A QUANTITATIVE STUDY ON FACTORS ASSOCIATED WITH THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION IN INDIA AND IRELAND

By

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CANDIDATE DECLARATION

I hereby certify that this document, which is now submit for assessment on the program of the study leading to the award of the MSc In Pharmaceutical Business And Technology, is my own; based on my personal study and/or research, and that I have acknowledged all material and sources used in its preparation. I also certify that I have not copied in part or whole or otherwise plagiarized the work of anyone else, including other students.

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ABSTRACT

Introduction

Vaccinations are the simplest, safest and cost-effective method to protect population from infectious diseases by boosting a person's immune system. It is important to enhance Paediatric immunogenicity as they are at high risk of getting serious infectious disease by harmful germs. Parents and healthcare professionals play an important role in the coverage rate of vaccination among children. Despite the success of Paediatric vaccination, the coverage rate of child immunization is very less in certain countries. It is essential to evaluate parental behaviour and knowledge of healthcare professionals about child immunization and to identify the factors associated with the implementation and uptake of childhood vaccination to improve the practice of Paediatric vaccination.

Method

A cross-sectional quantitative study was undertaken on parents and healthcare professionals, who live in Ireland and India. A total of 133 participants; 69 parents and 64 healthcare professionals were involved in the study. Specifically developed questionnaire used to collect data from participants through email and mobile apps.

Results

The study found that most of the parents have a positive attitude towards childhood vaccination and majority of healthcare professionals expressed good and average knowledge on Paediatric vaccination. Lack of communication between parents and healthcare professionals, concern about the safety of vaccines, misinformation, storage of vaccines and reluctance of parents were identified as barriers to the implementation and uptake of Paediatric vaccination. Getting consent letter from parents, close monitoring of children, high quality data about infant population, establishment of immunization programs and training for parents can facilitate the future practice of Paediatric vaccination.

Conclusion

Despite the favourable attitude of parents and adequate knowledge of healthcare professionals, concern about the side effects of vaccines, multiple injections at a visit and lack of communication between parents and healthcare professionals have negative influence on the coverage of child immunization. Therefore, it is necessary to conduct vaccination programs and provide training for healthcare professionals and parents to update knowledge on child vaccination in society in order to reduce the child mortality rate across the world.

CHAPTER 1

INTRODUCTION

1.1 PAEDIATRIC VACCINATION AND ITS IMPORTANCE

According to World Health Organization (WHO), vaccinations are the simplest, safest and cost-effective method to protect humans from infectious diseases by boosting a person's immune system. It is important to enhance Paediatric immunogenicity as they are at high risk of getting serious infectious disease by harmful germs. After the successful intervention of Paediatric vaccination, the overall rate of child mortality has been declined across the world(Whelan *et al.*, 2020).

The success of variolation led to the discovery of vaccination by Edward Jenner in 1796. Advancement in chemistry technologies and molecular biology helps to establish more vaccines for children. The child death rate was 5.1 million in 1990 and it is decreased to 1.8 million by 2017 due to the coverage of vaccine preventable diseases(Vanderslott, Dadonaite and Roser, 2013). Childhood immunization provides protection to infants and children from severe disease, which is caused by certain pathogens like virus, bacteria and parasite. The introduction of Paediatric vaccination is one of the successful interventions in healthcare sector(Sankar, Rameh and Sunny, 2018). As a result of National Vaccine Programs, Paediatric vaccines prevented millions of death every year in the world. Vaccines contain inactivated cells of virus or pathogens that cause serious infectious diseases. They act by interacting with child's immune system, resulting in a rapid and specific immune response produced against antigen present in the vaccines (Pollard, Finn and Curtis, 2017).

As a result of smallpox eradication effort, WHO has established a new program in 1974, called Expanded Program on Immunization (EPI) with an aim to vaccinate all children in the world for a better public health. EPI has introduced new vaccines for infant against six infectious diseases included Diphtheria, pertussis, measles, poliomyelitis and tuberculosis. After the implementation of six vaccines, a considerable progress was obtained in the child mortality and morbidity rate. Apart from these six vaccines, a number of new vaccines such as Hepatitis B,

Men B and C, Pneumococcal conjugate vaccines (PCV) and Rotavirus oral vaccines were included in the list of routine vaccination for children(WHO, 2021).

Vaccination reduces the transmission of diseases by protecting everyone in the world. Since majority of virus are transmitted by the air, it is easy to spread among children. A completed dose of DTP provides 99% protection against Diphtheria, tetanus and pertussis. The proportion of vaccination coverage rate is indirectly connected to the spread of diseases. In other words, higher the uptake of vaccination among children, lesser will be the spread of diseases or childhood mortality rate(Vanderslott, Dadonaite and Roser, 2013).

According to a study of Anderson et al., (2018), establishment of child vaccination programs have resulted with a decreased number of childhood mortality rate and an increased rate of vaccination uptake among children under 5 years old across the world. The practice of rotavirus vaccines have been decreased approximately 94% of hospitalization rate of children with diarrheal diseases in 2012, according to National surveillance data. After the implementation of heptavalent Pneumococcal conjugate vaccine (PCV4), the rate of children with IPD- Invasive pneumococcal disease have decreased in the USA in 2000 followed by 64 percent decrease in IPD cases after the entry of 13-valent PCV (PCV13) in 2010(Anderson *et al.*, 2018).

1.2 ROLE OF PARENTS AND HEALTHCARE PROFESSIONALS IN THE PRACTICE OF PAEDIATRIC VACCINATION

Parents and healthcare professionals play an important role in the coverage rate of vaccination among children. The rate of child immunization is mainly depends upon the parental attitude towards Paediatric vaccination. Parental decision making regarding the immunization for their children is influenced by many factors such as side effects of vaccines, misinformation and parent's knowledge regarding Paediatric vaccination. Misinformation about the side effects and inadequate knowledge about vaccination often leads to take a decision to avoid vaccination for children by parents. Good practice of child immunization by parents can minimize many immunization errors in the society. Thus, helps to reduce child mortality rate and provides 100% protection against infectious diseases(Qutaiba B Al-lela *et al.*, 2014).

The knowledge of healthcare professionals and their willingness to recommend vaccination for children are another set of major factors, which plays an important role in the implementation and uptake level of Paediatric vaccination. Healthcare professionals such as doctors, nurses, pharmacist and other healthcare providers are considered as the primary source of information on child immunization(Herzog *et al.*, 2013). Since healthcare professionals are the most trusted resource for parents, their level of confidence in childhood vaccination has a significant impact on parental attitude towards Paediatric vaccination. The healthcare professional's lack of knowledge and concerns regarding the adverse effects of vaccination would directly affect the child immunization rate(Huber *et al.*, 2020).

As parents and healthcare professionals plays an important role in the vaccination coverage rate, it is essential to evaluate their attitude and knowledge regarding Paediatric vaccination. The study will explore healthcare professional's knowledge and parental behaviour towards childhood vaccination in Ireland and India. Despite the success of vaccination in child immunization, the practice of Paediatric vaccination is low in certain countries especially in developing countries such as India. The uptake level of Paediatric vaccination in Ireland is not beyond 92%, according to the report of UNICEF and WHO (2019). By identifying the primary facilitators and barriers to the implementation and uptake of childhood vaccination will help to resolve the pure coverage rate of vaccination among children.

1.3 AIMS AND OBJECTIVE OF THE STUDY

- To evaluate parental attitude towards Paediatric vaccination in India and Ireland.
- To identify the factors associated with the implementation of Paediatric vaccination in India and Ireland.
- To evaluate the knowledge of healthcare professionals regarding Paediatric vaccination in India and Ireland.
- To identify the barriers and enablers to the practice of Paediatric vaccination in India and Ireland.

CHAPTER 2

LITERATURE REVIEW

It has been proven that an approximately 95% of the morbidity rate is decreased after the entry of the vaccines into the market. Therefore, children need to be vaccinated to improve their immunogenicity to handle an attack of harmful germs(Anderson *et al.*, 2018). The literature review will provide an overall concept of Paediatric vaccination in India and Ireland with child immunization schedule and current uptake level of Paediatric vaccination. A literature research was undertaken in different database such as PubMed, Science Direct and Google Scholar to obtain data regarding the child immunogenicity. The data related to the current uptake level and immunization schedule was collected from the website of relevant healthcare departments of India and Ireland. This literature review included studies regarding the mortality rate, knowledge and attitude of parents and healthcare workers towards Paediatric vaccination from different countries.

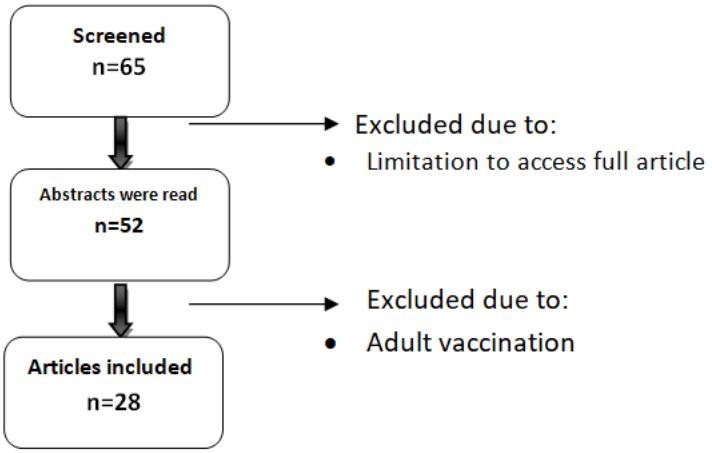

Chart 1: Flow chart of number articles which are included in the study

2.1 OVERVIEW OF CHILDHOOD IMMUNIZATION IN IRELAND

Health Service Executive (HSE), public agency of Ireland provides Paediatric vaccination to children under 13 months free of charge. In the year 2016, HSE in Ireland, established a booklet named “Your Childhood Immunization”, to support and guide parents to improve the immunogenicity of Irish children. The booklet guides the parents on the importance of

Paediatric vaccination, which type of vaccines and when it should be received by children, mechanism of vaccines and after effects of vaccination. According to HSE, children under 13 months must visit their General Physician for five times to complete their childhood vaccination in order to achieve complete protection from infectious diseases. Ward et al. (2007) states that childhood immunization routine of Republic of Ireland is marginally different compared to other European countries. The department of health such as National Immunization Advisory Committee (NIAC) and Health Information and Quality Authority (HIQA) declared that there is no need to provide BCG or Tuberculosis vaccine to all new born babies in Ireland. Therefore, HSE is not conducting any programs on BCG/Tuberculosis vaccination after the announcement of health department in 2015. At the month of two, infants are recommended to take four types of vaccination, which are given below;

VACCINE	DISEASE
6 in 1	Diphtheria, Haemophilus influenza b (Hib), Hepatitis B, Pertusis, Polio and Tetanus (T)
Men B	Meningococcal B
PCV/Pneumococcal Vaccine	Pneumococcal
Rotavirus Oral Vaccine	Rotavirus

Table 1: List of vaccines for infants with two months of age

HSE also provides detailed information about the expected side effects that could occur after vaccination and also guides about ways to prevent and solve them. HSE suggests to give 3 doses of liquid Paracetamol after every vaccination. When they are at 4 months, children are advised to take three different vaccines, which are similar to the vaccines that are recommended at the age of two months but with an exception of PCV. Most of the recommended vaccines are given in the form of an injection, except rotavirus vaccine as it is an oral vaccine. On their third visit, children are supposed to get three different vaccinations which are 6 in 1, PVC and Men C vaccine to fight Meningococcal C disease. HSE does not advise to provide Paracetamol after their third visit as Men B vaccine is not recommended at 6 months. The MMR (Measles, Mumps and Rubella) vaccine is suggested to be provided at 12 months or one year along with Men B

vaccine. Finally, two vaccines namely Hib/Men C and PCV vaccines are suggested to be given at the age of 13 months. A second dose of MMR and 4 IN 1 (Pertusis, Polio, Tetanus and Diphtheria) are recommended to be given between the age of 4 and 5 years. According to HSE, a few numbers of parents are worried when their children are vaccinated by more than one vaccine(HSE, 2016).

Based on the quarterly reports (2020) of Health Protection Surveillance Centre, the current uptake level of Paediatric vaccination in Ireland is given in the following table;

At 12 months of age:

AGE	BCG (%)	DT3 (%)	P3 (%)	Hib3 (%)	POLIO3 (%)	Hep3 (%)	MenB2 (%)	MenC1 (%)	PCV2 (%)	Rota2
12 months	0.02	89.33	89.33	89.33	89.33	89.33	92.33	89.33	89.33	89.66

At 24 months of age:

AGE	6in1 (%)	MenB complete (%)	MMR1 (%)	MenB3 (%)	Rota2 (%)	PCV3 (%)	Hibb	MenCb
24 months	94.5	92	92	90.5	90	86	89.5	89.3

(HPSC, 2020)

Table 2: Current uptake level of Paediatric vaccination in Ireland

Doherty et al., (2014) conducted a study to evaluate socioeconomic inequalities in relation to child vaccination in Ireland. According to Doherty et al, factors such as socio economic background, household income, household structure and parental and doctors attitude have an important influence on the uptake rate of infant vaccination in Ireland. The influence of socioeconomic background is directly related to the intake of infant vaccination. Even though, child vaccination is free in Ireland, there is an inequality in the rate of childhood vaccination(Doherty, Walsh and Neill, 2014). According to Welcome Global Monitor Report-2018, 91% of Irish parents agreed that vaccines are safe and important for children to boost their immunogenicity. And, 39% and 55% of parents from Ireland have expressed high and medium trust in scientists' index respectively. Whelan et al recommended to use parental

attitude as a tool for Paediatrician to encourage uptake level of Paediatric vaccination in Ireland(Whelan *et al.*, 2020).

2.2 OVERVIEW OF CHILDHOOD VACCINATION IN INDIA

International Institute for Population Science (IIPS) established a collaborative project called National Family Health Survey (NFHS) to collect comprehensive data on population, family welfare and health, with a focus on children throughout India. The fifth series of NFHS, 2019-20 deals with the data collected from 22 states/union territory (UT) of India. According to NFHS-5 (2019-2020), the current uptake level of Paediatric vaccination is higher than the data collected from 2015-16(NFHS-4). The table, which is given below shows the percentage of fully vaccinated children between 12 and 24 months in different states of India based on NFHS-4 and NFHS-5.

STATES OF INDIA	NFHS-5 (%) (2019-20)	NFHS-4 (%) (2015-16)
ASSAM	66.4	47.1
ANDHRA PRADHESH	73.0	65.3
BIHAR	71.0	61.7
GOA	81.9	88.4
GUJARAT	76.3	50.4
HIMACHAL PRADHESH	89.3	69.5
JAMMU & KASHMIR	86.2	75.0
KERALA	77.8	82.1

Table 3: Percentage of fully-vaccinated children in different state of India

The current rate of fully vaccinated children in different parts of India is increased compared to data from NFHS-4 except certain states such as Kerala and Goa(National Family Health Survey, 2020).

According to Gurunani's study in 2018, approximately 38% of children did not get their basic vaccination in 2016, due to lack of awareness and anti-vaccination messages. In 2014, Ministry of Health & Family Welfare, Government of India initiated Mission Indradhanush (MI) to

address all underserved and insecure population due to poor coverage rate of Paediatric vaccination. Between 2015 and 2017, MI vaccinated about 25.5 million children and 6.9 million pregnant mothers with an increased rate of 6.7% in total immunization rate. MI is modified to Intensified Mission Indradhanush (IMI) in 2017, with an aim to cover 90% immunization rate by 2020(Gurnani, 2018). The immunization Programme IMI mainly focused on children aged up to 5 years and all pregnant women in targeted 173 districts across 24 states of India. After the implementation of IMI, an approximate 5.95 million children were vaccinated and about 8,50,000 children received their vaccination for first time during the period between October,2017 and January 2018(Gurnani, 2018).

