA Health. available in: https://www.sahealth.sa.gov.au.

Baiee, H. A., & Hatif, W. 2017. Epidemiological characteristics of Mumps outbreak in the south districts of Babylon province during the years 2016-2017. Medical Journal of Babylon, 14(3), 585-592

Bale Jr, J. F. 2014. Measles, mumps, rubella, and human parvovirus B19 infections and neurologic disease. In Handbook of clinical neurology. Elsevier .Vol. 121, pp. 1345-1353.

Barskey, A. E., Glasser, J. W., & LeBaron, C. W. 2009. Mumps resurgences in the United States: a historical perspective on unexpected elements. Vaccine, 27(44), 6186-6195

Beleni, A. I., & Borgmann, S. 2018. Mumps in the vaccination age: global epidemiology and the situation in Germany. International journal of environmental research and public health, 15(8), 1618.

Boxall, N., Kubinyiova, M., Príkazský, V., Beneš, C., & Castkova, J. 2008. An increase in the number of mumps cases in the Czech Republic, 2005-2006. Eurosurveillance, 13(16), 18842

Cecil, R. L. F., Goldman, L., & Schafer, A. I. 2012. Goldman's Cecil Medicine. Expert Consult Premium Edition--Enhanced Online Features and Print, Single Volume, 24: Goldman's Cecil Medicine (Vol. 1). Elsevier Health Sciences.p: 2109.

Centers for Disease Control and Prevention - CDC.2019. Protect Your Child with Mumps Vaccine. Centers for Disease Control and Prevention, 8 Mar. 2019, Available in www.cdc.gov/mumps/vaccination.html

Centers for Disease Control and Prevention -CDC. 2015. Epidemiology and prevention of vaccine-preventable diseases. Washington DC Public Health Foundation, 13th Edition, p:247

Choi, H. I., Dal Mo Yang, H. C. K., Kim, S. W., Jeong, H. S., Moon, S. K., & Lim, J. W. (2020). Testicular atrophy after mumps orchitis: ultrasonographicifindings. Ultrasonography, 39 (3), 266

Clemmons, N., Hickman, C., Lee, A., Marin, M., & Patel, M. 2018. Mumps. Centers for Disease Control and Prevention. National Center for Immunization and Respiratory Diseases. Manual for the surveillance of vaccine-preventable diseases.pp:9.1- 9.18

Clifford, V., Wadsley, J., Jenner, B., & Buttery, J. P. 2010. Mumps vaccine associated orchitis: Evidence supporting a potential immune-mediated mechanism. Vaccine, 28(14), 2671-2673.

Cohen, J., Powderly, W. G., & Steven, M. 2017. Infectious Diseases. Fourth Edition. Mosby, China. Volume one. p:1404-1405.

Contreras, G. A., & Rodríguez, J. M. 2011. Mastitis: comparative etiology and epidemiology. Journal of mammary gland biology and neoplasia, 16(4), 339-356.

Cui, A., Zhu, Z., Hu, Y., Deng, X., Sun, Z., Zhang, Y., ... & Xu, W. 2017. Mumps epidemiology and mumps virus genotypes circulating in mainland China during 2013-2015. PLoS One, 12(1), e0169561.

D'Epiro, J. Hanna Friend. 2015. Mumps–It's Back. 4 Clinician Reviews, 25(4), 24-31.

Davis, N. F., McGuire, B. B., Mahon, J. A., Smyth, A. E., O'Malley, K. J., & Fitzpatrick, J. M. 2010. The increasing incidence of mumps orchitis: a comprehensive review. BJU International, 105(8), 1060–1065. doi:10.1111/j.1464- 410x.2009.09148.x

Dayan, G. H., Quinlisk, M. P., Parker, A. A., Barskey, A. E., Harris, M. L., Schwartz, J. M. H., ... & Clayton, J. 2008. Recent resurgence of mumps in the United States. New England Journal of Medicine, 358(15), 1580-1589

Demicheli, V., Rivetti, A., Debalini, M. G., & Di Pietrantonj, C. 2013. Vaccines for measles, mumps and rubella in children. Evidence- Based Child Health: A Cochrane Review Journal, 8(6), 2076-2238.

Denis, F., & Hantz, S. 2018. Viral Diseases. Neuroepidemiology in Tropical Health, Chapter 20. Elsevier Inc. doi:10.1016/b978- 0-12-804607-4.00020-4.p: 285.

Desailloud, R., & Hober, D. 2009. Viruses and thyroiditis: an update. Virology journal, 6(1), 5.

Didel, S., Suthar, R., Sahoo, D., Singh, M. P., & Sahu, J. K. 2017. Mumps associated acute motor axonal polyneuropathy. The Indian Journal of Pediatrics, 84(9), 724-724.

Donahue, M., Schneider, A., Ukegbu, U., Shah, M., Riley, J., Weigel, A., ... & Cardemil, C. 2017. Notes from the Field: Complications of Mumps During a University Outbreak Among Students Who Had Received 2 Doses of MeaslesMumps-Rubella Vaccine—Iowa, July 2015–May 2016. MMWR. Morbidity and mortality weekly report, 66(14), 390.

Edwards, K.M., Hackell, J.M., 2016. Committee on Infectious Diseases and Committee on Practice and Ambulatory Medicine. Countering vaccine hesitancy. Pediatrics, p.e20162146.

Evans, A. S. 2013. Viral infections of humans: epidemiology and control. Springer Science & Business Media.

Faraj, R. K., & Khalifa, M. F. 2014. Assessment of Science Teachers' Awareness towards Communicable Diseases Control in Baghdad City Primary Schools. nursing national Iraqi specility, 27(2), 7-16.

Feldman H.A. 2013. Mumps. In: Evans A.S. (eds) Viral Infections of Humans. Springer, Boston, MA. https://doi.org/10.1007/978-1-4684-4727-9_16

Ferri, F. F. 2009. Ferri's Clinical Advisor 2010 E-Book. 5 Books in 1. Elsevier Health Sciences.p:739

Fields, V. S., Safi, H., Waters, C., Dillaha, J., Capelle, L., Riklon, S., ... & Haselow, D. T. 2019. Mumps in a highly vaccinated Marshallese community in Arkansas, USA: an outbreak report. The Lancet Infectious Diseases, 19(2), 185-192.

Fine, P. E. M., Mulholland, K., Scott, J. A., & Edmunds, W. J. 2018. Community Protection. Plotkin’s Vaccines, 1512– 1531.e5. doi:10.1016/b978-0-323-35761-6.00077-8

Gardner, E. 2018.Tracing the story of mumps: A timeline. (2018, January 31).Retrieved August03,2020,from:https://www.pharmaceuticaltechnology.com/features/tracing-story-mumps-timeline

Gershon, A. A. 2011. Chickenpox, Measles, and Mumps. Infectious Diseases of the Fetus and Newborn, 661–705. doi:10.1016/b978-1-4160-6400-8.00022-5

Ghosh, R. K., Somasundaram, M., & Ravakhah, K. 2016. Iodide mumps following fistulogram in a haemodialysis patient. Case Reports, 2016.

Gibson, Michael, and Lakshmi, Gopalakrishnan. 2019. Mumps Risk Factors. Wikidoc, www.wikidoc.org/index.php/Mumps_risk_factors.

Gnann, J. W. 2012. Mumps. Goldman's Cecil Medicine, Chapter 377. E-book. Elsevier Health Sciences. doi:10.1016/b978-1- 4377-1604-7.00377-8.p: 2109 – 2111.

Gnepp, D. R., & Simpson, R. H. 2020. Salivary glands. Gnepp's Diagnostic Surgical Pathology of the Head and Neck EBook, 3rd Edition. Elsevier. P: 43

Goto, A., Takahashi, Y., Kishimoto, M., Nakajima, Y., Nakanishi, K., Kajio, H., & Noda, M. 2008. A case of fulminant type 1 diabetes associated with significant elevation of mumps titers. Endocrine journal, 0805310158-0805310158.

Gouma, S., Koopmans, M. P., & van Binnendijk, R. S. 2016. Mumps virus pathogenesis: Insights and knowledge gaps. Human Vaccines & Immunotherapeutics, 12(12), 3110-3112

Guerrant, R. L., Walker, D. H., & Weller, P. F. 2011. Tropical Infectious Diseases: Principles, Pathogens and Practice E-Book. Elsevier Health Sciences.P:419

Gupta, R. K., Best, J., & MacMahon, E. 2005. Mumps and the UK epidemic 2005. Bmj, 330(7500), 1132-1135.

Haiyan, T. I. A. N., & Mengbo, X. U. 2018. Clinical efficacy observation of comprehensive ying needling therapy for mumps. World journal of acupuncture-moxibustion, 28(1), 29-32.