The Universal Immunization program (UIP) of India is providing free Paediatric vaccinations for all infants especially to resist 6 types of diseases. According to Ministry of Health & Family Welfare, Government of India, national immunization schedule for infants and children is as follows;

National Immunization Schedule

Age	Vaccines given
Birth	Bacillus Calmette Guerin (BCG), Oral Polio Vaccine (OPV)-0 dose, Hepatitis B birth dose
6 Weeks	OPV-1, Pentavalent-1, Rotavirus Vaccine (RVV)-1, Fractional dose of Inactivated Polio Vaccine (fIPV)-1, **Pneumococcal Conjugate Vaccine (PCV) -1***
10 weeks	OPV-2, Pentavalent-2, RVV-2
14 weeks	OPV-3, Pentavalent-3, fIPV-2, RVV-3, **PCV-2***
9-12 months	Measles & Rubella (MR)-1, **JE-1**** , **PCV-Booster***
16-24 months	MR-2, **JE-2****, Diphtheria, Pertussis & Tetanus (DPT)-Booster-1, OPV – Booster
5-6 years	DPT-Booster-2

(National Immunization Schedule, 2020)

Table 4: Routine vaccination schedule for infants and children in India

Shrivastwa et al., (2015) conducted a study in different part of India with the help of District Level Household and Facility Survey Data (DLHS3) conducted in 2008. The study focused on the prediction of Paediatric vaccination among Indian children aged between 12 and 36 months. This primary research study classified childhood vaccination into three categories namely; fully vaccinated, under vaccinated and non-vaccinated according to the intake rate of BCG, DPT3 and

MCV vaccines in children in accordance with WHO. According to Shrivastwa et al, predictors of vaccination belongs to four groups namely; childhood, maternal factor, sociocultural factors and household, all these predictors have an important influence on the child's immunization status. Apart from these predictors, religion, caste and birth place like urban or rural, have a huge effect on the children's vaccination status. According to the research data, 57% of children got their suggested dose of vaccinations; at the same time the percentage of children who comes in the category of under vaccinated and non-vaccinated were 31 percent and 12 percent respectively. Although the Universal Immunization Program (UIP) of India is supplying essential Paediatric vaccines to the new born babies for free of cost, India has the lowest immunization coverage rate due to the lack of unavailability of vaccines and inadequate knowledge regarding the benefits of Paediatric vaccination. Major parts of the total study population of children were listed in the category of under and non- vaccinated and the children from rural area were reported low immunization rate than the children from urban area. Multifaceted health programs are the essential factors required to support or improve the status of Paediatric vaccine coverage rate(Shrivastwa *et al.*, 2015).

2.3 PARENTAL BEHAVIOUR TOWARDS PAEDIATRIC VACCINATION

The role of parental decision and their knowledge regarding Paediatric vaccination is an important factor in the overall immunization rate. Adequate knowledge, attitude and practice of vaccines by parents are mandatory elements to improve child's immunization rate. Parental perception regarding adverse effects and misinformation of child's immunogenicity may have a detrimental impact on uptake level of childhood vaccination and often result in a range of health issues. Good practice of Paediatric vaccination by parents is closely related to source of information they receive from healthcare professionals. Therefore, communication between parents and health care providers is a significant determinant, which affects parental decision regarding children's immunization(Qutaiba B Al-lela *et al.*, 2014). According to Richards and Sheridan, parental attitude and guidance from healthcare practitioners are the major predictors of Paediatric vaccination. Many parents did not provide up to date vaccination to their children as they considered that mild illness is a contraindication to vaccination(Richards and Sheridan, 1999).

As per Mills et al., (2005) parental concerns regarding the adverse effects of vaccination, discomfort from painful process, belief that vaccination is not required while the child has mild disease and inadequate communication between parents and healthcare providers are the major barriers to Paediatric vaccination. A number of parents are concerned about the short and long term effect of vaccination and some parents also reported several access issues that hampered vaccination(Mills *et al.*, 2005). According to VACSATC project (Vaccination Safety, Attitude, Training and Communication Project), majority of parents in five European countries agreed to vaccinate their children after attending childhood vaccination programs. They also agreed that it is important to immunize their children for a better community. The research study of Miller et al (1994) and Prislin et al (1998) reported highly educated parents are less worried about vaccine safety, as a result, their children had greater immunization rate. Higher proportion of parents from England, considered that disease such as Meningitis, Poliomyelitis and tetanus are the most serious disease and measles, mumps, rubella and diphtheria are less serious(Stefanoff *et al.*, 2010). In 2012, Chow et al., (2017) conducted an online survey to assess attitude of Australian parents toward Paediatric vaccination. 90% of parents were responded positively to questionnaire regarding childhood vaccination. Providing parents with clear and evidence based information would improve the average coverage rate of Paediatric vaccination and guide them to make an informed decision regarding their children's immunogenicity(Chow *et al.*, 2017).

Chidiebere et al (2014) says that maternal sociodemographic factors such as mother's educational status, religion, wealth class, urban/rural residence and occupation status have a greater influence on child immunization uptake. In comparison to mothers within 15 to 18 and 19 to 34 years age category, mothers between 35 and 45 were more willing to have their children vaccinated. Likewise, parents from urban area with access to media and upper or middle class have been shown positive response to Paediatric vaccination(Chidiebere, Uchenna and Kenechi, 2014). According to a report by Gellin et al (2000), some parents were willing to provide vaccines for their children by considering school entry requirements as a primary reason. Despite the fact that the majority of parents accept Paediatric vaccination, many are concerned with their children being vaccinated with so many vaccines or several vaccines at

once(Gellin *et al.*, 2000). In order to increase the immunogenicity rate of children, it is important to provide accurate information about childhood vaccination to parents. As a result, healthcare providers should conduct vaccination programmes with reliable and comprehensive information(Stefanoff *et al.*, 2010).

2.4 ATTITUDE AND KNOWLEDGE OF HEALTHCARE PROFESSIONALS ABOUT PAEDIATRIC VACCINATION

Globally, vaccines are approved as a tool to reduce the burden of infectious disease for better public health(Andre *et al.*, 2008). WHO reports state that the practice of vaccines is safer more than the use of therapeutic medicines. Yaqub et al conducted a study on the attitude of healthcare professionals and public towards the implementation and practice of vaccination in Europe. In their study, it is stated that healthcare professionals are facing lots of challenges to make trustful bond with patient to convince them regarding the benefits of vaccines due to lack of information. According to Yaqub et al. (2014), the attitude of healthcare professionals and their information regarding vaccines and vaccination plays an important role in the coverage and uptake rate of vaccines across the world. The advice from doctors and other health care professionals is considered a major strength to encourage patients to be vaccinated, but in many studies like Gottvall et al., (2011) and Oscarsson et al., (2011) report says that doctors have no time to discuss or to advise their patients regarding vaccination. Doctors can recommend vaccines to their patients by giving information about the benefits of vaccination to their patients and this trustful bond between the physician and patient may improve the knowledge of society in relation to vaccination(Yaqub *et al.*, 2014). The greatest factor, which has influenced the uptake level of Paediatric vaccination is the ability of healthcare professionals like Doctors, Nurses, Pharmacist and other healthcare providers to communicate with parents regarding the information related risk and benefit of vaccination(Taylor *et al.*, 1997).

A cross sectional study was conducted by Huber et al on parents (1040) and Paediatric healthcare professionals (198) in Hungary to evaluate the attitude and knowledge regarding the practice of varicella vaccination in children. Huber et al., (2020) found that healthcare professionals are the important sources that provide information of Paediatric vaccines to

parents. Recommendation of the intake of vaccines by healthcare professionals was identified as the key determinant in the case of acceptance of Paediatric vaccine by parents in their study. Huber et al included 189 healthcare professionals in their study, out of which, 46 participants did not support varicella vaccination with and/or without reasons. 25 out of 46 were given reasons for why they were not supporting; the reasons included cost of the vaccine, fear of its side effects, doubts or disbelief in vaccination, misinformation and insufficient knowledge regarding the Paediatric vaccination. The decision of parents on Paediatric vaccination is highly influenced by the recommendation or advice of healthcare workers, therefore it is mandatory to evaluate the knowledge of healthcare professionals and to clear their misinformation regarding the Paediatric vaccination(Huber *et al.*, 2020). A research study of Petousis-Harries et al included family practice nurses to identify and evaluate nurses' view regarding the immunogenicity of children less than five years. Around 89% of nurses reported fear of vaccination by parents, as a major reason for the decreased coverage level of Paediatric vaccination in New Zealand and only 4% of them agreed with the lack of knowledge among healthcare workers as a barrier to achieving better immunization rate. They also identified the area of educational needs such as information about new vaccines, current issues related to Paediatric vaccination, side effects, knowledge of diseases and information regarding the advanced technology, by the participants(Petousis-Harris *et al.*, 2005).

Systematic research conducted by Herzog et al (2013) reported that a few numbers of healthcare workers in developed countries are not ready to recommend vaccination due to lesser knowledge about vaccines and diseases, past belief and historical side effects of vaccination. Healthcare workers are the important source to provide information on vaccination and to encourage public to accept Paediatric vaccination for healthy generation; therefore it is crucial to improve the knowledge and attitude of healthcare workers about vaccination. As the importance of the healthcare worker's knowledge and belief about vaccines takes an account in the uptake level of Paediatric vaccination, the Summit of Independent European Vaccination Experts (SIEVE) in 2007 recommended conducting various healthcare programs or events to improve healthcare professional's understanding regarding the importance of both Paediatric and adult vaccination(Herzog *et al.*, 2013). Schupfner et al,

(2002) conducted a cross sectional study in Germany and reported that some of the Paediatricians recommend providing combined vaccines rather than taking each vaccines separately. Furthermore, the study of Taylor et al, (2002) and Davis et al., (2003) reported that 25% of family Physicians and Paediatricians preferred to give more than one dose of Paediatric vaccines at one visit. At the same time, Salmon et al, (2008) expressed the concerns of Paediatricians about the side effects of vaccines in their study conducted in USA. According to Huber et al. (2020), the healthcare workers who did not support the Paediatric vaccination are concerned about various factors which included side effects of vaccination, actual need of vaccination and safety of vaccines. Healthcare worker's knowledge regarding Paediatric vaccination is an important factor as healthcare professionals with more education and knowledge are known to recommend vaccination to parent at a higher rate than healthcare workers with lesser knowledge. It is important to provide accurate information and to clear their potential concerns regarding the Paediatric vaccination in order to enhance their confidence level(Huber *et al.*, 2020).

2.5 OVERVIEW OF CHILDHOOD MORTALITY RATE IN INDIA

A review study of Rohini Gosh, (2012) says that, India, a south central Asian country has the second world wide largest population in terms of children. At the same time, India is failing to minimize the rate of childhood mortality as the country is holding number one highest position in the case of child mortality rate and Neonatal death rate. As per Rohini Gosh, India is contributing around one million of deaths to the total world's number of neonatal deaths(Ghosh, 2012). Pandey et al., 2000 reviewed NFHS- National Family Health Survey (1992-93) in the year 1998, in their study, the mortality rate and reasons behind the childhood mortality are determined in terms of four different categories namely; Neonatal, Post neonatal, infant and child mortality. Exposure to tetanus is the biggest reasons behind the increased neonatal mortality rate due to certain background attributes include rural and urban residence and unhygienic handling of umbilical cord. The enhanced rate of neonatal mortality can be prevented by the uptake of tetanus vaccination in new born babies(Pandey *et al.*, 2000).

Establishment of child vaccination programs have resulted with a decreased number of childhood mortality rate and an increased rate of vaccination uptake among children under 5

years old across the world(Anderson *et al.*, 2018). Child mortality rate is highly influenced by the knowledge and preventive health care behaviour of parents. The lack of knowledge about the benefits of vaccination leads to increase in the mortality rate as well as kids are forced to suffer from serious conditions that should have been avoided(Esposito, Principi and Cornaglia, 2014). A number of studies include Basu, 1989; Muhuri and Preston, 1991 have reported that sex of child is an important factor in the childhood mortality level; discrimination and son preference are some of the factors that has caused a significant increase in the female child mortality rates. According to NFHS, the main cause of escalated child mortality includes insufficient realization regarding the Paediatric vaccination among parents due to socioeconomic background and demographic characteristics.

In fact, the fifth series of NFHS (2019-20) reported that there is a moderate decrease in the level of child and infant mortality rate compared to NFHS-4 based on data collected from 2015-2016. For example, the neonatal mortality rate (NNMR) has decreased from 23.6% to 19.9% in Andhra Pradesh, a state of India and rate of infant mortality and child mortality has reduced from 34.9% and 40.8% to 30.3% and 35.2% respectively(National Family Health Survey, 2020). The factors such as unavailability of health care and nutritional events, unawareness of child immunogenicity, various socioeconomic and cultural practice and discrimination mentality are highly influenced on the child mortality rate in India(Ghosh, 2012).

2.6 CONCLUSION

The knowledge of healthcare professionals and parental behaviour towards Paediatric vaccination are the major factors that have influence on the overall child immunization rate(Richards and Sheridan, 1999). Communication between parents and healthcare workers is very important as good practice of Paediatric vaccination is closely connected to source of information(Qutaiba B Al-lela *et al.*, 2014). Despite the healthcare departments of India and Ireland are providing free childhood vaccination to all infants, the uptake level of Paediatric vaccination is still remains low. It is necessary to conduct multifaceted health programs to clear potential concerns regarding the Paediatric vaccination to improve child immunization rate((Stefanoff *et al.*, 2010);(Shrivastwa *et al.*, 2015);(Huber *et al.*, 2020)).

CHAPTER 3

RESEARCH METHODOLOGY

This section will provide with a brief idea about the study design, sampling size and method of sampling size, data collection, data analysis and description of developed questionnaire with ethical considerations.

3.1 RESEARCH DESIGN

A cross-sectional descriptive survey will be conducted among parents and healthcare professionals in India and Ireland to evaluate the factors associated with the implementation and uptake of Paediatric vaccination during the month of May, 2021. In order to conduct a quantitative study, the researcher must select relevant research techniques like questionnaire because a quantitative research methodology is characterized as a standardized questionnaire to collect information(Choy, 2014). The research design for my study includes an online survey approach to collect quantitative data. According to overall child immunization coverage rate (2019) by UNICEF and WHO, it has been identified that the total coverage rate of childhood vaccination in India and Ireland is not beyond 92%. This study will evaluate the parental attitude and knowledge of healthcare professionals with the identification of barriers and enablers of the practice of Paediatric vaccination. Descriptive statistical analysis will be performed to describe and summarize the generated data response to maximize the practice of Paediatric vaccination as the research involved focus groups to identify the factors associated with the implementation and uptake of childhood vaccination. The study follows positivism as it is a general fact that parental behaviour and healthcare professional's knowledge have a great influence on the uptake of vaccination among children(Saunders, Lewis and Thornhill, 2009). Online questionnaire will be prepared with the help of online survey tools such as Google form and prepared questionnaire will be distributed to participants through Email and other social media apps (Facebook and Whatsapp) during the month of May, 2021. The importance and objectives of the study will be informed to all participants prior to answering the questionnaire.

3.2 RESEARCH POPULATION AND SAMPLE SIZE

Depending upon the nature of the data to be collected, two cohorts of participants will be involved in this research study; parents and healthcare professionals like doctors, nurses and pharmacist. According to latest United Nation Data, the contribution of India and Ireland to the total worldwide population size is 17.70% and 0.06% respectively. India has the second highest position with a population size of 1.3 billion, whereas Ireland is in the 124th position. A sample size of 69 parents and 64 healthcare professionals were selected for the survey depending on the proposed criteria, parameters, availability of resource and duration of the study. The sample size was calculated using Survey Monkey, an online survey tool by providing randomly selected population size of 1 million of parents and 1000 of healthcare professionals. All the participants will be contacted through the Email and other social media apps such as Whatsapp, Facebook and Linked In as these were the easiest way to connect.

3.2.1 INCLUSION CRITERIA

- Parents who reside in India and Ireland.
- Healthcare professionals like Doctors, Nurses and Pharmacists who are working in India and Ireland.
- Healthcare professionals like Doctors, Nurses, Pharmacist and who are working in hospitals, private clinics, pharmacies and nursing homes.
- Healthcare professionals who are working in private sector and public sector will be accepted to participate in this research.

3.2.2 EXCLUSION CRITERIA

- All healthcare professionals who are working outside Ireland and India will be excluded from this research study.
- Parents who do not live in India and Ireland.
- The healthcare professionals such as doctor, nurses and pharmacists who do not have interest to participate in this research study and students or any other healthcare providers who have prior experience in healthcare profession will be excluded.