Hashimoto, H., Fujioka, M., Kinumaki, H., & Kinki Ambulatory Pediatrics Study Group. 2009. An office-based prospective study of deafness in mumps. The Pediatric infectious disease journal, 28(3), 173-175

Hughes, K., & Watson, C. J. 2018. The Mammary Microenvironment in Mastitis in Humans, Dairy Ruminants, Rabbits and Rodents: A One Health Focus. Journal of mammary gland biology and neoplasia, 23(1-2), 27–41. https://doi.org/10.1007/s10911- 018-9395-1

Hussein, A. A., Dawood, S. B., & Kamel, H. F. 2021. Awareness of Primary Schools Teachers towards Mumps in Basrah City. Indian Journal of Forensic Medicine & Toxicology, 15(2), 1445.

Hussein, A. F. A. 2018. Effectiveness of an Educational Program on Teachers' Knowledge about Early Detection of Communicable Diseases at Primary Schools in Al- Hilla City. [PhD. dissertation]. Babylon: University of Babylon.P:83

Hussein, A., Sheren, N., & Fatah, K. 2012. Knowledge and Attitude of Teachers about Communicable Diseases in some of Primary Schools in Erbil. Kufa Journal for Nursing Sciences, 2(2), 104-114.

Hviid, A., Rubin, S., & Mühlemann, K. 2008. Mumps. The Lancet, 371(9616), 932-944.

Irani, D. N. (2008). Aseptic meningitis and viral myelitis. Neurologic clinics, 26(3), 635-655.

James, S. H. 2017. Measles, Mumps and Rubella Viruses. Infectious Diseases, doi:10.1016/b978-0-7020-6285-8.00163-5, P: 1404-1405

Jasem, J., Marof, K., Nawar, A., & Islam, K. M. 2012. Epidemiological analysis of measles and evaluation of measles surveillance system performance in Iraq, 2005–2010. International Journal of Infectious Diseases, 16(3), e166-e171.

Jerome, K. R. (Ed.). 2016. Lennette's laboratory diagnosis of viral infections. CRC Press.

Jiang, Q., Wang, F., Shi, L., Zhao, X., Gong, M., Liu, W., ... & Han, D. 2017. CXC motif chemokine ligand 10 produced by mouse Sertoli cells in response to mumps virus infection induces male germ cell apoptosis. Cell Death & Disease,

Kanbayashi, D., Kurata, T., Takahashi, K., Kase, T., & Komano, J. 2018. A novel cell-based high throughput assay to determine neutralizing antibody titers against circulating strains of rubella virus. Journal of virological methods, 252, 86-93.

Kanra, G., Kara, A., Cengiz, A. B., Isk, P., Ceyhan, M., & Atas, A. 2002. Mumps meningoencephalitis effect on hearing. The Pediatric infectious disease journal, 21(12), 1167- 1169.

Katsushika, M., Kashio, A., Ogata, E., Akamatsu, Y., Hoshi, Y., Iwasaki, S., & Yamasoba, T. 2018. Outcomes of cochlear implantations for mumps deafness: A report of four pediatric cases. International Journal of Pediatric Otorhinolaryngology, 114, 76-79.

Kesson, A. M. 2012. Mumps. Netter’s Infectious Diseases, 47–50. doi:10.1016/b978-1-4377-0126-5.00011-2, pp. 47-50

Kitano, T., Onaka, M., Ishihara, M., Nishiyama, A., Hashimoto, N., & Yoshida, S. 2017. Static model simulation for routine mumps vaccination in Japan: with a result of mumpsrelated complications in a Japanese community hospital. Clinical and experimental vaccine research, 6(2), 120-127.

Koenig, K. L., Shastry, S., Mzahim, B., Almadhyan, A., & Burns, M. J. 2016. Mumps virus: modification of the identifyisolate-inform tool for frontline healthcare providers. Western Journal of Emergency Medicine, 17(5), 490.

Labeeb, S., El-Sherief, M., & Ahmed, M. 2009. Assessment of Knowledge and Practice of Primary School Personnel towards Communicable Diseases among School Age Students in El-Minia City. Journal of High Institute of Public Health, 39(4), 669-686.

Lafta, R., & Hussain, A. 2018. Trend of vaccine preventable diseases in Iraq in time of conflict. The Pan African medical journal, 31, 130. https://doi.org/10.11604/pamj.2018.31.130.16394

Lewnard, J. A., & Grad, Y. H. 2018. Vaccine waning and mumps reemergence in the United States. Science translational medicine, 10(433).p:2

Lievano, F., Galea, S. A., Thornton, M., Wiedmann, R. T., Manoff, S. B., Tran, T. N., ... & Plotkin, S. A. 2012. Measles, mumps, and rubella virus vaccine (M–M–R™ II): a review of 32 years of clinical and postmarketing experience. Vaccine, 30(48), 6918-6926.

Litman, N. and Baum, S. G.2015. Mumps Virus. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases (Eighth Edition)..https://doi.org/10.1016/B978-1- 4557-4801-3.00159-4 . P: 1942-1947,e2

Litman, N., & Baum, S. G. 2005. Mumps virus. Principles and practice of infectious diseases, 7, 2201-2206

Louten J. 2016. Virus Transmission and Epidemiology. Essential Human Virology, 71–92. https://doi.org/10.1016/B978-0- 12-800947-5.00005-3

Mahy, B. W., & Van Regenmortel, M. H.2010. Desk encyclopedia of human and medical virology. Academic Press. Elsevier Ltd. p:204 – 205

Malaiyan, J., Nellapillai, S. R., Ramanan, P. V., & Gokul, A. 2017. Serum Th1/Th2 Cytokine Levels During Acute Mumps Infection: Prediction To Infertility Patients with History of Mumps Infection. IOSR, 16(5), 83-90.

Mansoor, H. I., & Hussein, K. H. 2020. Evaluation of Science Teachers' Knowledge towards Mumps Disease in Primary Schools. Medico-legal Update, 20(2), 603.

Marin, M., Marlow, M., Moore, K. L., & Patel, M. 2018. Recommendation of the Advisory Committee on Immunization Practices for use of a third dose of mumps virus–containing vaccine in persons at increased risk for mumps during an outbreak. Morbidity and Mortality Weekly Report, 67(1), 33.

Masarani, M., Wazait, H., & Dinneen, M. 2006. Mumps orchitis. Journal of the Royal Society of Medicine, 99(11), 573–575. doi:10.1258/jrsm.99.11.573

McLean, H. Q., Fiebelkorn, A. P., Temte, J. L., & Wallace, G. S. 2013. Prevention of measles, rubella, congenital rubella syndrome, and mumps, 2013: summary recommendations of the Advisory Committee on Immunization Practices (ACIP). Morbidity and Mortality Weekly Report: Recommendations and Reports, 62(4), 1- 34.

Mehta, A., Mahale, R., Khanapure, K., Jagannatha, A. T., Acharya, P., & Srinivasa, R. 2020. Acute hydrocephalus in a case of mumps meningoencephalitis: A rare occurrence. Journal of Pediatric Neurosciences, 15(1), 34.

Ministry of Health. 2010. A Basic Health Services Package for Iraq. With the Technical Support from WHO Funding UNDG ITF - EUROPEAN FUND.p:2.

Mishra, B., Pujhari, S. K., Dhiman, V., Mahalakshmi, P., Bharadwaj, A., Pokhrel, S.,& Ratho, R. K. 2013. Genotyping and subtyping of mumps virus isolates from the Indian subcontinent. Archives of virology, 158(11), 2359-2363.

Mo, Z., Dong, Y., Chen, X., Yao, H., & Zhang, B. 2016. Acute transverse myelitis and subacute thyroiditis associated with dengue viral infection: A case report and literature review. Experimental and therapeutic medicine, 12(4), p: 2332.

Moore, M., Gelfeld, B., & Adeyemi Okunogbe, C. P. 2017. Identifying future disease hot spots: infectious disease vulnerability index. Rand health quarterly, 6(3)

Morita, S., Fujiwara, K., Fukuda, A., Fukuda, S., Nishio, S. Y., Kitoh, R., ... & Matsubara, A. 2017. The clinical features and prognosis of mumps-associated hearing loss: a retrospective, multi-institutional investigation in Japan. Acta oto-laryngologica, 137(sup565), S44-S47.

Mourez, T., & Dina, J. 2018. Mumps virus: a comprehensive review. Virologie, 22(4), 14-27

Murray, C. C., Sheremenko, G., Rose, I. D., Osuji, T. A., Rasberry, C. N., Lesesne, C. A., ... & Roberts, G. 2019. The Influence References 167 of Health Education Teacher Characteristics on Students' Health- Related Knowledge Gains. Journal of School Health, 89(7), 560-568.

Nagai, T., Okafuji, T., Miyazaki, C., Ito, Y., Kamada, M., Kumagai, T., ... & Ochiai, H. 2007. A comparative study of the incidence of aseptic meningitis in symptomatic natural mumps patients and monovalent mumps vaccine recipients in Japan. Vaccine, 25(14), 2742-2747.