3.3 DATA COLLECTION AND ANALYSIS

The data will be collected from the candidates via Email and Whatsapp by using online survey form; Google Forms during the month of May 2021. Specifically developed two separate questionnaires will be used to collect data from parents and healthcare workers. Prepared questionnaire will be distributed to all participants includes parents and healthcare workers who are working in India and Ireland. The purpose and objective of the study will be included as an introduction part to the questionnaire for understanding of the participants. A section that will collect participant informed consent will be introduced to the questionnaire to confirm the participation of the candidates to the survey as it is difficult to collect consent from candidates directly.

The obtained data will be analysed based on the factors influencing, knowledge of healthcare professionals and attitude of parents toward Paediatric vaccination. The researcher can estimate and evaluate the general knowledge and awareness of the healthcare professionals regarding the application and uptake rate of vaccination in children and parental behaviour through the analysis of collected data. The study will represent the collected data with the help of charts, graphs and contingency table. A deductive approach will be performed to test the hypotheses;

Null Hypotheses: The parental behaviour and knowledge of healthcare professionals regarding the Paediatric vaccination are not dependent upon the country; they live in.

Alternate Hypotheses: The parental behaviour and knowledge of healthcare professionals regarding the Paediatric vaccination are dependent upon the country; they live in.

The data analysis tools such as chi-square test will be used to check null and alternate hypotheses. Chi Square test is one of the simplest and easiest tests to check whether the two variables are related or not. The chi square test will be performed in Excel using contingency table and observed P value will be compared with alpha/critical value of 0.1 at confidence level of 90%. If the p value is greater than alpha value then the null hypotheses will be accepted (Rana, 2015).

3.4 QUESTIONNAIRE DEVELOPMENT

As mentioned earlier, the survey will include two groups of candidates depending upon the nature of the research. A questionnaire is a quick fix and multi-method approach to collect data as it is structured by researcher in such a way that the responders can only answer the questions or select the answers from given choices. Questionnaire is the best way to get information with number of advantages such as easy to analyse, low cost in terms of time and price and anonymity of participants(Gillham, 2008).

3.4.1 QUESTIONNAIRE FOR PARENTS

The questionnaire for parents will be divided into three sections to evaluate their attitude towards Paediatric vaccination and factors that have influence on parental decision about child immunogenicity. This questionnaire is developed with the help of previously published articles(Herzog *et al.*, 2013);(Qutaiba B Al-lela *et al.*, 2014);(Yaqub *et al.*, 2014).

Section 1: Demographic characteristics- this section will deal with the demographic details of parents such as age, residence and number of children they have to confirm inclusion criteria for the study.

Section 2: this section will contain questions to evaluate parental behaviour towards the implementation and uptake of childhood vaccination in India and Ireland. The Likert scale and closed ended questions will be used in this segment. Closed questions are commonly used in a quantitative type of study. It is preferred when the researcher has predetermined answers to their questions(Gillham, 2008). The attitude of parents towards Paediatric vaccination can be evaluated by using Yes or No questions followed by five point Likert scale. Likert scale or agree-disagree scale will determine how strongly a respondent agree to a statement using five point scale (strongly agree, agree, neither agree nor disagree, disagree and strongly disagree). Likert scale provides overall attitudinal score with a standard deviation(Brace, 2004).

Section 3: this section is designed to determine factors that have influence on parent's decision making skills on childhood immunization using Yes or No questions.

3.4.2 QUESTIONNAIRE FOR HEALTHCARE PROFESSIONALS

The questionnaire for healthcare professionals will be divided into four sections to assess their understanding regarding the Paediatric vaccination and to identify barriers and enablers to its implementation and uptake.

Section 1: Demographic Details

This section will deals with the demographic characteristics of healthcare workers to confirm sampling specification for inclusion.

- Profession of the participant
- Country you are work in;

Section 2: to evaluate healthcare professional's knowledge

Using Yes or No questions and five point Likert scale, the awareness section was developed to assess healthcare worker's knowledge of Paediatric vaccination.

Section 3&4: This section is designed to identify factors those have influence on the implementation and practice of Paediatric vaccination in children according to healthcare professional's opinion. It will help to discuss the significant barriers and enablers of the practice of Paediatric vaccination in India and Ireland.

3.5 ETHICAL CONSIDERATION

The proposed study will follow the terms and conditions provided in the Research Ethics Committee, Griffith College, Ireland. Participant information sheet, ethical approval form and participant consent will be submitted to the Research Ethic Committee. Before collecting data, all the participants will be informed regarding the purpose and aim of the study. In order to obtain Participants consent, a section will be included in the online survey. The dignity of each participant will be protected and the collected data will be used only for the research purpose. Researcher can only access the data and the data will be protected by a real time antivirus protection with daily virus definition updates.

CHAPTER 4

DATA ANALYSIS AND RESULTS

4.1 ANALYSIS OF DATA OBTAINED FROM PARENTS

A total of 80 parents participated in this survey from India and Ireland in the month of May, 2021. The online survey was distributed through email and mobile apps (Facebook and Whatsapp). Out of 80 responders, 11 were rejected because of the late submission and calculated sample size as the study required 69 parents. Finally, responses from 69 parents; were included in this study for the analysis of data to evaluate the attitude of parents towards Paediatric vaccination.

4.1.1 DEMOGRAPHIC CHARACTERISTICS

4.1.1.1 AGE AND NUMBER OF CHILDREN

The table given below demonstrates the demographic details of parents. Majority of parents (54%) falls under the age group of 25-34 followed by 35-44 years (25%), 18-24 years (10%), 45-54 years (7%) and only 4% of parents with above 55 years have responded to this survey. 52% of parents reported have one child, where as 48% of parents have two or more than two children.

AGE	INDIA, n (%)	IRELAND, n (%)
18-24	4 (11%)	3 (9%)
25-34	21 (60%)	16 (47%)
35-44	7 (20%)	10 (29%)
45-54	2 (6%)	3 (9%)
Above 55	1 (3%)	2 (6%)
NUMBER OF CHILDREN		
One	20 (57%)	16 (47%)
Two or More two	15 (43%)	18 (53%)

Table 5: The number and percentage of age and number of children.

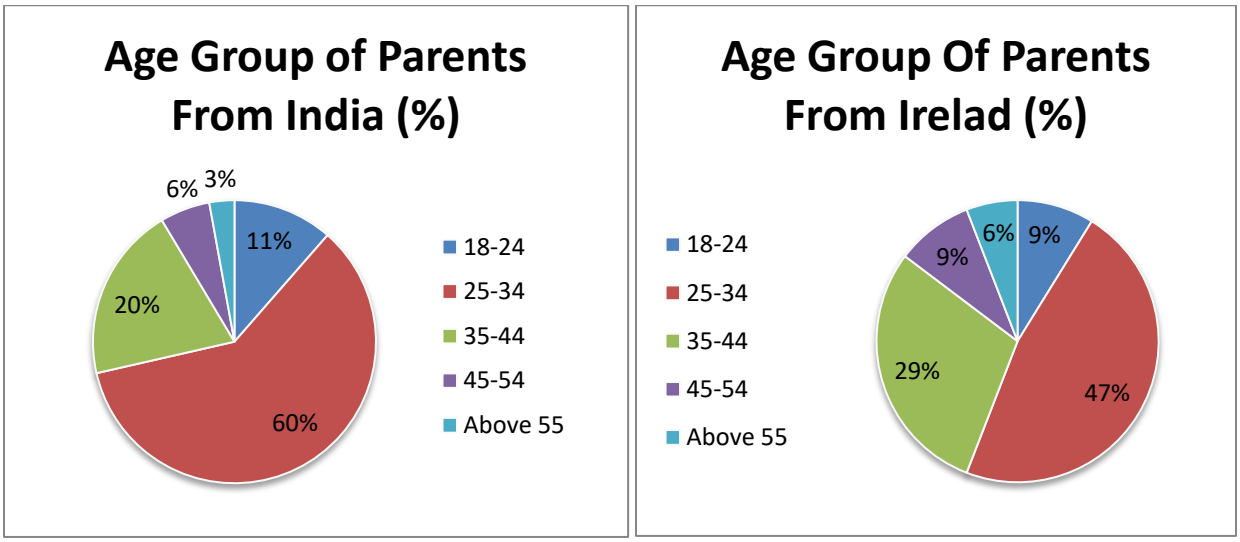

Chart 2: Percentage of age of parents from Ireland and India.

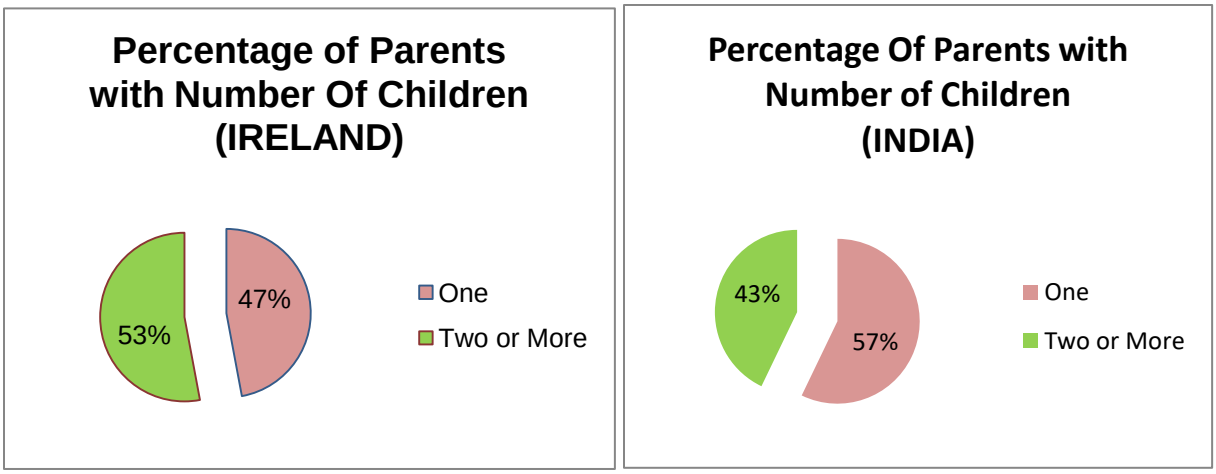

Chart 3: The percentage of parents with number of children from Ireland and India.

4.1.1.2 COUNTRY OF RESIDENCE

The chart given below represents the number of participated parents from India and Ireland. A total of 69 parents included in this study, in which participants shared almost equal proportion of participation from each country. 35 parents from India and 34 parents from Ireland responded to the survey.

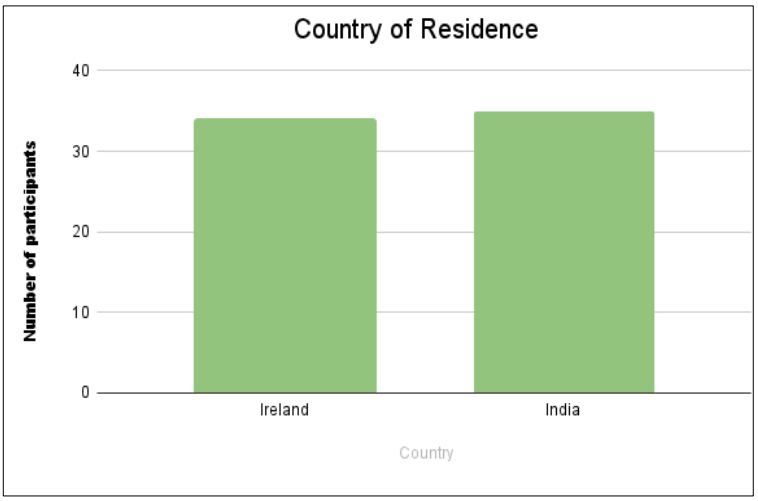

Chart 4: Number of parents who participated from Ireland and India.

4.1.2 ATTITUDE OF PARENTS TOWARD PAEDIATRIC VACCINATION

To evaluate attitude of parents towards the practice of Paediatric vaccination, the parents from India and Ireland were asked several questions using Yes or No questions and five point Likert scale. The data collected from the responders were analysed using Chi Square test in order to prove the hypotheses.

4.1.2.1 PARENT'S TRUST IN PAEDIATRIC VACCINATION PROGRAMS RUN BY GOVERNMENT

The table 6 shows the number and percentage of parents who responded positively and negatively to the question regarding their confidence level in Government-Run Paediatric vaccination programs.

CONFIDENCE LEVEL OF PARENTS IN PAEDIATRIC VACCINATION RUN BY GOVERNMENT							
COUNTRY	OBSERVED VALUE					EXPECTED VALUE	
	YES	(%)	NO	(%)	TOTAL	YES	NO
IRELAND	32	94%	2	6%	34	31.5	2.5
INDIA	32	91%	3	9%	35	32.5	2.5
TOTAL	64	93%	5	7%	69	64	5

Table 6: Trust in Paediatric vaccination run by Government.

According to table 6, 94% Irish parents and 91% Indian parents have shown trust in Paediatric vaccination run by respective Governments. By considering the P value (p=0.66) from the statistical analysis, it was clear that the confidence level (Attitude) of parents in Paediatric vaccination not dependent on the country they live in.

4.1.2.2 RECOMMENDATION LEVEL OF PAEDIATRIC VACCINATION BY PARENTS

The table 7 evaluates the parental behaviour towards Paediatric vaccination by analysing data regarding the rate of recommendation of Paediatric vaccination by parents.

RECOMMENDATION OF PAEDIATRIC VACCINATION BY PARENTS							
COUNTRY	OBSERVED VALUE				EXPECTED VALUE		
	YES	(%)	NO	(%)	YES	NO	TOTAL
IRELAND	31	91%	3	9%	30.1	3.9	34
INDIA	30	86%	5	14%	30.9	4.1	35
TOTAL	61	88%	8	12%	61	8	69

Table 7: Level of recommendation of Paediatric vaccination by parents.

91% of parents' livings in Ireland were willing to recommend vaccination for infants and children and the same was 86% for Indian parents who responded to the survey. For the data in this table, the calculated P value was 0.47, which is greater than 0.1 (Alpha value). Therefore, it is clear that the recommendation level of Paediatric vaccination by parents is not dependent on the country they live in.

4.1.2.3 IMPORTANCE OF PAEDIATRIC VACCINATION BY PARENTS

Parents were asked about their opinion about the importance of Paediatric vaccination against common childhood diseases.

IMPORTANCE OF PAEDIATRIC VACCINATION FOR COMMON CHILDHOOD DISEASES BY PARENTS							
COUNTRY	OBSERVED VALUE				EXPECTED VALUE		
	YES	(%)	NO	(%)	YES	NO	TOTAL
IRELAND	30	88%	4	12%	30.1	3.9	34
INDIA	31	89%	4	11%	30.9	4.1	35
TOTAL	61	88%	8	12%	61	8	69

Table 8: Response to importance of vaccination against common childhood diseases.

Table 8 displays the data how parents feel the importance of Paediatric vaccination against common childhood vaccination. 31 (89%) parents from India and 30 (88%) parents in Ireland reported that it is necessary to take vaccination by children to prevent common childhood diseases. According to P value (P=0.965) from the statistical analysis using Chi Square test, the attitude of parents from India and Ireland are same. The attitude of parents does not depend on the country they are living in.

Five point Likert scale was used to determine how strongly they support or disagree with a statement to evaluate their attitude towards childhood vaccination. Following are the outcome of five point Likert scale evaluation.

4.1.2.4 VACCINATION INCREASES CHILDREN'S IMMUNOGENICITY

The response on statement; vaccination increases children's immunogenicity were collected, analysed and illustrated in the following table.

VACCINATION INCREASES CHILDREN'S IMMUNOGENICITY - OBSERVED VALUE										
COUNTRY	**STRONGLY AGREE**	**%**	**AGREE**	**%**	**NEUTRAL**	**%**	**DISAGREE**	**%**	**STRONGLY DISAGREE**	**TOTAL**
IRELAND	19	51%	12	35%	2	6%	1	3%	0	34
INDIA	18	51%	15	43%	1	3%	1	3%	0	35
TOTAL	37	54%	27	39%	3	4%	2	3%	0	69

Table 9: Parent's level of agreement whether vaccination boosts children's immunogenicity.

As per the table 9, 91% parents from Ireland and 94% parents from India agreed that vaccination can boost the immune system of children and 3 parents; one from India and 2 from Ireland have reported neutral opinion to the statement. Only 3% from each country disagreed that Paediatric vaccination do not increases the immunogenicity of children.