Nieswiadomy, R. M. Foundations of nursing research (4th ed.). Upper Saddle River, New Jersey: Pearson Education. 2002.

Obeng-Gyasi, E., Weinstein, M. A., Hauser, J. R., & Obeng, C. S. 2018. Teachers' Strategies in Combating Diseases in Preschools' Environments. Children, 5(9), 117

Okeke, T., Anyaehie, U., & Ezenyeaku, C. 2013. Premature Menopause. Annals of Medical and Health Sciences Research, 3(1), 90. doi:10.4103/2141-9248.109458

Onyema, E. M., Eucheria, N. C., Obafemi, F. A., Sen, S., Atonye, F. G., Sharma, A., & Alsayed, A. O. 2020. Impact of Coronavirus pandemic on education. Journal of Education and Practice, 11(13), 108-121.

Orenstein, W.A., Offit, P.A., Edwards, K.M. and Plotkin, S.A., 2018. Plotkin's Vaccines. Preface to the Seventh Edition. (Seventh Edition). P: 666

Park, S. B., Jin, K. B., Hwang, E. A., Han, S. Y., Kim, H. C., Kim, H. T., ... & Ahn, K. S. 2008. Case of adult mumps infection after renal transplantation. In Transplantation proceedings. Elsevier. Vol. 40, No. 7, pp. 2442-2443.

Plotkin, S. A., Orenstein, W. A., & Paul, A. Offit, eds. 2013. Vaccines. 7th edition. p:419

Principi, N., & Esposito, S. 2018. Mumps outbreaks: A problem in need of solutions. Journal of Infection, 76(6), 503-506

Public Health England (PHE). 2008. Mumps: Risk in Pregnancy, Infection in Healthcare Settings and MMR Vaccine. GOV.UK, www.gov.uk/government/publications/mumpsrisk-in-pregnancy-infection-in-healthcare-settings-andmmr-vaccine/mumps-risk-in-pregnancy-infection-inhealthcare-settings-and-mmr-vaccine.

Rajma, J., & Arun, A. C. 2017. Severe Complications of Mumps. Indian pediatrics, 54(8), 689-689.

Ridenhour, B. J., Braun, A., Teyrasse, T., & Goldsman, D. 2011. Controlling the spread of disease in schools. PloS one, 6(12), e29640.

Rota, J. S., Turner, J. C., Yost- Daljev, M. K., Freeman, M., Toney, D. M., Meisel, E., & Nicolai, L. A. 2009. Investigation of a mumps outbreak among university students with two measles–mumps–rubella (MMR) vaccinations, Virginia, September–December 2006. Journal of medical virology, 81(10), 1819-1825.

Rouse, B. T., & Sehrawat, S. 2010. Immunity and immunopathology to viruses: what decides the outcome. Nature reviews Immunology, 10(7), 514-526.

Rubin, S. A. 2018. Mumps vaccine. Vaccines, 7th edition, Elsevier Inc. p:663

Rubin, S., Eckhaus, M., Rennick, L. J., Bamford, C. G., & Duprex, W. P. 2015. Molecular biology, pathogenesis and pathology of mumps virus. The Journal of pathology, 235(2), 242- 252.

Ryan F., Donohue S., Murphy H., Ward M. 2014. Management of Infectious Disease in Schools . Scientific Advisory Committee of the Health Protection Surveillance Centre.p:6,43. Available at: https://www.healthpromotion.ie/hpfiles/docs/HPM00406.pd

Samal, S. K. 2011. The biology of paramyxoviruses. Horizon Scientific Press. p:

Sane, J., Gouma, S., Koopmans, M., de Melker, H., Swaan, C., van Binnendijk, R., & Hahné, S. 2014. Epidemic of mumps among vaccinated persons, The Netherlands, 2009– 2012. Emerging infectious diseases, 20(4), 643.

Shaw, S.R., Gomes, P., Polotskaia, A. and Jankowska, A.M., 2015. The relationship between student health and academic performance: Implications for school psychologists. School Psychology International, 36(2), pp.115-134

Shrestha, R. M., Miyaguchi, M., Shibanuma, A., Khanal, A., Yasuoka, J., & Jimba, M. 2016. A School Health Project Can Uplift the Health Status of School Children in

Smith, S. D., & Gemmill, I. 2011. Mumps: resurgence of a vanquished virus. Canadian family physician Medecin de famille canadien, 57(7), 786–e248

Strikas, R. A., Mawle, A. C., Pickering, L. K., & Orenstein, W. A. 2018. Active Immunization. Principles and Practice of Pediatric Infectious Diseases, 43–71.e4. doi:10.1016/b978-0-323-40181-4.00006-2

Taii, A., Sakagami, J., Mitsufuji, S., & Kataoka, K. 2008. Acute pancreatitis from mumps re-infection in adulthood. A case report. JOP, 9(3), 322-6.