EXPECTED VALUE						
COUNTRY	**STRONGLY AGREE**	**AGREE**	**NEUTRAL**	**DISAGREE**	**STRONGLY DISAGREE**	**TOTAL**
IRELAND	18.2	13.3	1.5	1	0	34
INDIA	18.8	13.7	1.5	1	0	35
TOTAL	37	27	3	2	0	69

Table 10: Expected value of Parent's level of agreement on vaccination boosts children's immunogenicity.

By comparing the p value (0.87) with the alpha value (0.1) at confidence level of 90%, it is apparent that there is a no relationship between parental behaviour towards Paediatric vaccination and country they live in.

4.1.2.5 HARMFUL SIDE EFFECTS OF VACCINATION

Out of 69 parents from Ireland and India, total of 55% disagreed that vaccination causes severe adverse effects and 30% parents (9 from Ireland and 11 from India) expressed neutral opinion regarding the adverse effect of Paediatric vaccination. At the same time, 18% in Ireland and 14% in India agreed with the same statement.

VACCINATION CAUSES HARMFUL SIDE EFFECTS-OBSERVED VALUE											
COUNTRY	**STRONGLY AGREE**	**%**	**AGREE**	**%**	**NEUTRAL**	**%**	**DISAGREE**	**%**	**STRONGLY DISAGREE**	**%**	**TOTAL**
IRELAND	1	3%	5	15%	9	26%	10	29%	9	26%	34
INDIA	1	3%	4	11%	11	31%	17	49%	2	6%	35
TOTAL	2	3%	9	13%	20	29%	27	39%	11	16%	69

Table 11: Parents response to harmful side effects of vaccination

The table for expected value of the same data is given below;

EXPECTED VALUE						
COUNTRY	**STRONGLY AGREE**	**AGREE**	**NEUTRAL**	**DISAGREE**	**STRONGLY DISAGREE**	**TOTAL**
IRELAND	1	4.4	9.9	13.3	5.4	34
INDIA	1	4.6	10.1	13.7	5.6	35
TOTAL	2	9	20	27	11	69

Table 12: Expected value of responses to harmful effects of vaccination

From the statistical analysis, p value was 0.16, which is greater than the alpha value. As a result, the response of parents regarding the side effects of childhood vaccination is not dependent upon the country they live in.

4.1.2.6 MULTIPLE INJECTIONS IN A SINGLE VISIT

The table 13 and 14 illustrate the actual and expected values of data related to the parental concept regarding the vaccination process by multiple injections in a single visit. 85% of Irish parents and 72% of Indian parents agreed that it is unpleasant when /children get their routine vaccines with multiple injections in one visit. All others disagreed the statement except 8 parents as they given neutral opinion.

MULTIPLE INJECTIONS IN A SINGLE VISIT-OBSERVED VALUE											
COUNTRY	STRONGLY AGREE	%	AGREE	%	NEUTRAL	%	DISAGREE	%	STRONGLY DISAGREE	%	TOTAL
IRELAND	9	26%	20	59%	1	3%	3	9%	1	3%	34
INDIA	10	29%	15	43%	7	20%	3	8%	0	0%	35
TOTAL	19	27%	35	51%	8	12%	6	9%	1	1%	69

Table 13: Parents response to multiple injections in single visit

EXPECTED VALUE						
COUNTRY	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL
IRELAND	9.4	17.2	3.9	3	0	34
INDIA	9.6	17.8	4.1	3	1	35
TOTAL	19	35	8	6	1	69

Table 14: Expected value of responses to multiple injections in single visit

As the p value (0.18) is more than significance level (0.10), it is failed to reject null hypothesis. The concept of parents regarding the multiple injections in a single visit for infants from India and Ireland is same.

4.1.2.7 UNVACCINATED CHILDREN SHOULD NOT BE SENT TO SCHOOL

Parents were questioned regarding the school entry requirement of unvaccinated children to determine their attitude. The collected data was analysed and demonstrated in the table 15.

UNVACCINATED CHILDREN SHOULD NOT BE SENT TO SCHOOL-OBSERVED VALUE											
COUNTRY	STRONGLY AGREE	%	AGREE	%	NEUTRAL	%	DISAGREE	%	STRONGLY DISAGREE	%	TOTAL
IRELAND	9	26%	2	6%	11	32%	7	21%	5	15%	34
INDIA	4	11%	12	34%	5	14%	9	26%	5	14%	35
TOTAL	13	19%	14	20%	16	23%	16	23%	10	15%	69

Table 15: Parents response to allowing unvaccinated children to school

From the table 15, it can be observed that total percentage of parents from Ireland and India who disagreed to send unvaccinated children to school were 32% and 45% respectively. At the same time 38% parents from both countries agreed to send their children even without vaccination and 23% parents neither agreed nor disagreed to the statement.

EXPECTED VALUE						
COUNTRY	**STRONGLY AGREE**	**AGREE**	**NEUTRAL**	**DISAGREE**	**STRONGLY DISAGREE**	**TOTAL**
IRELAND	6.4	6.9	7.9	7.9	4.9	34
INDIA	6.6	7.1	8.1	8.1	5.1	35
TOTAL	13	14	16	16	10	69

Table 16: Expected value for sending unvaccinated children to schools

The table 16 shows the estimated value of parent's response on sending unvaccinated children to school. According to Chi-Square test (P value=0.020), it was concluded that Parent's view on the school entry requirements for non-vaccinated children is dependent on the country; they live in.

4.1.2.8 PAEDIATRIC VACCINATION IS WASTE OF TIME AND MONEY

PAEDIATRIC VACCINATION IS WASTE OF TIME AND MONEY -OBSERVED VALUE											
COUNTRY	**STRONGLY AGREE**	**%**	**AGREE**	**%**	**NEUTRAL**	**%**	**DISAGREE**	**%**	**STRONGLY DISAGREE**	**%**	**TOTAL**
IRELAND	0	0%	2	5%	7	21%	7	21%	18	53%	34
INDIA	1	3%	3	9%	2	6%	10	29%	19	54%	35
TOTAL	1	1%	5	7%	9	13%	17	25%	37	54%	69

Table 17: Parents response to vaccination as waste of time and money

As per table 17, only 8% of parents say that the Paediatric vaccination is waste of time and money. In contrast, 79% parents have disagreed to the same statement and 13% of parents were of neutral opinion. From the data, it is understood that majority of parents from both

countries expressed positive attitude in terms of money and time spent on Paediatric vaccination.

EXPECTED VALUE						
COUNTRY	**STRONGLY AGREE**	**AGREE**	**NEUTRAL**	**DISAGREE**	**STRONGLY DISAGREE**	**TOTAL**
IRELAND	0	2.5	4.4	8.4	18.2	34
INDIA	1	2.5	4.6	8.6	18.8	35
TOTAL	1	5	9	17	37	69

Table 18: Expected value for response to vaccination as waste of time and money

Here, the p value was 0.340 from the statistical analysis of data. Therefore, it was clear that there is no relation between the opinion of parents regarding the Paediatric vaccination in terms cost and time and country they live in.

4.1.3 FACTORS THAT INFLUENCE PARENTAL DECISION

Certain questions were included in the survey to identify variables that affect parental decision-making when discussing vaccination for their children. The collected data is represented with the help of bar charts.

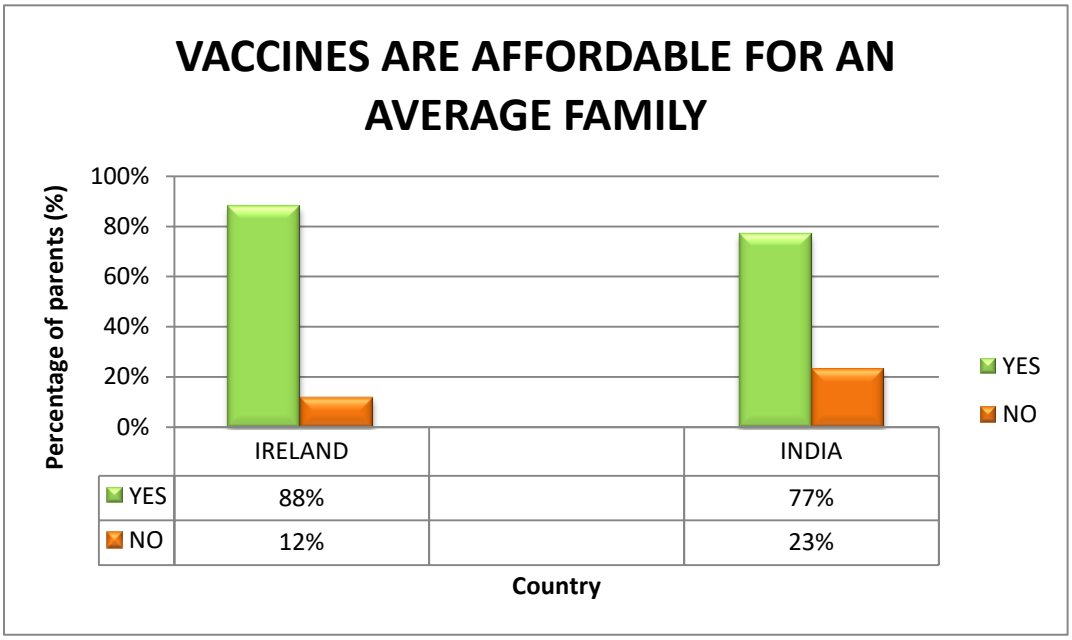

Chart 5: Response of parents on affordability of vaccines for an average family in percentage.

Total of 83% (n=57) parents from Ireland and India said that the cost of Paediatric vaccines is not a barrier as Paediatric vaccines are free in Ireland. 4 (12%) parents from Ireland and 8 (23%) from India reported that vaccines are not within reach of the normal family's budget.

The chart 6 depicts the response of parents when they were asked regarding the awareness of the benefits of childhood vaccines in society. 13 (38%) Irish parents and 19 (54%) Indian parents agreed that there is not enough knowledge or awareness with regards to the importance of Paediatric vaccination in the society. On the other hand, the percentage of parents who responded positively from Ireland and India were 62% and 46% respectively.

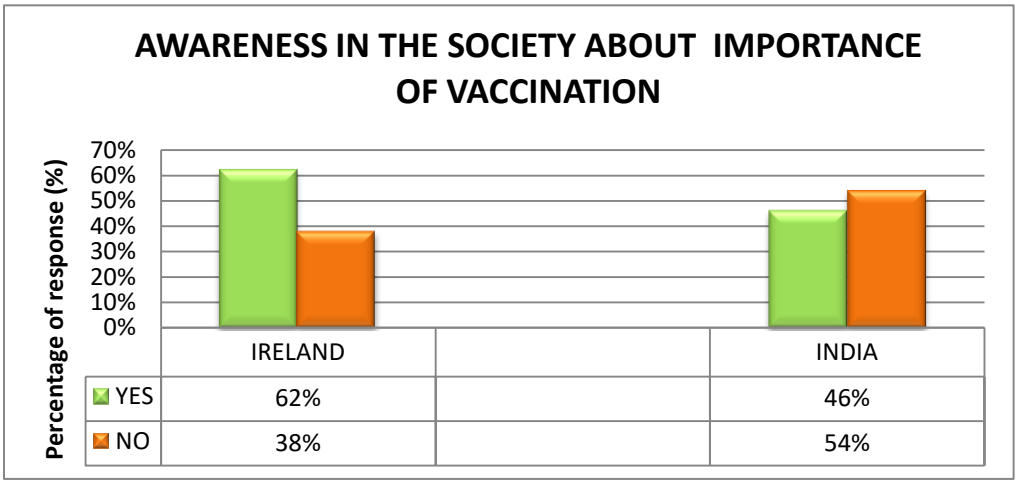

Chart 6: Response to awareness about Paediatric vaccination in society.

Parents were questioned whether they have any concerns about the quality of the Paediatric vaccines or not. Most of the parents included 24 (71%) Irish parents and 18 (51%) Indian parents said "Yes" and total 39% parents reported they have no fears regarding the safety of vaccines.

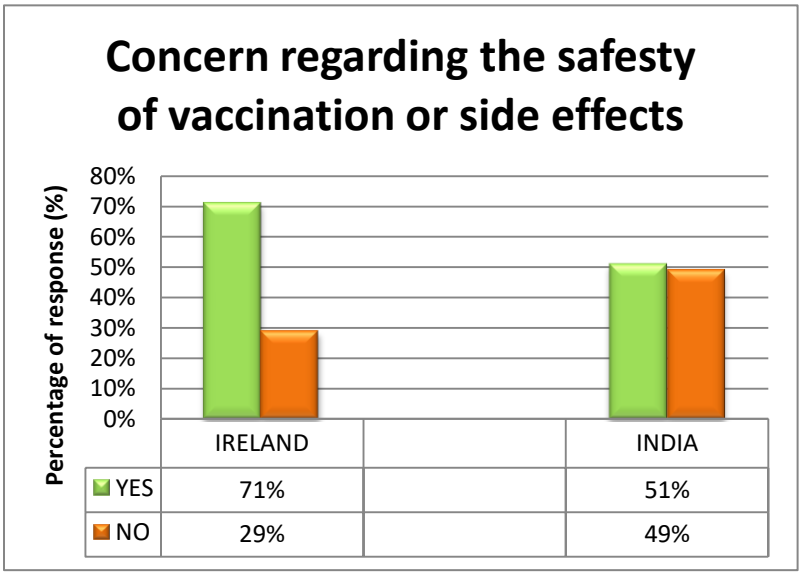

Chart 7: Parent's response on the safety of Paediatric vaccines

The chart below displays the influence of religious belief on parental decision-making regarding the vaccination for their children.

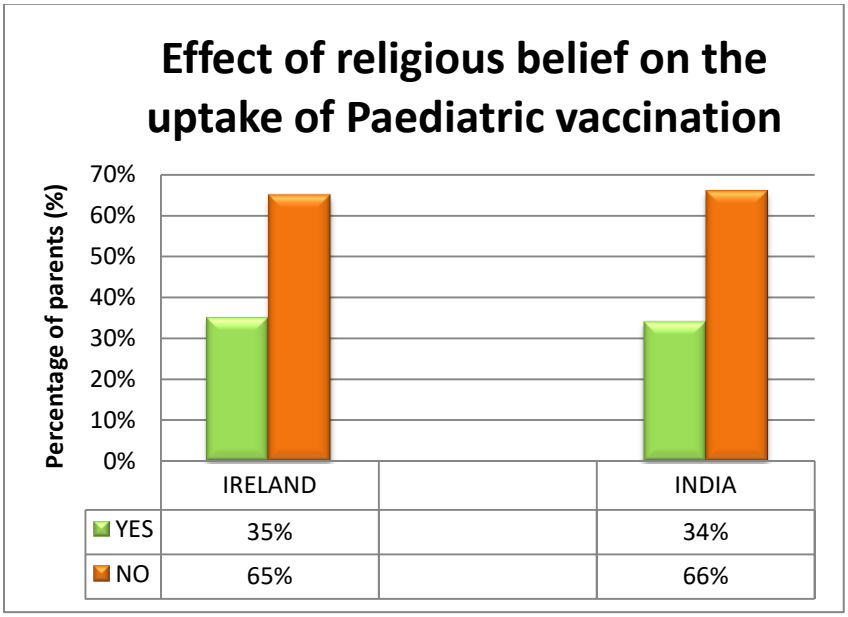

Chart 8: Response on the influence of religious belief on Paediatric vaccination.

From the above chart, it is clear that 65% parents in Ireland and 66% parents in India believe that religious beliefs have no influence on the uptake rate of paediatric vaccination. At the same time, total 35% parents agreed that religious has an effect on the practice of Paediatric vaccination.

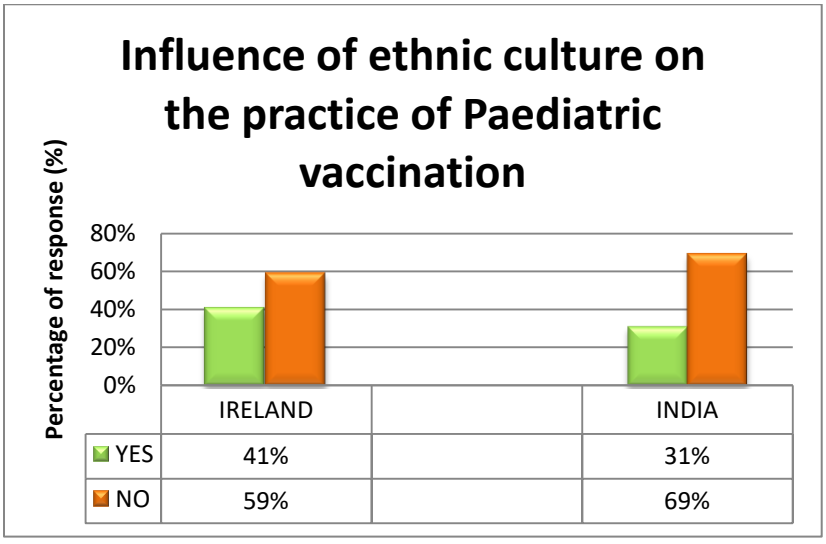

Chart 9: Response on the influence of ethnic culture on the uptake of Paediatric vaccination.

According to chart 9, it can be inferred that majority of the respondents (64%) believe that certain ethnic cultures have no effect on the uptake level of paediatric vaccination. 41% parents from Ireland and 31% from India said that there is an influence of ethnic culture on the practice of Paediatric vaccination.

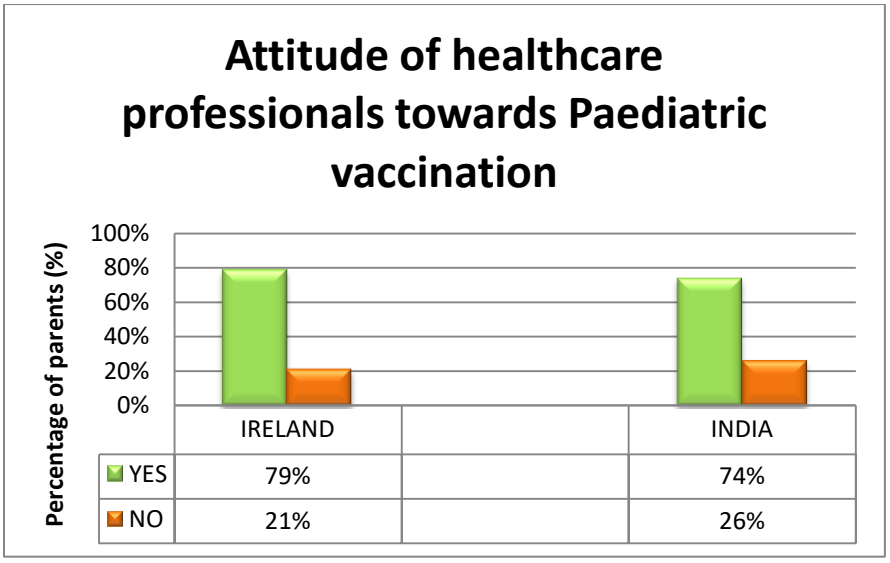

Chart 10: Response on the attitude of healthcare professionals in Paediatric vaccination.

When parents were asked about the role of healthcare workers in the implementation and uptake of Paediatric vaccination, majority of parents (Ireland=79% and India=74%) believed that the attitude of healthcare professionals has a great influence on the practice of Paediatric vaccination. It is significant to note that around 24% of parents from each country said that there is no relationship between the attitude of healthcare professionals and uptake of Paediatric vaccination.

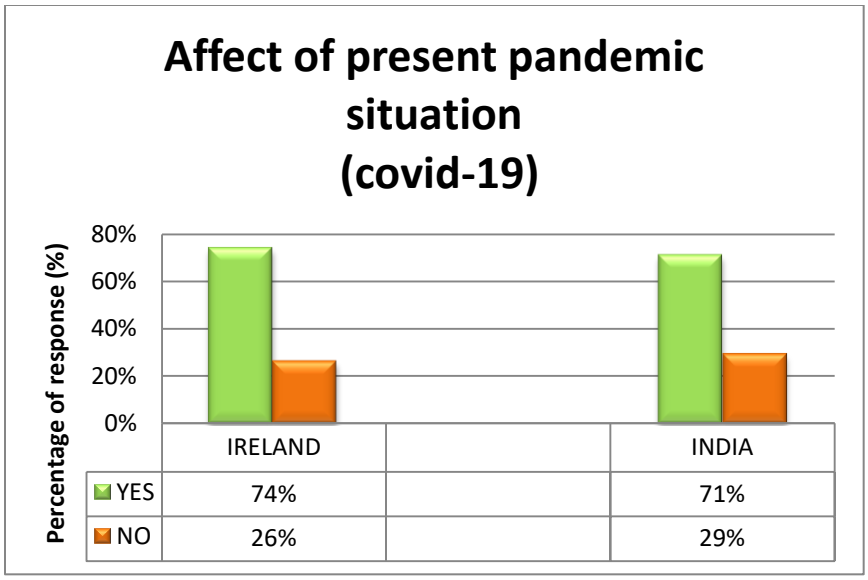

Chart 11: Response on the effect of COVID-19 on Paediatric vaccination.

From the analysis of collected data from parents, it is found that 74% of parents from Ireland and 71% from India reported that present pandemic situation (Covid-19) is factor when they discussing about the vaccination for their children. At the same time, 28% parents said that COVID-19 pandemic has no influence on the uptake of childhood immunization.

4.2 ANALYSIS OF DATA OBTAINED FROM HEALTHCARE PROFESSIONALS

4.2.1 DEMOGRAPHIC CHARACTERISTICS

The demographic information such as occupation and the country, where they work; was collected from the healthcare workers in order to confirm the inclusion criteria for the survey.

COUNTRY	DOCTOR, n (%)	NURSE, n (%)	PHARMACIST, n (%)
IRELAND	12 (38%)	17 (53%)	3 (9%)
INDIA	13 (41%)	9 (28%)	10 (31%)

Table 19: Demographics of healthcare professionals who participated

According to the professional background of participants, the responders classified into three categories. The pie chart given below shows the percentage of healthcare professionals with their medical profession from both countries.

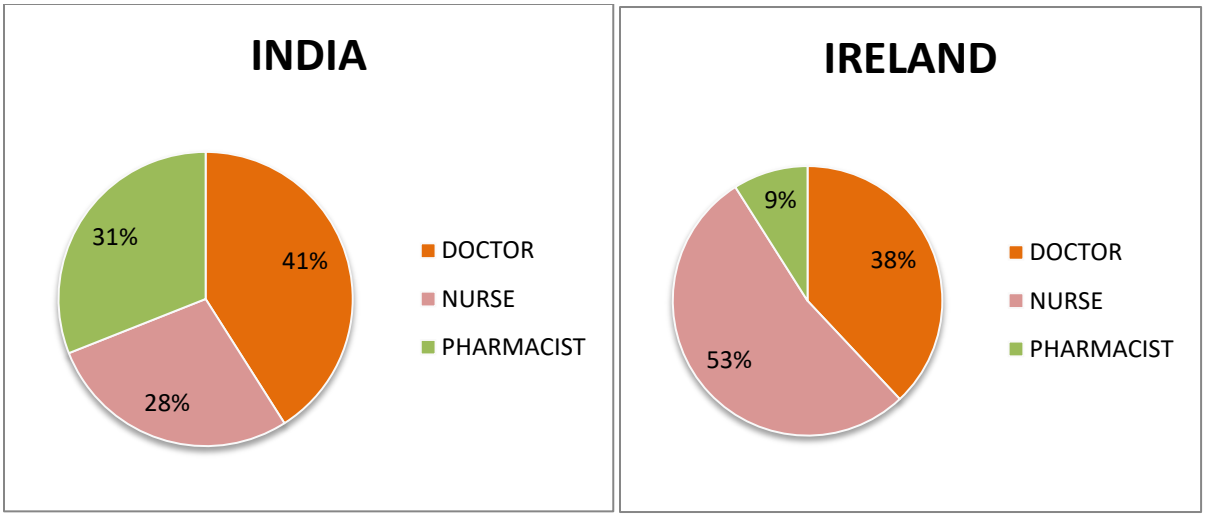

Chart 12: Medical profession of healthcare professionals in percentage.

Total of 64 healthcare professionals were part of this survey, 32 participants from both the countries.

4.2.2 **KNOWLEDGE OF HEALTHCARE PROFESSIONALS**

In the survey, the respondents were assessed about their knowledge regarding the Paediatric vaccination. A knowledge section with ten statements was introduced into the questionnaire, where the healthcare professionals were to answer either True or False against statements made regarding Paediatric vaccination.

Sl. No	STATEMENT	CORRECT STATEMENT	TRUE		FALSE	
1	Vaccines interact with the children's immune system and produce antibodies that are quite close to those produced by a normal infection.	True	IRELAND 94%	INDIA 88%	IRELAND 6%	INDIA 12%
2	Paediatric vaccines do not cause any diseases or put your children at risk of its potential side effects.	True	84%	84%	16%	16%
3	If good hygiene and proper sanitation is provided then diseases will not spread even without vaccination.	False	34%	50%	66%	50%
4	Paediatric vaccination contains toxins.	False	6%	16%	94%	84%
5	Giving a child multiple vaccinations for different diseases at the same time increases the risk of harmful side effects and can overload the immune system.	False	53%	47%	47%	53%
6	Proper breastfeeding gives better long term immunogenicity than vaccines.	False	63%	63%	37%	37%
7	The combined vaccine against diphtheria, tetanus and pertussis (DTP) will not cause sudden child death.	True	72%	94%	28%	6%
8	Children with mild diseases like cold, fever etc. should not receive their routine vaccines.	False	44%	50%	56%	50%
9	Children should not be given	False	12%	16%	88%	84%

	their routine vaccination during this Covid-19 pandemic.					
10	Paediatric vaccination is the safest and simplest way to boost infant's immune system.	True	94%	91%	6%	9%

Table 20: Response of healthcare professionals regarding Paediatric vaccination

The healthcare workers from both countries were asked regarding the mechanism of Paediatric vaccines once it reaches the children's immune system. Out of 64 participants, 94% (Ireland) and 88% (India) healthcare professionals provided correct answer to the statement. Only 9% of the responses were incorrect. When asked regarding the side effect of Paediatric vaccines, the responses from the both countries were identical. According to the data, 66% healthcare professionals from Ireland and half of the participants from India answered correct to the statement regarding the importance of vaccination even with good hygiene and proper sanitation.

Majority of the respondents from Ireland (94%) and India (84%) said that vaccines do not contain any toxins. It is evident that 16% of healthcare professionals working in India believe that there is toxins present in Paediatric vaccines. While 53% of participants from Ireland believed that there is a risk of overloading the immune system when infants are vaccinated with multiple doses at once. At the same time, 53% of Indian healthcare professionals stated that it is safe to give a child multiple vaccinations in a single time for different infectious diseases.

It is common belief that proper breastfeeding can provide better immunogenicity than vaccines. Therefore, the healthcare workers were surveyed about the same to determine their knowledge. It was significant to note that responses from both countries were same and surprisingly 63% of respondents believed it to be true, and only 37% of healthcare workers gave the correct response. 94% of healthcare workers from India and 72% respondents from Ireland believe that combined vaccines do not cause any impact on children's health. Only 2 individuals from India said that combined vaccines would result in sudden child death. According survey data, it can be inferred that half of the respondents believe that it is unsafe to give children's

routine vaccine when they have minor diseases. Whereas, 56% of responses from Ireland believed it to be safe.

A statement about the uptake level of Paediatric vaccinations during this Covid-19 pandemic was included in the survey to determine awareness of healthcare providers in India and Ireland. The favourable responses from Ireland and India were 88% and 84% respectively. A total of 14% said that children should not take their regular vaccination during this pandemic situation (Covid-19).

According to healthcare professional's response, they were classified into three categories to evaluate their knowledge regarding Paediatric vaccination.

COUNTRY	OBSERVED VALUE						EXPECTED VALUE			TOTAL
	8 TO 10	(%)	6 TO 7	(%)	Below 5	(%)	8 TO 10	6 TO 7	Below 5	
IRELAND	18	56%	10	31%	4	13%	18.5	8.5	5	32
INDIA	19	59%	7	22%	6	19%	18.5	8.5	5	32
TOTAL	37	58%	17	26%	10	16%	37	17	10	64

Table 21: Observed value and expected value of healthcare professional's response in the evaluation of their knowledge. (P VALUE: 0.619> ALPHA VALUE: 0.1)

Healthcare professionals who responded with 8-10 correct answers were considered to have a good knowledge followed by average knowledge with 6-7 correct answers to the statement and respondent who given less than 5 correct answers were categorized into below average knowledge.

From the above table, More than 50% of healthcare professionals have a good knowledge about Paediatric vaccination and total 26% of them have average knowledge. It was clear from the collected data that 19% and 13% of healthcare professionals were identified with below average knowledge on Paediatric vaccination from India and Ireland respectively. From the statistical analysis using Chi Square test, it can be concluded that the healthcare professional's knowledge is not dependent on country; they work in.

4.2.2 BARRIERS TO THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION

The survey included several questions to identify the barriers to the implementation and practice of Paediatric vaccination in India and Ireland. The data was collected from healthcare professional's using five point Likert scale and the same is illustrated in the form of charts.

According to the chart below, it can be inferred that majority of healthcare workers (92%) from both countries opinioned that economic factors such as educational status of parents act as a key barrier to the intake of Paediatric vaccination. One respondent from each country had a neutral opinion about it.

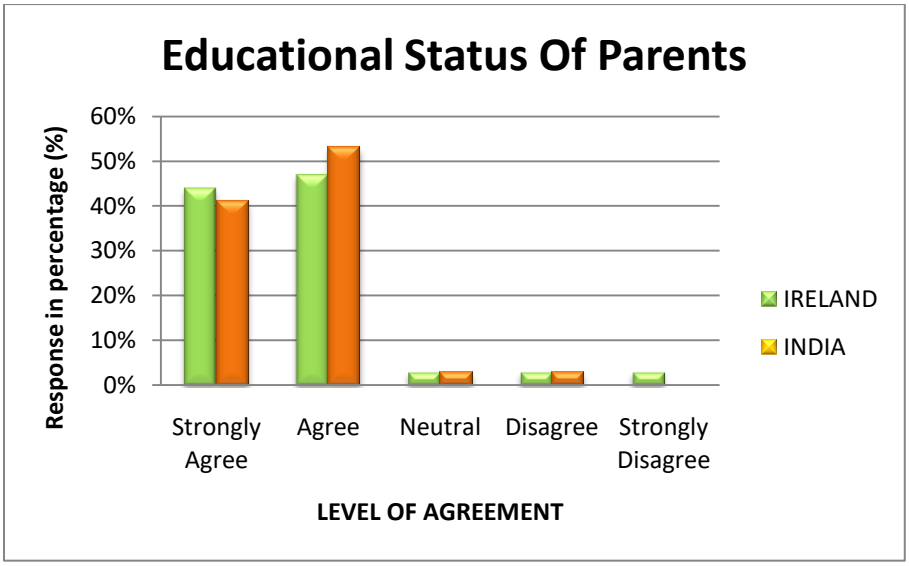

Chart 13: Response to Educational status of parents as a barrier.

Healthcare workers were asked to reveal their level of agreement on family income as a barrier to children immunization. Family income was identified as a barrier to the practice of Paediatric vaccination by 59% participants from Ireland and 63% participants from India. A small number of respondents (Ireland=22% and India=9%) disagreed with the factor as a barrier and total 23% healthcare workers neither agreed nor disagreed.