The Health Service Executive of Ireland.2015. Schools for Health in Ireland. Publication Date: July 2013 / Review Date: October 2015 available on: https://www.healthpromotion.ie/hpfiles/docs/HPM00841.pdf. p:3.

Thumil, A. H., & Bahlol, A. 2016. Effectiveness of Cholera Infection Education Program on Teachers' Knowledge at Secondary Schools in Bagdad City. International Journal of Scientific and Research Publications, 5(8), 93-101.

Vaidya, S. R., Chowdhury, D. T., Jadhav, S. M., & Hamde, V. S. 2016. Complete genome sequence of mumps viruses isolated

Wang, Q., Wu, H., Cheng, L., Yan, K., Shi, L., Zhao, X., ... & Han, D. 2016. Mumps virus induces innate immune responses in mouse ovarian granulosa cells through the activation of Toll-like receptor 2 and retinoic acid-inducible gene I. Molecular and Cellular Endocrinology, 436, 183-194.

Webster, R. G., Granoff, A., & Chalcraft, T. 2013. Encyclopedia of Virology. Trends in Microbiology, 3(2), 79.

WHO Staff. 2019. GHO | By category | Mumps - Reported cases by country. Retrieved August 08, 2020, from https://apps.who.int/gho/data/node.main.WHS3_53?lang=e

WHO. 2012. Mumps virus nomenclature update: 2012. Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire, 87(22), 217-224.

Xu, Xiaoyan., Yu, Z., Liang, Y., Gao, H., Liu, Y., & Yu, Y. 2017. Mumps caused by paraquat-induced poisoning: A case report. Experimental and therapeutic medicine, 13(2), 401-404

Yan, K., Cheng, L., Liu, P., Liu, Z., Zhao, S., Zhu, W., ... & Han, D. 2015. Polyinosinic–Polycytidylic Acid Perturbs Ovarian Functions Through Toll-Like Receptor 3- Mediated Tumor Necrosis Factor A Production in Female Mice. Biology of Reproduction, 93(1), 11-1.

Yasir, A. A., & Hussein, A. F. A. 2018. evaluation of teachers' Knowledge about the early Detection for Mumps Diseases at the Primary schools in Al-Hilla City. EXECUTIVE EDITOR, 9(8), 229.

Yoo, K. H., Agarwal, K., Butterfield, M., Jacobson, R. M., Poland, G. A., & Juhn, Y. J. 2010. Assessment of humoral and cellmediated immune response to measles–

mumps–rubella vaccine viruses among patients with asthma. In Allergy and asthma proceedings: the official journal of regional and state allergy societies. NIH Public Access. Vol. 31, No. 6, p. 499.

Yu, G., Yang, R., Yu, D., Cai, J., Tang, J., Zhai, W., ... & Qin, J. 2018. Impact of meteorological factors on mumps and potential effect modifiers: An analysis of 10 cities in Guangxi, Southern China. Environmental research, 166, 577-587.

Zamir, C. S., Schroeder, H., Shoob, H., Abramson, N., & Zentner, G. 2015. Characteristics of a large mumps outbreak: Clinical severity, complications and association with vaccination status of mumps outbreak cases. Human Vaccines & Immunotherapeutics, 11(6), 1413-1417.

Zhao, Y., Lafta, R., Hagopian, A., & Flaxman, A. D. 2019. The epidemiology of 32 selected communicable diseases in Iraq, 2004–2016. International Journal of Infectious Diseases, 89, 102-109

APPENDIX

Appendix A. Etık Kurul Değerlendırme Formu

Appendix B. Araştırma Kurulu Kararı

Appendix C. Expert Committee Table

Appendix D. Questionnaire

Appendix A. Etık Kurul Değerlendırme Formu

Appendix B. Araştırma Kurulu Kararı

Appendix C. Expert Committee Table

Appendix D. Questionnaire

CURRICULUM VITAE

Name **:** Noor Hussein Noor Noor

Country

Academic qualifications

Currently

Section

Work places