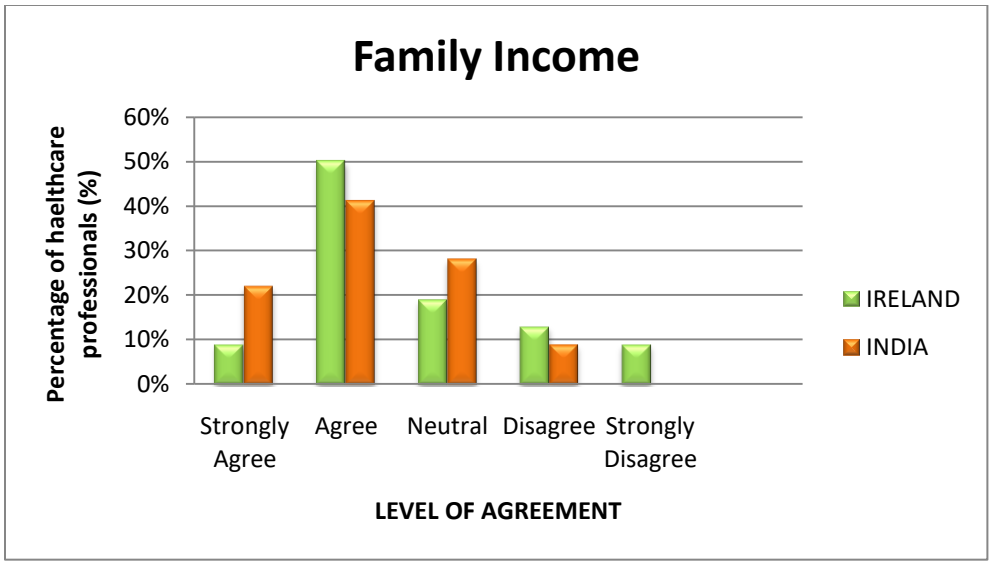

Chart 14: Response on family income as a barrier.

The demographic characteristics like religious beliefs of parents and residence were also included in the survey to see how much they agreed that these had an influence on the uptake of vaccination. The data collated is represented in the chart 15 and 16.

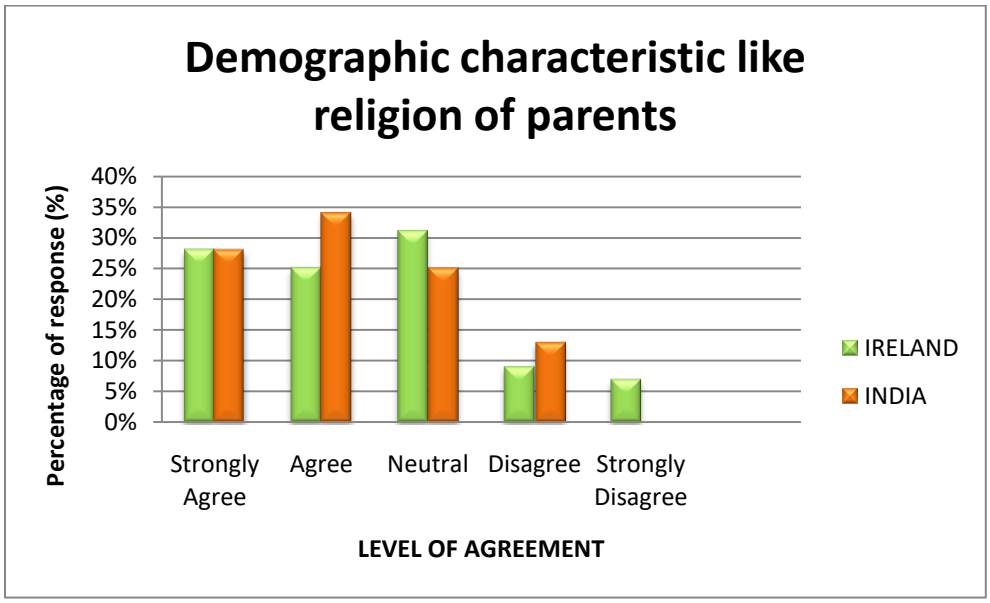

Chart 15: Response on religion of parents as a barrier.

From the above chart 15 it is clear that 28% of participants from both countries strongly agreed that a religious belief is a deterrent to the children's immunization. Whereas, a total of 14% disagreed that religion is not a barrier and 28% responses were neutral.

The data collected for the next factor; place of residence is illustrated in the following table 16. From the chart 16, it can be inferred that 69% of healthcare professionals working in Ireland and 72% from India agreed that the place of residence like rural or urban influences the uptake level of Paediatric vaccination. The level of disagreement was very low (9%). At the same time 25% from Ireland and 22% from India neither agreed no disagreed to the statement.

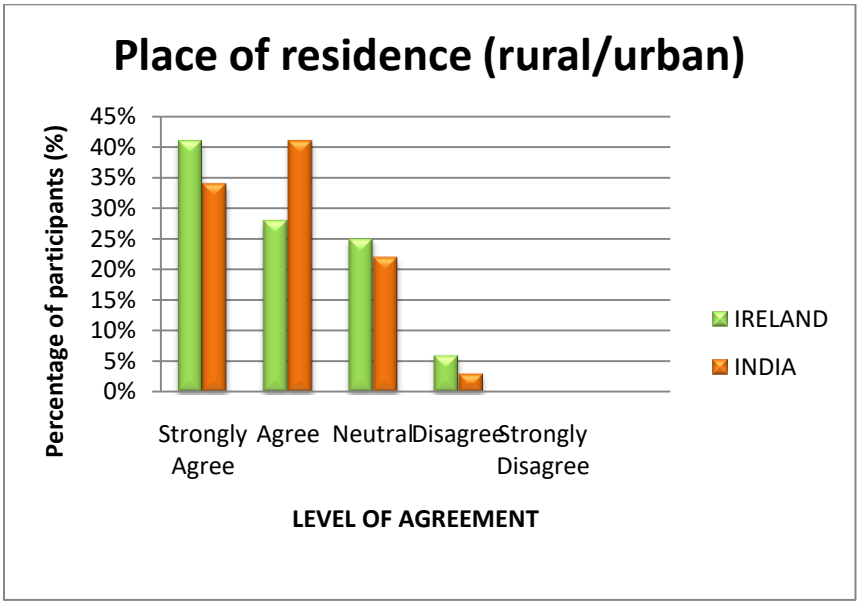

Chart 16: Response on place of residence (rural/urban) as a barrier.

Chart 17 shows the percentage of views on anti-vaccination campaign as a barrier to the implementation and uptake of Paediatric vaccination. 36% of healthcare professional working in India agreed that anti vaccination campaign is a barrier to the practice of childhood vaccination. It was 27% from Irish respondents. Majority of respondents (44%) from Ireland expressed neutral opinion and only 5 people in the healthcare field disagreed with the statement.

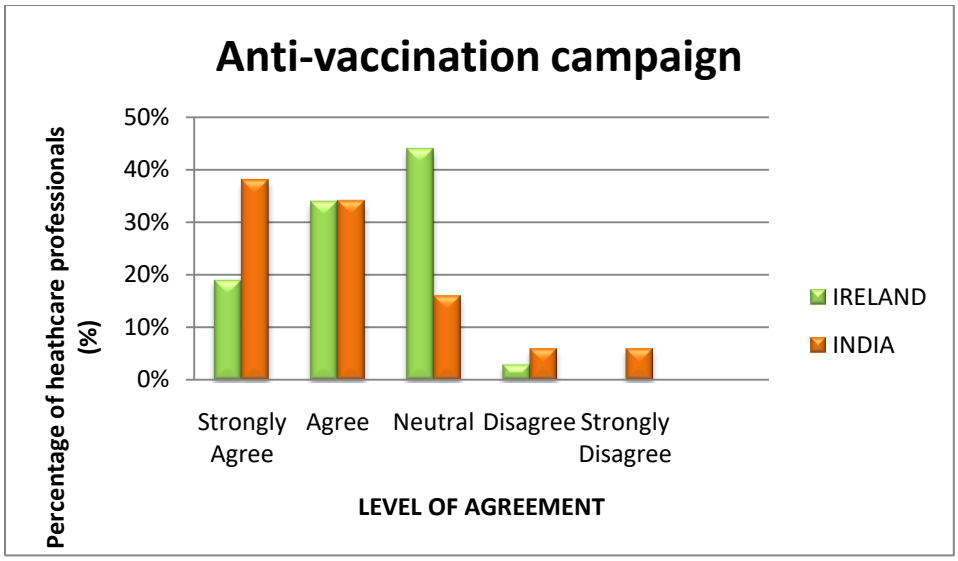

Chart 17: Response on anti-vaccination programs as a barrier.

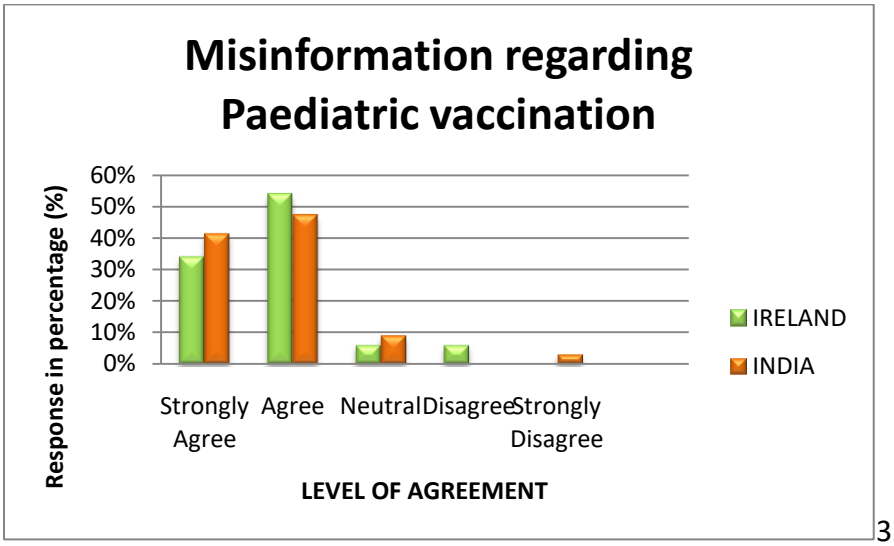

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Chart 18: Response on misinformation regarding Paediatric vaccination as a barrier.

From the above chart, it is clear that an equal proportion (44%) of healthcare professionals from both countries said that misinformation about childhood vaccination leads to decrease the rate of child immunogenicity. Whereas the respondents marking disagree and strongly disagree was 6% and 3% respectively.

The graph below illustrates the percentage of respondents who consider negative attitude of parents towards Paediatric vaccination as a barrier to the practice of childhood vaccination.

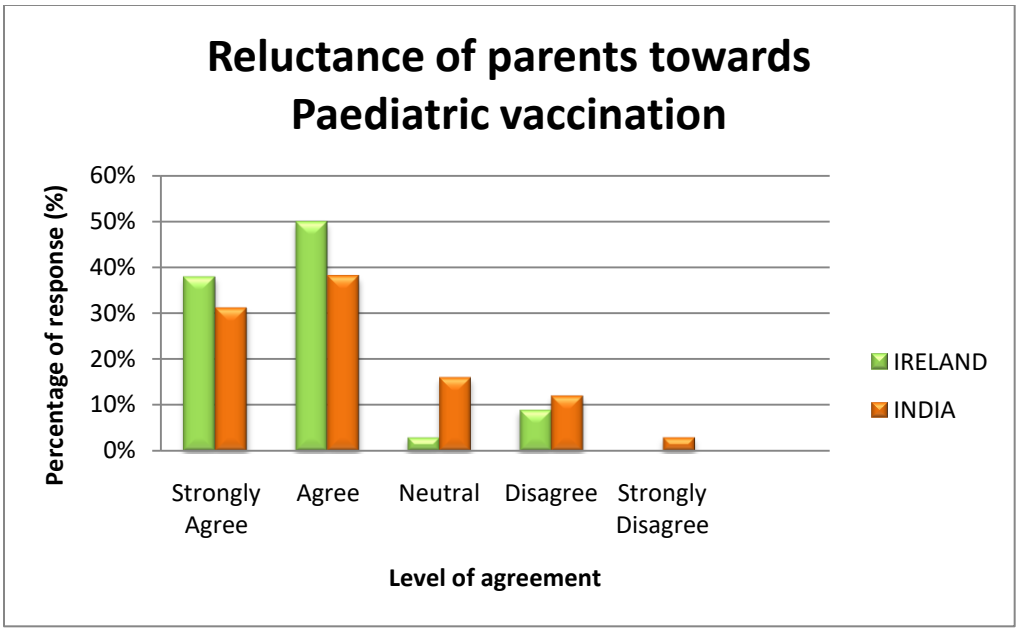

Chart 19: Response on reluctance of parents towards Paediatric vaccination as a barrier.

As per the data illustrated in the chart 19, 44% from Ireland and 35% respondents from India believe that the reluctance of parents towards the Paediatric vaccination is a barrier to the implementation and uptake of vaccination for children. At the same time, 17% of participants disagreed to the statement and 6% responded neutrally.

Healthcare professionals were asked whether the lack of their knowledge regarding Paediatric vaccination is a barrier to the rate of children's immunogenicity or not. The collected data is demonstrated in the chart 20. Most of the respondents disagreed to the statement. Only 11% strongly agreed that the insufficient knowledge of healthcare workers is a barrier to the practice of Paediatric vaccination.

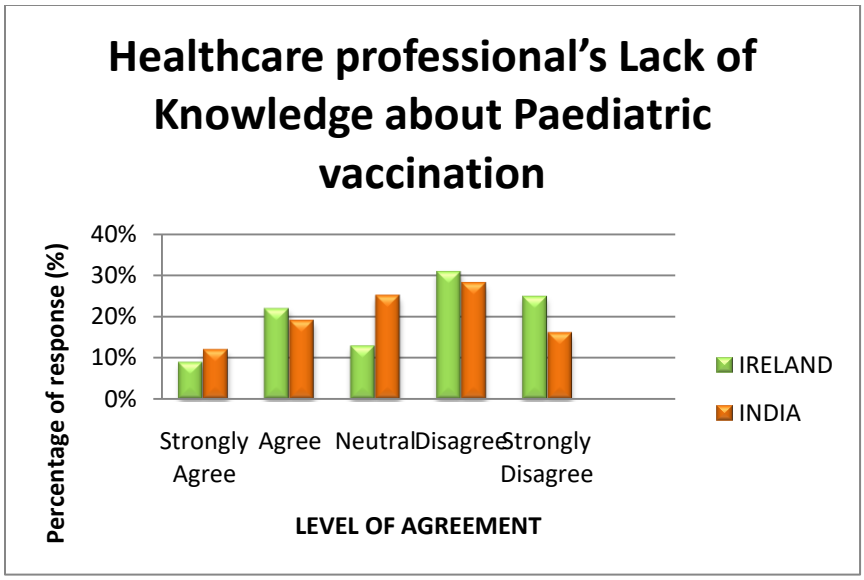

Chart 20: Response on lack of healthcare professional's knowledge about Paediatric vaccination as a barrier.

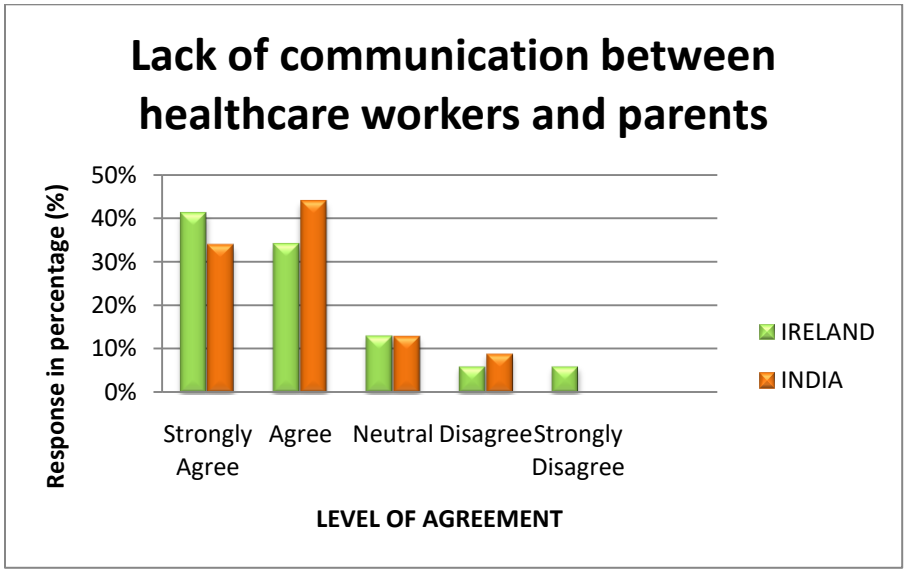

Chart 21: Response on lack of communication between parents and healthcare workers as a barrier.

According to chart 21, 77% of respondents believe the lack communication between parents and healthcare workers as a barrier to the implementation and uptake of Paediatric vaccination. The level of disagreement was very less from both countries. Total 13% expressed neutral opinion to the statement.

The graph below depicts the percentage of respondents who consider insufficient facility to store vaccines as a barrier to the implementation of Paediatric vaccination.

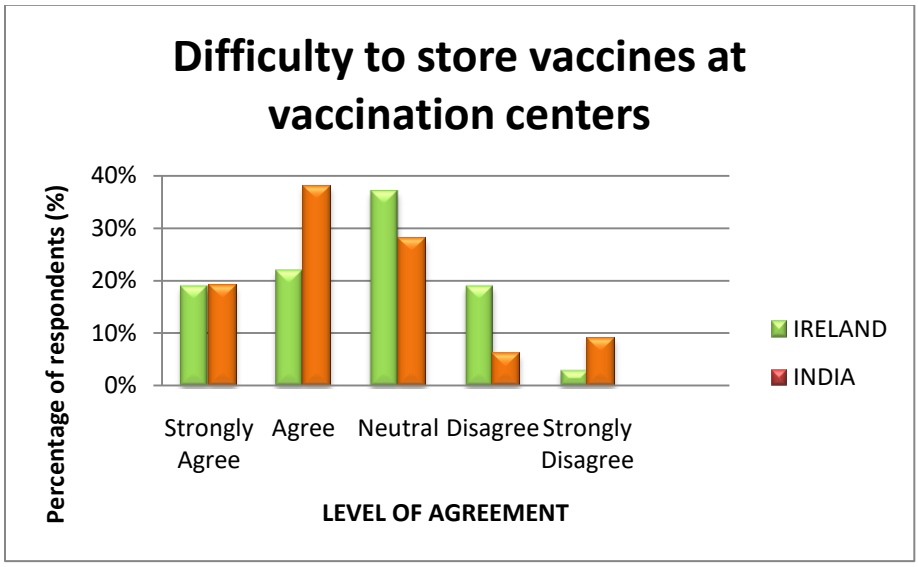

Chart 22: Response on storage of vaccines as a barrier.

Majority of respondents (37%) from Ireland neither agreed nor disagreed to the statement and 21% of them agreed storage of vaccines as a barrier. At the same time, 29% of Indian participants agreed to the statement and 8% of participants from India disagreed.

4.2.3 ENABLERS TO THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION

The research tried to identify key enablers to the practice of Paediatric vaccination, by collecting opinions from health care professionals about some of the possible activities which can improve Child immunization rates.

Chart 23: Response on continuous training programs as an enabler.

From the above chart, it can be seen that 97% of healthcare professionals from both countries believed that continuous training programs can improve the uptake of Paediatric vaccines. Surprisingly, only one healthcare worker from Ireland disagreed to the statement and 3% from India said neutral opinion to continuous improvement programs as enabler of the Paediatric vaccination.

According to chart 24, 81% from Ireland and 82% from India said that getting a consent letter from all parents at the time of childbirth to confirm the follow up of routine vaccine schedule for their children against infectious diseases will be facilitator to the implementation and practice of Paediatric vaccination in order to enhance the overall child immunization rate. Whereas, 9% participants disagreed to get consent from parents and 14% neither agreed nor disagreed to the statement.

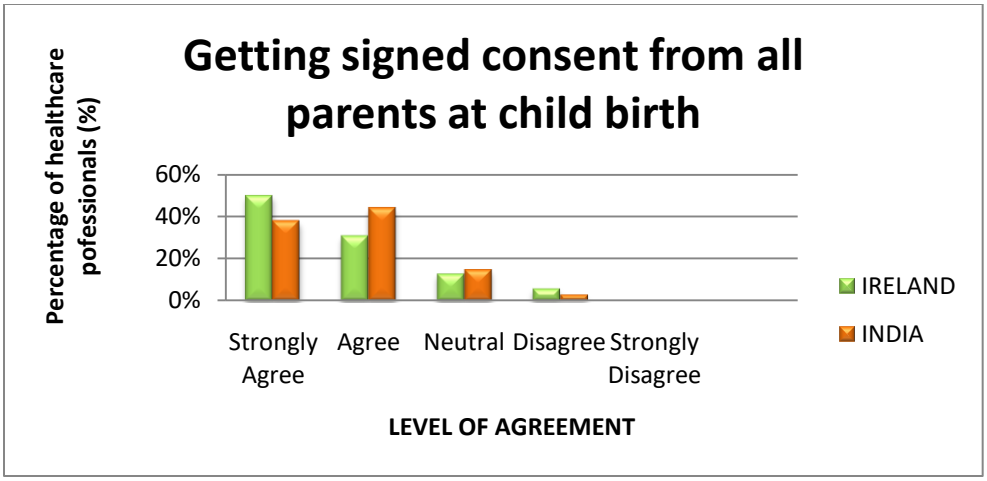

Chart 24: Response on getting signed consent from parents as an enabler.

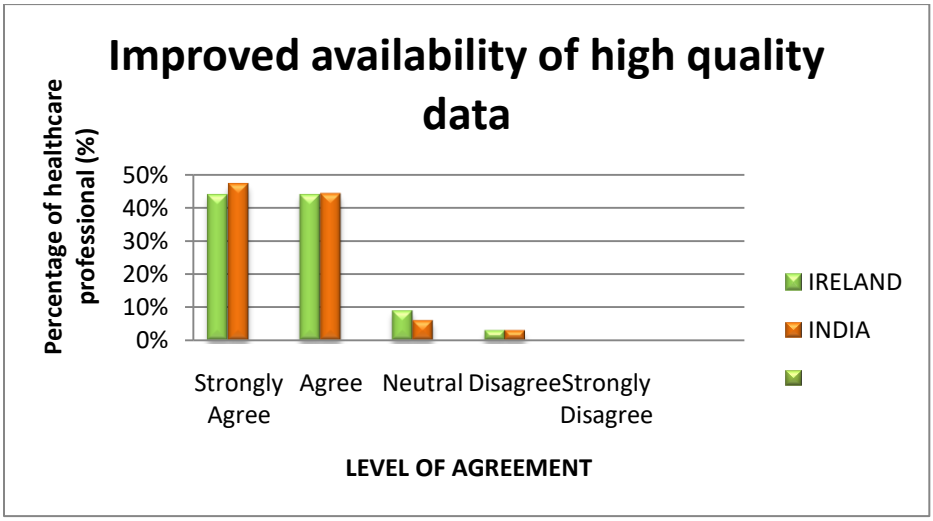

Chart 25: Response on improved availability of high quality data as an enabler.

It is clear from the above graph that majority participants 91% of Indian healthcare professionals and 88% Irish healthcare workers agreed that availability of better data regarding the infant population can improve the uptake rate of vaccinations for children and only 3% from India and Ireland disagreed to the statement.

Chart 26 depicts healthcare professional's views on the influence of close monitoring of infants by parents to follow proper vaccination schedules 88% of the health care professionals in Ireland and 81% in India agree that close monitoring will improve vaccination uptake.

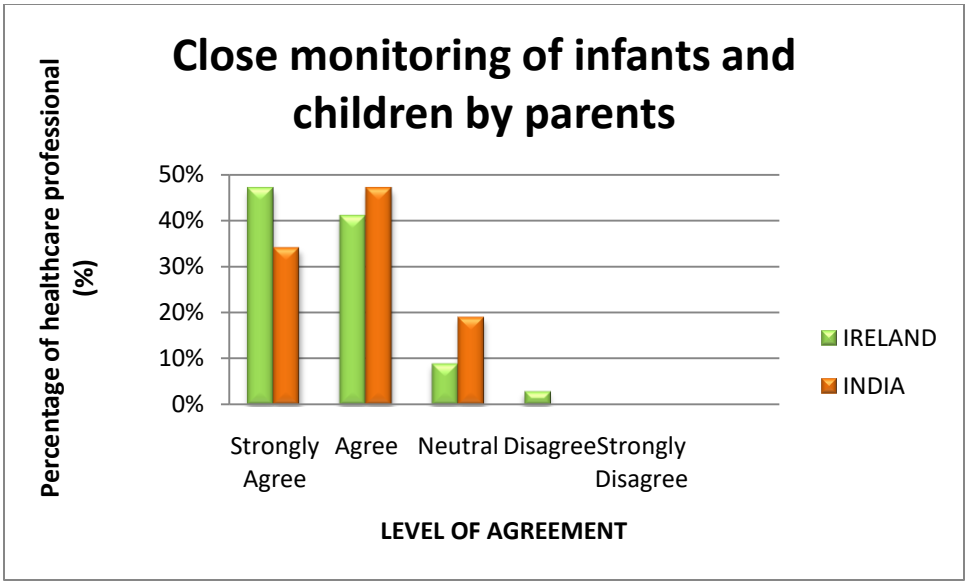

Chart 26: Response on close monitoring of infants by parents as an enabler.

Chart 27 shows us the response of health care professionals on whether availability of better vaccine storage facilities at hospitals and medical centres specially ones in remote areas can improve the vaccination uptake rate. 81% and 84% healthcare professionals in Ireland and India respectively agreed to the above statement. Whilst 13% in both the countries have neutral opinion about the impact of better storage facilities.

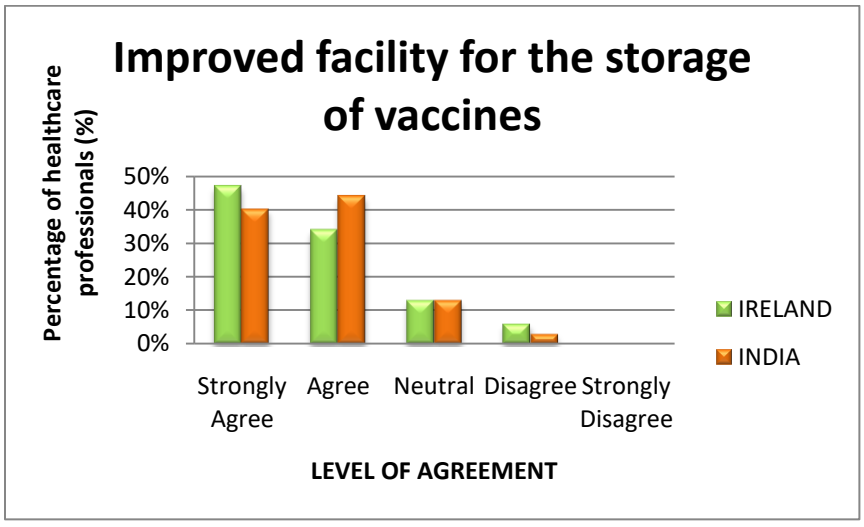

Chart 27: Response on improved vaccine storage facility as an enabler.

The chart 28 shows that 88% of Irish and 81% Indian healthcare professionals believe that a door to door visit by health care workers to create awareness about vaccination amongst the society will improve the vaccination uptake rate.

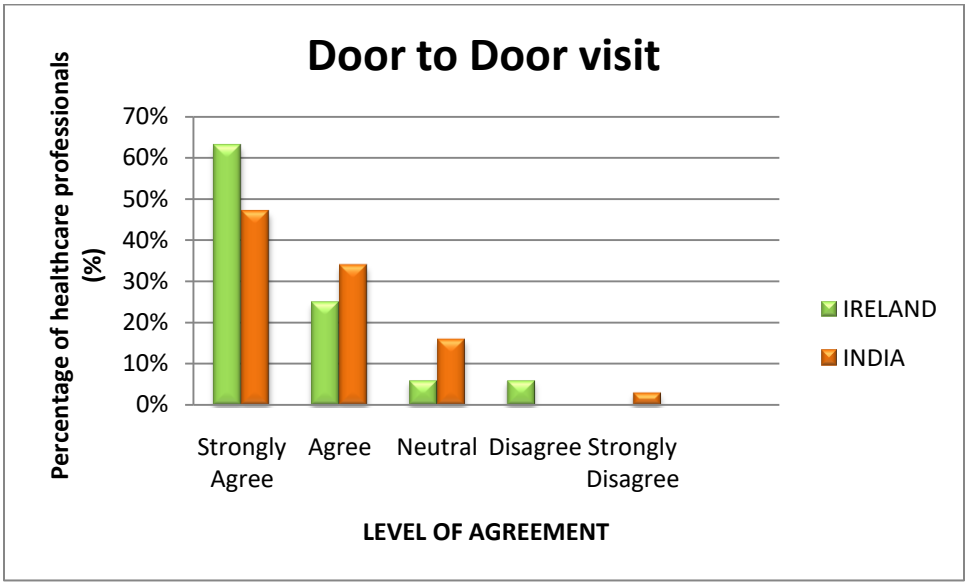

Chart 28: Response on door to door visit and reminders as an enabler.

4.3 DISCUSSION

In the last three decades, the rate of child mortality has declined as a result of the cost-effective intervention of Paediatric vaccines, predominantly in developing countries(Whelan *et al.*, 2020). This study evaluated the attitude of parents and knowledge of healthcare professionals about Paediatric vaccination while identifying factors in relation to the implementation and uptake of childhood vaccination. This research was carried out using an online survey and included a total 69 parents and 64 healthcare professionals who are working in India and Ireland.

4.3.1 ATTITUDE OF PARENTS TOWARD PAEDIATRIC VACCINATION

The study revealed the attitude and certain concerns of parents regarding the practice of Paediatric vaccination. Majority of parents from Ireland and India have expressed a positive attitude towards vaccination for children. The research results showed that more than 85% of parents from both countries have trust in childhood vaccinations and they would recommend vaccines for children against common childhood diseases. This result is quite similar to a study conducted by Sankar et al., 2018; who highlighted that 70% of mothers had acceptable attitude towards Paediatric vaccination for their children(Sankar, Rameh and Sunny, 2018).

The survey included various statements about the importance of vaccination for children to understand parental behaviour by expressing their level of agreement. It is significant to report that only 3% of parents from both countries reported vaccination do not increases the immunogenicity of children and rest all parents agreed with a percentage of 91 and 94 from Ireland and India respectively. A positive attitude was reflected with a significant number of participants when they surveyed about the harmful side effects of childhood vaccination. 90% of parents with positive attitude were identified by Chow et al, (2017), when they conducted an online survey in Australia(Chow *et al.*, 2017).

At the same time, the study found that a great number of parents were concerned about the painful process of vaccination with multiple injections in a single visit. 75% from Ireland and 72% from India said that it is painful to have more than one injection in a single visit, indicating a reason to avoid vaccination for their children. The result was similar to other studies conducted in other countries. For example; a systematic review of qualitative studies stated

that discomfort from painful process of multiple-vaccination injection is one of the biggest barriers to the uptake of Paediatric vaccination(Mills *et al.*, 2005).

4.3.2 FACTORS INFLUENCE ON PARENTAL DECISION

The study examined what influences parents' decision about their child immunogenicity as parental decision is the major factor to enhance the rate of child immunization(Qutaiba B Al-lela *et al.*, 2014). According to this research, more than 50% of Irish and Indian parents agreed that cost of vaccines and socio-demographic factors such as religious belief and certain ethnic culture do not act as barriers to the parental decision-making regarding Paediatric vaccination. This result is opposite compared to a study conducted by Shrivastwa et al in India, where high inequalities noted in the case of Paediatric vaccination coverage due to ethnic culture and religious belief(Shrivastwa *et al.*, 2015).

An interesting finding of this study was that majority of Indian parents reported the inadequate awareness of childhood vaccination in the society. Although, a significant number of Irish parents (62%) agreed that there is enough awareness of Paediatric vaccination in the society, 71% of them are concerned about the safety and side effects of vaccination for their children. Huber et al., (2020) concluded in their study, lack of awareness about vaccines and fear regarding the side effect and safety of vaccines are the most important reasons for not giving vaccines for children by parents(Huber *et al.*, 2020).

The collected data clearly demonstrated that around 75% of parents from India and Ireland agreed that the attitude of healthcare professionals have an important role in parental-decision making about child immunization. It was reported that healthcare professionals with greater knowledge will have favourable attitude toward vaccines(Herzog *et al.*, 2013). The study found an important result regarding the effect of present pandemic situation (Covid-19) on the practice of Paediatric vaccination. More than 70% of respondents reported that current state of COVID-19 has a great influence on the child immunization rate as they concerned about potential exposure to COVID during visits for vaccination.

4.3.3 KNOWLEDGE OF HEALTHCARE PROFESSIONALS

The study explored the knowledge of healthcare professionals working in India and Ireland about Paediatric vaccination to understand how aware they are about the same. Inadequate knowledge of healthcare professionals is found to be most important barrier in the coverage rate of vaccines among children(Esposito, Principi and Cornaglia, 2014). The findings of this study showed that majority of healthcare workers included in this survey have a good understanding regarding the Paediatric vaccination.

Around 90% of healthcare professionals responded correctly when they were surveyed about the mechanism of vaccines in children's immune system. It was interesting to note that the response from India and Ireland about the side effects of Paediatric vaccines was similar. 16% of healthcare workers are still concerned regarding the harmful adverse effects of the vaccination. Healthcare professionals who are not willing to recommend vaccines for children, are more anxious about the side effects of vaccination(Herzog *et al.*, 2013). At the same time, total 92% of participants agreed that Paediatric vaccination is the simplest and safest way to increase children's immunization.

In order to understand healthcare professional's knowledge regarding the effect of combined vaccines such as Diphtheria, Tetanus and Pertusis (DTP), they were asked to choose correct answer to a statement (7), majority of respondents (81%) provided correct answer, whereas 28% from Ireland responded with incorrect answer. A study conducted in Germany, reported that many of the physicians included in the study recommended to take combined vaccines than taking single vaccines for several time(Schupfner *et al.*, 2002). It was significant to report that 50% of healthcare professionals from India said that following good hygiene can tolerate the spread of infectious diseases even without vaccination; it was 34% from Ireland.

However, the study found that more than 60% of healthcare professionals are unaware of the long term immunogenicity of Paediatric vaccines compared to proper breastfeeding. Van de Perre reported that healthcare professionals should encourage breastfeeding so as to improve the effect of vaccines in infants(Van de Perre, 2003). An unexpected response obtained from healthcare professionals that total of 53% preferred to avoid routine vaccination for children

when they have mild diseases like a cold. A study conducted by Richard and Sheridan reported that minor diseases is generally considered as a contraindication to the practice of Paediatric vaccination by parents and healthcare professionals(Richards and Sheridan, 1999).

Finally, healthcare professionals were assessed to evaluate their awareness about the practice of Paediatric vaccination during this Covid-19 pandemic. A significant number of (Ireland=28 and India=27) participants said to follow routine vaccination schedule for children even in this pandemic situation as directed by WHO.

4.3.4 FACTORS ASSOCIATED WITH IMPLEMENTATION AN UPTAKE OF PAEDIATRIC VACCINATION

Finally, the researcher identified the barriers and enablers of the implementation and uptake of Paediatric vaccination. Majority of the healthcare professionals from India and Ireland agreed that economic factors such as educational status of parents and family income as a barrier to implement Paediatric vaccination. Similarly, the study found that demographic characteristics of parents like religion and place of residence have a negative influence on the rate of child immunization. This result is found to be more similar with results published by many previous studies(Harvey, Reissland and Mason, 2015), (Mills *et al.*, 2005) and (Stefanoff *et al.*, 2010)).

According to healthcare worker's opinion, misinformation regarding vaccination and anti-vaccination campaigns is found to be other barriers to the practice of vaccination among children. At the same time majority of participants from Ireland neither agreed nor disagreed to anti-vaccination campaign as a barrier to Paediatric vaccination. Smith et al., (2017) reported that advice and information against vaccination is one of the biggest barriers to the practice of Paediatric vaccination(Smith *et al.*, 2017). Most of the healthcare professionals reported that the reluctance of parents toward childhood vaccination as a barrier to the uptake of vaccination among children under 5 years of age. According to Whelan et al., (2020) and Yaqub et al., (2014), vaccine hesitation by parents has a detrimental impact on vaccination coverage rates and raises the risk of child mortality and morbidity throughout the world.

Next highlighted barrier was lack of communication between healthcare professionals and parents. As healthcare professionals found to be a key source of information to parents, it is important maintain a strong communication bond between parents and healthcare professionals(Smith *et al.*, 2017). A significant number of participants from India agreed that storage of vaccines as a barrier to the implementation of Paediatric vaccination, whereas 37% of healthcare professionals from Ireland provided neutral opinion to the same. Although the data collected from healthcare professionals, majority of them are not ready to accept the healthcare professional's lack of knowledge as a barrier to the implementation an uptake of Paediatric vaccination. The same result was reported in a study conducted in New Zealand; highlighted that only 4 nurses accepted healthcare providers knowledge as a barrier to the uptake of Paediatric vaccination(Petousis-Harris *et al.*, 2005).

The findings of the study identified the key enablers to the implementation and uptake of Paediatric vaccination. Continuous improvement programs and training for healthcare professionals regarding the importance of Paediatric vaccination is found to be a best enabler to enhance the coverage rate of vaccination among children. Healthcare professionals with more training is found to be more confident in recommending vaccination for children(Petousis-Harris *et al.*, 2005). Majority of participants (90%) agreed that improved availability of high quality data about the infant population in the region about the vaccinations undertaken can facilitate the uptake level of Paediatric vaccination.

The study introduced new intervention; getting signed consent from parents at the time of delivery to follow routine immunization schedule for their children. Around 80% of healthcare professionals supported with the new intervention as an enabler to the implementation of Paediatric vaccination. Close monitoring of children by parents to follow proper vaccination schedule is identified as an enabler to the practice of vaccination. Even though it is difficult for individuals who working in healthcare sector, 88% from Ireland and 81% from India supported a door to door practice to educate the society regarding the importance of Paediatric vaccination.

CHAPTER 5

CONCLUSION

5.1 PARENTAL ATTITUDE AND FACTORS INFLUENCES PARENTAL DECISION

In conclusion, majority of parents in Ireland and India have a positive attitude towards Paediatric vaccination. The study identified that there is no relation between the attitude of parents towards Paediatric vaccination and country they live in, except for the parental views on school entry requirement for unvaccinated children. According to the collected data, willingness of parents to recommend vaccines for children and their trust in Paediatric vaccination were found to be similar in India and Ireland. A positive attitude was reflected with a significant number of participants when they were surveyed about the harmful side effects of childhood vaccination.

Although, a positive attitude was reflected by majority of parents, there still remained a significant number of them concerned about the painful process of vaccination with multiple injections in a single visit, indicating fear of parents and a reason for vaccine hesitancy by parents thereby, decreasing the uptake level of Paediatric vaccination. In fact, majority of parents from Ireland, were still worried about the side effects of vaccination for children, while a great number of Indian parents reported lack of awareness regarding the child's immunogenicity in the society as the reason to avoid vaccination for their children. The study identified that attitude of healthcare professional and present situation of Covid-19 are the other factors influencing parental decision-making.

Overall, despite the favourable attitude of parents towards Paediatric vaccination, lack of awareness about the importance of vaccination in the society, concerns regarding the side effects of vaccination, multiple injections in a visit, attitude of healthcare professionals and current situation of Covid-19 were found to have great influences on the implementation and uptake of Paediatric vaccination in India and Ireland.

5.2 KNOWLEDGE OF HEALTHCARE PROFESSIONALS ABOUT PAEDIATRIC VACCINATION

The researcher evaluated that majority of healthcare professionals have a good knowledge regarding Paediatric vaccination. It can be concluded that the knowledge of healthcare professionals is not dependent upon the country they work in. According to gathered data, a large proportion of participants fall into the good and average knowledge category. Majority of healthcare professionals have good understanding of vaccine mechanism, quality and safety of vaccines and practice of Paediatric vaccines during this pandemic situation.

Surprisingly, a significant number of healthcare professionals still believe that it is unsafe for children to be vaccinated while they have mild disease. Despite the extensive knowledge of healthcare professionals about child immunization, majority of them still feel that proper breastfeeding can protects infants from infectious diseases than vaccination. It is essential to provide more training for healthcare professionals and to conduct immunization programs in the society to rectify misinformation regarding childhood vaccination and to encourage the good practice of vaccination among children.

5.3 BARRIERS AND ENABLERS OF PAEDIATRIC VACCINATION

It can be concluded that a number of factors limit the implementation and uptake level of Paediatric vaccination. According to healthcare professionals, economic variables such as parents' educational status and demographic characteristics of parents like religion and certain ethnic culture have a detrimental impact on the practice of Paediatric vaccination. It may be a reason for many of parents to avoid vaccination for children. Likewise, misinformation regarding Paediatric vaccination, anti-vaccination campaigns and insufficient facility to store vaccines have all been identified as challenges to implement vaccination for children. Another important barrier identified by healthcare professionals was parental reluctance to Paediatric vaccination. As parents have a major role in paediatric immunization, it is their responsibility to protect their children from infectious diseases. Despite the fact that majority of healthcare professionals disagreed on accepting lack of their own knowledge to be a barrier, they all agreed that the most significant barrier to the uptake of child vaccination was the lack of communication between parents and healthcare professionals.

The study identified various enablers to improve the practice of Paediatric vaccination. The establishment of continuous improvement programs and training for healthcare professionals was considered to aid in the advancement of the healthcare professional's expertise, allowing them to recommend and update parents on the importance of Paediatric vaccination. It is mandatory to conduct various health and educational programs to enhance community knowledge as well as to correct misinformation regarding the Paediatric vaccination. Getting signed consent from parents at the time of delivery, would make them more conscious about the immunogenicity of their children. Improved availability of high quality data about infant population, improved facility to store vaccines and closely monitoring children to follow routine immunization schedule were identified as other ways to improve the uptake level of Paediatric vaccination. Door to door visit by healthcare professionals would improve the communication bond between parents and healthcare providers and help parents to make more informed decisions for their children's immunogenicity.

It is the crucial time to provide adequate training and establish immunization events to improve vaccination coverage rate. The programs should focus more on healthcare professional's knowledge and parental behaviour as they play an important role in the practice of Paediatric vaccination. Door to door visit by healthcare providers, close monitoring of children, availability of high quality data about the infant population and improved facility to store vaccines at health centres will helps to increase the uptake of Paediatric vaccination. The study recommends collecting signed consent from parents to follow routine vaccination for their children and make them more conscious about the child immunogenicity. The key facilitator to improve the practice of childhood vaccination is the strong communication bond between parents and healthcare professionals. As a result, it is necessary to update information regarding child immunization in the society in order to minimize the global childhood mortality rate.

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APPENDIX 1: QUESTIONNAIRE FOR HEALTHCARE PROFESSIONALS

A QUANTITATIVE STUDY ON FACTORS ASSOCIATED WITH THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION IN INDIA AND IRELAND

A research on "Factors associated with the implementation and uptake of Paediatric vaccination in India and Ireland" is conducted as a part of my master's program. The purpose of the study is to evaluate the attitude of parents towards Paediatric vaccination and knowledge of healthcare professional about Paediatric vaccination. This survey will also help to identify the barriers and enablers of the practice of Paediatric vaccination in India and Ireland.

The survey will take around 3-5 minutes to complete. If you have any questions on this survey, please do not hesitate to contact me.

Contact: nithyamariageorge@gmail.com

Thank you for your time.

Required*

QUESTIONNAIRE FOR HEALTHCARE PROFESSIONALS

1) Do you understand the reason for the study?
- ○ Yes
- ○ No

2) I voluntarily agree to participate in this research?
- ○ Yes
- ○ No

SECTION 1: DEMOGRAPHIC DETAILS

3) What is your medical profession?

○ Doctor ○ Nurse ○ Pharmacist ○ other

4) Which country do you work in?

○ India ○ Ireland

SECTION 2: KNOWLEDGE SECTION

5) State whether the statement is correct or not?

STATEMENT	YES	NO
Vaccines interact with the children's immune system and produce antibodies that are quite close to those produced by a normal infection.		
Paediatric vaccines do not cause any diseases or put your children at risk of its potential side effects.		
If good hygiene and proper sanitation are provided then diseases will not spread even without vaccination.		

Paediatric vaccine contains toxins.		
Giving a child multiple vaccination for different diseases at the same time increases the risk of harmful side effects and can overload the immune system		
Proper breastfeeding gives better long term immunogenicity than vaccines.		
The combined vaccine against Diphtheria, tetanus and pertussis (DTP) will not cause sudden child death.		
Children with mild diseases like cold, fever etc. should not receive their routine vaccines.		
Children should not be given their routine vaccination during this Covid-19 pandemic.		
Paediatric vaccination is the safest and simplest way to boost infant's immune system.		

SECTION: 3 BARRIERS TO THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION

6) To what extent do you agree that the following factors act as a barrier to the practice of Paediatric vaccination?

BARRIERS	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Education of parents					
Family Income					
Religion of parents					
Place of residence (rural/urban)					
Anti-vaccination campaign					
Misinformation regarding Paediatric vaccination					
Reluctance of parents towards Paediatric vaccination					
Healthcare professional's Lack of Knowledge about Paediatric vaccination.					
Lack of communication between healthcare workers and parents.					
Difficulty to store vaccines at vaccination centers.					

SECTION: 4 ENABLERS OF PAEDIATRIC VACCINATION

7) To what extent do you agree that the following factors act as an enabler to the practice of Paediatric vaccination?

ENABLERS	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Continuous improvement programs and training for healthcare workers					
Close monitoring of infants and children by healthcare workers.					
Improved facility for the storage of vaccines.					
Improved availability of high quality data about the infant population in the region about the vaccinations undertaken.					
Getting signed consent from all parents at child birth.					
Door to Door practice (the healthcare worker should visit, educate and remind the time for vaccination).					
Reduced cost of vaccines					

APPENDIX 2: QUESTIONNAIRE FOR PARENTS

A QUANTITATIVE STUDY ON FACTORS ASSOCIATED WITH THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION IN INDIA AND IRELAND

A research on "Factors associated with the implementation and uptake of Paediatric vaccination in India and Ireland" is conducted as a part of my master's program. The purpose of the study is to evaluate the attitude of parents towards Paediatric vaccination and knowledge of healthcare professional about Paediatric vaccination. This survey will also help to identify the barriers and enablers of the practice of Paediatric vaccination in India and Ireland.

The survey will take around 3-5 minutes to complete. If you have any questions on this survey, please do not hesitate to contact me.

Contact: nithyamariageorge@gmail.com

Thank you for your time.

Required*

QUESTIONNAIRE FOR PARENTS

1) Do you understand the reason for the study?
- ○ Yes
- ○ No

2) I voluntarily agree to participate in this research?
- ○ Yes
- ○ No

Section 1: Demographic characteristics

3) Age of the participant?

○ 18-24 ○ 25-34 ○ 35-44 ○ 45-54 ○ above 55

4) Country of residence?

○ India ○ Ireland

5) How many children do you have?

○ One ○ two or more children

Section 2: Parental attitude towards Paediatric vaccination

6) Do you have trust in Paediatric vaccination programs run by government?

○YES ○ NO

7) Would you recommend vaccination for infants and children?

○YES ○ NO

8) In your opinion is it necessary for children to be vaccinated against common childhood diseases?

○YES ○ NO

9) Mark in the suitable column your views against each points

STATEMENT	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Vaccinations increases children's immunogenicity.					
Vaccinations cause harmful side effects.					
Is it painful to have multiple injections in a single visit?					
Unvaccinated children should not be allowed in school.					
Paediatric vaccination is a waste of time and money.					

10) Factors that influence parental decision regarding Paediatric vaccination. Please mark your response to the following questions.

Questions	YES	NO
Are the vaccines affordable for an average family?		
Do you think there is enough awareness with regards to the importance of vaccination in the society?		
Is there a concern regarding the safety of vaccination or side effects of vaccines?		
Do you think religious beliefs have influence on the uptake of Paediatric vaccination?		
Do you think ethnic cultures have influence on the uptake of Paediatric vaccination?		
Do you think attitude of healthcare professionals influences vaccination?		
Do you feel the present pandemic situation (Covid-19) can affect the Paediatric vaccination?		

APPENDIX 3: PARTICIPANT COSENT FORM

PARTICIPANT COSENT FORM

- I…… voluntarily agree to participate in this research "A QUANTITATIVE STUDY ON FACTORS ASSOCIATED WITH THE IMPLEMENTATION AND UPTAKE OF PAEDIATRIC VACCINATION IN INDIA AND IRELAND".
- I understand that even if I agree to participate now, I can withdraw at anytime or refuse to answer any question without giving any reason for my withdrawal.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that I will not benefit directly from participating in this research.
- I wish to participate in the study under the conditions set out in the Information Sheet.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that under freedom of information legalizations I am entitled to access the information I have provided at any time while it is in storage as specified above.

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Signature of participants Date

I believe the participant is giving informed consent to participate in this study

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Signature of Researcher Date